3. The Colombian Context

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3.1. Introduction

Skill mismatches are a widespread phenomenon that have strong implications on unemployment and informality rates, among other variables (McGuinness and Pouliakas 2016) (see Chapter 2). Nevertheless, some countries display a higher incidence of these issues, which might have severe effects on local labour outcomes. This chapter presents evidence that Colombia is a country where the degree of skill mismatches (skill shortages), unemployment, and informality is relatively high. However, public policies that tackle those outcomes are limited, and, consequently, this makes Colombia a relevant case of study to develop novel ways to analyse and reduce skill mismatches.

Based on the concepts discussed in Chapter 2, this chapter, first, provides an overview of the main characteristics of the Colombian labour market and its evolution over time. Second, it shows that the issue of skill mismatches and their possible incidences have a relatively high impact on the national economy, which needs to be addressed by public policies. Subsequently, it explains the importance of maintaining systems with accurate labour market information to address these phenomena. Finally, it is argued that the lack of information about skill requirements, together with an institutional disarticulation, especially in Colombia (and other developing countries), makes it difficult to develop well-orientated public employment policies to deal with the skill shortage phenomenon. For this reason, there is a need to find novel solutions to systematically provide accurate information and analyse employer requirements and possible skill mismatches.
A web-based approach to measure skill mismatches and skills profiles for a developing country

3.2. The characteristics of the Colombian labour market

This section describes the main characteristics of the Colombian workforce and labour demand in order to present the structure of one of the most relevant labour market issues Colombia has been facing: unemployment and informality.

3.2.1. Labour supply

Figure 3.1 shows the structure of labour supply in Colombia at a macroeconomic level. In 2016, the Colombian working-age population was composed of around 37,851,500 people, of which 64.4% participate in the labour market (approximately 24,405,000 people), representing the current labour supply in Colombia. As mentioned in Chapter 2, labour supply is composed of: 1) people in the working-age population who do not have a job but are looking for one (unemployed), and 2) people who are in the working-age population and are hired by employers (employed), and who are self-employed. As shown in Figure 3.1, around 90.7% of the economically active population (EAP) have a job (employed); however, 5,776,750 people work in informal jobs. In addition, around 9.2% of the Colombian workforce is unemployed.

These indicators highlight a key point: in Colombia, the labour participation rate is relatively high. Indeed, it is 2.6 percentage points above the Latin American average (ILO 2016b, p. 29). However, only 51.4% of the employed population has a formal job (Figure 3.1). Moreover, high unemployment and informality rates are persistent in Colombia. As shown in Figure 3.2, in 2001, the annual national unemployment rate was approximately 15%, while the participation rate was 62.4%. In the same period, the informality rate decreased from 50.4% in 2006 to 47.5% in 2016 (DANE 2017a). This result means that during the last fifteen years more people have participated in the Colombian labour market. Formal labour demand has absorbed a considerable proportion of labour supply to the point that unemployment and informality rates have declined, even with more people participating in the labour market.

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27 In 2001, there were changes in the household survey methodology, which affect the comparison of labour market indicators before 2001.

28 Due to methodological changes, informality rates are not comparable before 2007.
**Figure 3.1. Labour structure in Colombia**

Source: Author’s calculations based on DANE 2017a.

*Informality is only calculated for urban areas. As explained in Chapter 2, for rural areas, the definition of informality (company size) is not accurate. At the time this chapter was written, there was no official measure of informality for those rural areas.

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**Figure 3.2. Participation, employment, unemployment, and informality rate trends, 2001-2018**

Source: DANE 2017a.

*Unemployment rates are graphed on the right-hand scale.
However, in Colombia, it took a relatively long period (15 years) to decrease unemployment and informality rates to 5.8 and 2.9 percentages points, respectively. Additionally, informality and unemployment trends changed in 2017 and 2018, when the unemployment rate increased by 0.2 and 0.3 percentage points, respectively, and informality rates stagnated around 47%. Although these rates have declined in recent decades, Colombia’s unemployment and informality rates are above the world average, and even above the Latin American average (World Bank, n.d.). In particular, in 2015, Colombia was the second economy in the Latin American region with the highest unemployment rate (only surpassed by Brazil), and its informality rate was around 1.4 percentage points higher than the regional average (ILO 2016b). However, informality and unemployment do not affect all workers equally. Table 3.1 shows the general characteristics of the Colombian workforce between 2016 and 2018.

Table 3.1. **Characteristics of the Colombian workforce**

| Variables                        | Formal workers | Informal workers | Unemployed |
|                                 |                |                  |            |
| % General characteristics        |                |                  |            |
| Male                             | 56.7%          | 53.9%            | 44.3%      |
| Less than 29 years old           | 30.5%          | 23.3%            | 49.1%      |
| Between 29 and 58 years old      | 64.9%          | 62.3%            | 45.7%      |
| More than 58 years old           | 4.6%           | 14.4%            | 5.2%       |
| % Educational level              |                |                  |            |
| Less than high school            | 7.0%           | 29.1%            | 14.5%      |
| High school                      | 42.5%          | 53.4%            | 53.3%      |
| Lower and higher vocational education | 21.3%      | 11.3%            | 18.4%      |
| Graduate                         | 19.5%          | 5.2%             | 11.4%      |
| Postgraduate                     | 9.8%           | 1.0%             | 2.4%       |
| Labour market outcomes           |                |                  |            |
| Mean wage (Colombian pesos)      | 1,511,246      | 910,508          | -          |
| Mean hours worked per week       | 47.2           | 43.8             | -          |
| Underemployment                  | 31.7%          | 35.6%            | -          |
| Agriculture, hunting, and forestry | 2.5%        | 5.2%             | 3.4%      |
| Mining and quarrying             | 1.0%           | 0.2%             | 1.0%      |
Variables | Formal workers | Informal workers | Unemployed
---|---|---|---
Manufacturing | 16.0% | 11.0% | 11.3%
Electricity, gas, and water supply | 1.3% | 0.0% | 0.5%
Construction | 5.3% | 8.4% | 11.3%
Wholesale and retail trade, hotels, and restaurants | 18.9% | 42.1% | 30.0%
Transport, storage, and communications | 6.7% | 11.5% | 6.8%
Financial intermediation | 3.3% | 0.4% | 1.6%
Real estate, renting, and business activities | 13.1% | 6.7% | 9.2%
Community, social, and personal service activities | 31.9% | 14.5% | 24.9%
Duration of unemployment (weeks) | - | - | 20.2

Source: Author’s calculations based on GEIH information.

According to the first column, 56.7% of formal workers are male, while the second column indicates that 53.9% of informal workers are male. This result is because in the Colombian labour market more men are working than women. However, the presence of women in the informal market is 2.8 percentage points higher than women in the formal market. Moreover, the third column shows that 55.7% of unemployed individuals are women. These results suggest that unemployment and informality issues are comparatively higher for women than for men.

According to the age distribution of all workers (males and females combined), 30.5% of formal workers were less than 29 years old, compared to 23.3% of informal workers. In contrast, only 4.6% of formal workers were over the age of 58 years, compared to 14.4% of informal workers. However, almost half (49.1%) of the Colombian unemployed population were less than 29 years old, followed by people between 29 and 58 years old (45.7%), and over 58 years old (5.2%). Consequently, older Colombian workers tend to be more exposed to informality, while young workers are more likely to experience unemployment issues.

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29 The age distribution presented in Table 3.1 follows the age bands indicated by the DANE, which define a person as young if she/he is less than 29 years old.
The educational distribution\textsuperscript{30} shows that the higher the level of education (lower and higher vocational education, graduate or postgraduate), the higher the proportion of formal workers when compared to the proportion of informal workers. Moreover, more than half of the unemployed individuals in Colombia have just a high school certificate. In fact, most formal and informal workers and those who are unemployed only have a high school certificate (42.5%, 53.4%, and 53.3%, respectively).

The monthly average wage of a formal worker is around 1,511,246 pesos (around £377), while the average salary of an informal worker is about 910,508 pesos (around £227). In accordance with Mondragón-Vélez, Peña, and Wills (2010), a formal worker earns 1.6 times more than an informal worker. In contrast, an informally employed person works 3.4 hours less per week than a formal worker. More than one-third of workers are underemployed because of the underutilisation of their skills (skill surpluses; see Chapter 2). However, this percentage is higher for informal workers.

Around 31.9% of formal workers are employed in companies related to community, social, and personal service activities, followed by the wholesale and retail trade, hotels, and restaurants (18.9%), as well as manufacturing (16.0%). In contrast, most informal workers are in the wholesale and retail trade, hotels and restaurants sector (42.1%), followed by community, social, and personal service activities (14.5%), as well as transport, storage, and communications (11.5%). Additionally, most unemployed individuals used to work in the wholesale and retail trade, hotels and restaurants sector (30.0%), community, social, and personal service activities (24.9%), construction (11.3%),

\textsuperscript{30} The general overview of the structure of the Colombian educational system is the following: Pre-school education is for children under six years old, and basic (and compulsory) education is composed of the elementary and middle schools (6\textsuperscript{th} to 9\textsuperscript{th} grades). To have access to higher educational programs it is necessary to have finished high school (10\textsuperscript{th} and 11\textsuperscript{th} grades). People with high school education can choose between lower, higher vocational or undergraduate programs. Frequently, it is not compulsory to have a lower vocational education qualification to access higher vocational programs. When people finish their undergraduate studies, they can continue studying in a specialisation or a master’s program. On the one hand, specialisations are programs that usually involve one year of part-time study, in which people can develop and deepen specific qualifications for a specific occupation, discipline, etc. (Ministerio de Educación Nacional 2006). On the other hand, master’s programs usually involve two years of full-time study. To be admitted to a PhD programme (in most cases), it is necessary to first obtain a master’s degree (OEI, n.d.).
and manufacturing (11.3%). Therefore, the sectors that concentrate most of the informal and unemployed people are the wholesale and retail trade, hotels and restaurants sector, and companies related to community, social, and personal service activities. The last row of Table 3.1 shows that the average duration of unemployment was around 4.7 months (20.2 weeks); this indicates that the duration of unemployment in Colombia is above average compared to the average of the OECD countries, which was 3.6 months between 2016 and 2017 (UK Data Service, n.d.).

The results from Figure 3.1, Figure 3.2, and Table 3.1 confirm that informality is a widespread and persistent problem in the Colombian economy. However, these outcomes can be explained by two different phenomena with different implications for public policy and economic research. As pointed out in Chapter 2, informality might be explained by “exclusion” and “exit” processes. The first term, “exclusion,” refers to the situation where there are labour market segmentation and barriers that prevent informal workers from taking formal jobs (with state-mandated benefits). The second term, “exit,” occurs when workers and firms decide to stay outside of formality given that the cost of being formal exceeds the benefits of belonging to this sector.

Even though both views (exclusion and exit) are important in Colombia, evidence suggests that exclusion mechanisms are more relevant for the Colombian context. According to Perry et al. (2007), the fraction of informal and independent workers who would rather be formal employees is around 40% in Argentina, 59% in Colombia, and 25% in Bolivia and the Dominican Republic. When informal self-employed workers were asked about their motivations/reasons for being in their current job as an independent worker (such as autonomy, flexible hours, could not find a salaried job, higher wages), their main response to why working as informal and self-employed was that they could not find a salaried job: 59% in Argentina and 55% in Colombia gave this response (Perry et al. 2007, p. 66). Additionally, the authors found similar results for informal salaried workers; thus, difficulties in finding a formal salaried job constitute a much higher fraction of the reported reasons for being in informal salaried jobs than other possible responses.

In consequence, evidence in Latin America shows that a considerable proportion of informal workers would prefer to work in a formal job but cannot find one. Furthermore, the majority of the Colombian unemployed population
(36%) reported in 2016 that the scarcity of available jobs, according to their occupation, is the main reason why they stop looking for formal employment.

This evidence reveals a number of relevant facts: 1) informality and unemployment are relatively high in Colombia, even compared to the country’s regional counterparts; 2) labour supply trends reveal that both informality and unemployment rates are explained by structural rather than a cyclical component; that is, there is a significant and persistent portion of people who are looking for a job, however, they are not hired by the Colombian labour demand; 3) most people affected by the phenomena of informality and unemployment are the following groups: less than 29 years old, more than 58 years old, women, and characterised by a low level of education; and 4) a significant share of the workforce employed in informal jobs desires to work as formal workers.

3.2.2. Labour demand

As discussed in Chapter 2, to understand the potential causes of the informality and unemployment results, it is important to analyse also the Colombian labour demand. With a GDP per capita of 14,181.406 US dollars in 2016 (World Bank 2019) (three times less than the OECD average), Colombia is an economy in which employment is high in the service sector. Indeed, this sector encompassed 57.4% of Colombia’s GDP in 2013 and employed around 63% of the labour workforce in 2016 (as mentioned in Subsection 3.2.1). Moreover, most employment is offered by micro-, small or medium-sized enterprises. According to the ILO (2014), micro-enterprises (defined as units with up to 10 employees) account for 96% of the country’s companies, small enterprises (defined as units between 11-50 employees) represent 3%, while medium-sized (between 51 to 200 employees) and large enterprises (>200 employees) represent 0.5% and 0.1%, respectively. Consequently, 80.8% of the Colombian workforce is employed by micro-enterprises and SMEs (small and medium-sized enterprises\textsuperscript{31}), and these enterprises contribute to approximately 40% of Colombia’s GDP (OECD 2017a). However, around 60% of those micro-enterprises were in the informal

\textsuperscript{31} According to OECD measures, SMEs refer to companies with fewer than 50 employees, while micro-enterprises have, at most, 10 employees or, in some cases, 5 employees (OECD Statistics Portal, n.d.).
sector in 2010 (ILO 2014). All these indicators reveal that there is an important informal economy in Colombia that employs a high number of people in the service sector, specifically, in activities related to sales and retail.32

Many factors might explain why labour demand does not fully utilise the Colombian labour force. For instance, the high cost of hiring is one of the main factors that prevent formal companies from hiring more personnel (Bell 1997; Kugler and Kugler 2009; Mondragón-Vélez, Peña, and Wills 2010). Mondragón-Vélez, Peña, and Wills (2010) observe that in the Colombian labour market there are comparatively high non-wage costs (payroll taxes, health and pension contribution, among others) and a high minimum wage relative to the productivity level. These labour market rigidities restrict the formal sector to adapt to the business cycle, thus the size of the informal sector and unemployment increases.

Despite the high cost of hiring in Colombia, there is a relatively high vacancy rate. According to the Human Capital Formation Survey (EFCH, for its acronym in Spanish) carried out by the DANE in 2012 (DANE 2018b), around 80.4% of open vacancies were related to sales and retail activities, and 87.6% and 94.4% to the service and industrial sectors (excluding sales and retail activities), respectively. Moreover, most new vacancies related to sales and retail activities were generated in the area of marketing and sales (68.6%), while in the industrial and services sectors (excluding sales and retail activities), most new vacancies were generated in the production area (66.9% and 82.2%, respectively).

Thus, Colombia’s labour demand suggests that, even with the relatively high cost of hiring, while there are formal vacancies available, there are also a high number of unemployed and informal individuals who are willing to work in formal jobs, but who do not do so. Consequently, there is a mismatch between supply and labour demand.

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32 The DANE carries out a specific survey annually to measure the economic activity of companies related to sales and retail because they possess such a high level of importance in the Colombian market.
### 3.3. Skill mismatches in Colombia

As presented in Chapter 2, skill mismatches occur where the labour demand and supply of skills are not aligned (UKCES 2014). This misallocation of skills might explain why some countries face high unemployment and informality rates, and, at the same time, a relatively high portion of companies complain about the scarcity of accurate human resources. Consequently, the skill mismatches framework might explain a considerable portion of the labour market outcomes in Colombia (as presented in the previous section).

Globally, Latin America possesses the largest gap between the labour demand and supply of skills (OECD 2017b). In this region, around 44% of companies in 2016 experienced difficulties finding accurately trained candidates (skill shortages) (ManpowerGroup 2016). For Colombia, this rate is even worse, as around 50% of companies face problems filling vacancies due to a shortage of skills (OECD 2017b).

The Beveridge curve for Colombia (that depicts the relationship between unemployment and vacancies to determine how well, or not, job vacancies correspond to unemployed workers) illustrates a deep and constant labour market mismatch (Blanchard and Diamond 1989). According to Álvarez and Hofstetter (2014), Colombia has a relatively high level of vacancies and unemployment, which suggests that a lack of skills in the workforce (skill shortages) is one of the main reasons for Colombia’s labour market mismatches.

Moreover, the 2012 EFCH shows that around 62.1%, 67.2%, and 61.7% of employers in the industrial and service sectors, as well as in sales and retail activities, respectively, cited skill shortages as the leading cause of difficulties to find suitable workers. In addition, low productivity/poor performance and lack of specific competences were selected as main reasons to fire workers (around 34.4%, 40.9%, and 33.1% in the industrial and service sectors, and in sales and retail activities, respectively). Thus, the lack of worker skills is a key problem in Colombia, especially in the service sector. In particular, there is a

33 Some of the categories were: sub-qualified, over-qualified, low performing, gave a bad impression during the interview, lack of candidate experience, lack of reliable information about qualifications and experiences, the candidates did not speak other languages.
large shortage of technical specialists, and a surplus of unskilled workers and middle management professionals (OECD 2015a).

Although the average year of educational attainment has increased to around six years during the last four decades for all age ranges (World Bank n.d.), Colombia remains a country with relatively low levels of education: in 2012, only 42% of Colombian people between 25 and 64 years old reached at least upper secondary school education, around 33 percentage points below the OECD average and just above Mexico in Latin America; whereas only 20% of adults completed a tertiary level of education (12 percentage points below the OECD average) (OECD 2014b). In addition, the Programme for International Student Assessment (PISA), which evaluates education systems worldwide by testing the skills and knowledge of 15-year-old students, reveals a low student performance in mathematics in Colombia. Almost 75% of students fail to achieve the baseline level of knowledge in mathematics, which contrasts with the OECD average of 23%. A low proportion of students (around 0.3%) are top performers, 12 percentage points below the OECD (OECD 2014b). Moreover, based on the Colombian household survey, the Gran Encuesta Integrada de Hogares (GEIH), only 9% of the working-age population during 2014 took a technical or vocational education and training course.

It is not only companies that have observed a large deficiency of skills. Arango and Hamann (2013) consulted an important group of labour market analysts (15 experts) in Colombia about the leading causes of unemployment. The majority (67%) agreed that skill mismatch between labour demand and supply was the main cause of unemployment in the country. Consequently, 60% of the experts recommended strengthening information systems to improve the efficiency of matches between employers and employees.

Thus, there is a generalised consensus between labour market experts and national and international institutions that lack of skills is one of the main reasons for skill mismatches in Colombia. Consequently, as explained in Chapter 2, one of the main issues faced by Colombia is that people, education and training providers, and the government are making decisions about human capital investments based on the currently available labour market information. However, these agents are not accurately anticipating employer requirements to fill their vacancies. Those workers whose skills are not in demand might choose between remaining outside of the labour market (being inactive),
being unemployed or getting employed in the informal sector. Based on the Colombian evidence (discussed above), a high proportion of people select the last two options: the informal sector or unemployment.

At the same time, a relatively high proportion of companies in Colombia complain about the scarcity of workforce according to their needs, which leads to a situation where there are vacancies to be filled. However, due to skill mismatches, the Colombian labour supply does not have the necessary characteristics to fill these vacancies (see Chapter 2). As a consequence, to reduce unemployment and informality problems, information asymmetries between supply (individuals) and demand (employers) for labour must be addressed. Tackling these problems might have a large positive impact on regions like Colombia where unemployment and informality rates are relatively high, and there is a large gap between the labour demand and supply of skills.

As the OECD (2017b) has pointed out, to tackle informality and improve economic stability Latin American countries like Colombia should invest in human capital. The same organisation argues that more education in terms of quantity and quality increases a person’s likelihood of finding a job and reduces the probabilities of being unemployed or working in the informal sector. Moreover, to guarantee the effectiveness of human capital investments and to avoid any labour market mismatches as described in Chapter 2 (e.g. overeducation), governments and other institutions need to promote skills that meet company requirements (Gambin, Green, and Hogarth 2009; OECD 2012).

Given the importance of skill mismatches, institutions such as the World Bank (2010), the OECD (2016a), and the ILO (2017b) agree that fostering education and suitable skills (to strengthen human capital) might have a large positive impact on the main employment problems of Latin America (e.g. Colombia). Thus, it is essential for Colombia to achieve at least the minimum skill levels in its population, and to improve the relevance of education and training systems in order to reduce unemployment and promote well-being (OECD 2015a; González Espitia and Mora Rodriguez 2011).

As González-Velosa and Rosas-Shady (2016) mentioned, advanced education and training systems achieve the above by encompassing tools to identify current and future skill requirements for the productive sector. With these tools, curriculum contents can be updated, and the relevance of education and training increased. Consequently, approaches that identify possible skill
mismatches, when combined with a functional system of active labour market policies, can ensure better matches between employers and workers (ILO 2016a).

3.4. An international example of skill mismatch measures

Examples of the above can be found in different regions. As Mavromaras et al. (2013) highlight, the most developed approaches to measure skill mismatches (skill shortages) can be found in the UK. For instance, the Migration Advisory Committee (MAC) built 12 indicators\(^3\) of shortage using data for labour demand and supply. With this set of indicators, the MAC advises to the UK Government on where skill shortages can be filled by immigration from outside the European Economic Area (EEA). In addition, the UK Commission for Employment and Skills (UKCES) and (subsequently) the Department for Education (DfE) carried out a biennial Employer Skills Survey (ESS), which provides insights about the skill problems employers are facing to fill their vacancies and the actions they are taking to solve them. The survey contributes to public policy decisions when addressing the skills challenge and prompting people to adopt relevant skills for the workplace (Vivian 2016).

Another example in the UK is the Local Economy Forecasting Model (LEFM), developed by Cambridge Econometrics (CE) in collaboration with the Institute for Employment Research at the University of Warwick (Cambridge Econometrics 2013). Based on the 2011-based Sub-National Population Projections (SNPP) developed by the Office for National Statistics (ONS), and assuming that the historical relationship between growth in the local area and the region or the UK economy will hold in the future, this model allows researchers to project/anticipate different economic scenarios (skill forecast), as well as to evaluate possible skill mismatches at occupation or qualification levels, among other outcomes (Cambridge Econometrics 2013).

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\(^3\) They can be enumerated as follows: percentage change of median real pay (1 yr); percentage change of median real pay (3 yrs); return to occupation; change in median vacancy duration (1 yr); vacancies/claimant count; percentage change of claimant count (1 yr); percentage change of employment level (1 yr); percentage change of median paid hours worked (3 yr); change in new hires (1 yr); skill-shortage vacancies/total vacancies; skill-shortage vacancies/hard-to-fill vacancies; and skill-shortage vacancies/employment.
Moreover, reports such as “The Future of Work: Jobs and Skills in 2030” interview experts (senior business leaders, trade union representatives, education and training providers, policymakers, academics, etc.) from different sectors and conduct a comprehensive literature review, workshops, among other researches, to analyse sector trends and examine future economic scenarios (possible skill mismatches) and their implications for the labour demand for skills in the UK (skill foresight). These kinds of prospective labour studies are valuable because they estimate future employer requirements and address the education and VET system according to possible future needs using different and robust sources of information (UKCES 2014).

Other valuable efforts include the O*NET system launched in 1998, which is updated by the US Department of Labour, and the European Skills, Competences, Qualifications and Occupations (ESCO) in Europe, which is updated under the jurisdiction of the European Union. Based on the US Standard Occupational Classification (SOC) system, the O*NET system periodically consults a variety of resources—such as a national sample of establishments and their workers, occupational experts and analysts, among others—to collect information on hundreds of standardised and occupation-specific descriptors, e.g. knowledge, skills, tasks, work activities, and other descriptors (National Research Council 2010). Consequently, the O*NET provides an updated and detailed description of requirements for each occupation (skills, tasks, knowledge, etc.). With this valuable information, government officials can understand ongoing changes in the nature of work and their implications on the US workforce. Moreover, the O*NET identifies specific groups of occupations, such as “Bright Outlook occupations” or, in other words, occupations that are expected to grow swiftly in the coming years (potential skill mismatches) or will have considerable numbers of job vacancies. Consequently, this system helps the government to develop and train the workforce depending on their skill needs.

In addition, the Cedefop has made important advances towards quantifying skill needs in Europe. For example, the Occupational Skills Profiles (OSP) approach aims to integrate and complement several European sources of skill requirement information in order to provide updated occupational profiles for the region (Cedefop 2012b). Importantly, as mentioned above, the European Commission has built the ESCO, a multilingual classification system, which attempts to cover all European skills, competencies, qualifications, and occupa-
tions. It is important to note that occupations in the ESCO follow the structure of the International Standard Classification of Occupations (ISCO-08) at the four-digit level, and that the ESCO provides lower levels of disaggregation of skills for each occupation, such as an exhaustive list of 13,485 relevant skills (skills pillar) (European Commission 2017). This system was created to be compatible with other European platforms and supports an automated matching of jobseeker skills and vacancies. Consequently, in principle, the ESCO can be used to identify mismatches between CVs and vacancies in Europe.

3.5. Lack of accurate information to develop well-orientated public policies

In contrast with the above-mentioned classification systems in the US and Europe, Colombia does not have these kinds of advanced tools to base its education and training policies on them (González-Velosa and Rosas-Shady 2016). There exist some approaches to analyse the labour market in terms of skills, but there is not an integrated information system for skill mismatch analysis (Saavedra and Medina 2012). Institutions that have tried to measure, directly or indirectly, human capital characteristics have used different statistical approaches and skill concepts.

Since 2006, the Colombian statistics office (DANE) carries out a monthly cross-sectional household survey, the GEIH, to measure the characteristics of the Colombian workforce. The GEIH is nationally representative and constitutes the main source for official labour market information in Colombia. For instance, based on the GEIH, each month the national government publishes the unemployment rate and other relevant labour market indicators for Colombia. In this survey, people are asked about their current level of education and occupation, among other characteristics. As pointed out in Chapter 2, the level of education and the occupation of the labour force are two of the most common indicators to measure skill levels in a country.

However, for the Colombian case, this occupational analysis is limited for two reasons. First, the country’s occupational classification system has not been updated since 1970. The DANE uses in its household surveys the Standard Occupational Classification (SOC), which was established in 1970 by the
Ministry of Labour and Social Protection and the SENA (Servicio Nacional de Aprendizaje), the vocational education and training institution in Colombia (Cabrera et al. 1997). The use of such outdated classifications might distort any subsequent statistical analysis due to labour market changes and new occupations that emerge or disappear over time. Occupations related to Big Data technologies (machine learning engineers, data scientists, and Big Data engineers) are representative examples, as these kinds of “Big Data” occupations did not exist 50 years ago, yet nowadays these are one of the top emerging jobs on LinkedIn (LinkedIn Economic Graph 2018).

Second, for analysis, the occupation variable is aggregated to two digits, which means that, for statistical purposes, the DANE aggregates the data into an “occupational area,” which groups different occupations together depending on their qualification level (defined by the complexity of their functions, their level of autonomy and responsibility, as well as their level of education, training, and experience) (Sánchez Molina 2013). However, as mentioned in Chapter 2, the human capital concept has evolved and encompasses different elements—for example, socio-emotional, higher-order cognitive, basic cognitive, technical skills, among others—that are relevant for the labour market and cannot be measured using an outdated and aggregated classification system. Consequently, occupational data from the GEIH is useful as it provides insights about the general labour market structure, but it does not convey detailed information about skills and important human capital characteristics in order to develop national or local public policies on human resources.

In 2012, the World Bank carried out the STEP Skills Measurement Program to measure skills in low and middle-income countries, which included Colombia (Pierre et al. 2014). This program consisted of a longitudinal household-based survey and an employer-based survey. Nevertheless, for Colombia, only the household survey is available in which people were asked about (self-reported) personality, behaviour, and time and risk preferences, among other personal characteristics, and which also measured reading proficiency and related competencies according to the Programme for the International Assessment of Adult Competencies (PIAAC) scores to allow international comparison. Questions regarding skills make the STEP survey instruments a valuable source of human capital information in Colombia. The survey sought to be representative for non-institutionalised people from 15 to 64 years of
age, living in private dwellings in the thirteen major urban areas of the country. However, the general sample is composed of only 9,960 people, and after a short questionnaire, a member of the household was randomly selected to answer a more detailed individual questionnaire, which contained questions regarding skills. The total number of people who answered the skills modules is about 2,617 (Pierre et al. 2014).

Consequently, one of the main limitations of the STEP surveys is its sample size; indeed, it only represents 0.02% of the target population. Thus, the data sample cannot be disaggregated into different levels (i.e. different occupations) to make national or regional inferences due to the lack of observations. Additionally, the survey has not been updated: the first wave of information-gathering was conducted in 2012, and the second wave in June 2014; however, Colombia was not part of the second wave.\cite{OECD2017b} Therefore, as noted by the OECD (2017b), the STEP approach can be used as an instrument to understand some of the general structure in the skills performance of people aged between 15 to 64 years old in each country, and allows international comparison, especially with OECD countries. However, as the labour market is dynamic and skills performance changes over time, the survey needs to be updated, at least for the Colombian case.

Additionally, both the GEIH (DANE) and STEP (World Bank) surveys are based on what people (labour supply) report. Consequently, they do not directly consider one essential part of the labour market: employer requirements. An analysis of labour demand based on what people report in household surveys is limited because it only takes into account the skills or characteristics that people possess for the labour market, but employer requirements (what is needed to fill their vacancies) remain unknown, which is an important aspect of the labour demand to understand in order to reduce possible mismatches (Autor 2001; Mavromaras et al. 2013).

The DANE carries out sectorial surveys (e.g. industrial, services, and sales-retail activities) to measure basic information, such as national account statistics, the composition of production and consumption lines, the amount of labour employed in each sector, among other indicators. Subsequently, these

\footnote{The following countries were included in the second wave: Armenia, Georgia, Macedonia, and Kenya.}
surveys are not designed to obtain detailed information about human capital such as occupational structure, nor about the skills required for each position. For example, regarding human capital characteristics, with these sectorial surveys it is only possible to distinguish the number of people employed by different functional areas (e.g. production, marketing and sales, investigation and development, among others). Additionally, in 2012, the DANE carried out another cross-sectorial survey named the Human Capital Formation Survey, where companies in the above mentioned three sectors were asked about job training and productivity. Although the EFCH provided valuable insights about job training, selection and hiring practices, as well as productivity, the data are still aggregated by functional areas and do not capture employer requirements.

For its part, the SENA—the institution in charge of delivering vocational education and training in Colombia—also conducts small, voluntary employer surveys (semi-structured survey questionnaires) in order to identify the occupational requirements of the private sector. However, González-Velosa and Rosas-Shady (2016) argue that these surveys do not have enough financial resources to guarantee the effectiveness of their results. Indeed, the same authors highlight that employer survey results are significantly affected by a lack of standard procedures, clarity in their objectives, and incentives for companies to participate.

In 2015, the SENA surveyed both employees and employers in order to create employability, performance, and relevance indices of its vocational programs. The SENA sought to evaluate the skills performance of its graduates, such as communication, adaptation to changes, responsibility, teamwork, among others. Around 4,502 people were interviewed, who graduated from the institution in the second semester of 2013 and in the first semester of 2014, in addition to employers who hired those graduates (SENA 2015). The survey attempted to evaluate the content of vocational programs by measuring skills performance in people’s jobs. However, even for that purpose, the results of these surveys are limited. Indeed, they are representative of only 13% of the total number of vocational programmes (SENA 2015), and employers were not asked about their skill requirements to fill vacancies. Moreover, information from the SENA (microdata) is not available to the public.

Thus, in Colombia, the main sources of information used in the analysis of labour demand have come from sectorial (entrepreneur) surveys or household...
surveys. These data have certain strengths, such as national standardisation and global representativeness, but the collection of labour demand information through surveys is limited, since it can be quite costly, both in terms of resources and time. Above all, these sources might not provide enough detailed information about what skills (or occupations) are in demand among different industries or regions (Handel 2012; OECD 2016b).

In 2013, a Colombian law\textsuperscript{36} established that all job portals and companies must report their vacancies to the Unidad Administrativa Especial del Servicio Público de Empleo (UAESPE, for its acronym in Spanish). Thus, potentially, the UAESPE can provide a vacancy data analysis for Colombia. However, the UAESPE approach has different limitations that affect the robustness of vacancy analysis. First, job portals and companies do not report all the information that describes a vacancy to the UAESPE. There is a predefined format that companies and job portals complete with certain information that partially describes the vacancy. Second, the UAESPE does not know whether companies report the total number of vacancies available. For instance, employers might underreport the number of vacancies because it might be time-consuming to fill and send all the information to the UAESPE. Moreover, the UAESPE does not have a methodology to systematically verify that employers have reported the total number of job vacancies advertised. Third, the inclusion or exclusion of some employers or job portals over time might affect the vacancy time series. An increase in the number of vacancies might be due to the inclusion of a new job portal (with not necessarily different and new vacancies). Fourth, as will be discussed in more detail in Chapters 4 and 5, the problem of duplication increases by adding more websites. The UAESPE collects information from different job portals and employers. However, a job vacancy can be published on various websites. Given that employers are not required to report full vacancy details, it is more difficult for the UAESPE to determine whether a vacancy is duplicated. Finally, the database and the UAESPE methodology to compile, clean, and classify vacancies are not available; hence, the vacancy analysis conducted by this institution lacks robustness.

These problems have made employer requirements or vacancy information scarce (Allen, Levels and Velden 2013). As Álvarez and Hofstetter (2014)

\textsuperscript{36} Decreto 2852 de 2013.
mention, vacancy data to study the labour market are scarce in developing countries like Colombia. As a result, the human resource needs of the country have remained unknown until the present study. As a consequence, Colombia lacks a human capital formation system with accurate tools (among other instructional agreements) to address public policy, education and job training programs. So far, these aspects have remained unaddressed and have not been aligned with the employers’ needs; instead, a low-quality education has proliferated. For instance, in 2013, only 4% of 1,576 technological training programs, and 3% of 740 professional technical training programs offered by private institutions were accredited (considering content and infrastructure, among other characteristics) in terms of quality by the Ministry of Education (González-Velosa and Rosas-Shady 2016). Likewise, the Regional Centres of Higher Education (CERES for its acronym in Spanish) have been reported to teach their students with outdated technologies and at an insufficient educational quality level (OECD 2016b). Given the low standards of training and education quality, even the Technical and Vocational Education and Training (TVET) system has not grown enough in the last few years due to lost prestige (OECD 2015b).

Given these facts, it has become necessary to seek new and novel ways to assess the labour supply needed by companies. One promising approach to address this issue is the provision and analysis of detailed labour demand information using Big Data techniques. As will be discussed in the following chapter, building a web-based model of skill mismatches (skill shortages) for Colombia (and potentially for its regional counterparts) might have a large impact, considering its potential use as a public policy tool related to a better management of human resources (i.e. the reduction of informality and unemployment rates), and also to assist in the allocation of skill development and educational budgets.

3.6. Conclusion

Despite the socio-economic improvements of the last decades, the Colombian labour market faces important challenges. The proportion of people participating in the labour market has considerably increased since 2008. Therefore,
the labour market needs to 1) engage new job seekers into the formal economy, 2) retain workers in the formal economy, and 3) move informal workers into the formal sector.

While other countries have created systems with statistical tools in order to measure skill mismatches and, thus, orientate public policies that seek to decrease this phenomenon, different barriers might prevent the pursuit of that goal in Colombia. According to the evidence presented in this chapter, skill mismatches are one of the most important barriers to reduce unemployment and to increase employment in the formal sector; consequently, skill mismatches might explain the high incidence of informality and unemployment in Colombia. A revision of the most important sources of information regarding human capital in the country shows that 1) available information sources are aggregated at levels that do not enable a detailed knowledge of existing occupations or skills; 2) there are difficulties in updating surveys or classifications (e.g. SOC 1970); 3) there are representation problems in the data gathering process (e.g. limited sample sizes), and 4) no information sources collect employer vacancy requirements. Thus, the available data indicate that there is a skill mismatch problem, which means that it is not possible to know in enough detail what skills are needed in the Colombian labour market.

The above analysis, in combination with institutional efforts, evidences the interest of Colombia in measuring and tackling skill mismatches. However, the absence of an accurate tool to measure the multiple dimensions of human capital, together with an institutional disarticulation, is one of the most critical factors that complicate the design of public policies, policies that need to be well-oriented in order to reduce the skill mismatch phenomenon in the country. Thus, a web-based model of skill shortages might provide valuable information for policymakers about employer requirements and might connect various efforts made by different institutions regarding skill mismatch analyses.