

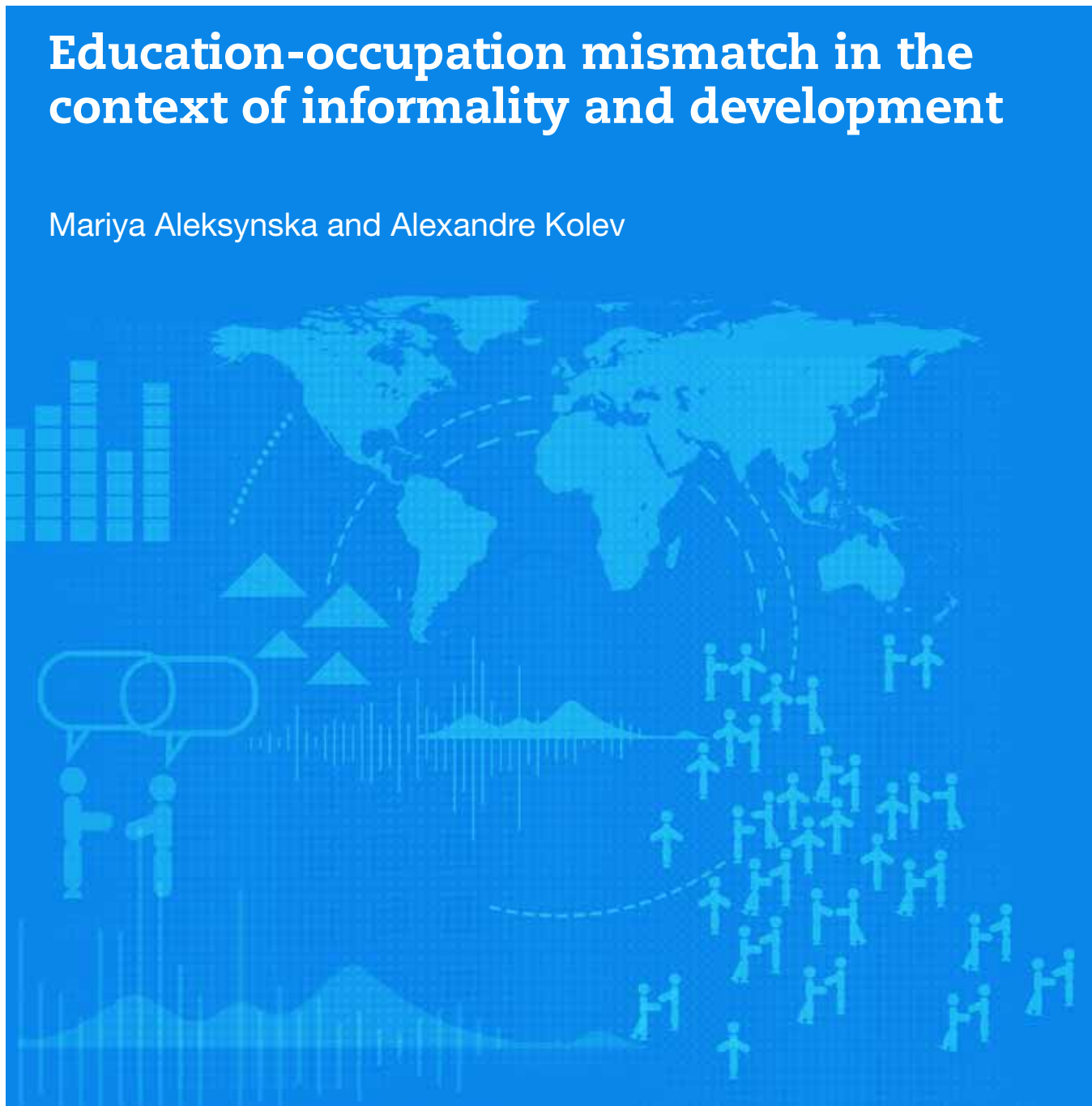
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Education-occupation mismatch in the context of informality and development

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Abstract

Using household data from 15 countries in Latin America and Africa, this paper explores linkages between informality and education-occupation matching. The paper applies a unified methodology to measuring education-occupation mismatches and informality, consistently with the international labour and statistical standards in this area. The results suggest that in the majority of low- and middle-income developing countries with available data, workers in informal jobs have higher odds of being undereducated as compared to workers in formal jobs. Workers in formal jobs, in contrast, have higher chances of being overeducated. These results are consistent for dependent as well as for independent workers. They also hold for men and for women according to the gender-disaggregated analysis. Moreover, in the majority of countries considered in this paper, the matching-informality nexus is also related to the extent of informality in a given area: in labour markets with higher informality, informal workers in particular have a higher chance of being undereducated. The paper discusses policy implications of these findings.

JEL classification: E26; E24; I21; J24

Keywords: occupational mismatch, overeducation, over-qualification, informal economy, developing country

Résumé

Ce document de travail analyse les liens entre l'emploi informel et l'inadéquation entre niveaux de formation et emploi à partir des données d'enquêtes de ménages qui couvrent 15 pays d'Amérique latine et d'Afrique. Il s'appuie sur une méthodologie unifiée pour mesurer l'inadéquation formation-emploi et l'informalité, conformément aux normes internationales du travail et des statistiques dans ce domaine. Les résultats suggèrent que dans la majorité des pays en développement à revenu faible et intermédiaire pour lesquels des données sont disponibles, les travailleurs occupant des emplois informels ont une probabilité plus élevée d'être sous-éduqués que les travailleurs occupant des emplois formels. Ceux-ci ont, a contrario, plus de chances d'être sur-éduqués. Ces résultats sont cohérents tant pour les travailleurs salariés que pour les travailleurs indépendants. Selon l'analyse ventilée par sexe, ils sont également valables pour les hommes comme pour les femmes. De plus, dans la majorité des pays considérés dans ce document, le lien entre l'inadéquation formation-emploi et l'informalité est également lié à l'étendue de l'informalité dans une région donnée : sur les marchés du travail où l'informalité est plus élevée, les travailleurs informels en particulier ont plus de probabilités d'être sous-qualifiés. Le document examine les implications de ces résultats pour les politiques publiques.

Classification JEL : E26 ; E24 ; I21 ; J24

Mots clés : inadéquation des compétences, sur-qualification, sous-qualification, économie informelle, pays en développement

Foreword

Over 60% of all employment in the world is informal. In this context, there are compelling reasons to believe that education-occupation matching can differ according to whether workers are in formal or informal jobs. The debate on this issue, however, has so far remained unsettled. This paper explores the linkages between informality and education (mis-)matching in developing countries.

It contributes to the literature on informality and skills in three important ways. First, the paper looks at the linkages between individual informality status and education matching, as well as how the overall incidence of informality observed in an economy can impact this nexus. Second, the paper applies a unified methodology to measuring education-occupation mismatches, and to measuring informality, in line with the international labour and statistical standards in this area. Third, the analysis builds on a different and larger set of cross-country household survey data compared to existing studies, including low- and middle-income countries not previously analysed as such.

Overall, the evidence brought to light in this analysis suggests that workers in informal jobs, in the majority of low- and middle-income developing countries with available data, have higher odds of being undereducated compared to workers in formal jobs. Workers in formal jobs, in contrast, have higher chances of being overeducated. These results are consistent for both dependent and independent workers, as well as men and women according to gender-disaggregated analysis. Moreover, in the majority of countries studied in this paper, the education-occupation matching and informality nexus is also related to the prevalence of informality in a given area; in labour markets with higher levels of informality, informal workers are more likely to be undereducated.

This paper was produced with financial support from the Swedish International Development Co-operation Agency, as part of the OECD Development Centre's work on social protection. We hope that it will enrich evidence-based knowledge on how to tackle vulnerability in the informal economy, and help design better policies to improve education-occupation matching of informal workers.

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1 Introduction

Informality is a defining feature of labour markets in developing countries, concerning over 70% of employment. The extent, the causes and consequences of informality have been widely researched [see, for example (OECD/ILO, 2019^[1]; Jütting and de Laiglesia, 2009^[2]; ILO, 2018^[3])]. However, gaps remain in understanding the portraits of informal workers. Another common feature of labour markets in developing countries is the large incidence of qualification and skill mismatches, skill shortages, and skill gaps. These problems are particularly exacerbated by low level of education and quality of schooling, demographic changes, structural transformation, rapid technological developments, the emergence of new types of jobs and of work organisation (ILO, 2019^[4]), and most recently, by the COVID-19 pandemic.

Recently, there has been a growing interest in better understanding the linkages between qualification/education¹ and skill mismatches and informality in large informal labour markets of developing countries (ILO, 2019^[4]; Handel et al., 2016^[5]; Herrera-Idárraga et al., 2013^[6]; Herrera-Idárraga et al., 2015^[7]). Indeed, there are good reasons to believe that the qualification/education matching would differ across formal and informal jobs. Moreover, the extent of the informality in a given economy could also affect the extent of the (mis-)matches. However, to date, the debate on the role of informality in shaping education-occupation matching is unsettled. For example, (Handel, 2019^[8]) reports that a written employment agreement (their proxy for formality), is associated with lower odds of over-qualification in half of the countries for which data are available; the opposite is true in the other half. This unsettledness of the debate is due in part to limited data, and in part due to differences in definitions employed across studies, notably the way informal employment is defined. Another reason is that the linkages between informality and mismatch are complex, and several competing hypothesis for explaining these linkages can be advanced.

In this light, the contribution of this paper is three-fold. First, the paper looks not only at the linkages between individual's informality status and education matching, but also how this linkage is shaped by the overall incidence of informality observed in an economy. The novelty, as compared to previous papers, is to consider the role that informality can play both at micro and macro level on individual's education matching. Second, the paper applies a unified methodology to measuring not only education-occupation mismatches, but also, for the first time, of informality, consistently with the international labour and statistical standards in this area. Third, the analysis is based on a different and somewhat larger set of cross-country household survey data, as compared to previous studies, including low- and middle-income countries not previously analysed in a cross-country setting.

The results of this paper show that, in selected low- and middle-income developing countries of Latin America and Africa, informal employment is rather associated with higher odds of undereducation, and with lower odds of overeducation in the majority of countries of our sample. The matching-informality nexus is also related to the extent of informality in a given labour market, and hence possibly to the underlying

¹ Terms "qualification mismatch" and "education mismatch" are very close to each other and often are used interchangeably. As explained further in this paper, technically we are operating with a specific type of mismatch: mismatch by level of education, on the basis of completed years of schooling; hence, we refer to it as "education" mismatch.

structural, macroeconomic and political reasons for overall informality. Specifically, in labour markets with higher informality, informal workers in particular have a higher chance of being undereducated.

Over- and under- education are not two sides of the same coin. Yet, both types of mismatch raise policy concerns. On the one hand, if too many workers are overeducated, there is an underutilisation of human capital, as workers operate below their productive capacity, thus hampering productivity growth. Among overeducated in medium- and high-skilled jobs there are those workers who genuinely “over-shoot” the work-related education requirements, often because competition for such jobs is fierce. Among overeducated in low-skilled jobs there are also those who could not find a right match in medium- and high-skilled jobs, and had to take up any job available, including low-skill; in other words, overeducation in low-skilled jobs is also a sign of a general scarcity of skill-intensive jobs in an economy. Overeducation is, thus, often taken to imply that resources are not efficiently used. As will be shown in this paper, in developing countries of our sample, overeducation goes primarily hand-in-hand with formal jobs.

Undereducated workers, on the other hand, include workers whose skills are lacking, as well as workers whose skills are not properly recognised (not certified). Among them are workers who did not have access to formal schooling, as well as those whose formal skills became obsolete too quickly. They also include those workers whose competences acquired through informal and non-formal learning are not recognised (Werquin, 2010^[9]). Such workers may have particular problems of proving their aptitudes. This, in turn, may hamper their labour market transitions, including to formal jobs. In this paper, we find that in developing countries of our sample, undereducation is more likely to be a feature of workers in informal jobs. This finding has relevance not only for formalisation policies, but also for education and for skills recognition policies.

The rest of the paper is organised as follows. Section 2 reviews the literature on education/qualification mismatch in general, and puts forward several hypotheses for empirical testing on how mismatch may be shaped by informality specifically. Section 3 describes the data and the measurement of informality and of education mismatch. Section 4 provides descriptive evidence on education mismatch. Section 5 sets up an empirical model and shows the results of an econometric estimation of the linkages between individual and regional informality and individual education matching. The last section offers a policy discussion of these results, in light of the COVID-19 pandemic and its impact on the labour markets and education systems.

2 Education-occupation mismatch and informality: What are the linkages?

Imperfect matching of education and jobs is quite a standard feature of labour markets. It has been widely documented for North America and Europe [starting as early as (Freeman, 1976^[10]; Rumberger, 1981^[11]; Groot, 1996^[12]; Dolton and Vignoles, 2000^[13]]; and more recently by (Green and McIntosh, 2007^[14]; Green and Zhu, 2010^[15]), or (Quintini, 2011^[16]; Quintini, 2011^[17]), as well as for a range of developing countries [ex: Mexico: (Quinn and Rubb, 2006^[18]); India, Mexico, the Philippines and Thailand: (Mehta et al., 2011^[19]); Colombia: (Herrera-Idárraga et al., 2013^[6]; Herrera-Idárraga et al., 2015^[7]), Indonesia: (Allen, 2016^[20]) among others].

Researchers explain this phenomenon by imperfect “screening” of workers’ education by employers (Spence, 1973^[21]); the incorrect temporary matches due to imperfect information in the labour market (Groot and Maassen Van Den Brink, 2000^[22]); or career building or conscious overeducation that can bolster promotion (Sicherman, 1990^[23]). (Sicherman, 1991^[24]) also argues that there is a trade-off between different types of human capital, such as education and experience, which may result in substitution of one by another. In such a framework, neither overeducation nor undereducation are undesirable: they may be an optimal, albeit temporary, outcome. Moreover, overeducated workers are the ones who are more likely to have less experience, while the opposite is true for undereducated workers.²

In addition to these reasons, there are also some “technical”, “measurement” reasons that explain the existence of a mismatch in any labour market. Given the definition of the mismatch that reflects the normal distribution property of realised matches, it is common to find that around 13% of workers are found on each end of the matching distribution (Hartog, 2000^[25]). Moreover, occupations may be a poor proxy for job requirements, to the extent that the occupational codes do not reflect the complexity and the level of responsibility in the specific job, and there is also a skill heterogeneity among individuals with the same qualifications (Chevalier, 2003^[26]; McGuinness et al., 2017^[27]; Quintini, 2011^[16]).

Recently, there has been a growing interest to examine the occupation-education mismatch in the context of developing countries, and particularly in the context of large informal labour markets [ex: (ILO, 2019^[4]; Handel et al., 2016^[5]; Herrera-Idárraga et al., 2013^[6]; Herrera-Idárraga et al., 2015^[7]]. The debate on the role of informality, however, remains unsettled. For example, (Handel, 2019^[8]) reports that a written employment agreement (a proxy for formality), is associated with lower odds of over-qualification only in half of the countries for which data are available. One of the reasons why their result may differ across countries is possibly linked to the measure of informality used. In some countries, legally, oral contracts are equivalent to written contracts, and hence do not induce informality; in others, even a written contract may not necessarily ensure all protections due to a worker, hence rendering the job informal. Thus, having a written employment agreement, especially in developing countries, can be quite a noisy measure of formality.

² See also McGuinness (2006) for assessments of these early theories and a review of earlier evidence.

This unsettledness is also due in part to the limited data allowing to measure both formality and education/qualification matching. For example, (Bergin, 2019^[28]) assesses the quality of data from labour force surveys for over 50 developing countries, to find that only 20 of these surveys, around the year 2012, could allow for an effective measurement of over- and underqualification rates at a comparable point in time. These surveys, however, allow only proxying informality, but not measuring it consistently with the international labour standards (such as the Guidelines concerning the statistical definition of informal employment adopted by the 17th International Conference of Labour Statisticians in 2003). Other cross-country surveys, specifically conceived to measure jobs and skills mismatches in developing countries, may also not measure informality consistently with the international standards (ex.: World Bank STEP surveys, which allow measuring informality only approximately, such as through having a written contract), or may focus only on a certain category of workers [ex.: ILO/MasterCard Foundation School-to-Work Transition Survey (SWTS) data that focus only on young workers, for whom overeducation is a standard and transitory feature world-wide].

Besides the data issues, the reason for this unsettledness of the debate is that the linkages between informality and mismatch are complex. The complexity is due to many issues. First, when comparing over- and under-education, in formal and informal jobs, many outcomes are possible: informal markets could have both over and under-education higher than in formal markets; or only one of them. Second, the informal economy itself is complex, and informal workers are very heterogeneous: they include poor workers finding a livelihood in the informal economy and traditional family business that have never been registered on the one end of the spectrum, but also better-off workers and firms who choose informality to offset taxes and competition on the other end (ILO, 2019^[4]). In that sense, informal workers contain a mixture of workers, some being victims of barriers to entry to a formal labour market, finding work based on opportunities that arise rather than a conscious process of matching education/skill to an occupation; while others making it a conscious choice.

Perhaps because of this complexity, there seems to be no uniform theory on how specifically informality can shape skill mismatch, and education-occupation mismatch more specifically. At the same time, several hypotheses for empirical testing may be advanced.

One of the hypotheses is that the relationship between informality and skill mismatch is shaped by the structure of the labour market and of the informality. For example, in some countries, the formal jobs may be found mainly in the public sector and require high (and specific) skills, while informal economy may offer mainly jobs requiring low skills. Workers with high education credentials, unable to find employment in the formal sector, would have as their only available option to take up low-skill jobs in the informal sector, leading to a higher incidence of overeducation in the informal sector. This hypothesis is confirmed for some selected countries by (OECD, 2017^[29]; Herrera-Idárraga et al., 2013^[6]; Herrera and Merceron, 2005^[30]; Handel, 2019^[8]). However, it is also possible that informality is so widely spread that it is found in all occupations, requiring all types of skills. This could explain why in some other countries overeducation would be found in both informal and formal sectors [some selected countries in (Handel, 2019^[8])]. Nevertheless, whether, globally, informal sector features more under- or overeducation than the formal sector, remains an empirical question.

Another hypothesis can be that, if different types of human capital, such as formal education and experience are indeed substitutes (Sicherman, 1991^[24]), then in informal labour markets such substitution may be easier as compared to the formal labour markets. This is because informal jobs by definition feature a lower level of protections for a worker, and lower labour costs for an employer, including separation costs. Given this, employers may be less strict in requiring that a worker's formal schooling matches perfectly to the job. Employers in informal economy may care less about a correct "screening" of the formal schooling and credentials, accepting their substitution by non-formally and informally acquired skills. Also, in the informal sector, workers are hired at an ad hoc short-term basis more systematically, reducing the need for excessive pre-screening. In addition, in the informal sector, other personal characteristics may matter more for finding a job – including trust, reliability, or personal connections. Employers in informal

sector also may not require formal education certificates. Even fewer certificates would be needed to start an informal job as a self-employed. All of this would lead to a higher incidence of undereducation of informal workers, as compared to formal ones. Finally, in informal economies, firms provide less training, and self-employed workers invest less in their own training. As a result, even an initially well-matched worker in an informal economy may see his or her skills become obsolete, rendering the worker under-skilled. This may be especially true if the technological change is taking place rapidly, leading, again, to a higher incidence of undereducation of informal workers.

Conversely, in the formal sector, on-the-job labour costs and separation costs are higher, and employers may be more willing to ensure from the very start that workers have the right formal credentials for a job. As a result, employers will tend to select those candidates whose education and experiences are less costly to screen. They will also be more risk averse to substitute experience with required schooling; and deliberately increase education standards at a hiring stage (Aleksynska and Tritah, 2013_[31]). As a result, undereducation will be rare.

In addition to this, in developing countries, formal jobs are mostly found in the public sector. There, not only barriers for entry are high, but also workers may be willing to accept overeducation as a price for job security. Moreover, jobs of the formal sector (and in public sector specifically), may feature different technologies and barriers to entry into specific occupations (such as, for example, the requirement to know specific technical standards, and to bear responsibility in case of misusing them). This would require having very specific credentials, increasing the probability of correct match or overeducation.

In the context of developing countries, there is also often the issue of a poor quality of education. In such cases, employers may also prefer to “over-shoot”, and hire workers with formal credentials above those that are required for a job, as to ensure at least a minimum level of skills. A certain formal education may also give an impression of certain personal qualities, such as ability to learn, dedication and perseverance, that make an employer hire “above” a certain educational level required by a certain occupation. All of these scenarios would lead to a higher incidence of overeducation in the formal sector in a whole range of occupations.

Given this, it seems important to test the linkages between individuals’ education mismatch and individuals’ informality status in the context of each specific country. This is because the underlying reasons for the informality as well as training and education requirements would be different across countries. Equally important is the need to account for the extent of informality: how widely spread is it in a given labour market? How does the extent of general informality shape the linkages between individual informality and mismatch?

3 Data

The analysis of this paper draws on individual-level micro-data from household surveys. To ensure the greatest country coverage, but also data comparability, data for over 40 developing countries, available through the OECD KILBIH database, have been first screened to identify countries with available information on the years of education and on occupations in a two-digit standardised format. Even if the initial objective was to cover as many countries as possible, the availability of comparable questions allowing to study occupation-education mismatch and informality, and the data quality, determined the final choice of countries. In addition, a common time-frame of 2015-18 was chosen. As a result, 15 countries were retained for the analysis (see Table A A.1 of the Annex for details), 9 in Latin America, and 6 in Africa. Only three countries of our sample were included in previous cross-country research on mismatch and informality [ex.: (Handel et al., 2016^[5]) : Bolivia, Colombia, and Ghana].

All variables, including measures of informality and of education-occupation mismatch, were created in a standardised manner across these household surveys. Except for the variable measuring occupation-education mismatch, which is described below, the description of all other variables is available in (OECD, forthcoming^[32]).

The analytic sample is restricted to workers aged 15–65, who are not in school or in the military, living in both urban and rural areas. In total, over half a million of observations is available for the analysis.

Measuring informal employment

The measurement of informal employment in this paper is based on the measurement used to construct the OECD KILBIH data, as outlined in the (OECD/ILO, 2019^[1]) report. The latter reflects the ILO Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204) and the Guidelines concerning the statistical definition of informal employment adopted by the 17th International Conference of Labour Statisticians in 2003.

As such, informal employment includes contributing family workers, employers and own-account workers, and employees in informal jobs. All contributing family workers are classified as having informal employment, irrespective of whether they work in formal or informal sector enterprises. Employers (with hired workers) and own-account workers (without hired workers) are considered to be informal when their economic units belong to the informal sector. Employees are considered to have informal jobs if their employment relationship is, in law or in practice, not subject to national labour legislation, income taxation, social protection or entitlement to certain employment benefits (advance notice of dismissal, severance pay, paid annual or sick leave, etc.). The underpinning reasons may be the non-declaration of the jobs or the employees; casual jobs or jobs of a short duration; jobs with hours of work or wages below a specified threshold (e.g. for social security contributions); or lack of application of law and regulation in practice. In the case of own-account workers and employers, the informal employment status of the job is determined by the informal sector nature of the enterprise.

The set of operational criteria to determine the informality status varies across countries, depending on the information available in household surveys. For examples of criteria used in each country, see Annex A of the (OECD/ILO, 2019^[1]).

Measuring education-occupation mismatch

According to the latest ILO Guidelines concerning measurement of qualifications and skills mismatches of persons in employment (ILO, 2018^[33]), it is important to distinguish two main forms of mismatches of persons in employment: qualification/education mismatch and skill mismatch.

Mismatch by level of education occurs when the level of education of the person in employment does not correspond to the level of education required to perform their job. Workers may be overeducated for the jobs when their level of education and training is higher than that required to perform their job; or undereducated, when their level of education and training is lower than that required to perform their job. Otherwise, the workers are considered as being correctly matched. In contrast, skill mismatch happens when worker's skills (such as job-specific, technical, basic literacy, digital, or other transferable skills) do not correspond to an occupied job. Obviously, the measurement of the two types of mismatches would rely on a different type of information.

Measurement of qualification/education mismatch requires information about the level of educational attainment, or completed years of schooling of a person and its correspondence with the educational attainment levels within the occupation. In contrast, measurement of skill mismatch requires information on the skills for the competent performance of the job. The ILO Guidelines suggest a range of methods to determine each type of mismatch. To determine the qualification mismatch, such methods include, among others, statistical approaches of using the mode, mean, or median, values of the completed years of schooling of all persons in employment, by occupation or occupational group (ibid).

In the economics discipline, previous empirical literature has developed numerous similar approaches to measuring qualification/education mismatch. They can be broadly divided into “normative” and “positive” approaches. The “normative” approach includes using national/international standards to match jobs with educational requirements (Chevalier, 2003^[26]; OECD, 2007^[34]); applying occupational prestige scores (Chiswick, Liang Lee and Miller, 2005^[35]); using workers self-assessment of skills needed for the job performed (OECD, 2017^[29]; McGuinness et al., 2017^[27]); examining probability of being in an occupation, or occupying a top position (Barrett and Duffy, 2008^[36]). “Positive”, or statistical, measures include primarily the realised matches' procedures (Chiswick and Miller, 2010^[37]; Hartog, 2000^[25]). They amount to relating the effective individual's educational attainment to the most prevalent one within each occupation. (Chiswick and Miller, 2010^[37]) and (Hartog, 2000^[25]) show that the analysis of the questions of interest is relatively insensitive to the choice of the measure, be it realised matches or, for example, workers self-assessment, while the (OECD, 2017^[29]) shows that, for young workers, self-assessment measures are more accurate. For an overview and comparison of different methods, see also (Quintini, 2011^[17]; Quintini, 2011^[16]).

In this paper, in order to ensure greatest methodological comparability across countries, we chose to use education mismatch measure, based on a statistical approach of using the mean value of the completed years of schooling by occupation. It amounts to computing the mean and standard deviation of years of education within each occupation, and qualifying individuals with years of education one standard deviation above this mean as being overeducated, and individuals one standard deviation below this mean as undereducated [for earliest “classical” empirical applications of this approach, see (Verdugo and Verdugo, 1989^[38]; Kiker, Santos and De Oliveira, 1997^[39])].

In what follows, we undertake the construction of this education-occupation mismatch variable within 2-digit classification of occupations for 14 out of 15 countries of our sample (exception is Mexico, as explained below). Further occupational disaggregation results in a prohibitively low number of individuals in some occupations. To compute the mean of the years of schooling within an occupation, only the years of schooling in primary jobs is used as a reference, of both formal and informal workers, males and females, aged 15 to 65. As years of schooling within an occupation may vary across countries, the measure is constructed on a country-by-country basis. The resulting education-occupation mismatch variable is

composed of three categories: undereducated, correctly matched, and overeducated, and is used as a dependent variable in further analysis.

We prefer using this method of computing mismatch, as compared to the qualification mismatch based on the mode of highest educational attainment for several reasons. In many countries, the highest educational attainment is measured in quite an aggregate way, sometimes only distinguishing between four categories (no education, primary, secondary, or tertiary educational attainment). Thus, first of all, working with years of schooling, rather than with educational attainment, allows better capturing the heterogeneity of education outcomes between individuals – a feature valuable in the regression analysis. Second, this method reduces the risk of erroneously labelling individuals with schooling that is just around the mode as over- or undereducated.³ Third, in some occupations, multiple modes of educational attainment measure may be present. Working with the years of schooling variable allows overcoming this problem.

This being said, there is one country in our sample (Mexico), for which the years of schooling are not available, while educational attainment is. For this country only, the mismatch variable is based on comparing individual's outcome with the mode of educational attainment in an occupation (and hence, it should rather be called a *qualification* mismatch). The results for this country are not comparable to all others; yet, as will be shown throughout the paper, they are fully consistent with the results for all other countries, despite a different method of computing the mismatch variable.⁴

The measure that we are using does not take into account informal qualifications acquired outside formal learning institutions. Previous research has shown that non-formal and informal training is an essential way of acquiring the necessary skills for one's job (Fialho, Quintini and Vandeweyer, 2019_[40]). Moreover, schooling "is only a proxy for the skills mastered at the moment of completion of an educational programme" (ILO, 2018_[33]). Skills may change over time with on-the-job training, past work experience, or various informal learnings. Workers with the same formal amount of formal schooling may also display different degrees of ability and competency to perform the same job (Fialho, Quintini and Vandeweyer, 2019_[40]). Given this, the two measures of mismatch – education and skills – need to be assessed separately. The results obtained in this paper concern only education mismatch.

³ To illustrate this point, and as an example, Annex Table A A2 offers a comparison of two methods: if computations are done at 1-digit, the self-reported mean schooling is different across all occupations, while the mode will be the same for most of the occupations (computations at 2-digit are not reported to gain space; but the results are similar).

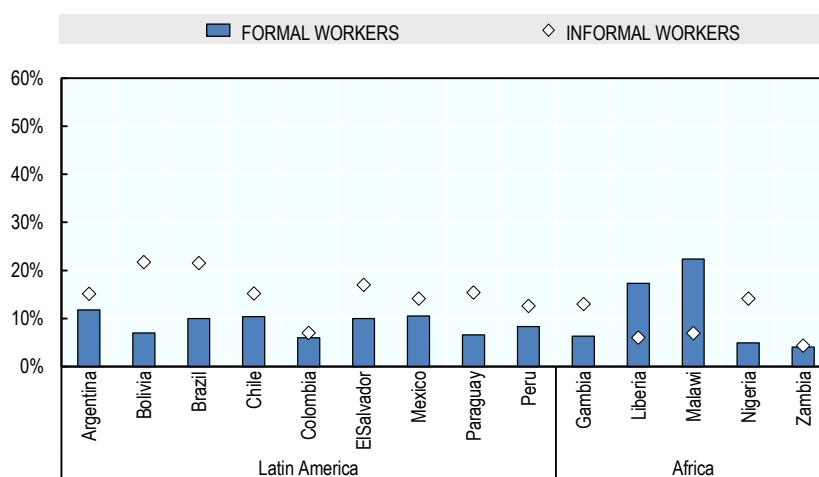
⁴ We have also replicated all regression analysis for all other countries, using the alternative *qualification* mismatch variable. The results are very similar, whether the *educational* mismatch (reported in this paper) or the *qualification* mismatch (not reported, but available on request) is used. They are the same for the linkage between informality and overeducation: informal workers have lower chances of being overeducated as compared to formal workers in all countries, regardless the measure. The results are somewhat more mixed for undereducation: *educational* mismatch gives a more consistent result across countries in that informal workers have a higher chance of being undereducated in all 15 countries; *qualification* mismatch confirms this result in 10 countries, but provides the opposite sign in 4 out of 15 countries. Given some concerns with *qualification* mismatch method outlined above, it is difficult to say whether the inconsistency of results stems genuinely from the data, or from the method. At the same time, given the acceptability of both methods in the literature, we prefer operating with the *educational* mismatch in this paper.

4 Descriptive evidence on the linkages between informality and educational mismatch

This section shows, in a descriptive manner, the incidence of over- and undereducation across formal and informal workers in 15 developing countries of our sample. In Namibia, data on occupations is available only for employees; hence, for this country, information is presented for employees only. For all other countries, comparisons are possible for the pool of all workers, including also self-employed. In all countries, the worker category “contributing family members” is omitted from the analysis because, by definition, these workers are always informal.

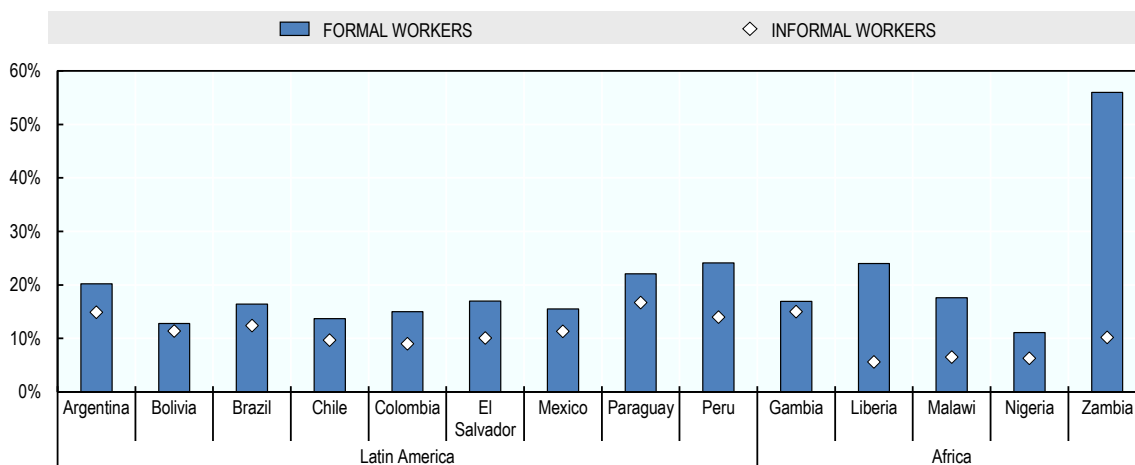
Figure 1 and Figure 2 present the incidence of under- and overeducation among all workers in formal and informal jobs, for 14 developing countries with available information.

Figure 1. Incidence of undereducation among informal and formal workers



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Figure 2. Incidence of overeducation among informal and formal workers



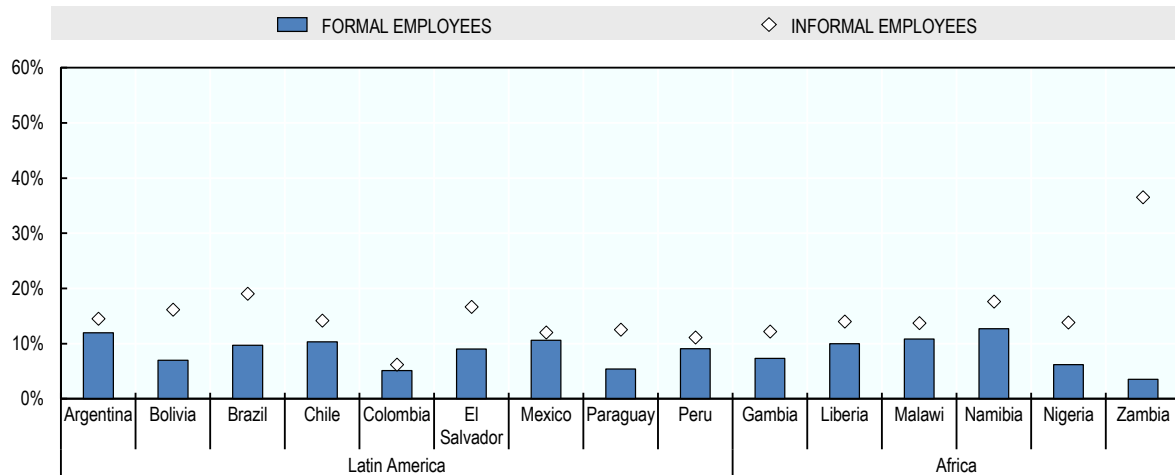
Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Because of the nature of the statistical method to create the variable, in perfect markets, it would be natural to have approximately the same share of under- and overeducated workers, around 13%. However, both figures clearly show that this is not the case.

Among informal workers, the incidence of undereducation ranges from 4% in Zambia to 22% in Bolivia and Brazil. Among formal workers, the incidence of undereducation ranges from also 4% in Zambia to 22% in Malawi. From Figure 1, there is a higher incidence of undereducation among informal workers, as contrasted to formal workers, in 11 out of 14 countries. It is twice as high for informal workers as compared to formal workers in Brazil, Paraguay, and Gambia; it is three times as high in Bolivia and Nigeria. The incidence of undereducation is similar among formal and informal workers in Zambia. The only countries where the incidence of undereducation is lower among informal workers as compared to formal workers are Malawi and Liberia.

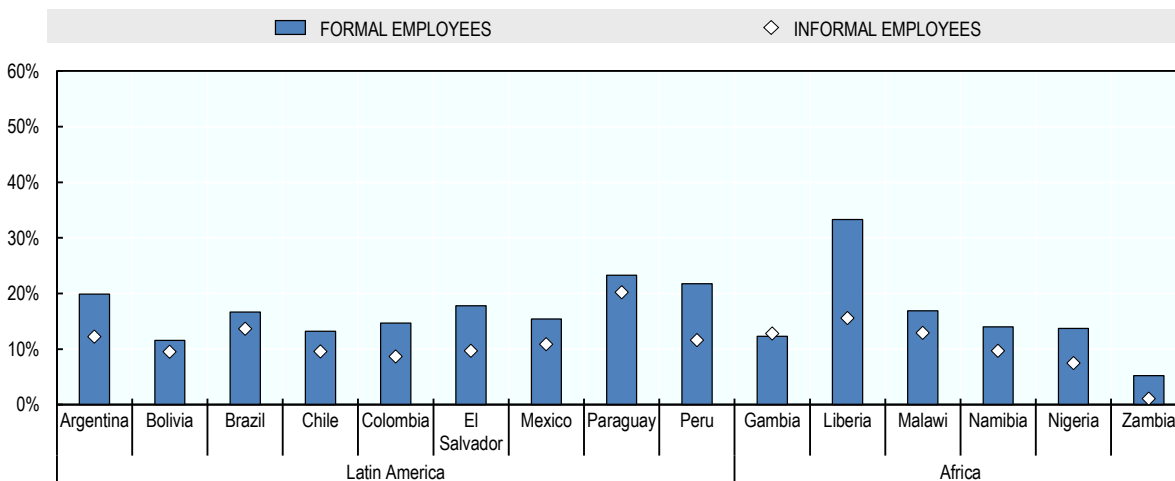
From Figure 2, there is a lower incidence of overeducation among informal workers, as contrasted to formal workers, in all 14 countries with available data. Among formal workers, the incidence of overeducation sparks between 11% in Nigeria and up to 56% in Zambia. In contrast, in Zambia, 10% of informal workers are overeducated: this is also the average rate of overeducation among informal workers in the sample.

Figure 3. Incidence of undereducation among informal and formal employees



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

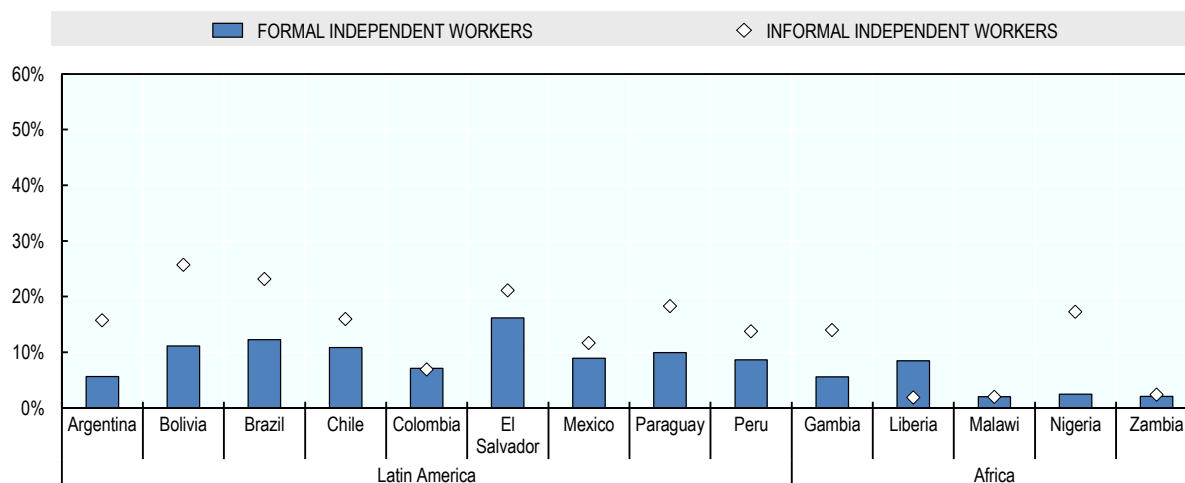
Figure 4. Incidence of overeducation among informal and formal employees



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

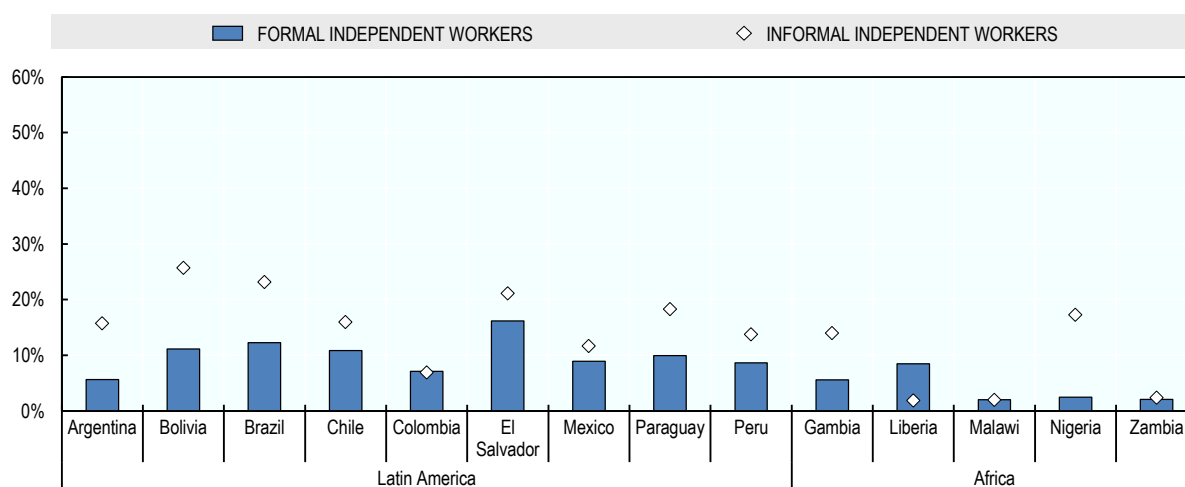
As “workers” is a very heterogeneous category, it is also instructive to examine the mismatch separately for dependent workers (wage employees) and for independent workers (employers and own-account workers). Looking at dependent workers only, Figure 3 and Figure 4 report even a more consistent pattern: the share of undereducated is higher among informal employees in all 15 countries of our sample. The share of overeducation is higher among formal employees, as compared to informal, also in all 15 countries.

Figure 5. Incidence of undereducation among informal and informal independent workers



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

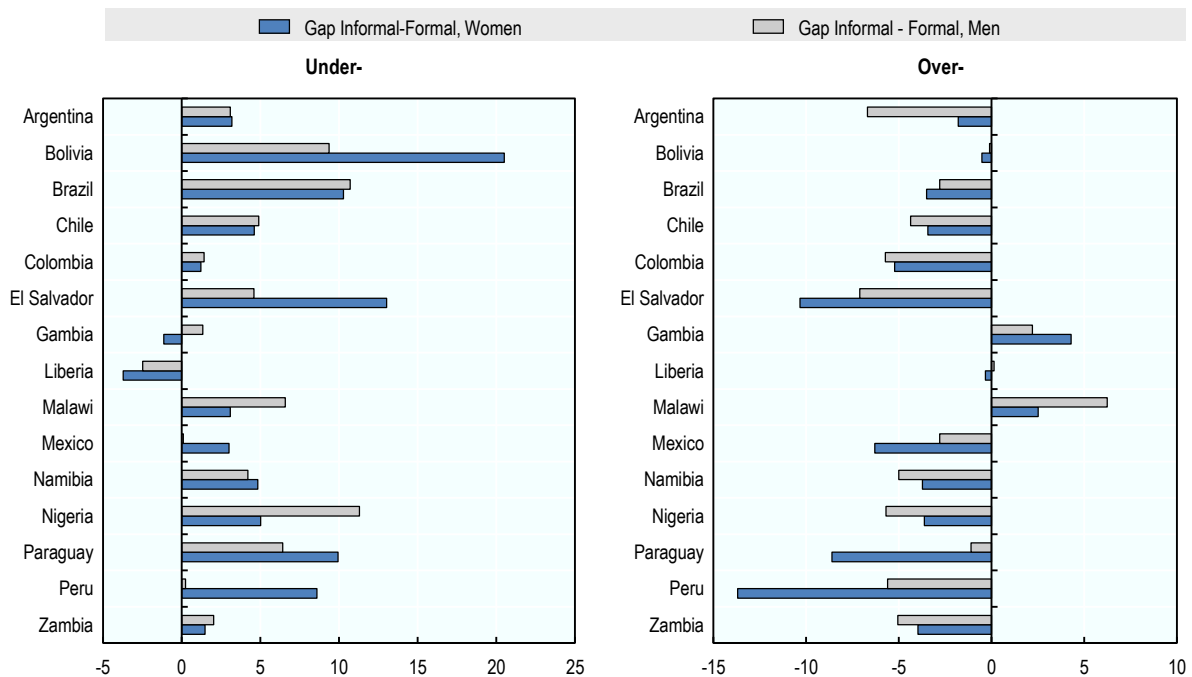
Figure 6. Incidence of overeducation among informal and formal independent workers



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Among independent workers (Figure 5 and Figure 6), informal workers have a higher incidence of undereducation than formal workers in all countries except Malawi and Liberia (as in Figure 1) and a similar incidence in Colombia and Zambia. There is also a lower incidence of overeducation in all countries. Looking jointly at Figure 1, Figure 3 and Figure 5, it seems that in Liberia and Malawi, there is a composition effect: the aggregate result of lower incidence of undereducation of all workers is driven by the lower incidence of undereducation in the sub-sample of independent workers, rather than employees. Considering jointly Figure 2, Figure 4 and Figure 6, the very high incidence of overeducation of formal workers in Zambia is fully driven by formal wage employees.

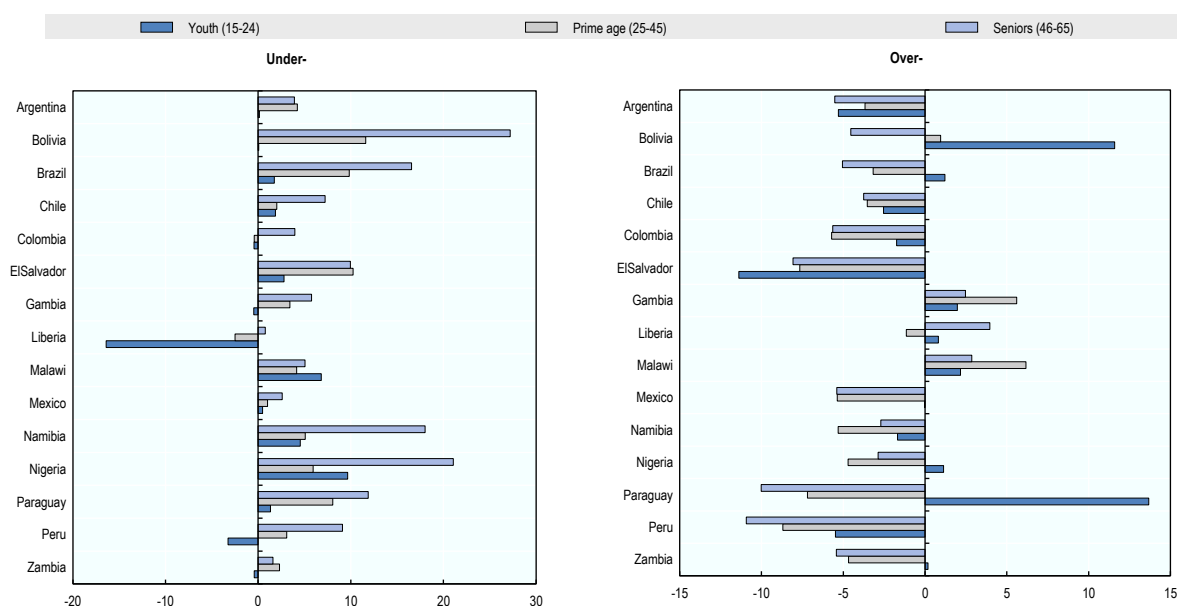
Figure 7. Gaps in under- and overeducation between informal and formal men, as well as informal and formal women; all employed; in percentage points



Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Examining men and women separately (Figure 7), a broadly similar pattern can be established. The incidence of undereducation is greater among informally employed men and women, as compared to formally employed men and women, in all countries except Liberia and Gambia (for women). The gap is substantially higher for women than for men in Bolivia, El Salvador, Mexico, Namibia, Paraguay and Peru. For example, in Bolivia, 26% of informally employed women are undereducated, in contrast with 6% of formally employed women (20 percentage points gap). Among men in Bolivia, the incidence of undereducation is 17% among informally employed, in contrast with 8% of formally employed (9 percentage points gap). Similarly, the incidence of overeducation is greater among formally employed men and women in all countries except Gambia and Malawi; the gap is pronounced stronger for women than for men in Brazil, El Salvador, Mexico, Paraguay and Peru.

Figure 8. Gaps in under- and overeducation between informal and formal workers, by age; all employed; in percentage points



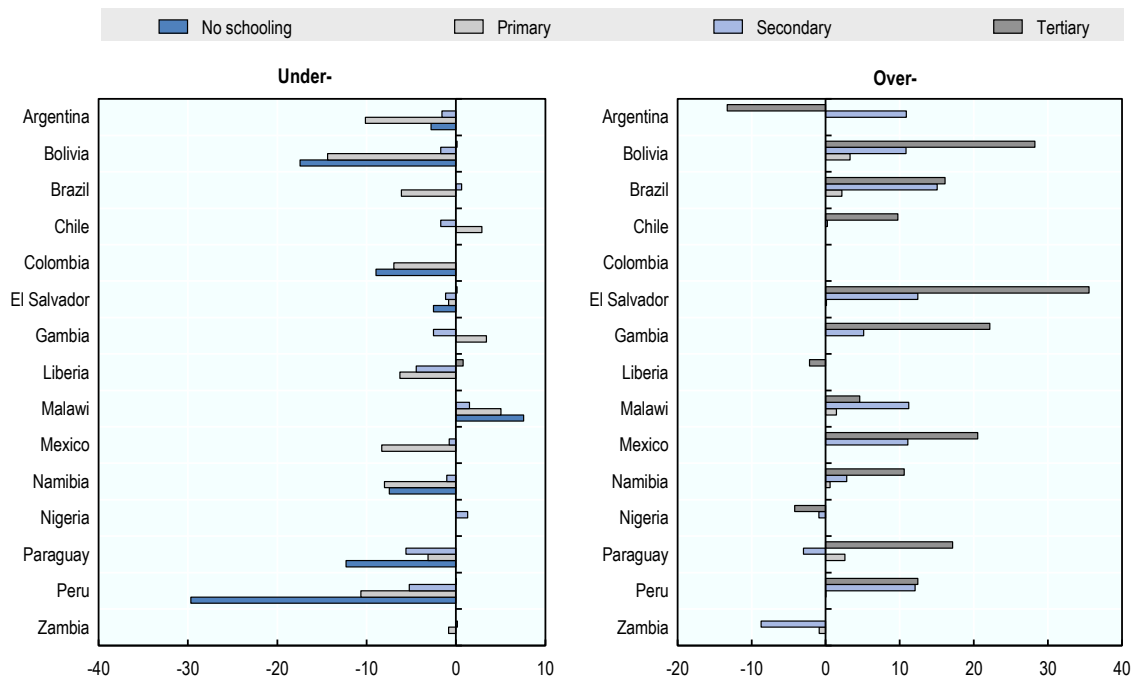
Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Some differences are also observed by age groups. On average, among youth, overeducation is twice more frequent than undereducation, whether among formal or informal workers (Table A A.3 of the Annex). This is consistent with the general literature explaining that young workers tend to substitute the lack of experience with schooling. In the prime-age group, overeducation is more frequent than undereducation among formal workers, while among informal workers, there is a similar share of under- and overeducated. Seniors exhibit a higher rate of undereducation, especially informal senior workers. This cohort is likely to have had poorer access to schooling in general. There is also a positive gap in undereducation between informal and formal workers almost in all countries and all age groups (Figure 8). Exceptions are, again, Liberia, where a negative gap is observed for young and prime-age workers, and in Peru (young workers only).⁵ The most sizeable gap in undereducation between informal and formal workers is quite generally observed among seniors. For overeducation, the largest positive gap between informal and formal workers is observed among young workers in Bolivia and Paraguay, as well as among prime-age workers in Gambia and Malawi (Figure 8).

Formal workers generally tend to have a higher level of education (measured by the mean years of schooling), as compared to informal workers. Table A A.9 of the Annex shows that this is the case in all countries, except Colombia, where informal workers on average have slightly more schooling as compared to formal workers.

⁵ In other countries and age groups with the negative gap, such gap is not significantly different from zero.

Figure 9. Gaps in under- and overeducation between informal and formal workers, by educational attainment; all employed; in percentage points



Note: Most of the overeducation is observed among workers with a tertiary level of education (this group, by definition, has more statistical opportunities to feature overeducation), but also, in some countries, with a secondary level of education. In contrast, undereducation is rather found among workers with no schooling or just the primary level of schooling.

Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

There is a higher incidence of overeducation at tertiary level among informal workers, as compared to formal workers, in the majority of countries; exceptions are Argentina, Liberia, and Nigeria (Figure 9). Undereducation is relatively more frequent among informal workers with no schooling, as compared to formal workers with no schooling, with the exception of Malawi (workers with no schooling, by definition, have more statistical opportunities to be undereducated) (Figure 9) and Table A A.7 of the Annex also show that overeducation is consistently more frequent, as opposed to undereducation, in formal jobs such as legislators, senior officials, managers, and professionals. Undereducation is prevailing in the intermediary and low-skill informal occupations, especially in informal elementary occupations. In some countries, such as Brazil, Colombia, Paraguay, Gambia, and Liberia, overeducation may also be found in informal elementary occupations, pointing to the general lack of work opportunities for mid-skill workers. Both under- and overeducation are important in many intermediary occupations (technicians and associate professionals; clerks; service, shop and market sales workers; skilled agriculture and fishery workers; craft and related trades workers; plant and machine operators and assemblers), and are more widespread than in other occupations, both among formal and informal workers. These high proportions of mismatched workers in intermediary occupations also point to limited availability of jobs requiring high level of education, with medium and low skill jobs absorbing most of the available workforce.

Summing up, education mismatch is an important feature of both formal and informal employment and there are sizeable differences in over- and undereducation of formal and informal workers. What remains to be tested, however, is whether individual's formality status is an important predictor of his or her education-occupation matching holding everything else equal, whether the education-occupation matching of an individual is also shaped by the overall incidence of informality, and if yes, whether the general level of informality affects differently the matching of formal and informal workers.

5 Multivariate analysis of the relationship between informality and education-occupation mismatch

Setting the empirical model

To isolate the relationship between informality and education-occupation mismatch, we estimate a multinomial logit model for the probability of being over- or undereducated versus being perfectly matched, separately for each country. The model for the education-occupation match is given by:

$$Y_{icj} | X_{ic} = \frac{e^{\beta_j X_{ic}}}{\sum_{j=1}^3 e^{\beta_j X_{ic}}} \quad (1)$$

Where Y_{icj} is the probability that worker i in country c is in one of the three (j th) education-occupation match categories: undereducated, correctly matched, or overeducated. The vector X_{icj} includes a series of standard socio-economic characteristics used in the literature on education-occupation mismatch: age, age squared,⁶ sex, civil status (married, divorced or widowed, with single being a reference group), number of household members, and living in an urban area. Additionally, to control for differences in the distribution of workers across industries and occupations due to sorting, different skill requirement, or regulations of occupations, in all regressions, we include one-digit occupation fixed effects and sector of economic activity fixed effects. All regressions are estimated separately for employees, and for all workers; in the former case, size of the enterprise is also controlled for; in the latter case, an additional independent variable indicating status in employment is also included. Finally, the variable of key interest – a dichotomous variable equal to one for individuals in informal employment – is among the variables forming vector X_{icj} . For the full list of variables and their description, see Table A A.8.

The rich literature on this subject also regularly includes other controls, such as the migrant or ethnic status, work-related responsibilities, and others. Because the data used here are from household surveys, most of these variables are not systematically available. The trade-off between having more controls and including more countries into the analysis is solved in favour of the latter. Worker's actual level of education, although it is an important determinant of occupational outcome, is not included into the model. As it already appears in the construction of the dependent variables, its inclusion would lead to spurious correlation.

⁶ Experience and on-the-job tenure are other important variables that some data allow controlling for. In the absence of such data, some authors compute experience as age minus years of schooling, minus six. Given differences in the schooling systems across countries, as well as a linearity embedded in thus constructed variable, the reported results control simply for the "age" variable. Controlling for the artificially constructed "experience" and omitting age does not change the results for the variable of interest (informality).

Individual's informality and qualification matching: Estimation results

Are informal employees more likely to be mismatched, and if yes, are they more likely to be under- or overeducated? To answer this question, the benchmark results of estimating model (1) are presented in Table 1. Columns 1 and 2 report estimation results for sub-samples of all employed. Columns 3-4 report estimation results for sub-samples of employees. The estimated coefficients are transformed to relative-risk ratios, with perfect match being the benchmark. Each cell shows a relative-risk ratio, and a standard error, of “being in informal employment” variable, from a separate country regression. In interpreting relative risk ratios, it is important to remember that the relative risk is never negative; rather, it is greater or smaller than one. If the relative risk ratio is greater than 1, the event (over- or under- education) is more likely to occur; if it is less than 1, the event is less likely to occur.

From Table 1 reported estimates on the *being informal* dummy variable suggest that, for informal workers as well as for the sub-set of informal wage employees, relative respectively to formal workers and formal wage employees, the relative risk of being undereducated is significantly increased in the majority of countries of our sample (column 1). Exceptions are Liberia and Malawi, where such risk is significantly decreased; the result is insignificant in Colombia. The effect is much more consistent for employees (column 3): informal employees are significantly more likely to be undereducated in 12 countries; the result is insignificant in other countries. Also, for informal employees as compared to formal, the relative risk of being overeducated is significantly decreased in all countries, in eleven of them – in a significant way (column 4). These results do not imply causality, but only correlation; yet, they are important in showing that informal jobs go hand-in-hand with undereducation, while formal jobs, with overeducation.

Other coefficients in these regressions are not reported because of space limitations, but are available on request. Notably, the coefficients on the *sex* variable suggest that women are more likely to be overeducated as compared to men, and less likely to be undereducated, in all countries of our sample. Moreover, comparing the coefficients on *sex* and on *being informal* variables within the same regressions, we find that, generally across countries, the effect of *being a female* is stronger and larger than the effect of *informality* as a predictor of overeducation; but the effect of *informality* is usually stronger and larger than *being a female* as a predictor of undereducation.

Table 1. Individual's informality as a determinant of mismatch

Country (sample)	All workers		Employees	
	Undereducated	Overeducated	Undereducated	Overeducated
Brazil	2.326*** (0.039)	0.859*** (0.014)	2.309*** (0.047)	0.921*** (0.017)
Argentina	1.294*** (0.123)	0.673*** (0.057)	1.398*** (0.140)	0.690*** (0.064)
Bolivia	3.246*** (0.319)	0.810* (0.065)	3.774*** (0.404)	1.031 (0.095)
Chile	1.232*** (0.033)	0.732*** (0.020)	1.174*** (0.039)	0.772*** (0.027)
Colombia	0.794 (0.029)	0.600*** (0.069)	0.888 (0.065)	0.555** (0.066)
El Salvador	2.192*** (0.103)	0.651*** (0.030)	2.330*** (0.129)	0.688*** (0.038)
Mexico	1.359*** (0.033)	0.545*** (0.012)	1.434*** (0.035)	0.600*** (0.014)
Paraguay	2.611*** (0.219)	0.727*** (0.040)	2.673*** (0.295)	0.813*** (0.053)

Peru	1.580*** (0.051)	0.607*** (0.019)	1.237*** (0.053)	0.605*** (0.025)
Gambia	1.454*** (0.122)	0.893* (0.060)	2.409*** (0.373)	0.803* (0.097)
Liberia	0.720* (0.136)	1.239 (0.186)	0.827 (0.388)	0.967 (0.539)
Malawi	0.725** (0.114)	1.014 (0.167)	0.729 (0.298)	0.950 (0.442)
Namibia	- -	- -	1.519*** (0.137)	0.830** (0.077)
Nigeria	4.460*** (1.373)	1.087 (0.309)	3.830*** (1.241)	1.223 (0.379)
Zambia	1.570*** (0.203)	0.162*** (0.012)	2.899*** (0.777)	0.305*** (0.012)

Note: Each cell reports coefficients of "being in informal employment" variable in terms of relative risk ratios, from multinomial logit regression, run separately for each country. Robust standard errors, clustered on occupation, are in parentheses. Dependent variable: individual education-occupation match category, taking values: undereducated, correctly matched, overeducated. Correct match is used as a reference category. All regressions include controls for age, age squared, sex, civil status (except Brazil and Zambia, where this variable is not available), number of household members, living in an urban area, one-digit occupation fixed effects, sector of economic activity fixed effects. In the regression for all workers, status in employment is also controlled for. In regressions for employees, size of the enterprise is also controlled for. All regressions are estimated accounting for the population weights. The symbols (***), (**) and (*) represent statistical significance at $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Redoing the analysis by gender, a largely similar effect of informality on under- and over- education is observed in regressions separately for men and women (Table 2), as compared to joint estimations. In the majority of countries, both informal men and women have a higher risk of being undereducated, as compared to formal men or women. However, the coefficients cannot be directly compared across these regressions, hence it is difficult to assess whether the effects are stronger for men or for women across all countries.

Table 2. Individual's informality as a determinant of mismatch, employed men and women

	Men				Women			
	Undereducated		Overeducated		Undereducated		Overeducated	
Argentina	1.272**	(0.149)	0.553***	(0.063)	1.361*	(0.225)	0.856	(0.114)
Bolivia	2.701***	(0.293)	0.870	(0.080)	5.669***	(0.850)	0.909	(0.114)
Brazil	2.275***	(0.048)	0.731***	(0.017)	2.436***	(0.068)	0.989	(0.022)
Chile	1.231***	(0.044)	0.708***	(0.027)	1.233***	(0.049)	0.766***	(0.032)
Colombia	0.641	(0.069)	0.646**	(0.073)	1.074**	(0.112)	0.568***	(0.068)
El Salvador	2.255***	(0.132)	0.659***	(0.038)	1.927***	(0.156)	0.649***	(0.054)
Gambia	1.652***	(0.180)	0.874	(0.071)	1.247	(0.173)	0.897	(0.113)
Liberia	1.115	(0.405)	0.659	(0.266)	3.338	(3.340)	0.000	(0.001)
Malawi	0.512	(0.233)	0.821	(0.439)	1.386	-2.265	1.025	(1.066)
Mali	2.094**	(0.715)	0.868	(0.202)	0.982	(0.490)	1.371	(0.476)
Mexico	1.465***	(0.046)	0.528***	(0.016)	1.329***	(0.051)	0.565***	(0.020)
Namibia	1.387***	(0.147)	0.919	(0.097)	2.041***	(0.297)	1.005	(0.129)
Nigeria	4.300***	(1.561)	1.276	(0.428)	1.879	(0.911)	0.404	(0.279)
Paraguay	2.250***	(0.226)	0.805***	(0.058)	3.301***	(0.513)	0.674***	(0.059)
Peru	1.334***	(0.064)	0.687***	(0.025)	1.645***	(0.088)	0.637***	(0.028)
Zambia	1.598	(0.625)	0.418***	(0.112)	0.623	(0.354)	0.124***	(0.092)

Note: Each cell reports coefficients of “being in informal employment” variable in terms of relative risk ratios, from multinomial logit regression, run separately for each country. Robust standard errors, clustered on occupation, are in parentheses. Dependent variable: individual education-occupation match category, taking values: undereducated, correctly matched, overeducated. Correct match is used as a reference category. All regressions include controls for age, age squared, sex, civil status (except Brazil and Zambia, where this variable is not available), number of household members, living in an urban area, one-digit occupation fixed effects, sector of economic activity fixed effects. In the regression for all workers, status in employment is also controlled for. In regressions for employees, size of the enterprise is also controlled for. All regressions are estimated accounting for the population weights. The symbols (***), (**) and (*) represent statistical significance at $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

The role of the overall incidence of informality in education matching

The previous section established that individual's informality is an important determinant of individual's education-occupation matching. As a next step, we also test how this relationship is affected by the overall incidence of informality. Is the education matching of formal and informal workers affected by the overall incidence of informality in the labour market? And if so, are formal and informal workers affected in the same manner?

Because the data are prohibitively large, we cannot run a pooled regression. All regressions are run separately for each country. Thus, we cannot control for a country-level incidence of informality. Instead, for each country separately, we construct a variable “regional level of informality”, as a share of informal workers in total regional employment, based on each country's own definition and administrative division of regions. Such data are available for 12 countries. For each of them, the sample is split into sub-samples of formal and of informal workers. Estimations such as in (1) are done separately for these sub-samples, and the “regional level of informality” is included among controls.⁷ Table 3 presents the results of these

⁷ An alternative to splitting the sample is doing these regressions in a pooled sample, and interacting individual's informality status dummy variable with the regional level of informality. The results thus obtained are equivalent to the regression results in splitted samples; they are available on request.

estimations. In a quite consistent manner, higher regional level of informality is associated with higher odds of being undereducated for informal workers. This is seen from column 3: relative risk ratio of the regional informality variable is above one in ten countries, and statistically significant in seven countries; moreover, there is no country where relative risk ratio of the regional informality variable is statistically significant below one. Thus, not only undereducation is observed mainly among informal workers, but also it is particularly the case in regions with higher general level of informality. In fact, in the regressions reported in this table, this is the only consistent result across countries. No similar pattern across countries is observed for formal workers, whether we look at their under- or overeducation (columns 1 and 2: relative risk ratio of the regional informality variable can be statistically significant either above, or below one, prohibiting us from drawing any over-arching conclusion).

Table 3. Regional informality as a determinant of mismatch, for formal and informal workers separately

	Formal workers		Informal workers	
	Undereducated	Overeducated	Undereducated	Overeducated
Argentina	0.081** (0.092)	3.544 (3.059)	1.930 (0.797)	3.240 (2.674)
Brazil	2.968*** (0.285)	0.855** (0.064)	20.937*** (1.569)	0.322*** (0.028)
Bolivia	2.698 (12.713)	1.341 (4.901)	2.281*** (3.916)	0.089 (0.168)
Chile	0.314*** (0.141)	0.103*** (0.041)	2.376 (1.482)	0.362 (0.267)
El Salvador	1.100*** (0.4304)	0.376*** (0.111)	8.854*** (2.152)	0.653 (0.184)
Paraguay	6.861** (5.429)	10.548*** (4.593)	2.544*** (0.905)	1.535 (0.486)
Peru	0.902 (0.272)	3.882*** (0.798)	6.825*** (1.022)	3.305*** (0.465)
Gambia	7.700** (7.652)	0.038*** (0.029)	4.051*** (3.268)	0.482 (0.320)
Liberia	0.000 (0.000)	2.145 (8.780)	0.001 (0.004)	3.061 (1.909)
Namibia	0.087*** (0.065)	0.763 (0.475)	0.890 (0.620)	0.167** (0.136)
Nigeria	0.002 (0.010)	1.232 (6.128)	4.1313* (8.769)	3.345* (1.057)
Zambia	0.000 (0.003)	4.630 (20.700)	12.643 (27.760)	0.001** (0.003)

Note: Each cell reports coefficients of “regional level of informality” variable in terms of relative risk ratios, from multinomial logit regression, run separately for each country. Robust standard errors, clustered on occupation, are in parentheses. Dependent variable: individual education-occupation match category, taking values: undereducated, correctly matched, overeducated. Correct match is used as a reference category. All regressions include controls for age, age squared, sex, civil status (except Brazil and Zambia, where this variable is not available), number of household members, living in an urban area, one-digit occupation fixed effects, sector of economic activity fixed effect, status in employment. All regressions are estimated accounting for the population weights. The symbols (***), (**) and (*) represent statistical significance at $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

Source: Authors’ calculations based on country-specific household data. See Table A A.1 of the Annex for details.

6 Conclusions

This paper has demonstrated that both formal and informal jobs in developing countries with available data can feature over- and under- education. Yet, in the majority of them, informal jobs are particularly prone to undereducation as compared to formal jobs. Formal jobs, in contrast, are more likely to go hand in hand with overeducation. These results are consistent for dependent as well as for independent workers. They also hold true for men and for women. Moreover, the effect of *being a female* is stronger and larger than the effect of *being informal* as a predictor of overeducation; but the effect of *being informal* is stronger and larger than *being a female* as a predictor of undereducation in most countries of our sample. Also, in the majority of countries considered in this paper, general incidence of informality also reinforces the link between individual informality and mismatch: the higher is the general level of informality in a labour market, the higher are the chances that informal workers will be undereducated.

These results suggest that, in the informal jobs, there is an excess of workers who do not have sufficient formal education to perform their jobs. Some of these workers are genuinely under-skilled: indeed, the vast majority of them does not have any schooling at all, or primary schooling at best. This finding is important, as it nuances our understanding why informal economy jobs are generally unproductive: it is because they disproportionately absorb under-skilled labour. As shown in other studies [ex.: (OECD, ECLAC and CAF, 2016_[41])], among youth, the reasons for being undereducated often relate to their family background, and the fact that they come from vulnerable households, often with low-skilled parents who are informally employed themselves. In other words, undereducated workers are often trapped in the informal-work low-skill low-productivity intergenerational cycle. Some other undereducated workers may have the right skills and productivity for the jobs that they perform, but not have the right credentials to prove their aptitudes. In this latter case specifically, the lack of formal schooling and credentials may impede workers' access to formal jobs that often feature better quality. This situation also gives rise to inequalities between workers whose educational credentials are recognised, and of those whose credentials are not recognised.

In contrast, scarce formal jobs mainly go hand in hand with overeducation, and hence with inefficient use of human capital, and with non-unleashed potential productivity.

As such, both situations warrant policy attention. On the one hand, general policies aimed at improving transitions towards formal jobs and combatting informality remain relevant for reducing informality and improving education-occupation matching [for examples, see (OECD/ILO, 2019_[1]; OECD, 2016_[42]; ILO, 2016_[43])]. On the other hand, there is also scope for a range of education and for skill-specific policies, targeting both under- and overeducation, for formal and informal workers, but also for children from households with formal and informal breadwinners. Given the wide heterogeneity of informal workers, as well as underlying reasons for under- and overeducation, different measures can be considered, adapted to specific situations. Many of such measures also need to be considered in the new light of challenges posed by the COVID-19 pandemic.

Policies relevant for tackling both under- and overeducation

Undereducation, especially in jobs with low skill requirement, is often a signal of very limited, if not absent, schooling. Indeed, in many developing countries, there is often an excess of unskilled labour, and a

shortage of skilled one. Moreover, this paper has shown that undereducation is systematically found in more disadvantaged areas, such as the ones with widespread prevalence of informality.

Thus, it would be important, as a first step, to ensure that all future workers have universal access to education to start with. This is still not the case in many countries, including the countries of our sample; moreover, access to education remains unequal between boys and girls, between urban and rural areas, and between children from vulnerable and non-vulnerable households (UNESCO, 2017^[44]). Eradicating child labour by raising and enforcing minimum age for employment; not only instituting but also enforcing free and compulsory education; making education available in rural areas are key in this respect (Doepke, 2018^[45]). If substantial progress in these directions has been made in the majority of countries of our sample in the last decades, the COVID-19 pandemic is putting at risk these developments. School closures over 2020-21, the lack of broadband in the rural areas, the lack of computers, and unequal preparedness of teachers, have particularly compromised education in rural areas, of children from vulnerable backgrounds, and of girls (UN, 2020^[46]). In this light, the “single most significant step that countries can take” to revert this situation is to suppress transmission of the virus to control national or local outbreaks; and further complement these actions by safe and inclusive re-opening of education facilities (ibid).

Raising the general education level is essential for providing basic fundamental skills to a larger pool of workers. But equally important is to improve the quality of education. For example, young Latin Americans, including in countries of our sample, perform poorly in reading, mathematics and science compared to their counterparts in OECD countries; more than half enrolled in school do not acquire basic-level proficiency in reading, mathematics and science, according to PISA results (OECD, 2015^[47]). This may explain why employers in these countries hire workers with formal credentials above those that are required for a job: they want to “over-insure” that workers have the right skills, by hiring over-skilled individuals. In this light, improving school enrolment and the quality of schooling would be important to reduce not only undereducation, but also overeducation: employers would have less incentives to “over-shoot” by hiring over-skilled individuals if they know that all workers have at least a minimum level of quality schooling and basic skills.

Raising the level and the quality of schooling requires resources. Government education spending as a share of GDP has not increased in the majority of countries of our sample since 2015, and even decreased in some; moreover, in all of them, it remains below the average world government expenditure devoted to education (UNESCO, 2021^[48]). This prevents attracting best individuals to the teaching profession and improving the quality of teaching, results in poor educational infrastructure and the lack of supporting materials, all of which impedes progress in schooling performance (OECD, 2016^[49]). Moreover, in the majority of countries of our sample, more spending is devoted to primary schooling as compared to secondary and tertiary one. While this is helpful to raise general literacy, as economies develop, it would also be important to ensure more spending on post-primary education, in order to further raise workers’ skills (UNESCO, 2021^[48]). The COVID-19 pandemic has put strain on public resources, especially in poorer countries: many countries, including those in our sample, have cut their public education budgets since the onset of the pandemic (Global Education Monitoring Team and World Bank, 2021^[50]). In this context, it is important to ensure that government expenditure devoted to education reverts to its previous levels in the longer run, and be increased where needed; and that the international aid for education continues despite the fiscal constraints of the donor countries (ibid).

In very poor settings, governments also need to devote resources to decrease the share of education-related expenses paid by the households. This is especially important for poor households with informally employed family members: for them, the burden of household expenditure on education may be particularly heavy, impeding progression in enrolment rates of their children, and hence impeding the inter-generational transition out of poverty and out of informality. Therefore, governments should pay particular attention to providing education subsidies to the families, such as in-kind or cash transfers to the families specifically destined to buy books, school materials, and clothing even if schooling is free; as well as providing school meals, in an inclusive manner. Countries should also expand access to high-quality

tertiary education by providing financing solutions that make quality higher education more affordable and accessible to all socioeconomic groups. Again, the COVID-19 pandemic presented unique challenges to the governmental and local municipality efforts to provide schooling and education-related support to the families. In several Latin American countries of our sample, efforts have been made to maintain school feeding despite school closures, adapting to distribution schedules and increased rations to avoid large gatherings: it is indeed important to continue supporting such measures (Economic Commission for Latin America and the Caribbean, 2020^[51]).

Both groups of undereducated workers and overeducated workers include individuals who dropped out of formal schooling (whether primary, secondary, or tertiary). Technically, these are workers who possess several years of schooling, which has not led to a diploma. In some instances, they may be able to access better-skilled jobs, if their other personal characteristics matter more than formal educational credentials (such as being part of the family business, having ties, or acquiring informal on-the-job experience) – hence be considered as undereducated. But in others, they take-up the lowest-skill jobs, whether in formal or in informal sector (including self-employment or family business, including in subsistence agriculture) – hence technically be overeducated yet not benefitting from their schooling as compared to other peers in the same jobs.

Even before the outburst of the COVID-19 pandemic, school dropout disproportionately concerned youth from disadvantaged socio-economic backgrounds, including households with informal breadwinners. This has been creating a vicious circle, whereby youth not engaged in employment, education or training (NEET) has particular difficulties of transiting from school to work, and especially to formal jobs. In Latin American countries that are part of our sample, drop-outs from secondary education concern primarily children from vulnerable households; one-fifth of young are NEET, with NEET rates surpassing 25% of youth in El Salvador and Mexico (OECD, ECLAC and CAF, 2016^[41]). The vast majority of them (83% of NEET women and 76% of NEET men) live in vulnerable households (ibid). This contributes to the intergenerational persistence of inequality and vulnerability, including informality of employment.

The COVID-19 pandemic has particularly exacerbated school dropout. School closures, unequal access to the broadband and computers for online education, inadequate and unequal supportive environments needed to focus on learning, the misalignment between resources and needs, all have contributed to this situation (OECD, 2020^[52]). Children and students from disadvantaged backgrounds often remained without any teaching support when their schools shut down; for many, especially for girls, temporary school closures led to permanent dropping out of school (UN, 2020^[46]). With regards to tertiary education, the crisis raised questions about the value offered by a university education, which goes beyond teaching and includes networking and social opportunities (OECD, 2020^[52]), leading to higher than usual drop out from tertiary education systems.

Yet, preventing school dropout is important for a longer-term reduction of both under- and over- education, and is especially relevant for countries of our sample. Indeed, it is easier for youth with completed schooling and a diploma to enter a labour market (including formal); and it is also easier to reduce the skills gap for youth, rather than doing this later in the working life (OECD, 2021^[53]). Often, prevention of school dropout has to be coupled with providing subsidies to the families to keep their children in school; or providing scholarships to best performing students. Systems of paid apprenticeship programmes are also a way of providing a bridge to a formal labour market.

In developing countries in particular, decisions to keep children and adolescents in school are often made within the family, and are based on calculated probability that staying in school actually leads to a job relative to the need to have the children participate in providing income to the family. Thus, aligning school programmes with the needs of the labour markets is very important.

In this respect, a particular role can be given to technical vocational education and training (TVET) institutions, which can be well placed to prepare youth for work. Many developing countries do not rely enough on TVET systems (Thang Tze Yian and Park, 2018^[54]). Often, this is because the TVET systems

do not have stable sufficient financial resources, lack up-to-date teaching materials, and do not have highly qualified professionals to teach within these systems. For example, if some countries have sophisticated programmes in place for the professional development of teachers and trainers for TVET systems, others have only weak or inadequate programmes at best [for an overview, see (Comyn and Brewer, 2015^[55])]. Malawi – one of the countries of our sample - does not have any formal training of TVET teachers; ad hoc pedagogical training takes through workshops (ibid). Yet, the extent to which countries can prepare, retain and motivate their TVET teachers determines the extent to which TVET systems can deliver the necessary skills and help reducing mismatches in the labour market. In order for such programmes to be successful, they also need high involvement and commitment from employers, in order to ensure that most relevant skills, reflecting industry and employer needs, are well incorporated into the curricula (ILO, 2017^[56]). TVET systems, too, have been a victim of the COVID-19 pandemic, which has been particularly disruptive to work-based learning. Some occupational fields where practical skills cannot be effectively delivered because of a lack of access to tools, materials, equipment and machinery, or require physical contact with clients, particularly suffered (OECD, 2020^[57]). Nevertheless, it is important to continue supporting both the TVET systems, and their apprentices, and continue adapting these systems to the prolonged crisis (ibid).

For young and prime-age workers who are already in the labour market, but who lack previous basic education, it is also important to develop, popularise, and make easily accessible adult education and training systems, second-chance education programmes, and continued education programmes allowing to combine work with schooling (OECD, 2010^[58]; Sparreboom and Staneva, 2014^[59]; Kupets, 2016^[60]). The goal of such programmes should be to provide at least basic literacy and numeracy skills, as a foundation to any technical skills required in the world of work, and keep other skills up-to-date with labour market needs. Receiving formal qualifications and certifications at the end of these programmes is important, so that these workers can have access to formal jobs. Examples of skills-enhancing programmes for youth that combine classroom teaching, workplace learning and job search, exist in most of Latin American countries, ever since the creation of Mexico Probecan in 1984, and Chile Joven in 1998. Depending on their modalities, such programmes have a potential to improve skills, skill matching, and ultimately youth employability in better quality jobs, including formal jobs (ILO, 2016^[43]; OECD, ECLAC and CAF, 2016^[41]). Employment in formal jobs at the end of such programmes seems to be especially promising for male and young workers in the short run [ex.: (Alzúa, Cruces and Erazo, 2015^[61])], and for women and least educated in the long run [ex.: (Attanasio et al., 2015^[62])]. With the COVID-19 crisis having a singular effect on formal and informal jobs, scaling up such programmes may be necessary.

Policies to diminish undereducation in informal jobs

As discussed throughout the paper, undereducated workers also include those whose skills are not properly recognised (not certified). Among them are not only workers who did not have access to formal schooling, but also those whose formal skills became obsolete too quickly, or whose competences were acquired through informal and non-formal learning (Werquin, 2010^[9]).

In this regard, it is necessary to develop a range of recognition tools in order to better value those skills acquired outside of formal schooling. More generally, recognition and formal certification of skills and competences acquired through non-formal and informal learning, such as on-the-job learning and learning from colleagues, could be useful for rendering workers' skills more visible (Werquin, 2010^[9]; Quintini, 2011^[16]). This, in turn, could add value to the informally acquired skills, improve workers' incentives to participate more proactively in various forms of learning (Fialho, Quintini and Vandeweyer, 2019^[40]), and help workers with the right skills to have better access to formal jobs. Moreover, the recognition of informally acquired skills may also be helpful for the overall structural adjustment in an economy, by allowing their further application in those parts of the labour market where they are valued most. On a national level, development, regular review and update of qualification frameworks can provide relevant support to establishing reliable skill recognition tools (Bjørnåvold and Chakroun, 2017^[63]).

Undereducation of informal workers is very consistently observed among employees. Given this, employers also have a role to play to help better matching. Employer-sponsored training and on-the-job training has been shown as effective in narrowing the gap between skills acquired at schools and skills required on the job (Arulampalam, Booth and Bryan, 2004^[64]), helping to reduce the skill mismatch (Smootenburg and Velden, 2000^[65]). But in order to have a wider involvement of employers in the provision of such trainings, there is a need for policies setting the right incentives to employers. Currently, in Latin America, around 50% of formal firms do not find the workforce with the skills they need, especially in semi-skilled jobs, compared to 36% of firms in OECD countries (Manpower Group, 2015^[66]). The situation is particularly pressing in some countries of our sample, such as Peru, Brazil and Mexico – a situation that could be helped with policies that encourage employers' involvement into skills provision. If COVID-19 presented challenges to employer-sponsored training, it may also be an opportunity to enhance such training thanks to the growth and a popularisation of online training tools.

In addition, there is also a need for policies encouraging workers to return to formal education after gaining labour market experience; and providing relevant training as part of active labour market policies for the unemployed (Quintini, 2011^[16]). Finally, broader policies favouring a culture of individual lifelong learning (UNESCO, 2017^[44]; OECD, 2019^[67]) also allow to keep the initially gained skills and education up-to-date.

Policies to tackle overeducation in formal jobs

Overeducation in formal jobs may stem from various factors, ranging from tight competition among workers for scarce formal jobs, to employers' preference for high formal credentials even in the jobs where they are not required, as an “insurance” against poor skills.

The former scenario has been particularly exacerbated by the current crisis induced by the COVID-19 pandemic: there is a general deficit of formal work, with employment recovery often taking the form of informal jobs [see, for example, (Maurizio, 2021^[68]) for Latin American countries of our sample]. Young people and women are particularly concerned (ibid). In this respect, sanitary measures, including vaccination, are among the key priorities for the “return to normal” in the labour markets. In addition, macroeconomic policies helping to generate more formal higher-skilled jobs not only in the public, but also in the private sector, in order to fully utilise the potential of highly skilled workers, should continue being deployed. Improving institutional environment, supporting job-creation, stimulating investments (including foreign) into technologies, facilitating mobility between jobs but also regions are additional important prerequisites for formal job creation (Kupets, 2016^[60]). Generation of formal middle-level jobs is equally needed: it would allow absorbing tertiary university and technical schools graduates, instead of pushing them to compete for lower-skilled jobs in case they are unable to get jobs at the top end of the occupational skill distribution (ibid). In addition to this, policies of career guidance, and provision of the information on sectors with skill shortages and on the returns to education by field of study, could help workers (especially labour market entrants) make more informed choices and improve their skill match (ILO, 2019^[4]).

In many developing countries, there is a “queuing” of high-skilled workers for formal public jobs. In African countries of our sample – Liberia, Malawi, or Zambia, the difference between the share of students who wish to work in high-skilled occupations and the actual share of highly skilled young workers in the labour market can be up to 73% (OECD, 2017^[29]; Lorenceau, Rim and Savitki, 2021^[69]). Yet, most of the jobs are found elsewhere, notably in the agriculture sector. In these countries specifically, there is a high potential for creating middle-level good quality jobs, with the aim of absorbing in a productive way skilled youth, in the agriculture sector (ibid). For this, there is a need for specific additional governmental policies, such as investing into agriculture infrastructure, improving access to markets, developing the use of information and communication technology, supporting innovations in the sector, but also improving the quality of these jobs, and making these jobs more attractive from a societal point of view (ibid). In Latin American countries, there is a growing, and so far unmet, demand for mid-level mid-skill jobs in automated manufacturing and

in services requiring digital skills (OECD, 2020^[52]). Specific additional governmental policies to direct youth to these jobs include not only improving school curricula by loading them with digital skill components, but also improving infrastructure for information and communication technologies; fostering the development of such sectors of activity as online commerce, open banking or financial technology; and generally striving for a better digital integration of their countries (ibid).

It may be expected that with the COVID-19 pandemic, the incidence of skill mismatches is likely to increase. Indeed, evidence from previous recessions shows that unemployment – especially prolonged unemployment – leads to an increased risk of both over- and under- qualification. This is because firms hiring in uncertain times prefer to “scream the best”, choosing workers with credentials above those required for the job; and there is also a significant competition between unemployed workers with high credentials, reinforcing the likelihood of overeducation. In addition, confinement, prolonged unemployment and inactivity reduce the possibilities and the effectiveness of both formal learning and informal on-the-job training, precipitating skills obsolescence. This means that the relevance of policies suggested above will only strengthen after the end of the pandemic.

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Annex A. Statistical details

Table A A.1. Sample description

Country	Survey year	Data source	Number of observations used in the regression analysis	
			Sample of employed	Sample of employees
Argentina	2018	Encuesta Permanente de Hogares	20 696	15 224
Bolivia	2018	Encuesta de Hogares	15 244	6 237
Brazil	2018	Pesquisa Nacional por Amostra de Domicilios	155 403	95 688
Chile	2017	Encuesta de Caracterización Socioeconómica Nacional	84 881	64 652
Colombia	2017	Encuesta de Calidad de Vida	13 149	5 981
El Salvador	2018	Encuesta de Hogares de Propósitos Múltiples	24 674	15 168
Gambia	2015	Integrated Household Survey	9 166	2 528
Liberia	2016	Household Income and Expenditure Survey	2 022	1 678
Malawi	2016	Integrated Household Survey	526	526
Mexico	2018	Encuesta Nacional de Ingresos y Gastos de los Hogares	117 589	92 862
Namibia	2015	Namibia Household and Income Expenditure Survey	-	7 849
Nigeria	2015	General Household Panel Survey	1 066	765
Paraguay	2016	Encuesta Permanente de Hogares	13 576	7 114
Peru	2018	Encuesta Nacional de Hogares	62 387	25 421
Zambia	2015	Living Conditions Monitoring Survey	1 694	341
<i>Total</i>			529 922	342 034

Note: Namibia, 2015: sample of employees only (data not available on occupations of other employed). Reported number of observations reflects the observations used in the regression analysis, hence reflecting non-missing data on all independent and control variables.

Table A A.2. Years of education and highest educational attainment: Comparing means and modes across occupations. Example of Brazil, 2018

	ISCO 1-Digit Classification of Occupations								
	1	2	3	4	5	6	7	8	9
Mean of self-reported years of education	13.37	15.43	13.22	12.93	10.45	6.47	8.97	9.33	7.69
Mode of self-reported years of education	16	16	12	12	12	5	12	12	12
Mode of self-reported highest educational attainment	4	4	3	3	3	2	2	2	2
Total observations	8 218	21 807	15 193	16 691	47 736	22 922	27 789	18 160	40 972

Note: Occupations: 1 – Legislators, senior officials, managers, 2 – Professionals, 3 – Technicians and Associate Professionals, 4 – Clerks, 5 – Service, shop and market sales workers, 6 – Skilled agriculture and fishery workers, 7 – Craft and related trades workers, 8 – Plant and machine operators and assemblers, 9 – Elementary occupations. Educational attainment is measured in 4 categories of the highest attained degree: 1 – none, 2 – primary education, 3 – secondary education, 4 – tertiary education.

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

Table A A.3. Incidence of under and overeducation, by age and informality

	Formal		Informal		Formal		Informal		Formal		Informal	
	Youth (15-24)				Prime age (25-45)				Seniors (46-65)			
	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over
Argentina	0.10	0.17	0.10	0.12	0.09	0.21	0.13	0.18	0.19	0.18	0.23	0.13
Bolivia	0.05	0.04	0.05	0.16	0.05	0.14	0.17	0.15	0.11	0.11	0.38	0.06
Brazil	0.05	0.17	0.07	0.18	0.07	0.18	0.17	0.15	0.18	0.13	0.34	0.07
Chile	0.11	0.12	0.13	0.09	0.08	0.16	0.10	0.13	0.14	0.11	0.21	0.07
Colombia	0.03	0.14	0.02	0.12	0.05	0.16	0.04	0.11	0.08	0.12	0.12	0.06
El Salvador	0.04	0.22	0.07	0.11	0.08	0.18	0.19	0.11	0.17	0.13	0.27	0.05
Gambia	0.05	0.17	0.04	0.19	0.06	0.16	0.10	0.22	0.09	0.22	0.15	0.25
Liberia	0.21	0.00	0.04	0.01	0.08	0.07	0.05	0.06	0.06	0.03	0.07	0.07
Malawi	0.00	0.00	0.07	0.02	0.01	0.01	0.05	0.07	0.01	0.00	0.06	0.03
Mexico	0.05	0.16	0.06	0.16	0.09	0.16	0.10	0.11	0.17	0.14	0.19	0.08
Namibia	0.08	0.10	0.12	0.08	0.10	0.16	0.15	0.10	0.21	0.12	0.39	0.09
Nigeria	0.00	0.00	0.10	0.01	0.05	0.11	0.11	0.07	0.05	0.11	0.26	0.08
Paraguay	0.03	0.22	0.04	0.35	0.05	0.25	0.13	0.18	0.13	0.16	0.24	0.06
Peru	0.08	0.22	0.05	0.16	0.07	0.26	0.10	0.17	0.11	0.22	0.20	0.11
Zambia	0.01	0.00	0.01	0.00	0.00	0.06	0.03	0.01	0.01	0.07	0.02	0.01
Average	0.06	0.12	0.06	0.12	0.06	0.15	0.11	0.12	0.11	0.12	0.21	0.08

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

Table A A.4. Incidence of under and overeducation, by educational attainment, in formal jobs

	Under				Over			
	No schooling	Primary	Secondary	Tertiary	No schooling	Primary	Secondary	Tertiary
	1	2	3	4	1	2	3	4
Argentina	0.81	0.08	0.01	0.00	0.00	0.00	0.46	0.25
Bolivia	0.75	0.03	0.00	0.02	0.00	0.05	0.12	0.46
Brazil	1.00	0.03	0.03	0.00	0.00	0.03	0.32	0.51
Chile	1.00	0.31	0.10	0.01	0.00	0.00	0.01	0.42
Colombia	0.99	0.03	0.17	0.01	0.00	0.00	0.08	0.59
El Salvador	0.80	0.24	0.02	0.00	0.00	0.00	0.23	0.35
Gambia		0.19	0.01	0.00		0.00	0.27	0.46
Liberia		0.12	0.03	0.01		0.00	0.02	0.07
Malawi	0.08	0.06	0.02	0.00	0.00	0.01	0.12	0.28
Mexico	1.00	0.10	0.02	0.00	0.00	0.00	0.15	0.69
Namibia	0.84	0.48	0.02	0.01	0.01	0.01	0.12	0.45
Nigeria	1.00	0.88	0.03	0.02	0.00	0.00	0.02	0.10
Paraguay	0.75	0.14	0.03	0.01	0.00	0.06	0.05	0.46
Peru	0.46	0.05	0.05	0.00	0.00	0.00	0.22	0.56
Zambia		0.04	0.00	0.00				

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

Table A A.5. Incidence of under and overeducation, by educational attainment, in informal jobs

	Under				Over			
	No schooling	Primary	Secondary	Tertiary	No schooling	Primary	Secondary	Tertiary
Argentina	0.84	0.18	0.02	0.00	0.00	0.00	0.35	0.38
Bolivia	0.92	0.18	0.02	0.02	0.00	0.01	0.01	0.18

Brazil	1.00	0.09	0.02	0.00	0.00	0.01	0.17	0.34
Chile	1.00	0.28	0.12	0.01	0.00	0.00	0.00	0.33
Colombia	0.88	0.09	0.05	0.01	0.00	0.00	0.05	0.30
El Salvador	0.80	0.24	0.02	0.00	0.00	0.00	0.24	0.35
Gambia		0.16	0.04	0.00		0.00	0.22	0.24
Liberia		0.18	0.08	0.00		0.00	0.00	0.10
Malawi	1.00	0.01	0.01	0.00	0.00	0.00	0.00	0.23
Mexico	1.00	0.19	0.03	0.02	0.00	0.00	0.03	0.49
Namibia	0.92	0.56	0.03	0.01	0.00	0.00	0.09	0.34
Nigeria	1.00	0.88	0.02	0.01	0.00	0.00	0.03	0.14
Paraguay	0.87	0.17	0.08	0.01	0.00	0.04	0.08	0.29
Peru	0.76	0.15	0.10	0.00	0.00	0.00	0.10	0.44
Zambia		0.05	0.00	0.00	0.00	0.01	0.09	

Source: Authors' calculations based on country-specific household data. See Table A A.1 of the Annex for details.

Table A A.6. Incidence of under and overeducation, by occupation, in formal jobs

		Occupation (1-Digit)								
		1	2	3	4	5	6	7	8	9
Argentina	Under	0.16	0.06	0.05	0.15	0.12	0.00	0.06	0.08	0.19
	Over	0.20	0.16	0.27	0.19	0.21	0.38	0.22	0.18	0.25
Bolivia	Under	0.07	0.03	0.04	0.04	0.10	0.00	0.12	0.18	0.13
	Over	0.10	0.08	0.09	0.15	0.26	0.44	0.19	0.14	0.16
Brazil	Under	0.03	0.07	0.05	0.08	0.11	0.11	0.14	0.15	0.09
	Over	0.12	0.28	0.29	0.26	0.15	0.23	0.09	0.16	0.12
Chile	Under	0.08	0.07	0.10	0.13	0.08	0.10	0.11	0.10	0.10
	Over	0.23	0.11	0.23	0.10	0.15	0.10	0.12	0.14	0.10
Colombia	Under	0.07	0.17	0.29	0.43	0.30	0.27	0.24	0.30	0.42
	Over	0.25	0.26	0.24	0.24	0.19	0.13	0.13	0.27	0.19
El Salvador	Under	0.05	0.02	0.12	0.07	0.11	0.08	0.10	0.17	0.12
	Over	0.16	0.17	0.23	0.18	0.07	0.28	0.23	0.19	0.32
Mexico	Under	0.07	0.10	0.20	0.08	0.17	0.03	0.05	0.14	0.03
	Over	0.17	0.16	0.34	0.27	0.16	0.17	0.10	0.11	0.10
Paraguay	Under	0.07	0.04	0.04	0.05	0.07	0.01	0.07	0.13	0.10
	Over	0.13	0.29	0.11	0.10	0.18	0.34	0.36	0.25	0.40
Peru	Under	0.10	0.03	0.11	0.17	0.07	0.06	0.06	0.08	0.06
	Over	0.34	0.22	0.19	0.24	0.34	0.35	0.29	0.21	0.19
Gambia	Under	0.10	0.03	0.11	0.11	0.15	0.02	0.10	-	-
	Over	0.15	0.06	0.14	0.12	0.09	0.24	0.28	-	-
Liberia	Under	0.00	0.15	0.00	0.50	0.35	0.00	0.33	0.43	0.21
	Over	0.33	0.08	0.15	0.00	0.06	0.33	0.00	0.00	0.34
Malawi	Under	0.00	0.00	0.18	0.00	0.30	-	0.00	0.20	0.09
	Over	0.31	0.13	0.12	0.00	0.20	-	0.00	0.20	0.09
Namibia	Under	0.06	0.31	0.21	0.20	0.41	0.14	0.12	-	-
	Over	0.28	0.00	0.21	0.05	0.14	0.18	0.19	-	-
Nigeria	Under	0.15	0.00	0.03	0.05	0.00	-	0.09	0.08	0.22
	Over	0.38	0.17	0.08	0.00	0.00	-	0.00	0.00	0.06
Zambia	Under	0.00	0.00	0.11	0.00	0.02	0.06	0.08	0.00	0.06
	Over	0.34	0.30	0.44	0.00	0.69	0.68	0.42	0.29	0.47

Note: 1 – Legislators, senior officials, managers, 2 – Professionals, 3 – Technicians and Associate Professionals, 4 – Clerks, 5 – Service, shop and market sales workers, 6 – Skilled agriculture and fishery workers, 7 – Craft and related trades workers, 8 – Plant and machine operators and assemblers, 9 – Elementary occupations. Missing cells: no observations, or less than 1% of the sample.

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

Table A A.7. Incidence of under and overeducation, by occupation, in informal jobs

		Occupation (1-Digit)								
		1	2	3	4	5	6	7	8	9
Argentina	Under	0.23	0.17	0.14	0.18	0.17	0.22	0.13	0.13	0.19
	Over	0.13	0.02	0.17	0.17	0.19	0.19	0.08	0.16	0.07
Bolivia	Under	-	0.10	0.11	0.11	0.24	0.19	0.24	0.22	0.22
	Over	-	0.09	0.09	0.11	0.11	0.22	0.09	0.12	0.09
Brazil	Under	0.26	0.26	0.09	0.20	0.23	0.17	0.26	0.24	0.22
	Over	0.00	0.00	0.24	0.15	0.08	0.20	0.05	0.07	0.20
Chile	Under	0.13	0.24	0.17	0.18	0.16	0.17	0.15	0.11	0.13
	Over	0.13	0.08	0.20	0.11	0.09	0.05	0.10	0.15	0.08
Colombia	Under	-	-	0.28	0.35	0.29	0.20	0.13	0.26	0.27
	Over	-	-	0.18	0.21	0.20	0.17	0.21	0.21	0.18
El Salvador	Under	-	-	0.29	0.23	0.22	0.20	0.20	0.25	0.23
	Over	-	-	0.10	0.14	0.05	0.14	0.13	0.05	0.16
Mexico	Under	0.29	0.19	0.29	0.12	0.23	0.11	0.07	0.23	0.17
	Over	0.04	0.12	0.30	0.16	0.14	0.11	0.08	0.10	0.10
Paraguay	Under	0.19	0.10	0.17	0.14	0.18	0.09	0.15	0.19	0.27
	Over	0.01	0.05	0.06	0.07	0.08	0.19	0.24	0.17	0.26
Peru	Under	-	0.14	0.16	0.25	0.16	0.07	0.16	0.13	0.12
	Over	-	0.13	0.12	0.18	0.17	0.21	0.15	0.16	0.10
Gambia	Under	-	0.05	0.27	0.05	0.17	0.02	0.15	0.13	0.10
	Over	-	0.05	0.09	0.10	0.06	0.24	0.22	0.21	0.22
Liberia	Under	0.09	0.10	0.14	0.10	0.15	0.18	0.23	0.13	0.21
	Over	0.06	0.14	0.18	0.08	0.08	0.16	0.06	0.14	0.23
Malawi	Under	0.05	0.08	0.20	0.18	0.08	0.29	0.20	0.18	0.00
	Over	0.13	0.12	0.00	0.18	0.20	0.07	0.00	0.10	0.00
Namibia	Under	0.03	0.14	0.02	0.13	0.08	0.12	0.09	0.08	-
	Over	0.37	0.10	0.46	0.24	0.22	0.21	0.22	0.26	-
Nigeria	Under	0.15	0.13	0.10	0.13	0.14	0.17	0.20	0.15	0.20
	Over	0.09	0.04	0.12	0.08	0.09	0.13	0.07	0.17	0.10
Zambia	Under	0.22	0.41	0.23	0.50	0.19	0.21	0.16	0.23	0.16
	Over	0.02	0.00	0.00	0.00	0.12	0.05	0.11	0.13	0.08

Note: 1 – Legislators, senior officials, managers, 2 – Professionals, 3 – Technicians and Associate Professionals, 4 – Clerks, 5 – Service, shop and market sales workers, 6 – Skilled agriculture and fishery workers, 7 – Craft and related trades workers, 8 – Plant and machine operators and assemblers, 9 – Elementary occupations. Missing cells: no observations, or less than 1% of the sample.

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

Table A A.8. Variables' definitions

Dependent variable
<i>Mismatch</i> : 1 – if undereducated; 2 – if correctly matched, 3 – if overeducated
Individual and job-related characteristics
<i>Age</i> – individual's age
<i>Age2</i> – age squared
<i>Sex</i> – dichotomous variable equal 1 if individual is male, 2 if female
<i>Hhmb</i> – number of household members
<i>Civil status</i> – set of dichotomous variables indicating whether an individual is married (including cohabiting), divorced or widowed, or single (reference group)
<i>Urban</i> – dichotomous variable equal to one if individual lives in urban area
<i>Status in employment</i> – set of dichotomous variables indicating whether the individual is an own-account worker, and employer, a contributing family member, or an employee (reference group).

Inform – dichotomous variable equal to one if individual is in an informal job

Econ sector – set of dichotomous variables, indicating the activity sector: manufacturing, service, or agriculture (reference group)

Occupation – set of dichotomous variables, indicating the two-digit occupation

Firm size – set of dichotomous variables, indicating whether the firm is small, medium, or large (reference group)

Table A A.9. Selected descriptive statistics

		Formal		Informal	
		Mean	St.Dev.	Mean	St.Dev.
Argentina	Age	38.17	11.28	35.81	12.96
	Years of schooling	12.79	4.54	10.33	4.55
	Household size	3.66	1.80	4.27	2.21
	Sex (2='female,' 1=male)	1.37	0.48	1.34	0.47
	Urban	1.00	0.00	1.00	0.00
Bolivia	Age	40.69	10.57	38.00	12.97
	Years of schooling	14.62	3.57	9.30	4.62
	Household size	3.76	1.61	4.02	1.85
	Sex (2='female,' 1=male)	1.41	0.49	1.43	0.49
	Urban	0.91	0.29	0.73	0.44
Brazil	Age	38.68	11.48	38.71	13.06
	Years of schooling	11.60	3.80	8.46	4.24
	Household size	3.39	1.40	3.61	1.68
	Sex (2='female,' 1=male)	1.46	0.50	1.39	0.49
	Urban	0.87	0.34	0.63	0.48
Chile	Age	40.98	12.18	42.21	13.28
	Years of schooling	12.62	2.95	11.26	2.82
	Household size	3.66	1.64	3.66	1.73
	Sex (2='female,' 1=male)	1.42	0.49	1.45	0.50
	Urban	0.85	0.35	0.76	0.42
Colombia	Age	38.34	11.55	40.13	12.81
	Years of schooling	6.54	3.67	6.59	3.38
	Household size	3.61	1.66	3.81	1.92
	Sex (2='female,' 1=male)	1.45	0.50	1.38	0.49
	Urban	0.77	0.42	0.58	0.49
El Salvador	Age	37.30	11.28	36.05	12.72
	Years of schooling	11.41	4.29	7.57	3.89
	Household size	4.20	1.78	4.38	1.97
	Sex (2='female,' 1=male)	1.39	0.49	1.37	0.48
	Urban	0.71	0.46	0.51	0.50
Gambia	Age	33.56	10.33	25.35	9.65
	Years of schooling	8.82	3.72	7.48	2.89
	Household size	9.11	6.60	10.26	6.27
	Sex (2='female,' 1=male)	1.39	0.49	1.37	0.48
	Urban	0.12	0.32	0.08	0.27
Liberia	Age	37.31	10.14	36.42	11.37
	Years of schooling	8.42	3.78	8.30	3.72
	Household size	5.01	2.40	4.93	2.44

	Sex (2='female,' 1=male)	1.29	0.45	1.33	0.47
	Urban	0.33	0.47	0.36	0.48
Malawi	Age	32.85	11.84	30.83	12.52
	Years of schooling	7.84	3.63	6.49	3.28
	Household size	5.60	2.43	5.80	2.42
	Sex (2='female,' 1=male)	1.44	0.50	1.52	0.50
	Urban	0.30	0.46	0.12	0.33
Mexico	Age	37.64	11.54	37.14	13.93
	Mode of educ. attainment	4.00	1.91	3.00	1.66
	Household size	4.23	1.91	4.51	2.09
	Sex (2='female,' 1=male)	1.36	0.48	1.45	0.50
	Urban	0.74	0.44	0.52	0.50
Namibia	Age	37.58	10.74	32.80	10.18
	Years of schooling	11.21	3.82	9.41	3.47
	Household size	4.07	2.71	4.60	3.17
	Sex (2='female,' 1=male)	1.46	0.50	1.40	0.49
	Urban	0.73	0.45	0.56	0.50
Nigeria	Age	38.96	9.59	35.56	11.66
	Years of schooling	13.05	1.62	12.49	2.17
	Household size	7.66	3.47	7.69	3.74
	Sex (2='female,' 1=male)	1.37	0.48	1.35	0.48
	Urban	0.62	0.49	0.50	0.50
Paraguay	Age	38.37	11.26	37.42	13.62
	Years of schooling	14.05	4.72	8.83	4.92
	Household size	4.24	1.86	4.57	2.23
	Sex (2='female,' 1=male)	1.42	0.49	1.40	0.49
	Urban	0.79	0.41	0.48	0.50
Peru	Age	41.25	11.59	39.57	13.77
	Years of schooling	7.52	2.15	5.37	2.16
	Household size	4.27	1.89	4.44	2.02
	Sex (2='female,' 1=male)	1.39	0.49	1.48	0.50
	Urban	0.91	0.28	0.59	0.49
Zambia	Age	38.79	9.35	36.69	11.47
	Years of schooling	13.13	3.06	8.04	3.16
	Household size	5.58	2.77	5.72	2.80
	Sex (2='female,' 1=male)	1.33	0.47	1.42	0.49
	Urban	0.79	0.41	0.36	0.48

Source: Authors' calculations based on country-specific household data. See Table A A.1 for details.

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