INTERNATIONAL LABOUR OFFICE

ICLS/20/2018/Room document 15

20th International Conference of Labour Statisticians
Geneva, 10-19 October 2018

Room Document*: 15

# Measurement of qualifications and skills mismatches of persons in employment

* This room document has not been formally edited

Room document

20th ICLS, Geneva, October 2018

# Measurement of qualification and skill mismatches of persons in employment[1]

## Contents



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# Abbreviations

| | |
|---|---|
| BLS | Bureau of Labor Statistics, United States Department of Labor |
| CEDEFOP | European Centre for the Development of Vocational Training |
| ESCO | European Skills, Competences, Qualifications and Occupations (ESCO) classification |
| ICLS | International Conference of Labour Statisticians |
| ILO | International Labour Organization |
| ISCO | International Standard Classification of Occupations |
| ISCED | International Standard Classification of Education |
| ISCED-F | International Standard Classification of Education: Fields of Education and Training |
| LFS | Labour force survey |
| OECD | Organisation for Economic Co-operation and Development |
| PIAAC | Programme for the International Assessment of Adult Competences |
| SDGs | Sustainable Development Goals |
| SWTS | School-to-work-transition survey |
| UNECE | United Nations Economic Commission for Europe |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| WEF | World Economic Forum |

## Introduction

1. Qualification and skill mismatches have become an issue of particular policy concern in both developed and developing countries, following rapid changes in labour markets, globalization, labour migration, technological change and demographic change. It is now a global priority to streamline qualifications and occupational skills to ensure better employment outcomes and employability for workers and increased productivity and competitiveness of the economy. The importance of skills and the implications of labour underutilization for economic and social development were emphasized by the international community in the 2030 Agenda for Sustainable Development (UN, 2015), in particular in Sustainable Development Goals (SDGs) target4.4*:*

   > "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship;"

   and SDGs target 8.5:

   > "By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value".

2. The International Labour Organization (ILO) has always played a lead role in promoting full and productive employment as an important pathway to sustainable development. This concept was embodied in the ILO Declaration of Philadelphia (ILO, 1944), article III of which recognizes, among other things, the need to achieve:

   > (a) full employment and the raising of standards of living;
   > (b) the employment of workers in occupations in which they can have the satisfaction of giving the fullest measure of their skill and attainments and make their greatest contribution to the common well-being.

   Thus, while employment is a precondition for personal development and social inclusion, it will only be satisfactory if skills and qualifications are developed and used to their full potential.

3. Statistics on various forms of mismatches (both incidence and trends) are in great demand for use by policy departments, educational institutions and businesses. Reliable internationally harmonized statistics on the qualifications (both formal and informal) and skills possessed and used by workers provide a better understanding of their impact on labour market outcomes and ensure that effective policy measures and tools are formulated to improve the quality and relevance of skills formation. The ILO has seen a growing demand for both statistical data and conceptual guidelines on the measurement of various form of mismatches so that monitoring systems can be established.

4. The resolution concerning statistics of work, employment and labour underutilization adopted by the 19th International Conference of Labour Statisticians (ICLS) in 2013 defines three measures of insufficient labour underutilization: (a) time-related underemployment, (b) unemployment and (c) potential labour force. While the resolution notes that the term "labour underutilization" refers, in addition to insufficient labour absorption, to various forms of inadequate labour absorption, such as skill mismatch, inadequate income or excessive working time, it does not define these terms or provide operational definitions.

5. The 19th ICLS therefore requested that the ILO, in collaboration with interested countries, international, regional and subregional organizations, workers' and employers' representatives, continue methodological work, in reference to this resolution, on the measurement of underutilization or inadequate employment related to skills, employment-related income and excessive working time, and report to the 20th ICLS with a view to the future adoption of international statistical standards.

6. In order to respond to the part of this request regarding the measurement of inadequate employment related to skills, the ILO Department of Statistics has prepared draft guidelines on the measurement of qualification and skill mismatches that may affect persons in employment (see appendix III). In addition to providing guidelines on best practices in the measurement of various types of mismatches, the purpose of the guidelines is also to provide a basis for the production of internationally comparable statistics on the topic.

7. The Conference may wish to discuss:

   (a) the suitability and relevance of the proposed statistical definition of qualification and skill mismatches of persons in employment;

   (b) the suitability of approaches that can be applied to the measurement of qualification and skill mismatches in household-based surveys;

   (c) the possibility of adopting the draft guidelines contained in appendix III as a set of international statistical guidelines;[2]

   (d) future steps in developing international statistical standards on this topic.

**Structure of the report**

8. The present report, which has been prepared to facilitate discussion at the 20th ICLS, is organized as follows:

   *Chapter 1*: historical background
   *Chapter 2*: objectives and potential uses of statistics on qualification and skill mismatches
   *Chapter 3*: concepts and definitions
   *Chapter 4*: approaches to measuring qualification and skill mismatches
   *Chapter 5*: data collection, analysis and dissemination
   *Chapter 6*: estimates of qualification mismatches based on different approaches

   Appendix I provides an overview of various approaches to measuring qualification and skill mismatches; appendix II includes examples of questions used in collecting information on qualification and skill mismatches; and appendix III proposes draft guidelines concerning the measurement of qualification and skill mismatches of persons in employment.

[2] The guidelines are meant to serve as a starting point to promote further development of common international standards on the topic.

## Chapter 1. Historical background

9. The measurement of underutilization of skills has been discussed by ICLS on several occasions; however, ICLS has not adopted a definition of underutilization related to skill that can be used for measurement purposes.

10. The issue of underemployment related to the misuse of skills was discussed for the first time at the 9th ICLS (ILO, 1957), when together with low income it was categorized as "disguised underemployment".

11. The 11th ICLS (ILO, 1966) also discussed underutilization of skills in terms of disguised underemployment but failed to develop and agree criteria for measurement. It recommended that experimental surveys and studies, particularly in regard to selected sectors or specific worker categories concerned, be undertaken for the purpose.

12. The problem of how to define and measure underutilization of skills was not addressed until 1998, when the draft resolution concerning the measurement of underemployment and inadequate employment situations was discussed by the 16th ICLS (ILO, 1998a). The Conference adopted the international statistical definition of time-related underemployment and highlighted the importance of producing separate indicators for three other forms of inadequate employment situations: (a) skill-related inadequate employment, (b) income-related inadequate employment and (c) inadequate employment related to excessive hours. However, because insufficient experience was available to measure skill-related and other forms of inadequate employment, the Conference did not adopt an operational definition or methods for measuring the inadequate employment situation. Therefore, the 16th ICLS requested the ILO to further develop concepts and definitions for indicators of inadequate employment (ILO, 1998b, para. 22).

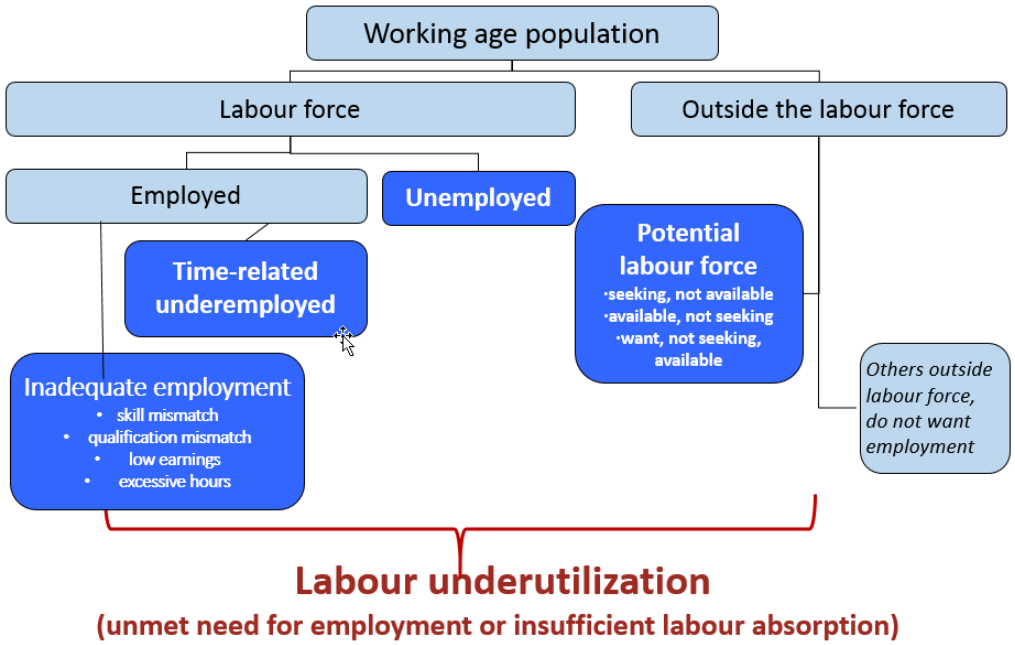
13. The concept of labour underutilization was discussed again by the 18th ICLS (ILO, 2008), when a proposal for a composite indicator on labour underutilization was developed and discussed. For estimating the component of labour underutilization related to overskilling, the proposed proxy indicator was years of completed schooling and the corresponding cut-off was the first standard deviation above the mean for completed years of schooling in the detailed occupation group. During the discussion, it was pointed out that the level of educational attainment was only a rough indicator of skill level and the occupation was only a rough indicator of skill use. The Conference agreed that further methodological work was needed to determine the most appropriate approach to measuring skill underutilization and other inadequate employment situations.

14. The 19th ICLS adopted the resolution concerning statistics of work, employment and labour underutilization (ILO, 2013a), which defines labour underutilization as a mismatch between labour supply and demand and defines three measures of labour underutilization: (a) time-related underemployment, (b) unemployment and (c) potential labour force. The 19th ICLS resolution notes that other dimensions of labour underutilization are skill mismatches and slack work, but it does not define those concepts (ILO, 2013a, para. 42). Therefore, in the discussion of recommendations on future work of the ILO in the field of labour statistics, the 19th ICLS identified as a priority further work on the measurement of underutilization or inadequate employment related to skills, employment-related income and excessive working time (ILO, 2013b).

**Development of proposal**

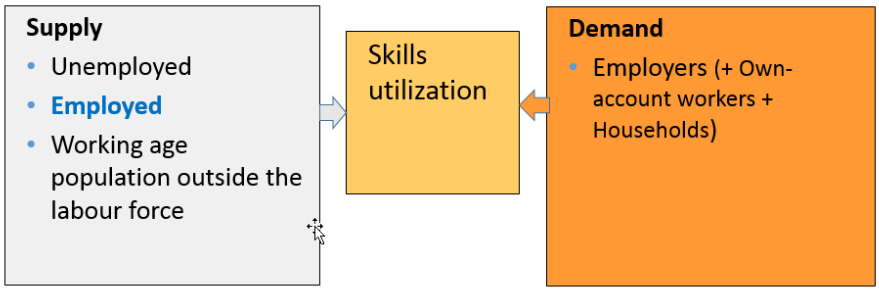
15. In order to respond to the need for conceptual and practical guidelines on the measurement of inadequate employment, the ILO Department of Statistics has begun work on reviewing and testing various approaches to measuring labour underutilization related to the inadequate use of skills and low earnings. However, the quality, availability and comparability of earnings data available at the ILO was assessed as insufficient to test the suitability of various approaches in a meaningful way. In addition, it was felt that the nature of the problem of low earnings required different policy interventions than those related to skill mismatch. As highlighted by the 16th ICLS, low earnings may be seen as an outcome rather than a source of inadequate employment. Therefore, it was felt that it would be more appropriate to treat skill mismatch separately from other forms of inadequate employment (e.g. low income, excessive hours, etc.).

**Figure 1. 19th ICLS labour underutilization and inadequate labour absorption**




16. The work done therefore focused on preparing draft guidelines on the statistical definition and measurement of various forms of mismatch that may affect persons in employment. In that process, consistency with existing standards related to labour statistics and education statistics was a key guiding principle, as well as the feasibility of measuring mismatch in statistical surveys. The ILO also has relied on the methodological work undertaken in a number of member countries and the work done by the Organisation for Economic Co-operation and Development (OECD) and the European Centre for the Development of Vocational Training (CEDEFOP). Efforts to measure labour underutilization related to qualification and skill mismatches have shown that, in most if not all countries and regardless of the measurement approach used, overqualification and overskilling coexist with undereducation and underskilling. Therefore, it was decided to cover and measure both sides of the coin, because overeducation and/or overskilling may require different policy interventions from undereducation and/or underskilling. A second key finding was that different approaches resulted in different estimates of qualification and skill mismatches. A third finding was that practical measurement considerations could not be neglected.

**Figure 2. Supply and demand of skills[3]**




17. A draft conceptual framework for defining and measuring qualification and skill mismatches was presented to a series of meetings and discussed by a group of experts at an informal technical expert meeting on the measurement of inadequate employment related to skills, organized by the ILO in September 2017. The proposed definitions, measurement approaches and the feasibility of data collection were discussed and a number of suggestions made.

18. Some of the main outcomes of the consultation process were that (a) the educational attainment is not a suitable variable for measuring skill and skill mismatch; (b) there was a need to make a distinction between qualification and skill mismatch; and (c) the correlation between various types of mismatches needs to be analysed. It was also noted that the measurement of skills mismatch requires the inclusion of additional variables on skill-related job characteristics in labour force surveys (LFSs) or other statistical surveys, covering both technical and soft skills. Participants also expressed concerns about the use of the International Standard Classification of Occupations (ISCO) as the basis for the measurement of qualification and skill mismatches, in particular regarding the difficulty of keeping ISCO up-to-date in terms of qualification and skill requirements and regarding heterogeneity within occupational groups.[4] It was also noted that skills could be acquired not only through formal education but also through a process of non-formal or informal learning.

19. In view of the practical and conceptual difficulties of measuring skills mismatch based on ISCO-08, priority was given to the development of another measure of skill mismatch. A measurement approach based on the self-perceived match between a person in employment's level of skills and the level of skills required by the job was considered an informative and useful approach. Since workers also acquire new skills outside formal education through on-the-job training, experience, self-learning, social activities or volunteering etc., which are often unrecognized, it was noted that they are themselves best placed to assess the level and/or types of skills required for their job against their own skills. It was also pointed out that the concept of skills is complex in that it covers many different skills, so that treating skills as a unidimensional concept could lead to different results than treating skills as a multidimensional concept. The view was expressed by some that the measurement of qualification mismatch should be based on qualification requirements as

[3] Qualification and skill mismatches of persons not in employment are outside the scope of this discussion paper and the proposed draft guidelines.

[4] Therefore, any work to review or update ISCO-08 would need to take into consideration its suitability for the measurement of qualification and skill mismatches.

specified in relevant legislation or national practice for specific occupation or occupational groups or, in the absence of these, according to empirically determined criteria.

20. To test the statistical feasibility of proposed approaches to measuring qualification and skill mismatches with a limited number of additional variables in ongoing LFSs and other household-based surveys, data-collection tools have been developed and are being tested in a few countries.

## Chapter 2. Objectives and uses of statistics on qualification and skill mismatches

21. Qualification and skill mismatches are complex phenomena that affect citizens, enterprises, economies and societies and have a big impact on individuals' labour market outcomes. Any form of mismatch signifies poor utilization of human capital and, if persistent, can result in high economic and social costs for workers, employers and society. In particular:

    (a) for workers, especially overqualified and/or overskilled workers, mismatch can result in lower wages, lower job satisfaction, loss of motivation, higher on-the-job search, unrealized expectations and a poor return on their investment in education. Underqualified and/or underskilled workers, on the other hand, can face a higher risk of being out of employment. Outcomes of matched workers may be also affected by mismatch due to increased completion from overqualified and/or overskilled workers;

    (b) for employers, mismatch can result in lost productivity, increased absenteeism, higher turnover of employees, lower growth and less innovation. The underutilization of skills can lead to skill depreciation, lower productivity because of increased employee turnover and impacts on workers' earnings and job satisfaction. The underqualification and underskilling of workers, on the other hand, can also slow down economic growth because workers lacking knowledge and skills are less able to adapt to technological changes;

    (c) for society, mismatch means wasted education costs because a skill that is not used can lead to a loss of skills and a waste of resources that were used to build up existing skills, higher costs of unemployment benefits since underqualified and/or underskilled workers are more likely to lose their jobs, especially in periods of recession, and lost income tax revenues due to the lower earnings of overqualified and/or overskilled workers.

    The total cost resulting from mismatch, in any given period, depends on the number of mismatched individuals and the type and severity of mismatches.[5]

22. Therefore, in order to support evidence-based policy-making to reduce mismatch, there is a need (a) to assess the extent to which the qualifications and skills of persons in employment correspond to the type and level of skills required by their jobs; (b) to identify qualification and skill deficits resulting from ongoing technical, structural and demographic changes in the economy; (c) to identify qualification and skill surpluses and workers whose skills and qualifications exceed those required by the job; and (d) to identify the causes and consequences of both overskilling and underskilling.

23. Statistics on the types, levels and trends of qualification and skill mismatches can provide measures of the extent to which the human resources of persons in employment are actually utilized or not. Such information is essential for macroeconomic and human resources development planning and policy formulation.

[5] It can be argued that not all types of mismatches are costly or undesirable.

24. A better understanding of the interaction between the supply of, and demand for, different types of skills can have important consequences for industrial and employment policies that foster demand and retraining, on-the-job training programmes that address skill shortages and skill gaps that influence supply. In order to ensure that skill needs are addressed and mismatches reduced, education and training systems need to have access to information on the type and level of skills and qualifications that are in demand and in supply, especially in industries and/or geographic areas of interest. When collected at different points in time, data provide a basis for monitoring current trends and changes in matching and employment outcomes. Another area of interest is the extent to which skills can compensate for a low level of education, since different types of skills are being acquired outside formal education, such as informal learning activities and on-the-job training. Statistics on mismatches can also be used to inform collective bargaining processes and labour migration policies, and can facilitate better-informed investment decisions by employers and workers in training and lifelong learning.

25. One of the areas in which policymakers are interested is how skill levels are related to labour market (economic) outcomes of individuals. Statistics on various form of mismatches can inform and contribute to a better understanding of the relationship between level of education, field of study and skills, on the one hand, and economic and social outcomes for individuals, including earnings, job mobility, job satisfaction and productivity, on the other. In addition, such information provides an input to statistics on quality of jobs and job satisfaction. Reducing skill mismatch is a crucial policy issue for social partners, including employers' and workers' organizations, because of its impact on job satisfaction, job-related stress and frustration, and financial and other material rewards for employees, such as making good choices and informed decisions on their employment and learning (careers).

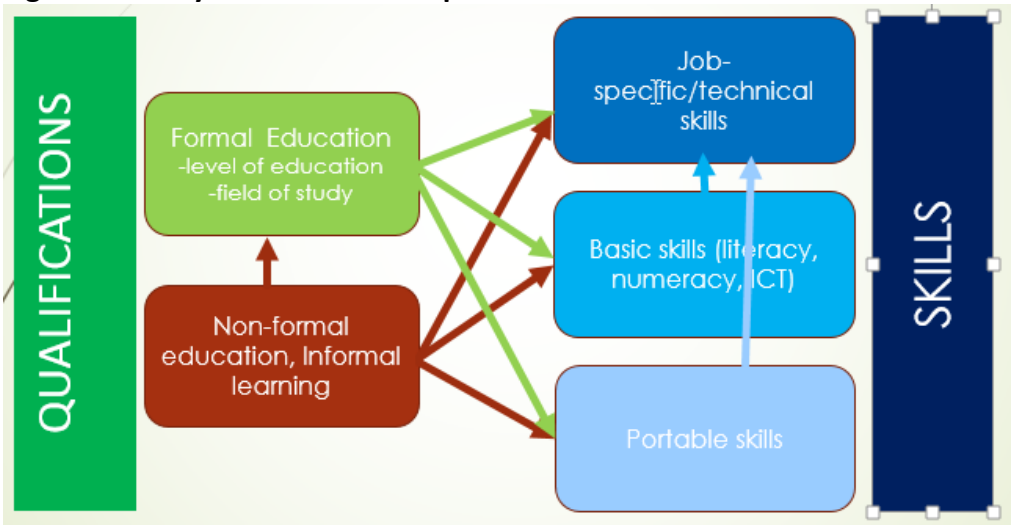
26. Finally, statistics on qualification and skill mismatches, when disaggregated, can be used to assess the extent to which population groups, such as women and men, young people, older workers, labour migrants, persons with disabilities and other groups of particular policy concern, are affected by various forms of mismatches. Policymakers have an interest in seeing which characteristics of education are most strongly related to higher skill levels in the population and which subgroups and age groups profit more from the investment in education and (re-)training.

## Chapter 3. Concepts and definitions

**Concepts**

27. Over the years, the terms "qualifications" and "skills" have been used interchangeably,[6] which may lead to misinterpretation of results. However, although qualification is an approximation of skills, the knowledge and competencies mastered at the time of completion of educational programmes provide only a very rough indicator of skills because they may either (a) become obsolete over time if not used, or (b) increase as workers acquire new skills outside formal education through on-the-job training, experience, self-learning, social activities or volunteering etc. In addition, qualifications do not indicate an individual's ability: two persons with the same qualification may have very different abilities. Hence the need to separately define and measure qualification and skills.

**Figure 3. Analytical framework: qualifications and skills**




28. Educational attainment, qualifications and field of study are defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in ISCED 2011 (UNESCO, 2012a) and ISCED-F 2013 (UNESCO, 2015a), as follows:

(a) *educational attainment* is the highest level of education an individual has successfully completed. This is usually measured with respect to the highest education programme successfully completed, which is typically certified by a recognized qualification;

(b) *qualification* is the official confirmation, usually in the form of a document, obtained through:

(i) successful completion of a full education programme;

(ii) successful completion of a stage of an education programme (intermediate qualifications); or

[6] Other terms in use with meanings that overlap the term "skills" include the terms "ability", "talent", "aptitude", "competence", "competency", etc.

(iii) validation of acquired knowledge, skills and competencies, independent of participation in an education programme (acquired through non-formal education or informal learning).[7]

It is an official record (certificate, diploma) which recognizes successful completion of education or training, or satisfactory performance in a test or examination. The latter means that qualifications obtained through validation of knowledge, skills and competencies gained by means of non-formal education and/or informal learning, could be recognized by relevant national education authorities, as equivalent to formal education qualifications;

(c) *field of study* is a broad domain, branch or area of content covered by an education programme, course or module.

29. Skills, and specifically employability skills, are defined by the ILO (ILO, 2000, para. 9) as follows:

> " …the skills, knowledge and competencies that enhance a worker's ability to secure and retain a job, progress at work and cope with change, secure another job if he/she so wishes or has been laid off, and enter more easily into the labour market at different periods of the life cycle. Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem solving, information and communications technology (ICT) and communication and language skills, learning to learn skills, and competencies to protect themselves and their colleagues against occupational hazards and diseases. This combination of skills enables them to adapt to changes in the world of work. "

30. In the proposed guidelines (see appendix III), "skills" are defined as the innate or learned ability to apply knowledge acquired through experience, study, practice or instruction and to perform the tasks and duties required by a given job.

31. The focus of this definition is on the skills that are useful for a particular job and not on other skills that a person in employment may possess in other areas (e.g. artistic, cooking, grooming) irrelevant to the job.

32. The concept of skills includes all job-relevant skills that a person has acquired through experience, study, practice or instruction.

33. There is no international classification of skills or operational measure of skills. Taxonomies currently in use include rather long lists of different types of skills, abilities and fields of knowledge. For example, O*Net[8] includes 35 skills classified in 6 groups; 52 abilities classified in 4 groups; and 33 areas of knowledge. The ESCO[9] classification of skills includes 13,485

[7] To facilitate the recognition, validation and accreditation of all learning outcomes, in particular those of non-formal and informal learning, the UNESCO Guidelines for the Recognition, Validation and Accreditation of the Outcomes of Non-formal and Informal Learning (UNESCO, 2012b) were developed in 2012 .

[8] https://www.onetonline.org/find/descriptor/browse/Skills/

[9] https://ec.europa.eu/esco/portal

skills/competences**.** Although all of these are important, it may not be possible to measure them in statistical surveys because they are too numerous and apply individually to a small fraction of the employed. In addition, the importance of various skills may vary from one occupation to another as well as for the same occupation over time. Therefore, there is a need for more general groups that are broadly consistent with the type of skills specified in ISCO-08 and UNESCO recommendations. As shown in table 1, for defining skill levels ISCO-08, in addition to technical knowledge and skills determining the specialization, refers to literacy and numeracy skills, communication skills, manual dexterity and physical strength and/or endurance. UNESCO, in its publication *Education for All Global Monitoring Report 2012* (UNESCO, 2012c), identifies three main types of skills: (a) foundation skills, (b) transferable skills and (c) technical and vocational skills. Some skills research and policy literature distinguishes between cognitive and non-cognitive skills, non-routine and routine skills, and manual and analytical skills.

**Table 1. Skill levels: ISCO-08**

| ISCO 08 Occupation | Skill level | Formal education required ISCED 2011 | Soft skills required | Work experience/Training required |
|---|---|---|---|---|
| Managers | 3, 4 | 5, 6, 7, 8 | Extended levels of literacy/numeracy,<br>Excellent interpersonal communication skills<br>Problem-solving, decision-making and creativity | Extensive experience and on-the-job training |
| Professionals | 4 | 6, 7, 8 | | |
| Technicians and Associate Professionals | 3 | 5 | High level of literacy and numeracy,<br>Well-developed interpersonal communication skills | Extensive experience and prolonged on-the-job training |
| Clerical Support Workers | 2 | 2, 3, 4 | Moderate literacy and numeracy,<br>Good interpersonal communication skill<br>Manual dexterity | On-the-job training |
| Services and Sales Workers | 2 | 2, 3, 4 | | |
| Skilled Agricultural, Forestry and Fishery Workers | 2 | 2, 3, 4 | | |
| Craft and Related Trades Workers | 2 | 2, 3, 4 | | |
| Plant and Machine Operators and Assemblers | 2 | 2, 3, 4 | | |
| Elementary Occupations | 1 | 1 | Basic literacy and numeracy<br>Physical strength and/or endurance | Short period of on-the-job training |

34. The review of various frameworks reveals that the concept of skills encompasses job-specific knowledge and skills required to perform a particular job, as well as soft skills that can be applicable to broad categories of jobs and occupations. Therefore the present proposal is to make distinction between:

    (a) *Job-specific/technical skills*, including specialist knowledge needed to perform job duties, knowledge of particular products or services produced, ability to operate specialized technical tools and machinery, and knowledge of materials worked on or with;[10]

    (b) *Basic skills*, such as literacy, numeracy, and information and communications technology (ICT) skills;

    (c) *Portable skills*, including but not limited to problem-solving and other cognitive skills, physical skills, language skills, socio-emotional and personal behavioural skills

[10] These concepts are considered in ISCO-08 for determining skill specialization (ILO, 2012).

35. Job-specific/technical skills are skills particular to an industry or a job that are not easily transferable from job to job. They are easily recognizable and observable. They include skills and competences needed to perform a given job, such as the ability to apply knowledge, use technology, methods, materials, tools and instruments, and build on combinations of transferable skills. Basic skills, such as literacy and numeracy and also ICT skills are considered as a prerequisite for further education and training and for acquiring transferable and technical and vocational skills. Portable skills are skills that are relevant to a broad range of jobs and occupations and can be easily transferred from one environment to another. The scope of portable skills includes a much longer list of skills, many of which are socially constructed concepts, intangible and more difficult to observe. The importance of different types of transferable skills varies across occupations as well as within the same occupations over time.11

36. A recent UNESCO review of the use of transferable skills in technical and vocational education and training in Asia and the Pacific (UNESCO, 2015b) concluded that there is emerging agreement that transferable skills play an important role in the workplace. The review further notes that there is no clear-cut agreement on the definition or understanding of the scope of transferable skills within regions or countries. However, according to the review, country experiences reveal some skills that fall under the transferable skills umbrella and are common to most if not all countries in the region, including communication, collaboration, problem-solving, entrepreneurship and learning to learn.

37. Although all jobs require skills, different types of skills and levels of proficiency may be required for different occupations or groups of occupations, depending on the complexity and range of tasks and duties to be performed on the job. Therefore, there is a need to take into consideration both the type and level of skills required for competent performance on the job. In ISCO-08, when determining the skill level, references are made to basic, moderate, high-level and extended proficiency of various skills.

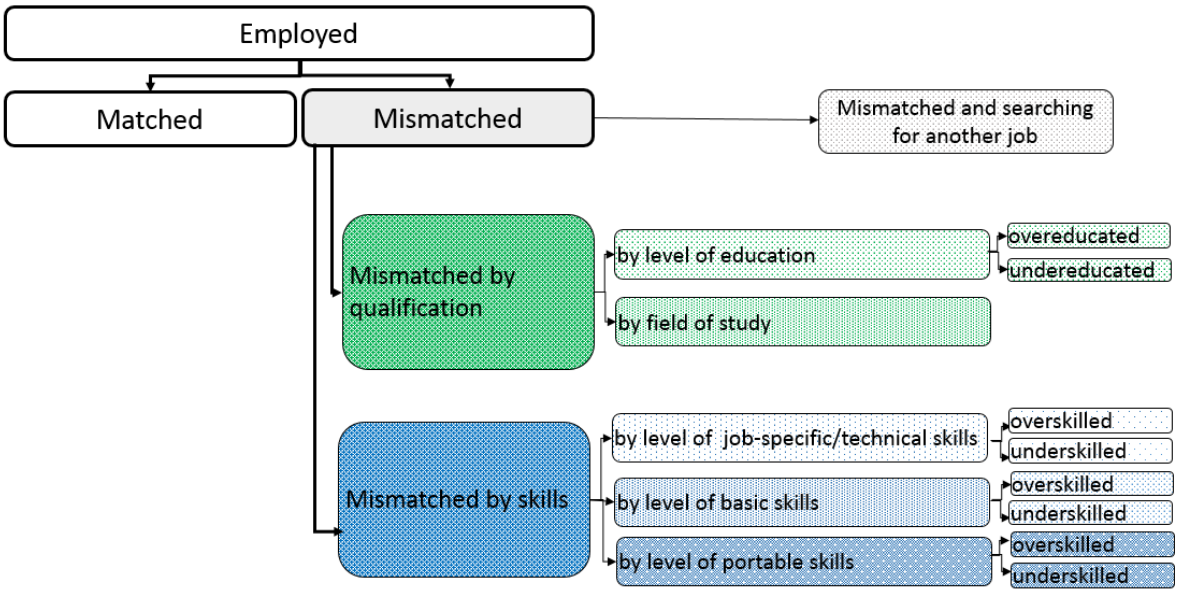
**Mismatch definitions**

38. A person in employment may experience two main forms of mismatches: qualification mismatch and skill mismatch.

39. Mismatch is defined with reference to the requirements of a job, i.e. from the demand side.

**Figure 4. Mismatch of persons in employment**

[11] For details, see World Economic Forum, *The Future of Jobs: Employment, Skills and the Workforce Strategy for the Fourth Industrial Revolution*, Global Challenge Insight Report (Geneva, 2016); available at https://www.weforum.org/reports/the-future-of-jobs




40. Qualification mismatch refers to a situation in which a person in employment, during the reference period, occupied a job whose qualification requirements did not correspond to the level and/or type of qualification they possessed.

41. Qualification mismatch includes:

(a) *Mismatch by level of education*: arises when the level of education of the person in employment does not correspond to the level of education required to perform their job:

- *Overeducation occurs when the level of education and training of the person in employment is higher than that required to perform their job;*
- *Undereducation occurs when the level of education and training of the person in employment is lower than that required to perform their job;*

(b) *Mismatch by field of study*: occurs when the field of study of the person in employment does not correspond to the field of study required to perform their job. Persons in employment working in a job unrelated to their field of study) are treated as persons in employment with a mismatched job.

42. Skill mismatch refers to a situation in which a person in employment, during the reference period, occupied a job whose skills requirements did not correspond to the skills they possessed.

43. Skill mismatch may refer to mismatch of overall skills or a mismatch of type of skills. A mismatch of type of skills includes:

(a) *Mismatch of job-specific/technical skills*;

(b) *Mismatch of basic skills*;

(c) *Mismatch of portable skills*.

44. A person in employment may experience:

- *Overskilling*, which arises when the level and/or types of skills of the person in employment exceeds those required to perform their job;
- Underskilling, where the level and/or type of skills of the person in employment is lower than those required to perform their job.

# Chapter 4. Measurement

45. The measurement of qualification and skill mismatches is based on the requirements for the main job in which a person is employed. Where relevant, a person holding more than one job may also be considered as matched or mismatched on the basis of the requirements for their other jobs.

**Qualification mismatch**

46. Most academic and policy analyses on mismatch have focused on education mismatches, mainly because the data needed to estimate such mismatches, such as data on occupation, level of educational attainment and/or field of study, are widely available from existing household-based surveys and establishment-based surveys.

*(a) Mismatch by level of education*

47. In the literature, there are three ways in which educational mismatch has been measured: the normative, statistical and self-assessment approaches, all of which use information about the highest level of educational attainment[12] of a person in employment, their occupation and the relevance of different levels of education to each occupation or occupational group.

48. In the normative approach, the mismatch is estimated by using a classification elaborated ex ante by a professional job analyst, in which the minimum level of educational attainment is specified for each occupation or group of occupations.[13] A person in employment is considered to be overeducated or undereducated if their attained level of education is above or below the requirements for their occupation or group of occupations (1-, 2- or 3-digit level of ISCO).

49. The statistical approach is based on the distribution workers' education levels within each occupation or occupational group to determine the level of education required for a job. The mismatch is estimated by:

(a) comparing the actual level of education of an individual worker with the modal level of education of all workers in their occupation or occupational group. In this approach, the modal level of education of all persons in employment in a given occupation or occupational group is used as a proxy for the required level of education for that occupation or occupational group. A person in employment is considered as overeducated or

[12] Alternatively, the number of completed years of schooling.

[13] For example, the US Dictionary of Occupational Titles (DOT), supplied by the US Department of Labor, and the Occupational Information Network (O*NET). Another example is the US BLS education and training classification system, developed by BLS analysts, which specifies for each occupation (a) typical education needed for entry, (b) commonly required work experience in a related occupation and (c) typical on-the-job training needed to obtain competency in the occupation. The US BLS *Occupational Outlook Handbook* (2016-2017) describes in addition to other information, the typical education and training requirements for 329 occupational profiles, covering 576 detailed occupation (details available at https://www.bls.gov/ooh/about/occupational-information-included-in-the-ooh.htm ).

undereducated if their level of education is greater or lower than the modal level of education of all persons in employment in the same occupation or group of occupations. Depending on the level of disaggregation, the heterogeneity of occupational groups and the precision of occupational estimates, the modal level of education may be determined at the level of an individual occupation or a group of occupations (1-, 2- or 3-digit level of ISCO); or

(b) comparing the actual years of schooling of an individual worker with the modal, median or mean years of schooling of all workers in their occupation or occupational group. In this approach, the mean, median or modal number of years of schooling of all persons in employment in a given occupation or a group of occupations is used as a proxy for the required number of years of schooling for that occupation of occupational group. A confidence interval (e.g. one standard deviation above/below the mean) around the average number of years of schooling may be used to account for the fact that the completion of most educational programmes requires more than one year of schooling. A persons in employment is considered overeducated or undereducated if their number of completed years of schooling is greater or lower than the average number of years of schooling (+/- confidence interval) of all persons in employment in the same occupation or group of occupations. Depending on the level of disaggregation, the heterogeneity of occupational groups and the precision of occupational estimates, the average number of years of schooling may be determined at the level of an individual occupation or a group of occupations (1-, 2- or 3-digit level of ISCO).

50. In the *self-assessment approach*, mismatch is derived from:

(a) workers' responses to a question on the self-perceived match between their level of education and the level of education required by their job (sometimes called the direct approach). In this approach, a person in employment is considered to be overeducated/undereducated if they report having a level of education that is higher/lower than that required to perform their current job; or

(b) workers' responses to a question on the level of education required to either get or perform[14] their current job, which is then compared to their actual level of education (sometimes called the indirect approach). In this approach, a person in employment is considered to be overeducated/undereducated if their level of education is above/below the modal value of the self-reported level of education appropriate to get the job or to perform the job reported by all workers in the same occupation or occupational group. As with the statistical approach, the mode may be determined at the level of an individual occupation or a group of occupations (1-, 2- or 3-digit level of ISCO).

51. All three approaches to qualification mismatch – normative, statistical and self-assessment – have their advantages and disadvantages.

[14] Canadian academic David Livingstone refers to mismatch by the level of education required *to get a job* as "entry credential matching" and mismatch by level of education required *to perform a job* as "performance matching".

52. The main advantage of the normative approach is that is based on a job analyst's knowledge about the requirements of a job. The main disadvantage is that classifications on which it is based are difficult to develop and are not always available at the national level. Even when they do exist, they quickly become obsolete because they are sensitive to technological change: as jobs become more complex, their educational requirements increase. Since classifications are based on entry requirements valid at the time of assessment was made, workers employed earlier or later may be incorrectly categorized as mismatched. In addition, the assumption that all jobs with the same occupational code are homogeneous (i.e. undertake exactly the same tasks) and require the same level of qualification may be questioned.

53. The main advantage of the statistical approach is that it is easy to apply and mismatch can be estimated just by using core variables covered in existing LFS or other household- based surveys. However, a major problem with this approach is that it also assumes the homogeneity of educational requirements for all jobs with the same occupational code. The occupational mode also tends to be driven by the majority of older workers and those with longer tenure, thus the approach will tend to reflect historical entry requirements rather than current ones. In addition, since mismatch is defined in relative terms, the estimated number of mismatched persons in employment may change from one year to another merely because the modal level of education increases within a given occupation or occupational group. A change in the mode may occur because the educational level of persons recently employed in that occupation is higher. As a result, many persons in employment who in previous years were classified as matched will be wrongly classified as "undereducated".

54. Similar problems exist with the mean, median or modal years of schooling, which assume that all years of schooling have equal value, i.e. that all workers with the same number of years of schooling are substitutes. An additional problem with the average years of schooling is that there is no general agreement on a method of converting levels of education into years of schooling, and it has been found that the incidence of mismatch also depends on the schooling equivalences used to construct the years of schooling variable. Regarding the confidence intervals around the average years of schooling, the arbitrariness of choosing one standard deviation (or +/- 10 per cent of the median/mode) as a threshold may be open to criticism.

55. The main advantage of the self-assessment approach is that it takes the heterogeneity of jobs into account because the respondents are most knowledgeable about their jobs and the tasks they require. The main disadvantage of this approach is its subjectivity; it depends on the perception of the respondent. One person's assessment of the education required to perform their job may not match that of another person performing a similar job. In addition, the estimates will depend on the exact wording of the question used. For example, an estimate based on a question about the requirements to get the job will be different from an estimate based on a question about the requirements to perform the job. Some argue that the measurement based on self-assessed level of education required to perform the job is better than measurement based on level of education required to get the job.[15] Others argue that

[15] Verhaest and Omey (2006) considered the reliability of different measures of overeducation and concluded that objective job evaluation and the self-assessed level of education required to perform

self-assessment measures of overeducation and undereducation are less problematic than measures that assume homogeneity within occupation/occupational groups.[16]

56. Given the limitations of the statistical approach and the subjectivity of the self-assessment approach, a preference may be given to a normative approach based on carefully conducted job assessments at the national level.[17] However, where such assessments are not available or are outdated, a statistical or subjective approach may be used. In the subjective approach, an indirect self-assessment based on the self-assessed level of education required to perform the job should be used.

57. The intensity (severity) of overeducation and undereducation may be estimated on the basis of the number of levels of educational attainment above or below the threshold used. A person in employment is classified as moderately mismatched if their level of education is one level away from the required level of education for their job and severely mismatched if their level of education is more than one level away from the required level of education for their job.

58. Where measurement is based on the average number of years of schooling, a person in employment are classified as moderately mismatched if their number of years of schooling is between one and two standard deviations away from the mean number of years of schooling of all persons in employment in the same occupation or group of occupations, and severely mismatched if their number of years of schooling is more than two standard deviations away from the mean number of years of schooling of all persons in employment in the same occupation or group of occupations.

*(b) Mismatch by field of study*

59. Measurement of field of study mismatch is based on information about the main field of study at the highest (or most recent) level of education of a person in employment, their occupation and the relevance of different fields of study to each occupation or occupational group.

60. The field of study mismatch can also be measured in three ways: the normative, statistical and self-assessment and approaches.

61. In the *normative approach*, the mismatch is estimated by using a classification elaborated ex ante by a job analyst, in which for each field of study it is specified which are matching occupations or groups of occupations[18] A person in employment is considered to be

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the job should be preferred over the empirical (statistical) method or the self-assessed level of education required to get the job.

[16] For example, see Halaby, 1994.

[17] Estimates based on educational requirements by ISCO-08 1-digit occupational group tend to overestimate the mismatch. Therefore, educational requirements should be established for more homogeneous occupational groups.

[18] For example, Wolbers (2003) developed a classification that provides a list of ISCO-88, 3-digit codes that are considered as suitable for each field of study.

mismatched if their field of study does not correspond to the requirements for their occupation or group of occupations (1-, 2- or 3-digit level of ISCO), as defined by a job analyst or national legislation or practice. A person in employment who is not employed in an occupation that is considered a good match for their field of study is considered as mismatched.

62. In the *statistical approach*, the mismatch is estimated by comparing the actual field of education of an individual worker with the modal field of education of all workers in that occupation or occupational group. The modal field of study of all persons in employment in a given occupation or occupational group is used as a proxy for the required field of study for that occupation of occupational group. A person in employment is considered as mismatched if their field of study is different from the modal field of study of all persons in employment in the same occupation or group of occupations. Depending on the level of disaggregation, the heterogeneity of occupational groups and the precision of occupational estimates, the modal field of study may be determined at the level of an individual occupation or a group of occupations (1-, 2- or 3-digit level of ISCO).

63. In the *self-assessment approach*, the mismatch is derived from:

(a) workers' responses to a question on self-perceived match between their field of study and the field of their job (direct approach). In this approach, a person in employment is considered to be mismatched if she/he report having a field of study that is inappropriate for her/his current job; or

(b) workers' responses to a question on the field of study required either to obtain or perform their current job, which is then compared to their actual field of education (indirect approach). In this approach, a person in employment is considered to be matched/mismatched if their field of study is different from the modal value of the self-assessed field of study reported by all workers in the same occupation or occupational group (1, 2- or 3-digit level of ISCO).

64. All three approaches have advantages and disadvantages similar to the approaches used for measuring mismatch by level of education. As with the measurement of mismatch by level of education, a preference is given to a normative approach based on carefully conducted job assessments. However, where such assessments are not available or are outdated, a statistical or self-assessment approach may be used.

65. The measurement of field of study may be limited to persons in employment with at least higher secondary education since those with lower levels of education do not have any specialization; for the latter, it may be sufficient to determine whether or not they are mismatched by level of education and by skills/type of skills.

**Skill mismatch**

**Workers' assessment versus employers' assessment versus direct assessment**

66. Skill mismatch cannot be measured in the same manner as qualification mismatch because skills are not certified and it is more difficult to determine individual skills. Therefore, worker's

assessment of skills required and possessed can be used as a proxy. Alternatively, measurement can be based on employer's assessment (employer measure) or by direct assessment of skills possessed.

67. Worker measures are based on workers' self-perceived match between their skills and the skills required for competent performance of the job. This type of questions can be easily included in LFSs or other household-based surveys covering a range of labour market-related topic. Although such measures may be subjective since respondents may exaggerate their own skills and/or the requirements of their job and results may be limited by a respondent's understanding of the skills required for a particular job, studies have found this approach to yield interesting and largely plausible results (see, for example, Allen et al., 2014). The United Nations Economic Commission for Europe (UNECE) *Handbook on Measuring Quality of Employment* (UNECE, 2015) identifies skill mismatch as one of the indicators for measuring the quality of employment and recommends the use of a measure based on the self-assessment of respondents.

68. Employer measures are based on employers' perception of skills possessed and utilized on the job. This type of question can be included in any establishment survey collecting employment-related data. However, conducting large-scale surveys with this type of question is expensive and challenging because of the difficulties in assessing workers' actual performance on the job. It may be possible to measure skill mismatches in small-scale studies that involve a limited number of establishments in specific industries and focus on specific occupations.

69. Direct measures are based on actual assessment of selected types of skills through tests (e.g. reading, writing and numeracy tests). The direct measurement of skills is very time-consuming and data-demanding as it involves detailed job analysis, occupation analysis and skills testing. A person in employment is classified as mismatched or matched by comparing their level of proficiency with the average level of proficiency for all workers in the same occupation or group of occupations. Attempts to objectively measure different types of skill mismatch have been criticized (Allen et al., 2014), with some arguing that subjective assessment by workers of skills required against their own skills can be reliable indicators of the skill matching (Green, 2013).

70. Another alternative is to combine assessments collected from both employers and workers in the same establishments.[19]

71. Finally, estimates of the extent of skill matching can be generated by using commonly available labour statistics. For example, the level of skill matching can be estimated by

[19] The only known case is the Canada Workplace and Employee Survey, which up to 2005 collected information from both employers and employees selected from within sampled workplaces; details available at http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=2615

comparing the distribution of employment by occupation (as a proxy for skill used[20]) with the distribution of employment by level of education (as a proxy for skill possessed). These studies are relatively easy to conduct. Their validity, however, is dependent on the assumptions upon which they are based.

**Measurement of overall skills versus type of skills**

72. Mismatch may be measured by type of skills or overall skills:

    (a) Mismatch of overall skills. A person in employment is considered as overskilled if they or their employer assess them as having the skills to perform more complex tasks, or as underskilled if they or their employer report that, for competent performance at the job, some of their skills need to be further developed.

    (b) Mismatch by type of skills (e.g. job-specific/technical skills, basic skills and portable skills). When measured by type of skills, mismatch is estimated by comparing a person in employment's assessments or employer's assessments about the type and level of skills required to perform the job with the actual levels and types of skills possessed by a person in employment. A person in employment is considered as overskilled/underskilled if they or their employers assess that the level of specific skills required to perform their job are lower/higher than the level of skills they possess.

73. The mismatch of overall skills treats skills as one-dimensional concept. It is based on the assumption that respondents are able to balance out the various work-related skills and come up with an assessment of the extent to which the skills required match the skills possessed. Although this type of information can easily be collected in LFS or other household-based surveys, its main limitation is that the question on overall skills is not very explicit, with low information content, and it may not be clear what the response means because respondents may not be thinking only of work- related skills when responding.

74. The mismatch by type of skills is more comprehensive since it collects detail information about the various skills required and possessed by persons in employment. Therefore, measuring mismatch by type of skills may be preferred. However, where the assessment of overall skills is highly correlated to assessment of the various types of skill, mismatch of overall skills can be used as a suitable measure.

[20] See table "Employees by sex and occupation (Thousands)", which shows employment by four skill levels defined in ISCO-08, available at www.ilo.org/ilostat/ ; and table 3 at the end of the present report.

## Chapter 5. Data collection, analysis and dissemination

**Data collection**

75. LFSs are generally regarded as the most comprehensive and appropriate means of collecting current data on the working age population and its labour market characteristics, including occupation, level of education and field of study. The coverage of these characteristics allows for estimation of mismatches by level of education and field of study. Illustrative examples of these estimates calculated on the basis of a selected set of national LFS are presented in chapter 6.

76. Since LFSs are flexible data collection instruments it is possible to include additional questions that ask respondents about the type and level of skills possessed, required and/or used on the job. A number of surveys, listed in appendix II, have already included such questions and the results are promising. Eurostat is planning to include questions on different types of mismatches in an LFS ad hoc module, "Young people on the labour market", to be implemented in 2024, as well as in an LFS ad hoc module on job skills in 2022. The ILO has also developed a set of questions that may be suitable for collecting information on skill mismatch in LFSs, which are currently being tested in Mexico.

***Box 1. Example of a question on overall skills mismatch***

Overall, how would you/… best describe your skills in relation to what is required to competently do your/… job?

- I have skills to cope with more demanding duties.
- My skills are matched to what is required by my job.
- Some of my skills are lower than what is required by my job and need to be further developed.
- Don't know.

77. Establishment surveys that are regularly undertaken by national statistical institutes to gather data on wages are another potential source of data. A set of supplementary questions could be included in these surveys to estimate the level of matching from the perspective of employers. As they are expensive to administer, examples of such surveys are rare.[21]

**Analysis**

78. The analysis of persons in employment who are mismatched may include their disaggregation by significant demographic, social and economic characteristics (such as gender, age, economic activity, sector, occupation, level of education, status in employment, migrant

[21] For more details on the feasibility of collecting data on skill mismatches through establishment-based surveys and direct assessments, see chapter 4, paras. 66-71.

versus non-migrant workers,[22] etc.), as well as appropriate cross-classifications, with due regard to the need for confidentiality and statistical significance.

79. It is important to disaggregate data because the overall level of qualification and/or skill mismatch of persons in employment is only a crude guide; any mismatch, for example, in occupations and/or industries that are critical to an economy can cause problems out of proportion to the overall incidence.

80. Analysis should target both job-specific technical skills and portable skills because both types of skill change as economies grow.[23]

81. Analysis may focus on occupational groups or sectors (e.g. formal/informal, employees, public/private), industries or age cohorts that are of particular policy interest or are affected more by technological changes. Occupational groups of interest may include occupations that require higher levels of education, occupations in which the matching is low and occupations for which there is short supply (e.g. medical staff). Age cohorts of special interest may include youth (e.g. age 15-29), those entering employment in the preceding 5 years, the elderly, etc.

**Impact of mismatch on labour market outcomes**

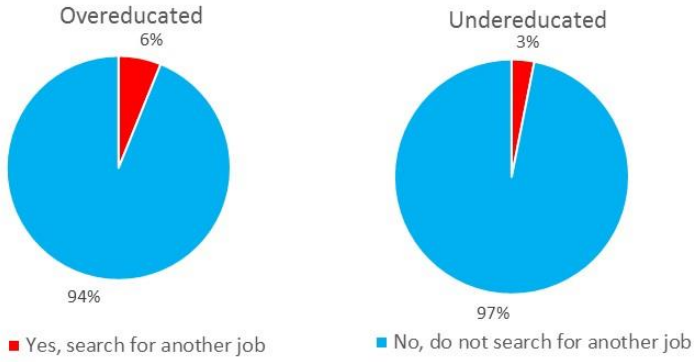
82. In order to understand the impact of mismatch, in particular overeducation and overskilling, on major labour market outcomes, it is necessary to separately identify those who are mismatched and who are (a) seeking better matched employment, (b) unsatisfied with the jobs and (c) earning less.

83. The identification of mismatched persons, especially persons who are overeducated and/or overskilled, and seeking a "better-matched job", is needed to assess the pressure on the labour market exerted by persons in employment who are mismatched. This is also needed because not all forms of mismatch are involuntary in nature. It is possible that some individuals accept jobs below their level of qualification and/or skills because these non-matched jobs offer other benefits that increase job satisfaction (e.g. less demanding and less stressful jobs, enhanced work life balance, better social protection, shorter commuting time, increased social responsibility, etc.). Mismatch may also represent a short-term strategy aimed at acquiring basic work-related skills in order to secure a better job in the future. As shown in figure 5, the overeducated are twice as likely as the undereducated to seek another job.

[22] Sparreboom and Tarvid, 2017, and OECD/ILO, 2018, show that foreign-born workers tend to be less educated than native-born workers but more likely to be overeducated for the jobs they hold.

[23] It is also important to track the changes in overall skills supply, including of persons not in employment.

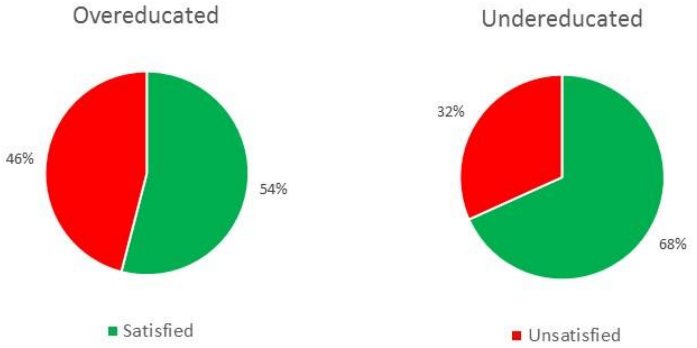
**Figure 5. Mexico, LFS 2016, population aged 15 and over: persons in employment, mismatched by level of education (statistical approach) who seek another job**




*Source:* ILO calculations.

84. The identification of mismatched persons, especially persons who are overeducated and/or overskilled and unsatisfied[24] with their job is also useful because, although for various reasons they may not be seeking a better matched job, their low job satisfaction is likely to affect their productivity, motivation and well-being and increase absenteeism. As shown in figure 6, the overeducated are more likely than the undereducated to be unsatisfied with their job.

**Figure 6. Republic of the Congo, SWTS, 2015, population aged 15-29: persons in employment mismatched by level of education (normative approach) and job satisfaction[25]**

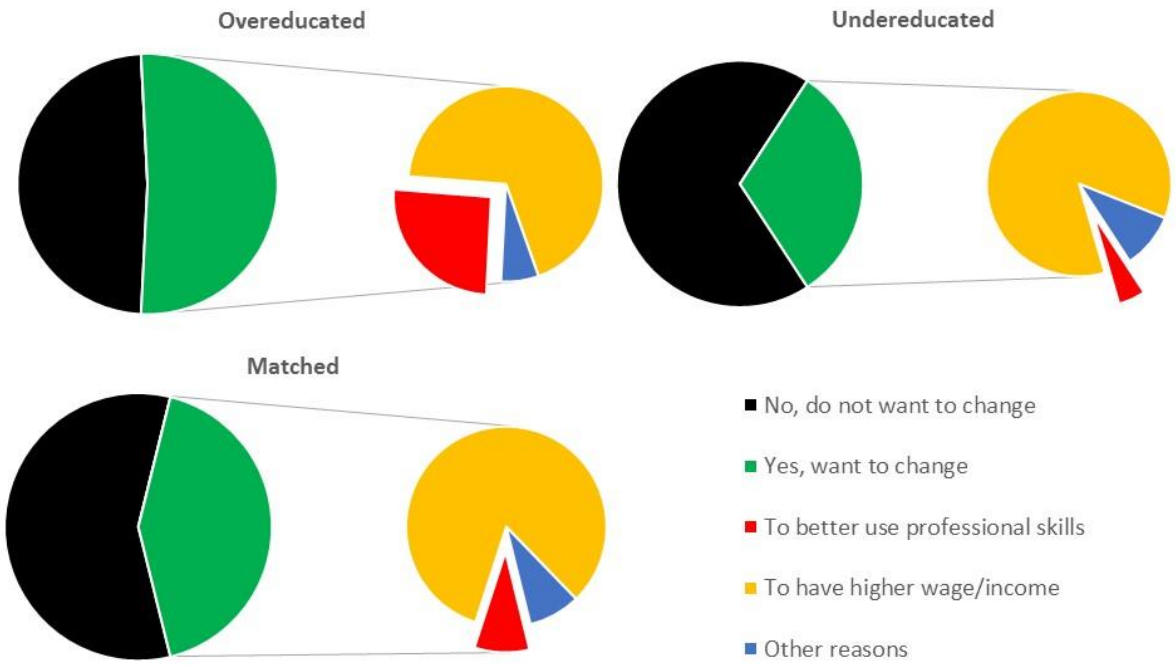



*Source:* ILO calculations.

[24] As a proxy for low job satisfaction, wanting to change the job can be used. As shown in figure 7, the overeducated are more likely than the undereducated and matched to want to change their job, and more likely than others to want to change their job in order to make better use of their skills.

[25] A similar pattern was observed in a SWTS, 2015, population aged 15-29, in Uganda.

**Figure 7. Armenia, LFS 2014, population aged 15-75: persons in employment mismatched by level of education (normative approach) who want/do not want to change their employment situation, by reason** [26]




*Source:* ILO calculations.

85. Therefore, the focus of analysis, and consequently of interventions, may be on persons in employment who are overeducated and/or overskilled and who seek another job or are unsatisfied by their jobs.

86. In order to assess the impact of mismatch on earnings, it may be useful to separately identify mismatched persons in employment who are earning less/more than the average wage of their occupational peers as well as their skills and qualifications peers. Both studies on mismatch[27] and ILO analysis have found that there are pay penalties for being overeducated.[28]

**Relationship between different forms of mismatches**

87. Qualification mismatch and skill mismatch are not always sufficiently informative measures when considered separately. For a better understanding of the relationship between the two, it is necessary to analyse them together.

[26] Similar patterns were observed in SWTSs, population aged 15-29, 2015, in the Republic of the Congo and Uganda.

[27] See, for example, OECD (2016), figure 5.12, "Effect of qualification, literacy and field-of-study mismatch on wages"; and McGuinness et al (2017).

[28] However, workers who are mismatched by field of study only do not suffer a wage penalty.

88. Some persons in employment may be overeducated for the job they hold but not overskilled, because their level of skills may be low compared to their educational peers. On the other hand, some persons in employment may choose to accept a job for which they are overeducated and/or overskilled because it offers them compensating advantages, such as less stress, enhanced work/life balance, better social protection, shorter commuting time etc. For this category of mismatched workers, job satisfaction may be high and the propensity to change jobs low. A third category is persons who accept a job for which they are overeducated and/or overskilled in order to get experience so that they can get a better job in the future.

89. Some persons in employment may appear to be undereducated for the job they hold but their level of skills may be comparable to their occupational peers. This is especially the case with older workers and those with long job tenures, who were well matched when they started their jobs, but because their jobs have become more complex over time and educational requirements have increased, now appear to be undereducated. However, their skills may have kept pace with their job due to job training and work experience It may also reflect the fact that skills required for some occupations can be acquired through pathways other than formal education, mainly through work experience and other non-formal or informal learning.

**Dissemination**

90. For effective skills policy intervention, statistics on qualification and skill mismatches should be collected at regular intervals, wherever possible on an annual basis. Relevant information and data analysis should be distributed widely, including to jobseekers, employers' and workers' organizations, public and private trainers, and career counsellors and employment service providers in both the formal and informal economies.

# Chapter 6. Numerical illustrations of selected approaches to measuring qualification mismatch

91. The purpose of this chapter is: (a) to examine the order of magnitude of mismatch, by level of education and field of study, in a range of countries in different regions of the world, using variables commonly available in national LFSs; and (b) to assess the impact of selected approaches to measuring qualification mismatch.

92. For this purpose, a sample of seven countries with LFSs was selected, covering different regions of the world (the Republic of the Congo, South Africa and Uganda in Africa; Ecuador and Mexico in Latin America; Armenia and the Republic of Moldova in Eastern Europe; and Cambodia and Indonesia in Asia). The choice of countries was based on the availability of data processing of individual records from LFSs. In addition to these countries, another set of countries with data from SWTSs were processed as well.

93. For estimating the mismatch by level of education, up to seven approaches have been calculated simultaneously: a normative approach based on two different models of educational requirements by occupational group at different skill levels (for mapping, see table 2); a statistical approach based on mean, median and modal number of years of schooling by occupational group; a statistical approach based on modal level of education by occupational group; and a self-assessment approach. In addition, a field of study mismatch was calculated using a normative approach.

**Table 2. Educational requirements by occupational group (ISCO and ISCO+): Mapping between 1-digit ISCO-08 groups and level of education**

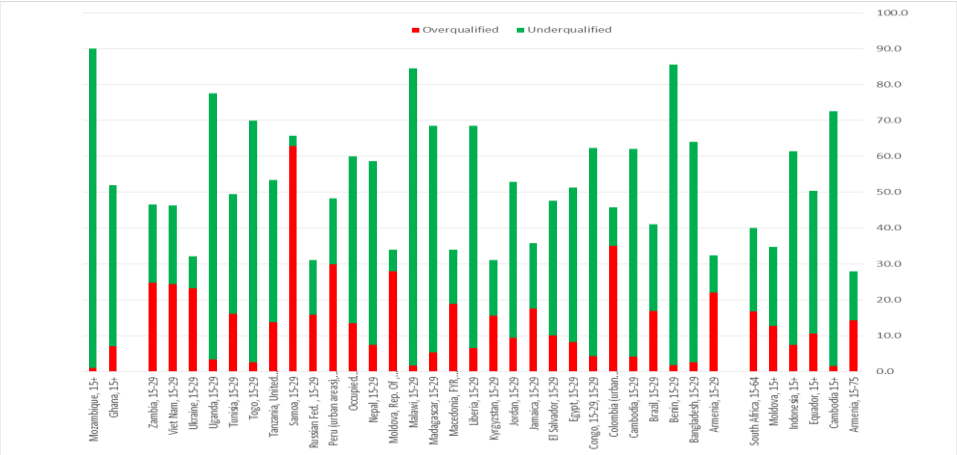
| ISCO 08 Occupation | ISCO Mapping | | ISCO+ Mapping | |
|---|---|---|---|---|
| | ISCO skill level | ISCED 2011 required level | Skill level | ISCED 2011 required level |
| Managers | 3, 4 | 5, 6, 7, 8 | 3 | 5, 6, 7, 8 |
| Professionals | 4 | 6, 7, 8 | 3 | 5, 6, 7, 8 |
| Technicians and Associate Professionals | 3 | 5 | 3 | 5, 6, 7, 8 |
| Clerical Support Workers | 2 | 2, 3, 4 | 2 | 3, 4 |
| Services and Sales Workers | 2 | 2, 3, 4 | 2 | 3, 4 |
| Skilled Agricultural, Forestry and Fishery Workers | 2 | 2, 3, 4 | 2 | 3, 4 |
| Craft and Related Trades Workers | 2 | 2, 3, 4 | 2 | 3, 4 |
| Plant and Machine Operators and Assemblers | 2 | 2, 3, 4 | 2 | 3, 4 |
| Elementary Occupations | 1 | x, 0, 1 | 1 | x, 0, 1, 2 |
| Domestic workers | 1 | x, 0, 1 | 1 | x, 0, 1, 2 |

94. Analysis also included the computation of educational mismatch by various characteristics, such as age, gender, economic activity, occupation, level of education, etc. In addition, wherever available, the correlation between overeducation/undereducation and job satisfaction, job search or willingness to change a job were investigated.

95. Despite efforts to make the data as comparable as possible, the results should be interpreted with caution because disparities exist, in particular regarding the compatibility of national classifications of education with ISCED, the duration of different national educational programmes, the presence and importance of some ISCED categories, the treatment of educational programmes attended but not completed, etc. Nevertheless, the data reveal some general patterns, as follows:

(a) The incidence of mismatch by level of education is not negligible. Figure 9 compares the overeducation and undereducation rate for sample countries. Estimates are based on a normative approach that defines educational requirements for each ISCO 1-digit group. Due to differences in national requirements and the heterogeneity of occupational groups, most likely this approach overestimates the level of mismatch;

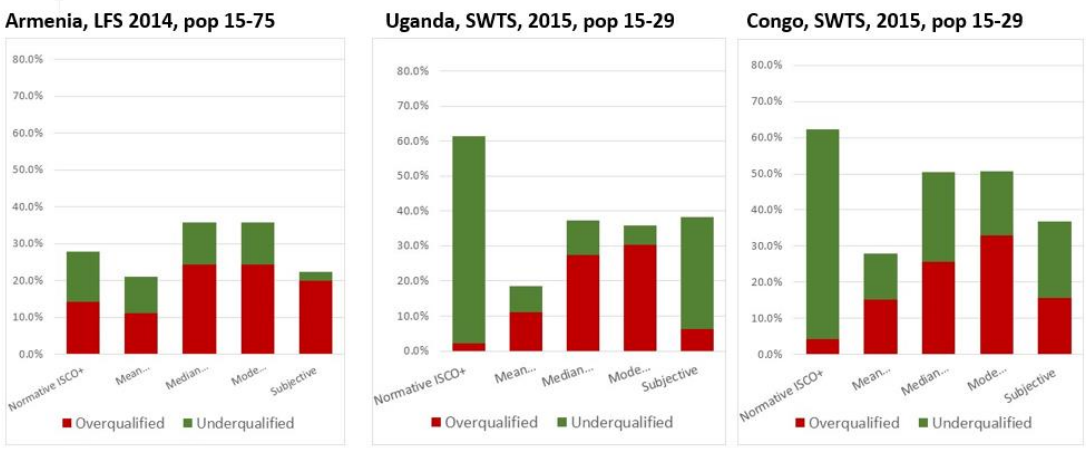
**Figure 8. Mismatch by level of education, normative approach, ISCO requirements**




*Source:* ILO calculations.

(b) Different measurement approaches lead to different results (see figures 9 and 11). Comparatively, the incidence of mismatch based on self-perceived matching lies between the normative and statistical approaches;

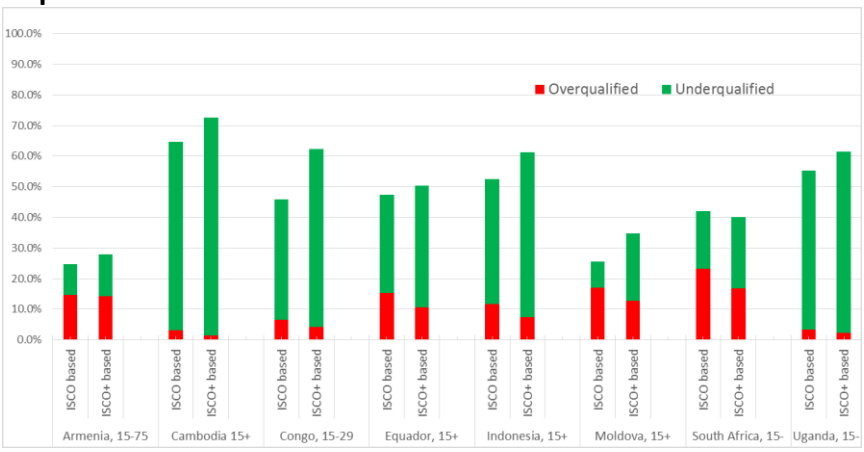
**Figure 9. Incidence of mismatch by level of education: comparison of normative, statistical and subjective measures**




*Source:* ILO calculations.

(c) Mismatch estimates based on a normative approach are sensitive to the mapping established between groups of occupations and levels of education (see figure 10);

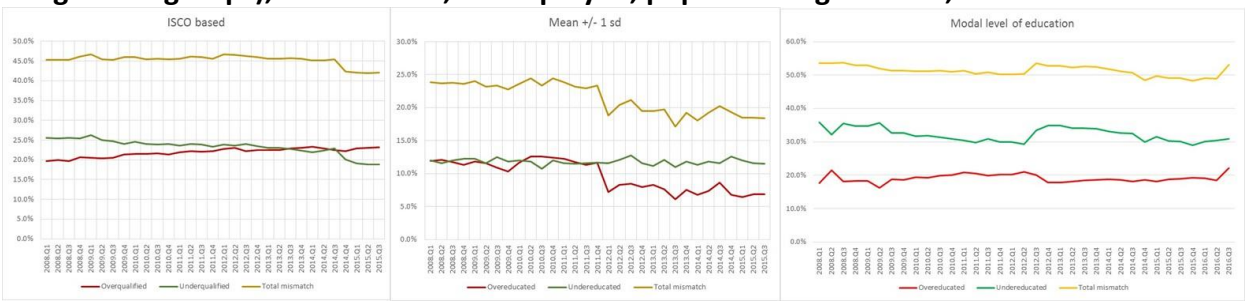
**Figure 10. Mismatch by level of education, normative approach, ISCO and ISCO+ requirements**




*Source:* ILO calculations.

(d) Trend over time based on the mean number of years of schooling diverge from trends based on the normative approach and the modal level of education (see figure 12). Estimates based on the modal level of education seem to be more robust than those based on years of schooling;

**Figure 11. Incidence of mismatch over time: Comparison of normative (ISCO mapping) and statistical approaches (based on mean years of schooling and modal level of education by 1-digit ISCO groups), South Africa, all employed, population aged 15-64,**




*Source:* ILO calculations.

(e) Persons with occupations that belong to ISCO major group 2, Professionals, are the least likely to be mismatched by level of education and/or field of study;

(f) Overeducation is associated with high job dissatisfaction, a willingness to change jobs and efforts to find another job. In contrast, the undereducated are more likely to be satisfied with their jobs and less likely to seek alternative employment than those who are matched.

# Appendix I. Approaches to measuring qualification and skill mismatches

| Type of mismatch | Approach | Survey variable | Threshold |
|---|---|---|---|
| **Qualification mismatch** | | | |
| Mismatch by level of education | | | |
| 1 | Normative | Level of educational attainment | As specified by job analyst |
| 2 | Statistical | Level of educational attainment | Mode |
| 3 | Statistical | No. of years of schooling | Mean |
| 4 | Statistical | No. of years of schooling | Median |
| 5 | Statistical | No. of years of schooling | Mode |
| 6 | Sell-assessment | Level of educational attainment | As declared by respondent |
| 7 | Sell-assessment | Level of educational attainment | Mode |
| Mismatch by field of study | | | |
| 8 | Normative | Field of study | As specified by job analyst |
| 9 | Statistical | Field of study | Mode |
| 10 | Sell-assessment | Field of study | As declared by respondent |
| 11 | Sell-assessment | Field of study | Mode |
| **Skill mismatch** | | | |
| Mismatch of overall skills | | | |
| 12 | Workers assessment | Overall skills | As declared by respondent |
| 13 | Employer assessment | Overall skills | As declared by respondent |
| Mismatch of job-specific/technical skills | | | |
| 14 | Workers assessment | Level of job-specific/technical skills | As declared by respondent |
| 15 | Employer assessment | Level of job-specific/technical skills | As declared by respondent |
| Mismatch of basic sills | | | |
| 16 | Workers assessment | Level of basic skills | As declared by respondent |
| 17 | Employer assessment | Level of basic skills | As declared by respondent |
| 18 | Testing | Literacy, numeracy, ICT | Mean |
| Mismatch of portable sills | | | |
| 29 | Workers assessment | Level of portable skills | As declared by respondent |
| 20 | Employer assessment | Level of portable skills | As declared by respondent |

# Appendix II. Examples of questions used in national and international surveys

**MISMATCH BY LEVEL OF EDUCATIONAL ATTAINMENT AND/OR FIELD OF STUDY**

**Spain. Survey on labour insertion of university graduates**[29] **(recent university graduates)**

Taking into account your current job (the main one) or your last job, in your opinion, what is, or was it, the most appropriate level of education to carry out this work?

1. Doctorate or postdoctoral
2. University degree (except PhD or postdoctoral)
3. Professional training of a superior level
4. Vocational training at the intermediate level / baccalaureate
5. ESO, EGB, etc.

Taking into account your current job (the main one) or your last job, in your opinion, what s, or was, the most appropriate field of education for this work?"

1. Exclusively the field of education in "...".
2. The field of education in "..." or some related field.
3. A totally different field of education.
4. No particular field of education.

*Same questions asked for the current or last job and for the first job after graduation:*

**Spain. Survey on quality of life and living conditions**

Do you find that your job is correct, taking into account your educational level?

1. Yes
2. No, it requires a lower level
3. No, it requires a higher level
4. No, I would need other studies different than those I have

If ≠1: On a scale of 0 (lowest score) to 10 (highest score) rate how useful is your formal education for your job?

**Canada. 2005 Workplace and employee survey (employee)**

What is the minimum level of education required for this job?

**Moldova. LFS**

Does this type of work correspond to your level of education and field of training?

1. Yes
2. No, it is below my level of education
3. No, it  is above my level of education
4. Level of education is equivalent but field is unrelated

**Italy.**

Do you think that in order to adequately perform your current job?

1. It's necessary exactly your educational level

[29] https://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736176991&menu=resultados&secc=1254736195339&idp=1254735573113#

2. It would be enough a lower educational level
3. It would be necessary an higher educational level
4. Don't know

**Hungary. 2016 Ad-hoc module Young people on the labour market**[30]

To what extent do you think your formal education helps you in meeting the demands of your current job?
1. Fully
2. To some extent
3. Very little
4. Not at all

Could you meet the demands of your current job with a lower education level?
1. Yes
2. No

**Poland. National LFS**

Please, do asses to what extent the main job you perform at present is compatible with your level of educational attainment?
1. work is fully compatible
2. work is compatible to a large extent
3. work is partially compatible
4. work is incompatible to a large extent
5. work is entirely incompatible

**Finland. National Adult education survey**

In your opinion do your tasks require?
1. less than your basic training qualifies you for
2. more than your basic training qualifies you for
3. the level required in your tasks correspond to your basic training

*(Basic training here means training leading to a qualification or degree (both vocational and general education))*

**United Kingdom. Skills and employment survey**

If they were applying today, what qualifications, if any, would someone need to get the type of job you have?
- list of national qualifications

How necessary do you think it is to possess those qualifications to do your job competently?
1. Totally unnecessary
2. Not really necessary
3. Fairly necessary
4. Essential
5. Don't know

[30] https://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_ad_hoc_modules

**Switzerland. Follow-up survey on tertiary graduates** [31]

Version 1: What kind of degrees were required?

Version 2: Which level of qualification do you consider necessary to carry out your professional activity?

1. Bachelor
2. Master
3. Licentiate/Diploma
4. PhD
5. Additional degree/training

Simplified version:

Version 1: Does your employer require you to have a degree from a higher educational institution for this job?

Version 2: Do you need a degree from a higher educational institution to do this job?

Version 1: Was a degree in a specific field of study required?

1. Yes, only in my field of study
2. Yes, also in related fields
3. No, no specific field of study was required

Version 2: Do you need a qualification in a specific field to carry out your activity?

1. Yes, only in my field of study
2. Yes, also in related fields
3. No, a qualification in a specific area of study is not necessary to carry out my activity.

Is your current employment related in content to your university education and/or an earlier occupation?

1. Related to my university education as well as to an earlier occupation
2. Related to my university education
3. Related to an earlier occupation
4. Unrelated to my university education nor to an earlier occupation

**OECD. PIAAC** [32]

If applying today, what would be the usual qualifications, if any that someone would need to GET this type of job?

**CEDEFOP. European skills and jobs (ESJ) survey** [33]

If someone was applying for your job today, what qualifications, if any, would they need to get the job?

What are the educational qualifications, if any, which someone actually needs to do your job today?

[31] https://www.bfs.admin.ch/bfs/en/home/statistics/education-science/surveys/ashs.assetdetail.5266609.html

[32] http://www.oecd.org/edu/48442549.pdf

[33] Cedefop Employee survey block C, q20-q26 http://www.cedefop.europa.eu/files/2015-10-06_cedefop_european_skills_survey-questionnaire.pdf

**SKILLS MISMATCH** [34]

**Tanzania. Integrated LFS, 2014**

Do you have skills that enable you to perform your tasks?

- Yes you can perform independently.....
- Yes, you can perform with assistance and you are on training.....
- Yes, you can perform with assistance but you are not on training.....
- No, you are on training.....
- No, you are not on training.....

Same question asked for the main job and the second job.

**Brunei Darussalam. LFS 2014**

Does the work you perform correspond to your skill/training received?

- Yes
- No

**NL – Working conditions survey** [35]

In how far does your knowledge and skills fit in / meet the requirements of your current work?

1. I have less knowledge and skills than I need for my work / is required to carry out my work
2. It fits well / my knowledge and skills meet the requirements of my work
3. I have more knowledge and skills than I need for my work / required to carry out my work

**Finland. National Adult education survey**

What kinds of skills do you have for your work at the moment?

1. You need more training in order to carry out your tasks well
2. Your present tasks correspond well to your present skills
3. Your present tasks are too simple, you think you could perform much more demanding tasks?

**United Kingdom. Skills and employment survey**

How much do you agree or disagree with the following statement "In my current job I have enough opportunity to use the knowledge and skills I have."

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree
5. Don't know

**Germany. BIBB (Federal Institute for Vocational Education and Training). Employment Surveys** [36]

In your work as …, do you generally feel equal to the demands placed on your professional knowledge and skills, or do you rather feel overchallenged or unchallenged?

[34] A number of countries include in LFS a response category “inadequate use of skills” as one of the reasons for seeking another job.

[35] https://www.eurofound.europa.eu/sites/default/files/page/field_ef_documents/nl_questionnaire.pdf

[36] https://www.bibb.de/dokumente/pdf/FDZ_DuMB_ETB12_4_1_EN.pdf

**Eurofound. European Working Conditions Surveys 2015 (EWCS)[37]**

Which of the following statements would best describe your skills in your own work?

1 - I need further training to cope well with my duties
2 - My present skills correspond well with my duties
3 - I have the skills to cope with more demanding duties
8 – Don't know/no opinion
9=Refusal (spontaneous)

**OECD. PIAAC**

Do you feel that you have the skills to cope with more demanding duties than those you are required to perform in your current job?

Do you feel that you need further training in order to cope well with your present duties?

**CEDEFOP. European skills and jobs (ESJ) survey[38]**

Overall, how would you best describe your skills in relation to what is required to do your job? Please select one option only

1. My skills are higher than required by my job
2. My skills are matched to what is required by my job
3. Some of my skills are lower than what is required by my job and need to be further developed
4. Don't know

ASK if CODE 3 To what extent would you say that your skills are lower than required to do your job? Please give your answer on a scale of 1 to 5 where 1 means your skills are a little lower than required and 5 means your skills are a lot lower than required.

1. My skills are a little lower than required
2.
3.
4.
5. My skills are a lot lower than required
6. Don't know

ASK if CODE 1. To what extent would you say your skills are higher than required to do your job?

Please use a scale of 1 to 5 where 1 means your skills are a little higher than required and 5 means your skills are a lot higher than required. Please select one option only

1. My skills are a little higher than required
2. .
3. .
4. .
5. My skills are a lot higher than required
6. Don't know

The same question is asked for the situation at the time of hiring.

[37] Eurofound EWCS 2015 Q64 https://www.eurofound.europa.eu/sites/default/files/page/field_ef_documents/6th_ewcs_2015_final_source_master_questionnaire.pdf

[38] Cedefop Employee survey block C, q20-q26 http://www.cedefop.europa.eu/files/2015-10-06_cedefop_european_skills_survey-questionnaire.pdf

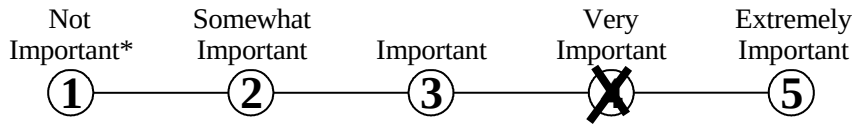
**O*NET. Questions**[39]

Respondent are asked two questions about each of 35 skills:

***A. How <u>important</u> is the skill to the performance of your current job?***

For example:

**How <u>important</u> is WRITING to the performance of *your current job*?**



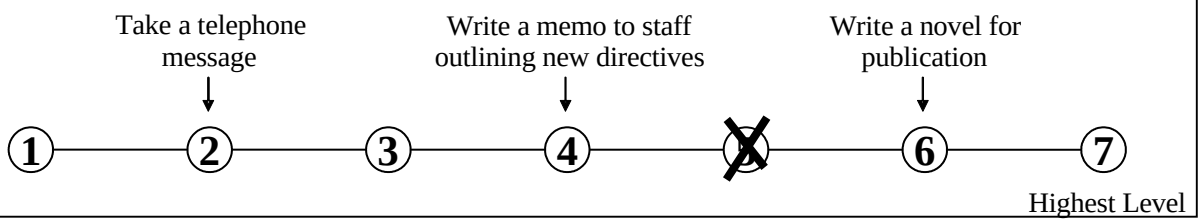

Mark your answer by putting an **X** through the number that represents your answer.

*<u>If you rate the skill as Not Important</u> to the performance of your job, mark the one [ (X) then <u>skip over question B</u> and proceed to the next skill.

***B. What <u>level</u> of the skill is needed to perform your current job?***

To help you understand what we mean by **level**, we provide you with examples of job-related activities at different levels. For example:

**What <u>level</u> of WRITING skill is needed to perform *your current job*?**




Mark your answer by putting an **X** through the number that represents your answer.

**World Bank. STEP SKILLS MEASUREMENT SURVEY. Armenia household survey 2012-2013**[40]

How useful were your studies <u>during your formal education</u> for your job (occupation)?

- not useful at all
- somewhat useful
- moderately useful
- very useful
- respondent had no formal schooling

What minimum level of formal education do you think would be required before someone would be able to carry out your job (occupation)?

- List of levels of education

How many years of work experience in other related work do you think would be required before someone with …would be able to carry out this work?

- none

[39] <u>https://www.onetcenter.org/questionnaires.html</u>

[40] <u>http://microdata.worldbank.org/index.php/catalog/2010</u>

- less than a year
- 1-2 years
- 3-5 years
- 6-10 years

About how long would it take someone to learn to do this work well if they had ["NECESSARY EDUCATION"] education and [“NECESSARY EXPERIENCE"] years of related work experience?

- less than one week
- one week to one month
- between one and six months
- 7-12 months
- more than a year
- more than 10 years
- don't know

**World Bank. STEP SKILLS MEASUREMENT SURVEY. Albania employer survey 2017**[41]

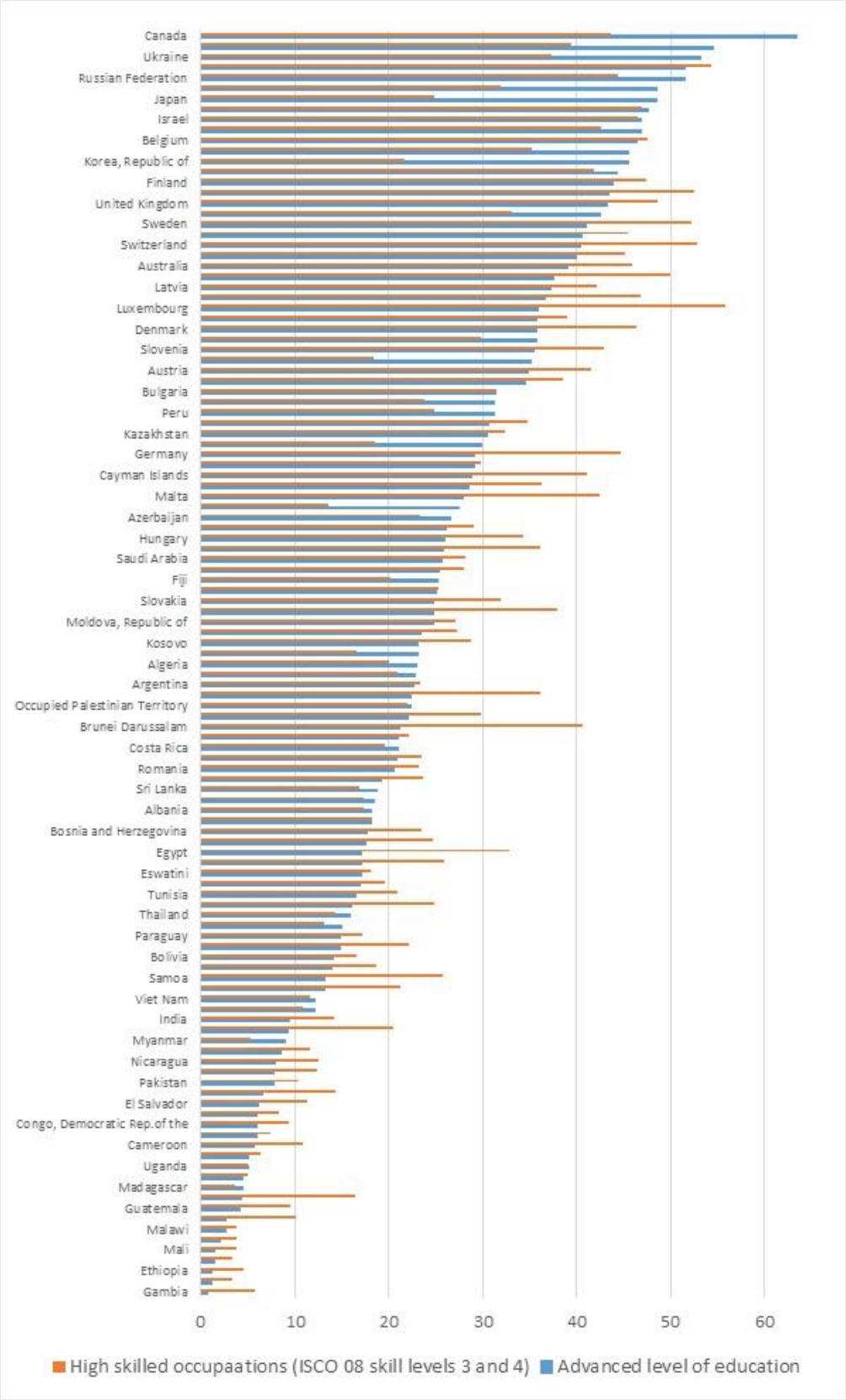
| **FOR OCCUPATION TYPE A**<br>USE SHOW CARD # 8a | (3.17)<br>**For each of the skills [ON SHOWCARD 8A] indicate if there is a difference between what is required for the job and the current level of this skill in a typical [OCCUPATION TYPE A] worker.**<br>*INT* IF THERE IS A DIFFERENCE, GO TO 3.18 BEFORE MOVING ON TO THE NEXT SKILL. | (3.18)<br>IF A YES WAS REPORTED IN Q 3.17: **How large is the difference between the current skills and the required skills in a typical [OCCUPATION TYPE A] worker?** | (3.19)<br>**Of these skills [ON SHOWCARD 8A], which ones do you think are important when making decisions regarding hiring or retaining [OCCUPATION] after a period of probation. Select the 3 most important skills you consider when making retention decisions for [Occupation Type A].** |
|---|---|---|---|
| | Yes, there is a difference - 1 | Small difference - 1 | Most Important - 1 |
| | No, there is no difference - 2 | Medium difference - 2 | 2nd most important - 2 |
| | This skill is not required for the job - 3 | Large difference - 3 | 3rd most important - 3 |
| SKILLS | [Type A] | [Type A] | [Type A] |
| 1. Can do calculations and work with numbers | 1 2 3 | 1 2 3 | |
| 2. Can read and write in English | 1 2 3 | 1 2 3 | |
| 3. Can read and write in another foreign language (For example, Italian, French, German, Greek etc.) | 1 2 3 | 1 2 3 | |
| 4. Can find new and better ways to do things | 1 2 3 | 1 2 3 | |
| 5. Can stay on a long and difficult task until it is finished | 1 2 3 | 1 2 3 | |
| 6. Can be relied on to get things done | 1 2 3 | 1 2 3 | |
| 7. Can work well with others and listens to others' views | 1 2 3 | 1 2 3 | |
| 8. Can work well in very busy or difficult situations | 1 2 3 | 1 2 3 | |
| 9. Can continue in the face of challenging situations at work | 1 2 3 | 1 2 3 | |
| 10. Can easily adapt to new tasks or changes in the workplace | 1 2 3 | 1 2 3 | |
| 11. Can use a computer for making presentations and/or other advanced purposes like creating and managing databases, or using specialized computer programs, etc. | 1 2 3 | 1 2 3 | |
| 12. Can demonstrate specific technical skills relevant to the job. | 1 2 3 | 1 2 3 | |

[41] http://microdata.worldbank.org/index.php/catalog/2994

## Appendix III. Draft guidelines concerning measurement of qualifications and skills mismatches of persons in employment presented to the 20th International Conference of Labour Statisticians

*(please see document published separately on the website)*

**Table 3. Share of employed with advanced level of education and share of employed in highly skilled occupations, selected countries or areas**




*Source: ILOSTAT, [www.ilo.org/ilostat/](www.ilo.org/ilostat/)*

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