STEPSKILLS
MEASUREMENT

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Measuring Skills for Employment and Productivity

What does it mean to be a well-educated worker in the modern economy?

The World Bank's key development objectives are reducing extreme poverty and increasing shared prosperity. This calls for raising living standards for all, reducing inequality, and improving other aspects of individual well-being and social inclusion. Achieving these objectives requires improving access to high quality services, developing well educated workers for the 21st century, increasing the number of high-skilled jobs, and reducing skill mismatches between workers and jobs. While information on the technology intensity of jobs and mismatches in the labor market may be found in labor force and enterprise surveys, it is important to define what it means to be a well-educated worker in the 21st century.

Education in the modern economy • In order to determine what it means to be a well-educated worker in the 21st century, it is necessary to reflect on the impact that swift changes in technology and the organization of production in a global economy are having on the labor market and on the nature of jobs. There is a robust body of evidence showing that technology has shifted the focus from the qualifications needed for doing a 'life-time' job to the skills needed to do specific tasks in jobs that are constantly changing. This means that more than ever a person has to be equipped with a solid foundation of multiple generic skills that enable further acquisition of job-specific (technical) skills and adaptation to repeated employment changes over the work life (Holzer, 2011; Acemoglu and Autor, 2010; Autor, Katz and Kearney, 2006; Autor, Levy, and Murnane, 2003).

However, the education (basic and post-secondary) and training systems do not currently focus enough on the development of these skills and often lag in responding flexibly to changes in skills demand. As education coverage has expanded rapidly across many countries, it has done so with varying quality. Basic educational attainment is becoming more of a norm and years of schooling no longer carry the same signal of the actual skills embodied in individuals (Arias et al., 2014; OECD, 2013; Sondergaard and Murthi, 2012).

Standard research indicators and their limitations • Standard research indicators such as educational attainment, employment and unemployment, occupation and industry, earnings, and hours worked are staples of policy and research and as such are usually available in labor force surveys. The indicators have some significant limitations. For example, they do not give any clear indication of the level of skill actually required by current or future jobs. They give no indication of why a particular level of education might be needed for certain kinds of jobs, what relationship it has to the technology associated with a job, or even what that level might be. They do not measure any mismatch between skill stocks and job skill requirements or the degree to which the skills of workers and jobs are meeting or approaching national goals. Standard indicators also fail to address the relative weight of cognitive and socio-emotional characteristics. In general, the level of detail in standard indicators is thin and leaves many questions unanswered regarding workforce skill characteristics, job skill requirements, quality of worker-job matches, working conditions, and job rewards other than earnings. The resulting information gaps prevent policymakers from making informed and timely decisions on education and training.

On measuring skills • Given the need to understand the role that skills play on employability, employment, and as productivity boosters, information on skills use and skill proficiency level is required. Sources of information that provide internationally comparable indicators on skill proficiency include the Programme for International Student Assessment (PISA) which measures generic skills (reading, mathematics, and

science) and knowledge of 15-year-olds globally and can be considered as a barometer of skill proficiency for new entrants to the labor force. Similarly, the Programme for the International Assessment of Adult Competencies (PIAAC), which focuses primarily on OECD countries--directly measures cognitive skills (literacy, reading components, numeracy and problem solving in technology- rich environments) and the utilization of skills in different contexts.

The Skills towards Employment and Productivity (STEP) survey—which focuses on developing countries--measures generic skills of the working-age population (current stock of workers) and tracks the evolution of skills across cohorts. Unique features of the STEP skill measurement program—not yet available in other large-scale surveys-- include the assessment of socio-emotional skills (which evidence indicates are as important as other skills) and a stand-alone Employer Survey to identify employers' views on skills needs (Heckman and Kautz, 2013; Heineck and Anger, 2010; Cunha Heckman, and Schennach 2010; Hanushek and Woessmann, 2009; Borghans et al., 2008; Duckworth et al. 2007; Heckman, Stixrud and Urzua, 2006; Jacob, 2002).

The STEP Skills Measurement Program • The STEP household and employer surveys were designed to inform policy and programs on skills rather than on education attainment or training alone. The surveys represent a unique resource for understanding (i) job skill requirements, (ii) backward linkages between skill acquisition and educational achievement, personality, and social background, and (iii) forward linkages between skill acquisition and living standards, reductions in inequality and poverty, social inclusion, and economic growth.

The STEP skills measurement program is comprised of a household-based survey (representative of urban areas) and an employer survey. The household survey includes three unique modules: (i) a direct assessment of reading proficiency and related competencies scored on the same scale as the OECD's PIAAC assessment; (ii) a battery of assessments to collect self-reported information on personality, behavior, and preferences (e.g., Big Five, GRIT, decision-making, and hostility bias); and (iii) a series of questions on task-specific skills that the respondent reports to possess or use in his or her job. The employer survey gathers information on job skill requirements using questions parallel to those in the household survey, a feature that facilitates analysis of skill gaps and mismatches. The employer survey also has information on practices relating to: (i) hiring and compensation, (ii) training, and (iii) enterprise productivity.

Types and Definitions of Skills Measured[1]

Cognitive skills are defined as the "ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought." Literacy, numeracy, and the ability to solve abstract problems are all cognitive skills. The STEP survey provides a *direct measurement* of reading proficiency and an *indirect measurement* of reading, writing, and numeracy skills.

The *direct measurement of cognitive skills* entails the assessment of reading proficiency through a reading literacy assessment designed by the Educational Testing Services (ETS).

The reading literacy assessment has three parts. The first part evaluates foundational reading skills, including word meaning, sentence processing and passage comprehension. The second part consists of a core literacy assessment that is intended as a filter to sort the least literate adults from those with higher reading skill levels. The core has a total of eight items. Respondents with three or more correct responses are regarded as having met a minimum reading literacy threshold and can move on to the next (third) part of the

[1] For a full technical description of the STEP surveys, see Pierre et al. (2014).

assessment. The third part provides overall reading proficiency scores using a scale ranging from 0 to 500, which is divided into 5 levels, with Level 1 characterized by the least demanding tasks and Level 5 by the most demanding tasks. The reading literacy assessment results are scored on the same scale (0-500 and 5 levels) as the assessment in the OECD's Program for the International Assessment of Adult Competencies (PIAAC).

Figure 1 ● Types of skills measured in STEP

Cognitive Skills	*Direct measurement* (reading assessment) of reading literacy based on the Survey of Adult Skills instruments (IALS). Reading assessment is on the same scale as PIAAC-OECD.	▪ Reading proficiency
	Indirect assessment (self-reported) on individuals' use of foundational skills--at work or in daily life	▪ Reading ▪ Writing ▪ Numeracy
Socio-emotional skills	Personality traits	▪ Openness ▪ Conscientiousness ▪ Extraversion ▪ Agreeableness ▪ Neuroticism ▪ Grit
	Behavior	▪ Hostile attribution bias ▪ Decision making
	Risk and time preferences	▪ Risk taking preferences ▪ Time preferences
Job-relevant skills	Qualifications required for the job and job learning times	▪ Qualification requirements for current job ▪ Learning times
	Indirect assessment of skills used at work	▪ Autonomy and repetitiveness ▪ Computer use ▪ Contact with clients ▪ Solving and learning ▪ Supervision ▪ Physical tasks

The *indirect measures of cognitive skills* include self-reported information on respondents' *use* of cognitive skills in daily life and at work, namely if they read, write, or use mathematics, as well as the *intensity* of use, which in most instances is a proxy for complexity. For each of these cognitive skills, a score ranging from 0 to 3 was computed. When a respondent reports not using a given skill, the score is set at 0. For respondents who do use a given skill, intensity or complexity of use is defined (1 for low, 2 for medium, and 3 for high).

Socio-emotional skills, sometimes referred to in the literature as non-cognitive skills or soft skills, relate to traits covering multiple domains (such as social, emotional, personality, behavioral, and attitudinal). The survey builds on the "Big Five" personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism (or its opposite, emotional stability). Measures of grit, which has been shown to have an impact on life outcomes, and hostile attribution bias were also included, as well as questions pertaining to how individuals make important decisions. In addition, the STEP survey includes measures of time and risk preferences. Score categories range from 1 ("almost never") to 4 ("almost always").

Job-relevant skills are task-related and build on a combination of cognitive and socio-emotional skills. The STEP survey asks respondents about their use of such skills on the job, including, among others, computer use, repair and maintenance of electronic equipment, operation of heavy machinery, client contact, solving and learning, and supervision. For each skill, a score ranging from 0 to 3 was computed. When a respondent reports not using a given skill, the score is set at 0. For respondents who do use a given skill, intensity or complexity of use was defined (1 for low, 2 for medium, and 3 for high). The survey also includes self-reported information about the educational attainment required to do one's job and the time required to learn how to do one's job; these responses

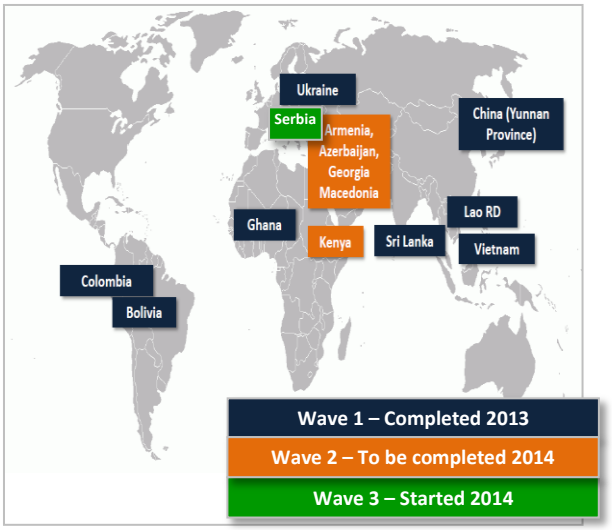
contribute to our understanding of what the education system is currently producing, what the current positions seem to demand, and how well they match.

Other terms used. This Snapshot uses several other concepts that are important to clarify from the outset. First, we use the term *early childhood education* (ECE) to refer to participation in any form of pre-school education; participation does not necessarily mean actual enrollment rates, nor is anything implied about the quality of such education. Second, the *socio-economic status at age 15* is a self-reported variable, for which the survey asks each individual to rank his or her household when she was 15 from 1 to 10 on their economic well-being. Third, the *current wealth index* is estimated using factor analysis on several non-income related assets and dwelling characteristics.

Fourth, we define as *entrepreneurs* all those who reported being self-employed without employees, hence we use the terms entrepreneur and self-employed inter-changeably. Lastly, in categorizing *innovative and/or fast growing sectors* we include high-tech manufacturing and knowledge-intensive services under high innovation sectors and medium low-tech manufacturing and less knowledge-intensive services under low innovation sectors. The agricultural and construction sectors were classified as low innovation sectors.

Implementation ● The STEP surveys have been implemented in 13 countries (Armenia, Azerbaijan, Bolivia, Colombia, Georgia, Ghana, Kenya, Lao PDR, Macedonia, Sri Lanka, Ukraine, Vietnam, and China (Yunnan Province), and are planned or ongoing in 3 countries (Kosovo, Lybia and Serbia).

Figure 2 ● Participating countries, 2011–13



This snapshot presents a handful of emerging findings from available data in Armenia, Bolivia, Colombia, Ghana, Lao PDR, Sri Lanka, Vietnam, and Yunnan Province (China).

Stand-alone country reports are available for Lao PDR, Sri Lanka, Vietnam and Yunnan province, China. The World Bank has supported similar skills surveys, most using the STEP socio-emotional module, in several countries, such as in Bulgaria, Peru, Pakistan, and Lebanon.

Snapshot 2014 | Summary of Findings

This is the first edition in a series of short snapshots summarizing findings from the STEP surveys. The results included in this 2014 issue are based on STEP household surveys carried out in eight countries: Armenia, Bolivia, Ghana, Colombia, Lao PDR, Sri Lanka, Vietnam and Yunnan Province in China. The results apply only to the urban population aged 15 to 64. The findings from the employer surveys are not presented here because, unlike the household survey, data from the employer surveys cannot be compared across countries because of differences in sample frames and/or sectors of interest. For each country, however, employer surveys provide meaningful insights on skills demands in a specific sector, sets of sectors, or region of the country where the data was collected.

The emerging findings in this Snapshot are consistent with the growing body of evidence pointing to the importance of a multiplicity skills for labor market success (Burks, et al. 2014; Heckman and Kautz 2013; Heineck and Anger, 2010; Cunha, Heckman, and Schennach, 2010; Borghans, 2008; Stixrud and Urzua, 2006). They are also consistent with findings that these skills are developed progressively; that strong foundations for job-relevant skills acquisition starts early in life and is shaped by family socio-economic conditions and schools; and that gaps in these skills affect many workers and employers.

It is important to emphasize that the information presented here is not meant to be either exhaustive or definitive, but rather indicative of the scope and depth of policy-relevant topics that may be analyzed with these data—from establishing patterns between early childhood education and socio-emotional skills to identifying linkages between reading proficiency and labor market outcomes. Most importantly, the results reflect suggestive correlations, whose causation can only be corroborated with evidence from carefully designed empirical studies.

Additional information on the STEP surveys can be found in the Technical Annex at the end of this Snapshot. The data are available for analysis here.

Summary of Findings:

1. Adults who participated in early childhood education as children have higher reading literacy proficiency and are more likely to have started primary education at the right age than those who did not participate.
2. Past socioeconomic status correlates with the development of socio-emotional skills; however, a high-quality educational system can play an important role in reducing skill gaps.
3. Adults' use of foundational skills, such as numeracy, has been increasing, but differences between men and women in these skills remain.
4. Strong cognitive and socio-emotional skills are a prerequisite for developing job-relevant skills.
5. Workers who report a smoother transition from school to work have different socio-emotional skills than those who took longer to find their first job. In particular, they tend to be more conscientious, emotionally stable and have more grit.
6. Foundational cognitive, socio-emotional and job-relevant skills correlate with higher wages, beyond a worker's educational attainment.
7. Because solid foundational cognitive and socio-emotional skills are the basis on which a worker's job-relevant skills can be built, the educational system, training programs, and apprenticeship programs should all do more to strengthen these skills.
8. Businesses are not making full use of their workers' existing skills. For example, employees are not fully utilizing their computer skills in their current jobs.

Step 1

Foundational Skills in Early Childhood

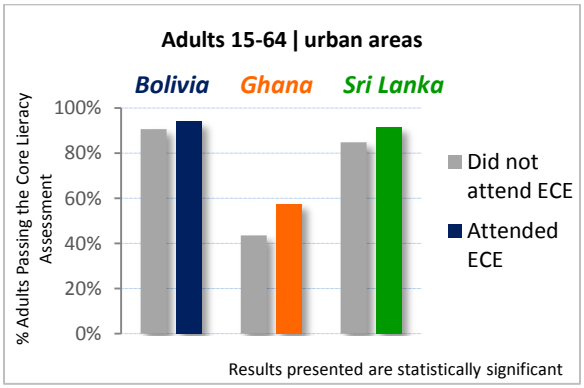
Getting children off to the right start

Early childhood development is a fundamental building block in the formation of a person's human capital. The skills developed in early childhood—between birth and entering primary school—form the basis of a person's future capacity to learn and succeed in the workplace.

The STEP data include information on the adult respondents' participation in any organized form of early childhood education (ECE) before the age of 7 (daycare, kindergarten, creche, nursery school, etc.). The section sheds light on whether there is an association between ECE participation and performance in reading literacy, starting age in primary education, and socio-emotional skills.

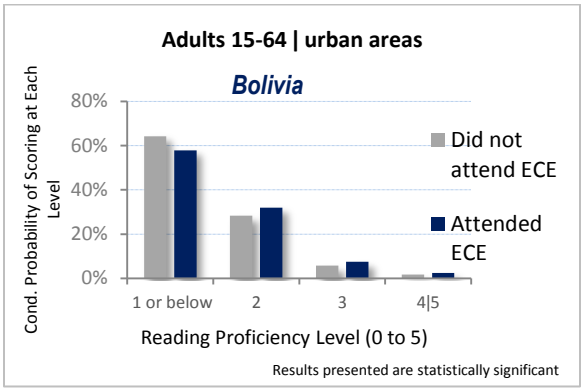
Adults who participated in early childhood education programs have better reading literacy proficiency… In Bolivia, Ghana, and Sri Lanka, the probability of passing the core reading literacy assessment—a measure of minimum literacy—is higher for adults who participated in an early childhood education program than for those who did not.

Figure 3 ● Adults aged 15-64 passing the core reading literacy assessment by ECE participation, Bolivia, Ghana and Sri Lanka



…and are more likely to read at advanced levels (level 2 and above). In Bolivia, for example, the probability of scoring at level 2 (or above) in reading is slightly higher for adults who attended ECE than for those who did not—albeit reading proficiency is low in Bolivia. (The 5-level reading proficiency scale is explained below in Table 1.)

Figure 4 ● Probability of attaining a reading proficiency score (1 to 5) by ECE participation, Bolivia



They are also more likely to have started primary education on time, at the compulsory age (6–7 years old)... In Ghana, for example, adults who participated in ECE are more likely to have started primary school at the right age than those who did not. Specifically, about 40 percent of adults who did not attend ECE started late compared to 20 percent of adults who attended ECE.

Figure 5 ● Probability of starting primary school at specific ages by ECE participation, Ghana

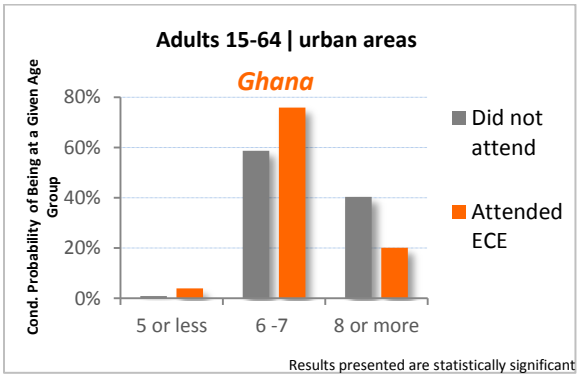
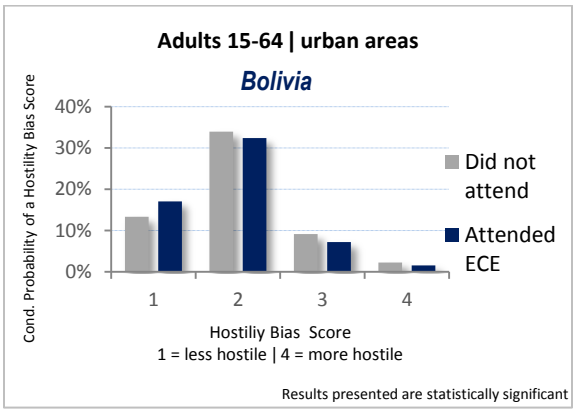


Table 1 ● Guide to Reading Proficiency Levels (1 to 5)

Level (score)	Expected milestone
Below Level 1 (0-175)	▪ Respondent are required to read brief texts on familiar topics to locate a single piece of specific information.
Level 1 (176-225)	▪ Respondent are required to read relatively short digital or print continuous, non-continuous or mixed texts to locate a single piece of information which is identical to or synonymous with the information given in the question or directive.
Level 2 (226-275)	▪ The complexity of text increases. The medium of texts may be digital or printed, and texts may comprise continuous, non-continuous or mixed types.
Level 3 (276-325)	▪ Texts at this level are often dense or lengthy, including continuous, non-continuous, mixed or multiple pages. Understanding text and rhetorical structures becomes central to successfully completing tasks, especially in navigation of complex digital texts.
Level 4 (326-375)	▪ Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesize information from complex or lengthy continuous, non-continuous, mixed, or multiple type texts.
Level 5 (376-500)	▪ At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments.

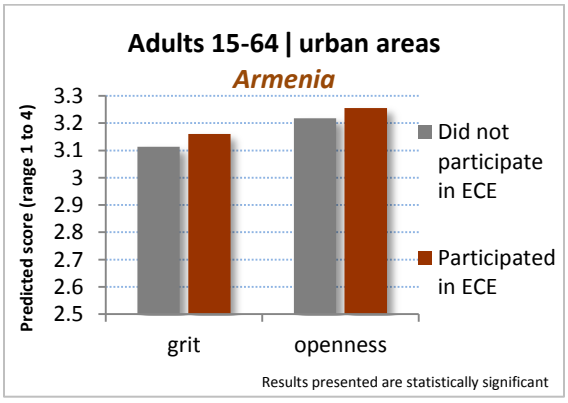
…and they are less likely to perceive hostile intent in others (low on hostility bias)... This personality trait is one that mediates the type of social interactions a person is likely to have throughout life. In Bolivia, for example, respondents who participated in ECE display lower levels of hostile bias.

Figure 6 ● Conditional probability of hostility bias score by ECE participation, Bolivia



…and are more likely than other adults to score higher in socio-emotional skills such as grit and openness. Participation in early education programs is associated with a higher probability of scoring higher on *grit* and *openness.* For example, adults who participate in ECE are more likely to get a higher grit score compared to adults who did not participate and whose grit scores are likely to be lower. The differences are statistically different after controlling for gender, mother's education, father's education, number of household shocks experienced by age 12, household socio-economic status at age 15, and indicator variables for age groups.

Figure 7 ● Conditional probability of grit and openness score by ECE participation, Armenia



These finding are generally consistent with the international literature. Both of these traits—in addition to others—are associated with

"character skills" that matter for a range of outcomes in life, including employability and labor market outcomes (Heckman and Kautz, 2013). Moreover, the finding is also consistent with research from Duckworth et al. (2007), which indicates that grit—broadly defined as perseverance and passion for long-term goals—is a trait capable of predicting long-term success. Duckworth's research indicates that individuals who score high on grit tend to work tirelessly through challenges, failures, and adversity to achieve goals, making them more likely to achieve their goals when compared to individuals who lack similar stamina. Similarly, openness—which is one of the traits of the Big Five personality traits—reflects individuals' openness to experiences, degree of intellectual curiosity, creativity, and a preference for novelty and variety. In fact, research from around the world suggests that, on average, people who register high in openness are intellectually curious, open to emotion, interested in art, and willing to try new things (McCrae and Costa, 1987; Atkinson et al., 2000; Matthews, Deary, and Whiteman, 2003). Openness is also linked to learning styles associated with higher grades and academic success (Komarraju et al. 2011). This is an important finding and consistent with the accumulated evidence on the role of high-quality early childhood and basic education programs to improve socio-emotional skills (Heckman and Kautz, 2013).

Step 2

Developing Foundational Skills for All

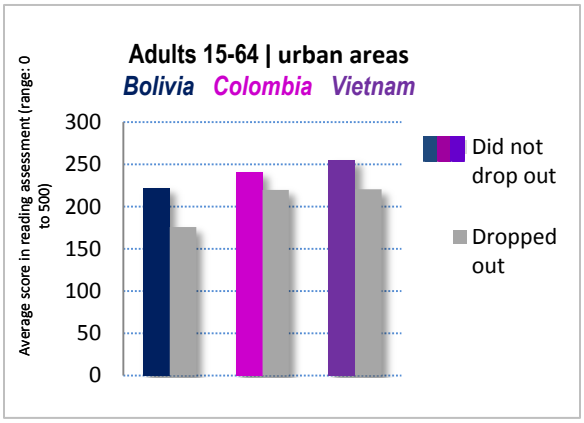
Ensuring that all students learn

Foundational cognitive and socio-emotional skills are essential to sustain a person's capacity to learn, discover, and innovate throughout life. Schools are expected to help students acquire basic skills and abilities to build social networks and make informed life choices that will later be valued by employers, will be useful for self-employment, and will contribute to society. The STEP surveys include a mix of direct measurement and self-reported use of skills that allows for a better understanding of skills workers possess and their utilization.

The household survey directly assesses the respondents' reading proficiency and socio-emotional profile. It also collects information on adults' use of these foundational skills and the relationship between possessing these skills and the demographic and socioeconomic context in which individuals live and work.

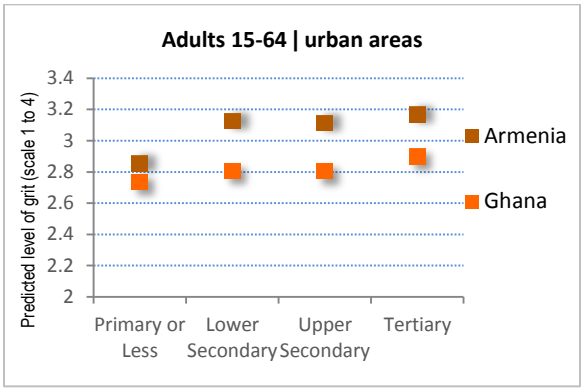
Adults who drop out of school are likely to score lower on reading proficiency than those who do not. In Bolivia, Colombia, and Vietnam, adults who drop out of school have a lower average score in reading than those who did not drop out.

Figure 8 ● Average score in reading assessment by drop-out status, Bolivia, Colombia, and Vietnam



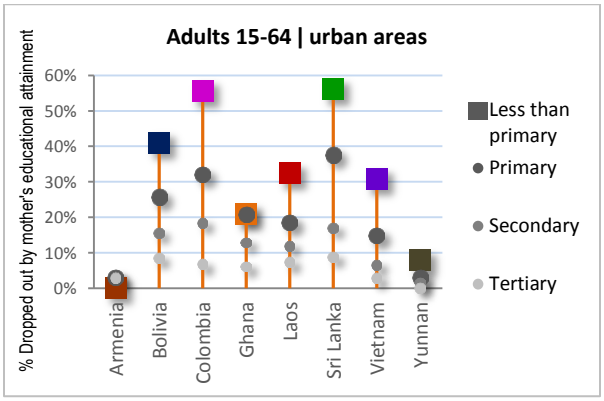
Similarly, adults with more education tend to score higher in terms of grit. While parents have a considerable influence on their children's long-term education and skills, the educational system can also play a substantial role in helping them to develop these skills.

Figure 9 ● Predicted level of grit by educational attainment, Armenia and Ghana



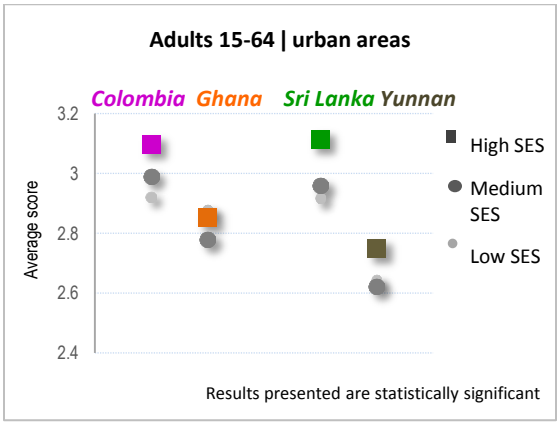
Family education background can shape educational outcomes. Adults whose mothers had only a primary education or less have higher school drop-out rates than those whose mothers had more education. In Colombia and Sri Lanka, for example, drop-out rates are higher than 50 percent for adults whose mothers had less than a primary education.

Figure 10 ● Percent of adults dropping out by mother's educational attainment, selected countries



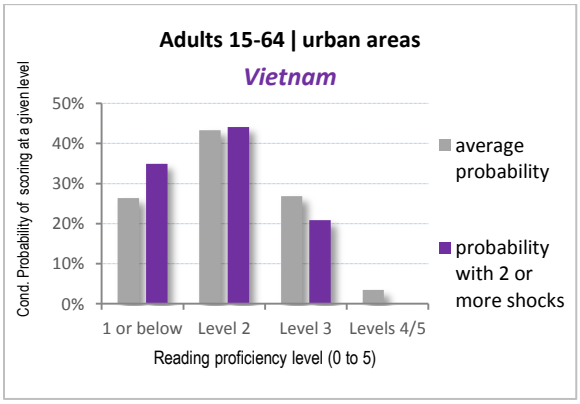
The socioeconomic status (SES)[2] of the parents can also shape the development of socio-emotional skills. For example, adults who lived in high-socio-economic-status households at age 15 had higher grit scores compared with adults who lived in low-socio-economic-status households at age 15.

Figure 11 ● Average grit score by socio-economic status at age 15, Colombia, Ghana, Sri Lanka, and Yunnan



Household vulnerability also correlates with skills outcomes. Adults who endured more than one household shock before the age of 15 are likely to have lower reading proficiency levels.

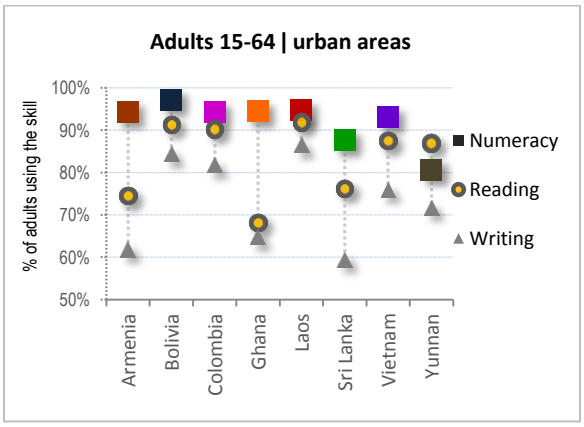
Figure 12 ● Conditional probability of scoring at a given reading proficiency level by household vulnerability, Vietnam



[2] For constructing past socio-economic status of the household, the STEP surveys asked individuals to rank their household's socio-economic status when they were 15 years old from 1 to 10. Similarly, to construct a wealth index for the household at the time of the survey was administered, the survey asked for information about different types of assets and dwelling characteristics, which was compiled into an index using factor analysis methods. Robustness checks rendered the variables reliable.

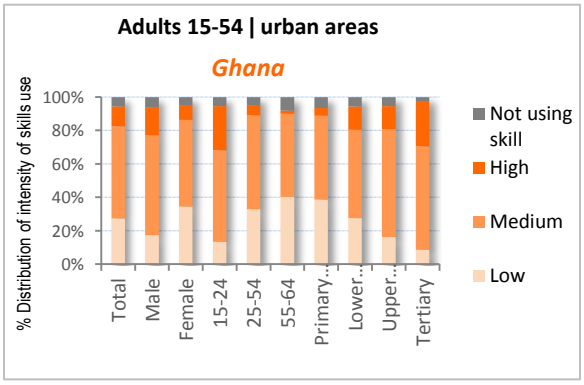
Most adults use their foundational cognitive skills regularly, especially numeracy skills. Across countries, nearly 90 percent of adults use their numeracy skills regularly at work or in their daily lives, while literacy skills are used less often.

Figure 13 ● Percent of adults using foundational skills, selected countries



However, the reported intensity of use of such skills varies across the adult population. Those who are more educated, youth, and men tend to use the skills more often. As illustrated for Ghana, the intensity of skills use varies depending on gender, age, and education level.

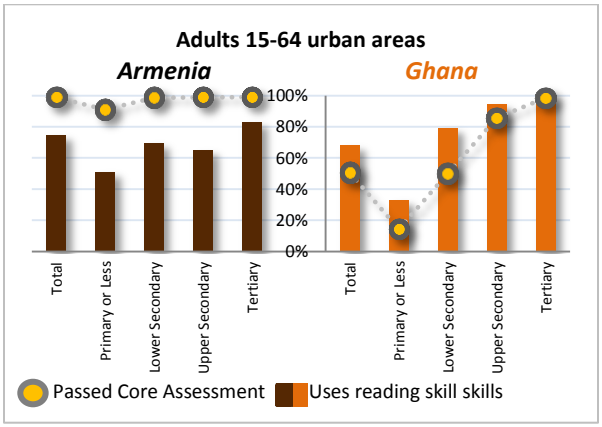
Figure 14 ● Percent of adults using foundational cognitive skills, by intensity of use, Ghana



Respondents' self-reported information on their use of reading skills is a weak indicator of their actual reading ability. In Ghana, a sizable proportion of adults report that they read, even

though they did not pass the minimum literacy threshold. The opposite is the case in Armenia

Figure 15 ● Percent of adults using reading skills and percent passing the core reading literacy assessment, Armenia and Ghana



Step 3

The Right Skills for the Job

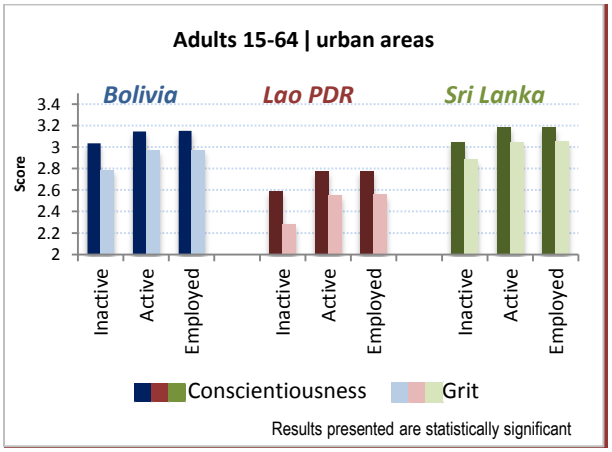
Building job-relevant skills

Acquiring job-relevant skills increases workers' employability and productivity. Firms around the world report that inadequate skills are a major constraint to their development (WB Enterprise Surveys, 2010). A large share of people living in urban centers in low-income and many middle-income countries are employed in low-skilled and low-paid jobs, in particular in the informal sector (Fluitman, 2009). Indeed, pre-employment training often fails to impart labor market relevant skills. Foundational skills, which are essential to the acquisition of job-relevant skills, have yet to be strengthened in many countries. Likewise, the development of socio-emotional skills has not received all the attention it deserves. Finally, few opportunities are available later in life to workers seeking to upgrade or broaden their skills sets. Lifelong learning programs and on-the-job-training play a key role in developing job-relevant skills. Yet such options remain limited for many workers in low- and middle-income economies, as they tend to favor employees of large formal firms with relatively high educational attainments (Heckman Lochner, and Taber, 1998).

The STEP data include detailed information on workers' job-relevant skills, including computer use, interacting with clients, solving complex problems, and learning new things at work. This information is aimed at pinpointing skills bottlenecks in different sectors and occupations.

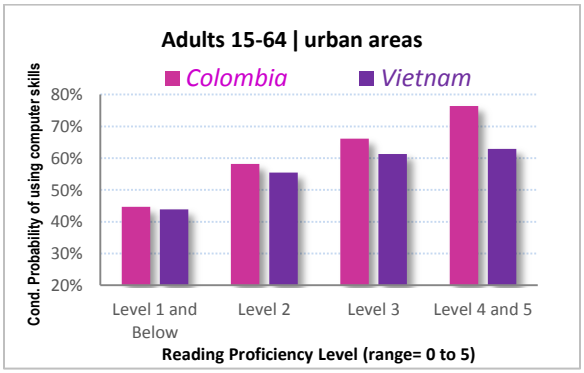
Socio-emotional skills and employment status are interrelated. Socio-emotional skills play a role in obtaining a job or setting up a business. Conversely, employment contributes to maintaining and developing these skills. Thus, active and employed individuals tend to display better socio-emotional skills than inactive people. For instance, labor force participation and employment are associated with higher scores of conscientiousness and grit in Armenia, Bolivia, Lao PDR, Sri Lanka, and Vietnam.

Figure 16 ● Conscientiousness and grit scores by labor force participation and employment status, Bolivia, Lao PDR, and Sri Lanka



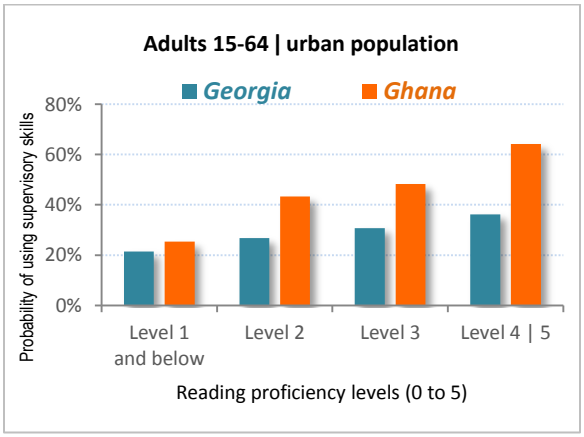
Job-relevant skills are connected with learning outcomes... Foundational skills are not found to be strongly correlated with employment status, in particular in settings where labor force participation is high and low-skilled jobs are common. However, these skills are associated with specific skills used at work. For example, in Colombia and Vietnam, the higher a person's reading proficiency level the more he or she uses computers at work.

Figure 17 ● Reading proficiency and probability of using a computer at work, Colombia and Vietnam



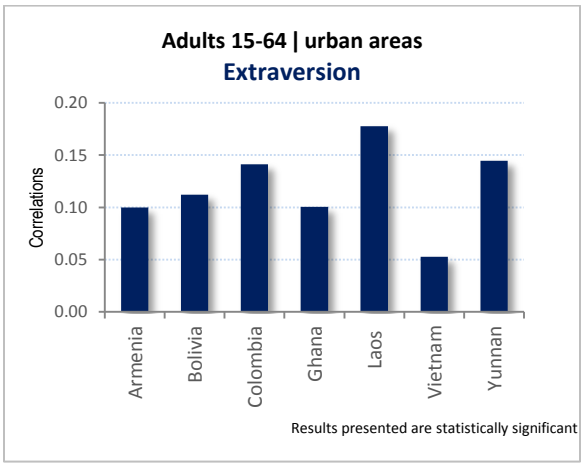
Similarly, reading proficiency is linked to supervising others at work. In Georgia and Ghana, for instance, the data suggest both that strong foundational skills are a stepping-stone to acquiring job-relevant skills and, conversely, that engaging in certain types of tasks at work may contribute to honing cognitive skills (e.g., attaining higher levels of reading proficiency).

Figure 18 ● Reading proficiency and probability of supervising others at work, Georgia and Ghana



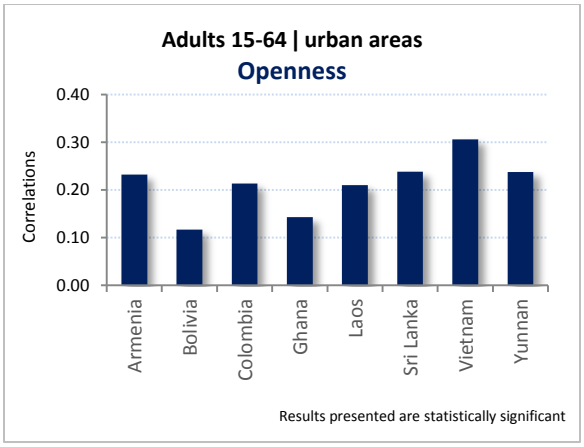
… and with socio-emotional skills. Socio-emotional skills are also associated with the use of job-relevant skills. For example, greater extraversion is associated with more contact with clients at work. Indeed, workers who tend to engage more intensively with the outside world and are more interested in interacting with people (extroverts) tend to seek contact with clients.

Figure 19 ● Correlation between extraversion and contact with clients at work, selected countries



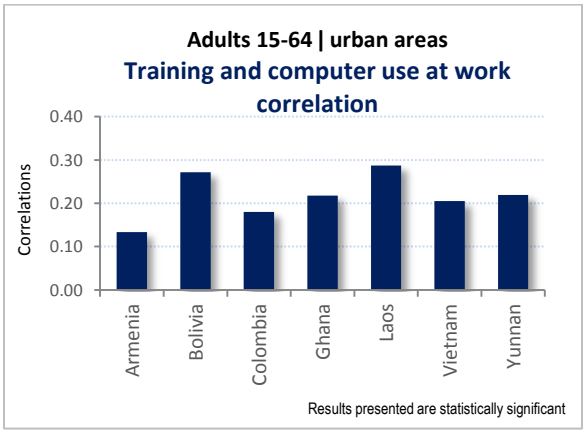
Likewise, workers who are more intellectually curious and open to experiences are more likely than others to report solving complex problems and learning new things at work.

Figure 20 ● Correlation between openness and solving and learning at work, selected countries



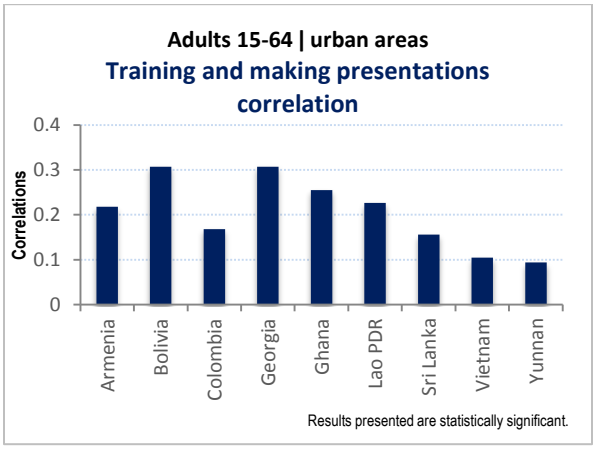
Training is associated with a higher use of job-relevant skills. Training provides workers with the opportunity to develop the specific skills required by their occupation or to otherwise evolve professionally. Training helps workers adapt to the introduction of new technologies or processes, thereby improving productivity. For instance, workers who report having taken part in a training program in the previous year also tend to use computers more than others.

Figure 21 ● Correlation between training and computer use at work, selected countries



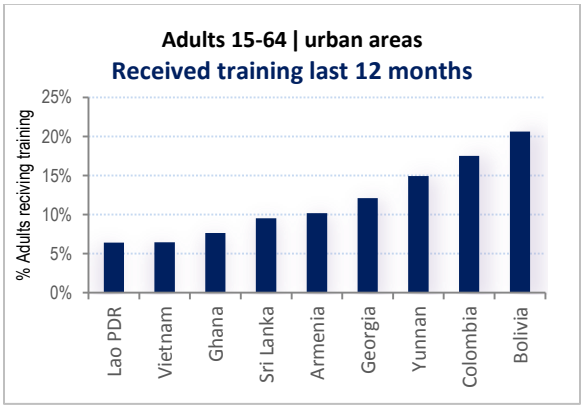
Receiving training is also correlated with making presentations to others at work, an important communications skill.

Figure 22 ● Correlation between training and making presentations, selected countries



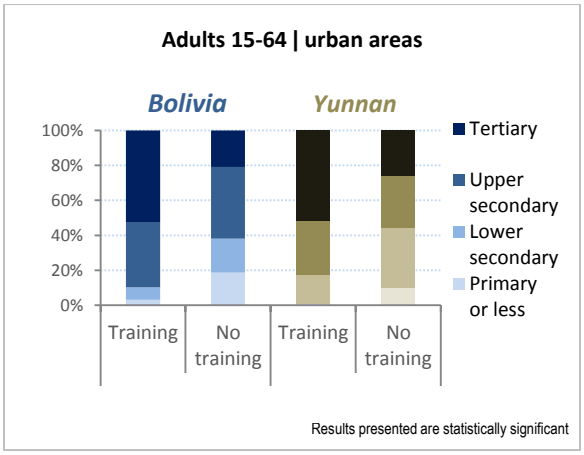
However, training primarily benefits the highly educated. In many countries, only a small proportion of individuals participate in training programs aimed at developing job-relevant skills. For instance, in Lao PDR, Vietnam, Ghana, and Sri Lanka, less than 10 percent of labor force participants report having taken part in some form of training in the past year.

Figure 23 ● Proportion of labor force participants who received some training in the past year, selected countries



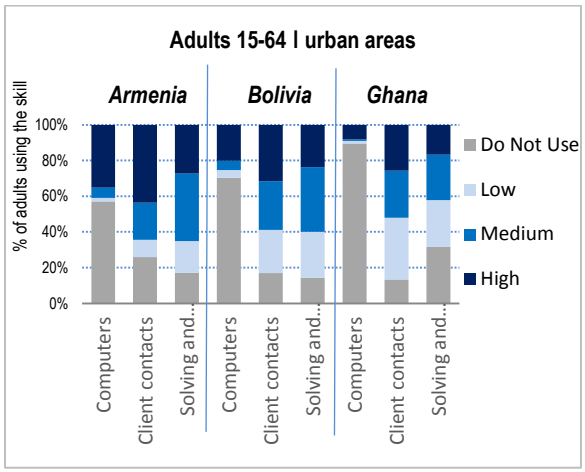
Workers who report having received some training also tend to be more educated than others, on average. For example, in Bolivia and Yunnan, 52 percent of recently trained individuals had a tertiary degree compared with, respectively, 21 and 26 percent of the individuals who had received no training.

Figure 24 ● Percent of labor force participants who received some training in the past year, by educational level, Bolivia and Yunnan



Differences in the use of job-relevant skills reflect different levels of modernization and economic structures. Differences between countries in the use of job-relevant skills may be due to different production processes or to different skill levels in the labor force. When the STEP labor force and employer surveys are analyzed together, the data can pinpoint the skills gaps that are relevant in each country.

Figure 25 ● Intensity of use of selected job-relevant skills, Armenia, Bolivia, and Ghana



Step 4

Encouraging entrepreneurship & innovation

Building job-relevant skills

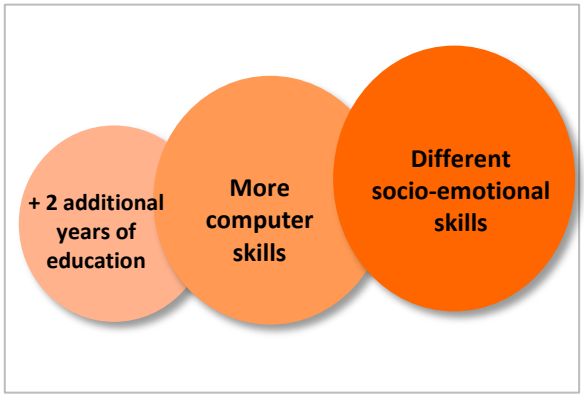
Successful entrepreneurial activties as well as innovation can be fostered by helping workers develop adequate skills and behavior. In many countries, encouraging entrepreneurship and innovation requires improving regulations and reducing constraints to doing business or introducing new technologies. Skills development also has an important role to play. A country's economic success depends on its ability to introduce or adapt products, processes, and services that meet constantly evolving market needs (World Bank, 2007). Although the focus is often set on manufacturing, all sectors, including service delivery, can benefit from new ways of doing things. Importantly, innovation may occur at any stage of a production process (Lederman et al., 2014). It is therefore crucial to ensure that workers across the board are able to acquire the type of skills required not only to adapt the periodic introduction of new technologies, but also to contribute to their creation.

In addition to detailed information on occupations and sectors, the STEP surveys include data on earnings from self-employment, sources of funds for setting up businesses, prospects for expanding, and the constraints to expansion that can be faced by the self-employed.

Who are the successful self-employed? In low- and middle-income countries, many opt for self-employment when they cannot access a wage-earning job. As a result, self-employment encompasses productive businesses generating high earnings, at one end of the spectrum, and at the other end low-paying, low-productive subsistence activities.

Determining who among the self-employed are successful and what characteristics distinguish them from the rest of the self-employed can provide useful pointers to policymakers, in particular when designing training programs aimed at fostering entrepreneurship (Valerio, Parton and Robb, 2014). Although educational attainment and job-relevant skills are found to be linked to successful self-employment, socio-emotional skills are also associated with running a thriving business.

Figure 26 ● Top features of the successful self-employed in urban Ghana

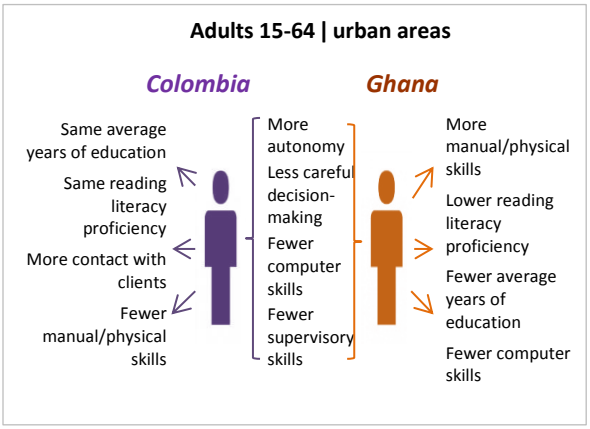


For example, in Ghana, among the self-employed the top 25 percent earners have, expected, more years of education than the other self-employed. They also tend to use more computer skills.

But the top earners among the self-employed in Ghana also differ from other independent workers when it comes to socio-emotional skills. They display lower scores in extraversion, emotional stability, and hostile attribution bias than the other self-employed. They are also less likely to make decisions carefully, that is, to go through an extensive and broad-reaching process before making a decision.

Are the successful self-employed similar to wage workers? Some of the self-employed actually might have chosen their status over wage employment. The more successful self-employed, however, do not necessarily display more skills than the average wage worker. Patterns may be associated with the country context.

Figure 27 ● Defining characteristics of Successful Self-Employed- compared with wage workers- in urban Colombia and Ghana



When compared with wage earners, the most successful self-employed workers in both Ghana and Colombia display less careful decision-making processes, lower supervision skills, and more autonomy.

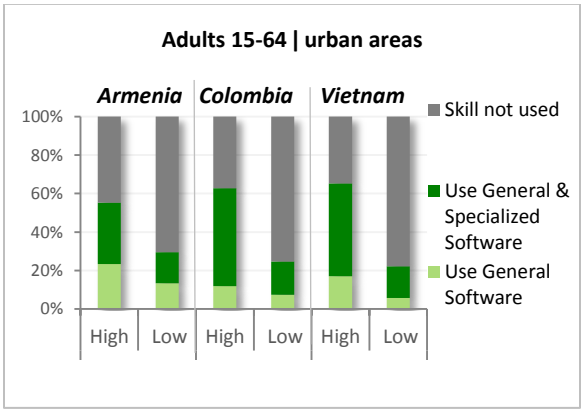
In Ghana, the most successful self-employed workers have fewer years of education and lower reading literacy than wage workers. They also use fewer computer skills and more physical skills.

By contrast, in Colombia, the most successful self-employed workers have the same average years of education, and the same reading literacy, more contact with clients, and they use fewer physical skills than wage workers.

Innovation and fast-growing sectors. Firms that are newer, faster-growing, and eager to adopt new technologies, such as those in high-tech manufacturing or non-retail services, lead the way in fostering employment and productivity in most countries.

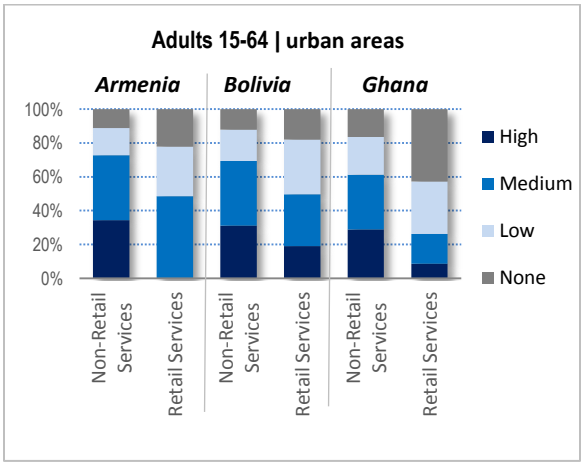
Innovation is fostered by many underlying factors, among them the skills possessed by the labor force. Workers in high-technology sectors are likely to be required to use advanced computer software, while workers in the non-retail service sector tend to need the ability to think and solve complex problems. These skills, along with socio-emotional skills, can add to an industry's innovative capacity.

Figure 28 ● Computer use at work in low- and high-technology sectors in urban Armenia, Colombia, and Vietnam



As illustrated above, jobs in high-technology sectors are more likely to require workers to use computers, in particular advanced software, than low technology sectors.

Figure 29 ● Problem-solving and learning at work in the service sector in urban Armenia, Bolivia and Ghana



Other types of skills are also important in the rapidly expanding service sectors. For example, in Armenia, Bolivia and Ghana, workers in non-retail service sectors, such as pharmaceuticals, television, and communication equipment are more likely than workers in other sectors to report solving complex problems and learning new things at work.

Step 5

Facilitating Labor Mobility & Job Matching

Putting Skills to Use

Even if individuals possess the "right" skills to be productive and creative, a poorly functioning labor market can prevent job creation and limit productivity. For the labor market to operate successfully, it needs a ready supply of workers with a quality education (Fasih, 2008) and with cognitive, socio-emotional (Diaz et al., 2012) and job-relevant skills (Autor and Handel, 2013). It is also crucial to a well-functioning labor market that the qualification and skills possessed by the available workers are the same as those in demand by employers—a process called job matching. However, the sources of mismatch can be multiple (including qualifications and skills mismatch) and they affect the individual's labor market outcomes differently (Quintini, 2011). Finally, labor market information is crucial both to reduce transaction costs and to shed light on the requirements in qualifications and skills for career advancement.

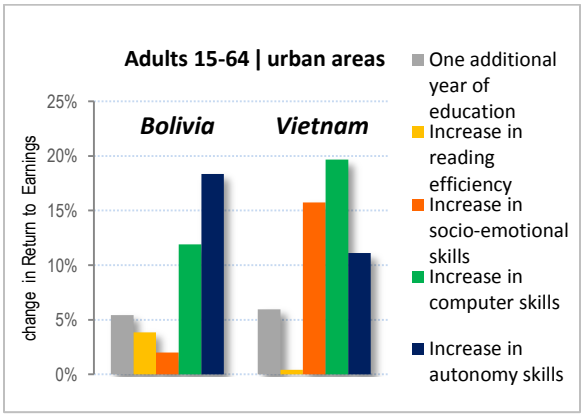
Using the new STEP data, it is possible to disentangle the effects associated with education and of skills on labor market outcomes. The STEP survey contains questions on the first job held by workers in all age groups as well as detailed information on their current abilities, illustrating the link between workers' school-to-work transition and the skills that they possess. It also contains data on when and how often workers use their skills both at home and at work as well as information on the educational requirements for each job. Furthermore, STEP contains data on what jobs workers expect to be able to do with their level of education and experience.

Studies on returns to education show that more years of schooling are associated with higher earnings. However, education is not the only mechanism through which workers may access higher earnings (Fasih, 2008). Another mechanism is the skills that people have. Since the quality of education can vary, multiple skills matter for wages, especially job-related and socio-emotional skills. To provide some evidence on how this works out in the developing world, simulations are presented to capture the changes in the wages with increases on individual characteristics, holding everything else constant. The increases range from one extra year of education, an extra unit increase on reading efficiency, to the maximum scores in job-related and socio-emotional skills.

Both education and skills matter for labor market success

In addition to education, all skills matter for wages, especially job-specific and socio-emotional skills. For instance, simulations show that wage workers in Bolivia and Vietnam could increase their earnings significantly by improving their socio-emotional skills, particularly personality traits and decision making. In Latin America and the Caribbean, relevant interventions are *Jovenes* and *Entra21* (Sanchez Puerta et al. 2014).

Figure 30 ● Simulation results on the change in hourly wages by increasing different characteristics, Bolivia and Vietnam

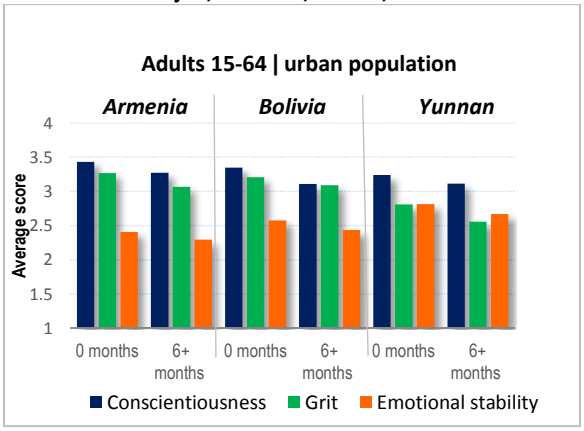


School to Work Transition

The transition from school to work is a crucial step in an individual's career. Studies looking at these transitions have shown that long periods of unemployment or inactivity can have a lasting negative effect on a worker's career and lifetime earnings.

Workers' current skill sets are related to how long it took them to find their first jobs. Among 35- to 45-year-old adults with a tertiary education, those who spent more than six months looking for their first job tend to display less conscientiousness, emotional stability, and grit than those who found a job right after graduating. Those who took the least time to find their first job, on the contrary, seem to have higher socio-emotional skills.

Figure 31 ● Average socio-emotional skill score by search duration for first job, Armenia, Bolivia, and Yunnan

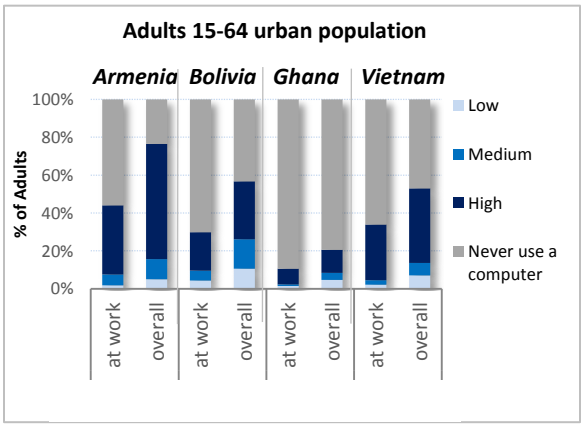


Link between Skills and Jobs

How firms use the abilities of their existing workers has a strong impact on their competitiveness and productivity. A firm's existing level of technology may underuse the skills of its workers. Conversely, these skills may not be adequate for the firm's current level of technology or its ability to adopt new technologies. A recurrent concern for policymakers is that workers may not be using their full potential in their jobs. Understanding the skills gaps or mismatches in the labor market can enable policymakers to help firms increase their competitiveness and productivity.

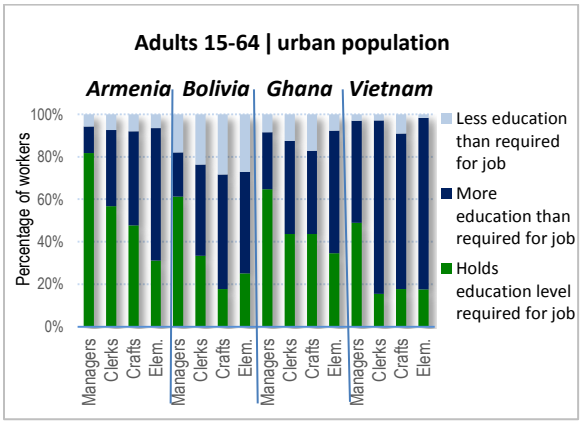
Workers underuse their computer skills in their jobs (skill mismatch). The share of workers who use computers in their lives in general is greater than the share of those who use them in their jobs, which suggests that firms are underusing their workers' computer skills. The extent of this underuse varies from country to country. In Armenia, for example, 76 percent of workers use computers in general, and only 44 percent of workers use them at work.

Figure 32 ● Percent of workers using computers at work and at home, by intensity of use, selected countries



Most workers feel they do not have the right level of education for their job (qualification mismatch). While most managers report that they have the educational level their job requires, workers in lower-skilled occupations are more likely to feel they are overqualified. The share of workers who believe they have less education than required for their positions is typically low, with the exception of Bolivia (where the share is over 20 percent).

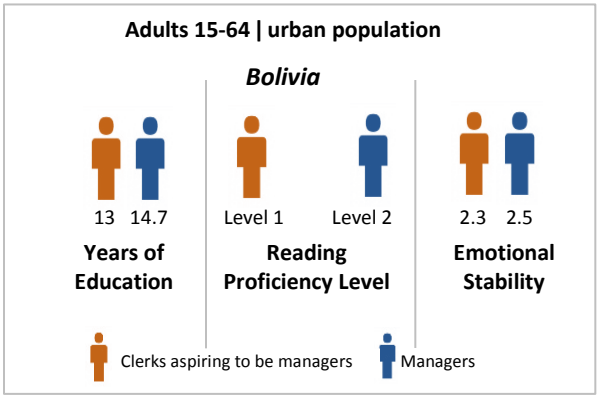
Figure 33 ● Qualification mismatch by occupation type, selected countries



Aspirations and Information on skills. Workers often lack precise information on the skills they need to advance in their careers. As a result, they may not acquire these skills, and their expectations may not be entirely aligned with the reality of the labor market.

Clerks aspiring to managerial positions have different skill sets from current managers. For instance, in Bolivia, about 25 percent of individuals in clerical positions said they could perform in a managerial role with their current skill set. However, when compared to individuals in managerial positions, aspiring clerical workers have fewer years of education, score lower in reading proficiency, and have less emotional stability. To overcome this gap, workers would benefit from information about further education and training opportunities or assignments that could prepare them for their desired positions.

Figure 30● Comparison of education and skills profiles of clerks and managers, Bolivia



RESOURCES

The STEP Skills Measurement Data Collection

The STEP Skills Measurement data files will be available in the World Bank's Microdata Catalog (link) starting on July 15, 2014. The *STEP Skills Measurement Data Collection* will provide a unique source of information on the STEP Skills Measurement program. It will be updated regularly to share new findings and materials related to the STEP program with a wide audience.

Country Reports

In addition to the **Snapshot 2014**, links to country reports will be made available through *STEP Skills Measurement Data Collection* page.

The following reports have already been published:

- LAO PDR ● Del Carpio, Ximena; Yuki Ikeda; Zini, Michele. 2013. *Lao PDR - Skills for quality jobs and development in Lao PDR: a technical assessment of the current context*. Washington DC : World Bank Group (link)
- SRI LANKA ● Dundar, Halil; Millot, Benoit; Savchenko, Yevgeniya; Aturupane, Harsha; Piyasiri, Tilkaratne A.. 2014. *Building the skills for economic growth and competitiveness in Sri Lanka*. Directions in development; human development. Washington, DC ; World Bank Group (**link**)
- VIETNAM ● Bodewig, Christian; Badiani-Magnusson, Reena. 2014. *Vietnam Development Report 2014 - Skilling up Vietnam: Preparing the workforce for a modern market economy.* Washington, DC ; World Bank Group (**link**)
- YUNNAN PROVINCE (CHINA) ● Liang, Xiaoyan; Chen, Shuang. 2013. *Developing skills for economic transformation and social harmony in China: study of Yunnan Province*. Directions in development; human development. Washington DC; World Bank. (**link**)

Materials

The STEP Collection will feature all STEP household survey datasets and background documentation required to understand how skills are measured in the STEP surveys and how to use the data.

In addition to country-by-country datasets and household questionnaires, the STEP Collection page will provide a methodology note (Pierre et al., 2014) offering guidance to data users and describing the design of the survey instrument as well the implementation process.

Technical documentation will also be made available to users seeking for particular information on specialized topics (e.g., sampling and weighting, operations, technical standards).

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TECHNICAL ANNEX[3]

The STEP Skills Measurement Program: The Household Survey

1. Geographic coverage

The STEP Skills Measurement household survey program covers a large sample of low and middle-income countries, including Armenia, Bolivia, Colombia, Georgia, Ghana, Kenya, Lao PDR, Macedonia, Sri Lanka, Ukraine, Vietnam, and the Yunnan Province in China. Surveys were carried out between 2011 and 2013. In Armenia, the household survey was implemented in 2013. The field work was carried out from April to June 2013.

2. Target population

The STEP target population is the urban population ages 15 to 64. The sampling strategy was designed to ensure that the target population represents at least 95 percent of the urban working-age population (aged 15 to 64) in each country.

3. Background questionnaire

The STEP survey collects comprehensive information not typically captured by traditional household surveys. It includes two distinct instruments: a background questionnaire and a reading literacy assessment. The background questionnaire is organized in three household background modules and seven thematic modules. Module 1 starts with a standard household roster and a section on dwelling characteristics. It concludes with the random selection of a household member aged 15 to 64 to whom the remainder of the survey is administered. The random selection is based on strict guidelines set by the STEP technical standards. Modules 2 to 11 are applied to the randomly selected respondent. Module 2 collects in-depth information on education, training, and the person's first job. Module 3 asks health-related questions. Module 4 gathers extensive information on the respondent's current occupation(s). Modules 5 and 6 include some of STEP's most innovative features. Module 5 asks detailed questions on the respondent's use of reading, writing, and numeracy skills in daily life and at work, as well as job-relevant skills used at work. Module 6 provides information on personality traits, behavior, and preferences. It is important to note the survey gathers skills information from the entire sampled population, regardless of their labor force status (employed, unemployed or inactive) and type of employment. Job-relevant skills, however, are captured only for respondents who are currently working or have worked at some time in the 12 months prior to the survey. Finally, Module 7 focuses on family background.

4. Reading literacy assessment

The second part of the STEP survey consists of a reading literacy assessment, which was specifically developed for the STEP survey by Educational Testing Services (ETS). This assessment provides a direct measure of respondents' reading proficiency. It is organized in three parts. The first part focuses on foundational reading skills, including word meaning, sentence processing and passage comprehension. The second part consists of a core literacy assessment, which is used as a screener intended to sort the least literate from those with higher reading skill levels. The third part is only administered to respondents having passed the core literacy assessment. It provides a finer evaluation of reading skills

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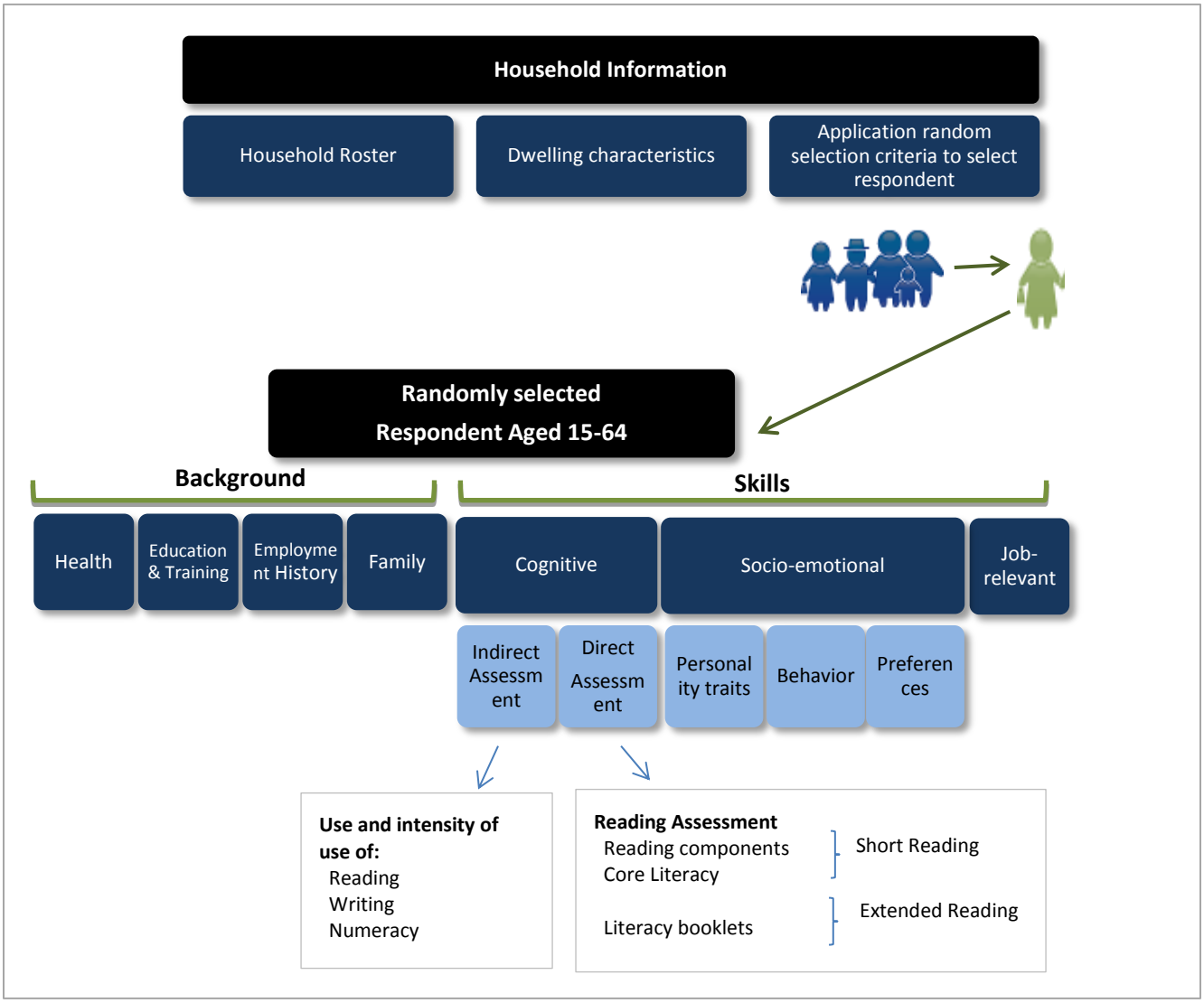
for the most literate individuals in the sample. The STEP Survey in the Yunnan province of China, Lao PDR, and Sri Lanka included only parts one and two of the reading literacy assessment. In Sri Lanka the test was administered in Tamil and Sinhala.

Figure A1. Structure of Household Survey



5. Technical standards

The STEP Skills Measurement household survey was specifically designed to ensure data comparability. Coordination and supervision were centralized so survey instruments were administered in a standardized way across all participating countries, including Armenia. All survey firms benefited from the STEP team's technical assistance throughout the implementation process and complied with the STEP technical standards. Each survey firm's implementation plan was summarized in a National Survey Design Planning Report. The sampling strategy and data weighting were carried out by a single survey methodologist to ensure consistency across methodologies (see Pierre, G., Sanchez-Puerta, M.L., Valerio, A., and Rajadel, T. (2014). "STEP Skills Measurement Surveys: Innovative Tools for Assessing Skills" World Bank, Washington, DC. (Forthcoming July 2014)).

6. Overall sample size and response rates

Sample sizes vary from 1,196 observations in Sri Lanka to 3,405 observations in Vietnam. Response rates range from 60 percent in Sri Lanka to 98 percent in the Yunnan Province. In Bolivia and Colombia however, response rates were markedly lower (respectively 43 percent and 46 percent).

Table A1. Sample sizes and response rates, by country

All samples are for URBAN areas ONLY									
	Armenia	Bolivia	Colombia	Georgia	Ghana	Lao PDR	Sri Lanka	Vietnam	Yunnan Province
Sample Size	2,992	2,435	2,617	2,996	2,987	2,032	1,196	3,405	2,017
Response Rate in %	50%	43%	48%	63%	83%	94%	60%	62%	98%

Skills Measured in the STEP Skills Survey

The STEP surveys measure the skills described below:

Cognitive skills are defined as the "ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought." Literacy, numeracy, and the ability to solve abstract problems are all cognitive skills. The STEP survey provides a direct measurement of reading proficiency and an indirect measurement of reading, writing, and mathematics skills.

1. Direct measurement

The survey includes a direct measure of reading proficiency through the reading literacy assessment designed by the Educational Testing Services (ETS), as outlined in Figure A2.
This assessment has three parts.

(i) The first part of the assessment (Section A) evaluates foundational reading skills, including word meaning, sentence processing and passage comprehension. Word meaning exercises ask respondents to match written words to pictures of everyday objects. Sentence processing exercises ask individuals to identify whether or not a given sentence makes sense. Finally, passage comprehension exercises require respondents to complete sentences embedded in a paragraph, by selecting one of two words that best fit the overall meaning of the section. As these exercises were timed, the analysis may also include a time dimension. The data provided by part one of the assessment can translate into multiple variables (e.g., score, pace).

(ii) The second part (Section B) consists of a core literacy assessment, which sorts the least literate from those with higher reading skill levels. This section includes eight items. Respondents with three or more correct responses are regarded as having met a minimum reading literacy threshold. The present document uses an indicator variable to identify respondents having passed the core reading assessment.

(iii) The third part (Exercise booklets) is only administered to respondents having passed the core assessment. It evaluates reading proficiency in more depth. The assessment uses a variety of materials, focusing on non-school-based items encountered in daily life. It also involves different types of tasks, including tasks that require respondents to access and identify information (in both text-based and non-prose materials such as tables, graphs and forms), to integrate and interpret information, and to evaluate information by assessing the relevance, credibility, or

appropriateness of the material for a particular task. Items present varying levels of difficulty, with tasks ranging from locating a single piece of information in a very short advertisement to summarizing reasons for using generic drugs as presented in a newspaper article. Overall reading proficiency scores are reported on a scale ranging from 0 to 500, which is divided into 5 levels, with Level 1 characterized by the least demanding tasks and Level 5 the most demanding. (Table A2 below explains the levels and scoring in detail.) For each respondent, 10 plausible values were generated. Findings presented in this report are based on using all 10 plausible values.

Figure A2. Direct Assessment of Reading Literacy – Reading Assessment Flow Chart

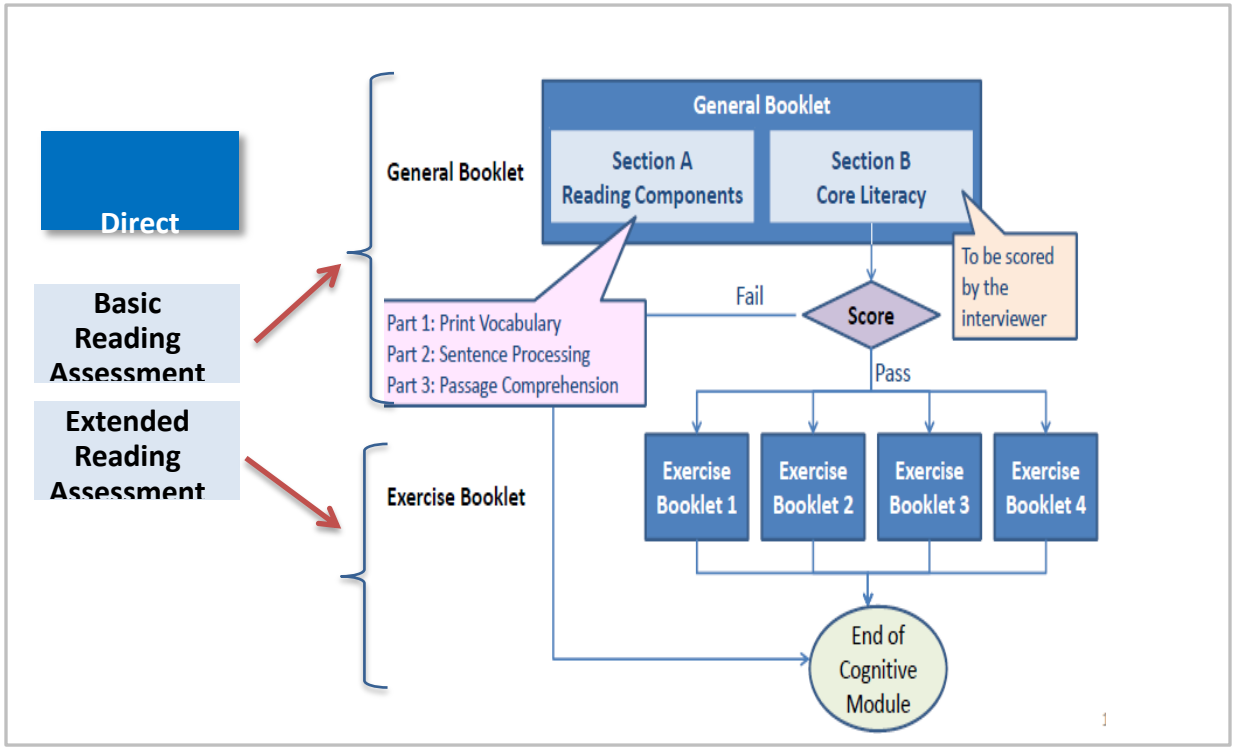


Table A2. Direct measurement of reading proficiency | Key indicators

Core Literacy Assessment	
Did not pass Answered fewer than 3 correct responses out of 8 items	Respondent's reading proficiency is below a minimum reading literacy threshold
Pass Answered 3 or more correct responses out of 8 items	Respondent has met a minimum reading literacy threshold

	Reading Proficiency Levels and Score
Literacy Below Level 1 **0 to 175**	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. While the texts can be continuous, the information can be located as if the text were noncontinuous. Tasks below Level 1 do not make use of any features specific to digital texts.
Literacy Level 1 **176 to 225**	Most of the tasks at this level require the respondent to read relatively short digital or print continuous, non-continuous or mixed texts to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. Some tasks may require the respondent to enter personal information into a document, in the case of some noncontinuous texts. Little, if any, competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognizing basic vocabulary, evaluating the meaning of sentences, and reading of paragraph text is expected.
Literacy Level 2 **226 to 275**	At this level, the complexity of text increases. The medium of texts may be digital or printed, and texts may comprise continuous, noncontinuous or mixed types. Tasks in this level require respondents to make matches between the text and information, and may require paraphrase or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to cycle through or integrate two or more pieces of information based on criteria, compare and contrast or reason about information requested in the question, or navigate within digital texts to access and identify information from various parts of a document. (cont'd. …)

Literacy Level 3 **276 to 325**	Texts at this level are often dense or lengthy, including continuous, noncontinuous, mixed or multiple pages. Understanding text and rhetorical structures become more central to successfully completing tasks, especially in navigation of complex digital texts. Tasks require the respondent to identify, interpret or evaluate one or more pieces of information and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or perform multistep operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate text content to answer accurately. Competing information is often present, but it is not more prominent than the correct information.
Literacy Level 4 **326 to 375**	Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesize information from complex or lengthy continuous, noncontinuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform successfully. Many tasks require identifying and understanding one or more specific, non-central ideas in the text in order to interpret or evaluate subtle evidence claims or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.
Literacy Level 5 **376 to 500**	At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a key requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialized background knowledge.

2. Indirect measurement

The STEP survey also asks respondents to report on their *use* of cognitive skills in daily life and at work, namely if they read, write, or use mathematics. For each skill, a score ranging from 0 to 3 was computed. When a respondent reports not using a given skill, the score is set at 0. For respondents who do use a given skill, intensity or complexity of use was defined (1 for low, 2 for medium, and 3 for high). The aggregation process and reliability testing are described in the STEP Skills Measurement Survey Methodology Note (2014). Table A3 below lists the key indicators for cognitive skills.

Table A3. Indirect measurement of cognitive skills | Key indicators

Use of reading and writing skills		Intensity of use	Level
Does not read/write	=	Does not use	0
Read/write documents of 5 pages or less	=	Low	1
Read/write documents of 6 to 25 pages	=	Medium	2
Read/write documents of more than 25 pages	=	High	3
Use of numeracy skills		Complexity of use	Level
Does no math	=	Does not use	0
Measures or estimates sizes, weights, distances; calculates prices or costs; performs any other multiplication or division	=	Low	1
Uses or calculates fractions, decimals or percentages	=	Medium	2
Uses more advanced math such as algebra, geometry, trigonometry	=	High	3

Socio-emotional skills, sometimes referred to in the literature as non-cognitive skills or soft skills, relate to traits covering multiple domains (social, emotional, personality, behaviors, attitudes, etc.). The survey builds on the "Big Five" personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism (or its opposite, emotional stability). Measures of grit, which has been shown to have an impact in life outcomes and hostile attribution bias, were also included, as well as questions pertaining to how individuals make important decisions. Response categories range from 1, "almost never", to 4, "almost always". The aggregation process and reliability testing are described in the STEP Skills Measurement Survey Methodology Note (Pierre 2014). Table A4 presents the questionnaire items used for each socio-emotional skill. Angela Duckworth (University of Pennsylvania) and Nancy Guerra (University of Delaware) provided extensive expertise to select the items included in the survey.

Table A4. Socio-emotional skills | Items

Socio-emotional skill	Items
Openness	Do you come up with ideas other people haven't thought of before? Are you very interested in learning new things? Do you enjoy beautiful things, like nature, art and music?
Conscientiousness	When doing a task, are you very careful? Do you prefer relaxation more than hard work? Do you work very well and quickly?
Extraversion	Do you come up with ideas other people haven't thought of before? Are you very interested in learning new things? Are you outgoing and sociable, for example, do you make friends very easily?
Agreeableness	Do you forgive other people easily? Are you very polite to other people? Are you generous to other people with your time or money?
Emotional Stability (Neuroticism)	Are you relaxed during stressful situations? Do you tend to worry? Do you get nervous easily?
Grit	Do you finish whatever you begin? Do you work very hard? For example, do you keep working when others stop to take a break? Do you enjoy working on things that take a very long time (at least several months) to complete?
Hostile Bias	Do people take advantage of you? Are people mean/not nice to you?
Decision-making	Do you think about how the things you do will affect you in the future? Do you think carefully before you make an important decision? Do you ask for help when you don't understand something?

Job-relevant skills are task-related and build on a combination of cognitive and socio-emotional skills. The STEP survey asks respondents about their use of such skills on the job, including among others computer use, repair and maintenance of electronic equipment, operation of heavy machinery, client contact, solving and learning, supervision, etc. For each skill, a score ranging from 0 to 3 was computed. When a respondent reports not using a given skill, the score is set at 0. For respondents who do use a

given skill, intensity or complexity of use was defined (1 for low, 2 for medium, and 3 for high). The STEP Skills Measurement Survey Methodology Note (2014) provides more information on the selection of this particular set of skills and on the way these skills are assessed in the STEP survey. Michael Handel (Northeastern University) and Peter Elias (University of Warwick) provided extensive support in the selection and calibrating of the items included in the survey. See Tables A5 and A6, below, for lists of skills and associated scales.

Table A5. Job-relevant skills

Computer use		Intensity of use	Level
"As a part of your work do you use a computer?" "As a part of your life [outside work] have you used a computer in the past 3 months?"			
Does not use a computer/use a computer almost never	=	Does not use	0
Uses computer less than three times per week	=	Low	1
Uses computer three times or more per week	=	Medium	2
Uses computer every day	=	High	3

Contact with clients		Intensity of use	Level
"As part of this work, do you have any contact with people other than co-workers, for example customers, clients, students, or the public?" *			
Does not have any contacts with clients	=	Does not use	0
Involvement scale ranges from 1 to 4	=	Low	1
Involvement scale ranges from 5 to 7	=	Medium	2
Involvement scale ranges from 8 to 10	=	High	3

* Scale ranges from 1 to 10, where 1 is little involvement and 10 means much of the work involves meeting or interacting with people other than co-workers.

Solving and learning at work			Intensity of use	Level
Average of 2 items	Item 1. "Some tasks are pretty easy and can be done right away or after getting a little help from others. Other tasks require more thinking to figure out how they should be done. As part of this work, how often do you have to undertake tasks that require at least 30 minutes of thinking?"			
	Never	=	Does not use	0
	Less than once per month	=	Low	1
	Less than once a week but at least once a month OR at least once a week but not every day	=	Medium	2
	Every day	=	High	3
	Item 2. "How often does (did) this work involve learning new things?"			
	Rarely	=	Does not use	0
	At least 2-3 months or at least once a month	=	Low	1
	At least once a week	=	Medium	2
	Every day	=	High	3

Autonomy and repetitiveness				Intensity of use	Level
Average of 2 items	Item 1. "Still thinking of your work, how much freedom do you have to decide how to do your work in your own way, rather than following a fixed procedure or a supervisor's instructions? Use any number from 1 to 10 where 1 is no freedom and 10 is complete freedom."				
	Decision freedom scale from 1 to 2	=	Close to none	0	
	Decision freedom scale from 3 to 6	=	Low	1	
	Decision freedom scale from 7 to 9	=	Medium	2	
	Decision freedom scale 10	=	High	3	
	Item 2. "How often does (did) this work involve carrying out short, repetitive tasks?"				
	Almost all the time	=	Close to none	3	
	More than half the time	=	Low	2	
	Less than half the time	=	Medium	1	
	Almost never	=	High	0	

Table A6. Aggregation of variables

Score	Use of computer (at work and outside it)	External inter-personal skills at work	Thinking at work of at least 30 minutes	Learning new things at work	Autonomy at work	Repetitive tasks at work	Physical tasks at work
0 (not used/close to none)	Does not use a computer/ almost never uses a computer	Does not have any contacts with clients	Never	Rarely	Decision freedom scale from 1 to 2	Almost all the time	Not at all physically demanding
1 (low)	Uses computer less than three times per week	Involve-ment scale ranges from 1 to 4	Less than once per month	At least 2-3 months or at least once a month	Decision freedom scale from 3 to 6	More than half the time	Physical demand scale ranges from 2 to 4
2 (medium)	Uses computer three times or more per week	Involveme nt scale ranges from 5 to 7	Less than once a week but at least once a month OR at least once a week but not every day	At least once a week	Decision freedom scale from 7 to 9	Less than half the time	Physical demand scale ranges from 5 to 6
3 (high)	Uses computer every day	Involve-ment scale ranges from 8 to 10	Every day	Every day	Decision freedom scale 10	Almost never	Physical demand scale ranges from 7 to 10