The Jobless Graduate? A Study of Skill-Mismatches in South Africa

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# Abstract

The South African economy is characterised by a marginally increasing gap between skilled and unskilled workers and faces an interesting phenomenon. Despite rising levels of unemployment, especially for graduates, there remains a difficulty for firms to find suitably qualified personnel within the labour market. Given the ongoing changes brought about by the so-called fourth-industrial revolution, this study aims to critically assess to what extent, if any, a skill mismatch may exist; and within which occupations and academic fields such a mismatch may exist. The study uses two publicly available datasets - the Quarterly Labour Force Survey (QLFS) to represent the demand within the labour market, and the Classification of Educational Subject Matter (CESM) to represent supply. The data sources are processed and proportioned for comparative reasons to draw conclusions about availability and subsequent use of various skill-categories within the labour force. The outcomes of the analysis indicate that, for some fields, there is reason to believe a skill mismatch does exist. In addition, the study was also able to highlight various complexities within the economy; and suggest possible improvements for corrective mechanisms throughout future years.

Keywords: *Graduate(s), Skills Mismatch, Skill Gap, Technological Change, South Africa, Labour Force*

# Introduction

Over the past 50 years the South African labour market has been characterised by a history of skills-biased labour demand, with employment largely shifting from the primary sector towards the secondary and tertiary sectors (Bhorat & Hodge, 1999; Edwards, 2001; Bhorat et al., 2014a).   In recent years, continuing this trend, growth in high-skilled occupations has outpaced growth in medium and unskilled occupations (Bhorat et al., 2014). Alongside shifts in labour market demand have come changes in the higher education (HE) landscape in South Africa. For example, institutions formerly known as technikons have been amalgamated as universities of technology; several higher education institutions have merged to form larger institutions (e.g., The University of Johannesburg); and, extending from changes in secondary education and fee structures, access to higher education has increased substantially over the past 20 years.  Despite these changes, as indicated by Moleke (2010) and reports published by the South African Department of Higher Education and Training (DHET, 2018) enrolments for degree programmes producing graduates with skills low in demand in the economy continue to rise, while enrolments in scarce skill programmes remain low.

Coupled with ongoing structural changes in unemployment and technological advancements, changes  in skills-demand and global economic forces have led to a significant skill-mismatch in the South African economy (Pauw et al., 2008). Reddy et al. (2016) argue that despite the increase in the number of university graduates, there exists an over-supply of graduates unable to find suitable employment and an under-supply of graduates capable of fulfilling the current demands of the economy.

According to [Banerjee et al. (2008)](https://www.zotero.org/google-docs/?oBbQg2) the country has experienced dramatic growth in its labour force since democratisation in 1994, doubling unemployment between 1995 and 2001. Amongst these complex mechanisms governing South Africa’s employment levels, the country is also experiencing a categorical shift from primary to secondary and tertiary sectors associated with an increase in demand for skilled occupations throughout the job market. This alters “the composition of employment in terms of educational attainment, favouring more skilled workers” [(Banerjee et al., 2008:724)](https://www.zotero.org/google-docs/?QGQbZA). Furthermore, this shift in labour demand, stemming from sectoral and economic changes, is structural by nature whereby a change in production methods shift the country towards a more technological and capital-intensive approach. According to Pauw et al. (2008:45) “production is shifting towards more skills- and capital-intensive industries, while the adoption of technologically more advanced production processes has also had an adverse effect on demand for low-skilled workers”. In addition, this is exacerbated by globalisation, whereby pressures to match competing global industries are high, further decreasing demand for lower skilled workers. Edwards (2005) asserts that employment in South Africa has been negatively affected by both rising import penetration and exports, showing that “skill-biased and trade-induced technological change, as reflected in increased use of computers, foreign investment and the importation of raw material inputs, have raised the skill intensity of production”. Lastly, the supply of labour has also been influenced by the emigration of existing skilled labour often accounting for an increase in wage rates. This increase in wage rates primes the economy toward more efficient methods of production which in turn affects the structure of employment further, increasing demand for higher skilled workers thus placing pressure on both the existing labour force and graduates coming into the economy - increasing the intensity of a possible skill mismatch.

The term skill mismatch describes the gap in skills between what the economy is demanding and the skills that are currently being supplied by the labour force. Furthermore, studies and evidence indicate that the mismatch occurs globally and across various sectors within an economy (Cappelli, 2015; Mateus et al., 2016; Mcguinness et al., 2017; Verhaest et al., 2017). Given the variety of terminology used in academia, for the purposes of this study we use ‘skill mismatch’ as an umbrella term, encompassing a skill mismatch arising from a direct mismatch between labour demanded and subsequently supplied, a ‘quality mismatch’, referring to a mismatch arising from either a perceived or actual quality mismatch, and ‘unskilled-labour growth’, referring to the portion of the shortage contributed by unskilled labourers without a formal standard of education entering the market.

The South African skills mismatch has been discussed at length by Mncayi and ﻿Dunga﻿ in 2016, Grapsa in 2017, Bhorat et al. in 2017 and many others. Mncayi & ﻿Dunga (2016) argue that a major contributor to the potential skill mismatch is a misalignment between graduate supply and occupation’s demanded. This skill mismatch could be further exacerbated through a lack of quality within tertiary institutions for participants enrolled in degree programmes that are in demand within the labour market. In other words, although some are studying what is demanded, they are not meeting the subsequent quality requirements (Reddy et al., 2016).

## Research Problem

South Africa is experiencing an interesting phenomenon, in that while there are a large portion of people unemployed, businesses still have difficulty filling skilled positions. This is often referred to as a skills mismatch. This study aims to investigate the existence and the nature of a skills mismatch within the South African economy. Given the implications and the potential effects of the fourth industrial revolution on the economy and demanded skills in South Africa, it is important to understand the possible skills mismatch and the effects thereof. This is important to investigate as current indicators of skills needed within the South African economy may not be sufficient, and an investigation into the possible existence of mismatches would provide important indicators for future research and policy. The outcomes of this investigation could, therefore, aid future policy makers in making informed decisions regarding both education and the labour market.

## Research objectives

Building on this problem, to provide a structure for the investigation, our primary objective is to: *Identify whether a skill mismatch exists within the context of the South African labour market.* Extending this, as a secondary objective, we aim to *determine within which job-categories skills mismatches, if any, are prevalent*. Finally, in acknowledging that economies are not static, we aim to *explore trends in skills demand and supply over the preceding decade throughout various job categories.*

To address these objectives, we have made use of a number of publicly available data sources. To obtain data about higher education institutions, i.e. skills and knowledge in supply, we have used the open data sets provided by the Department of Education and Training (DHET) and the Council for Higher Education (CHE). To obtain data about the skills in demand we have used the Quarterly Labour Force Survey data produced by StatsSA. In our analysis we combine these datasets in a meaningful way to produce a detailed description of the patterns in skills supply and labour uptake within the South African economy for an 8-year period between 2010 and 2017.

# Literature Review

To provide a theoretical grounding and contextual background we aim to unpack various factors within the South African labour market. Particular emphasis will be placed on factors affecting its demand and supply. In addition, both external and internal factors are considered when analysing the skill mismatch phenomenon within a South African context.

## Overview of the South African Labour Market

In the following sections we provide a brief analysis of the South African labour market. Firstly reviewing various historical aspects, shown by [Bhorat (2005](https://www.zotero.org/google-docs/?2sP0AX)) and [Banerjee et al. (2008)](https://www.zotero.org/google-docs/?FAOSW9) to have an overwhelming effect on the economy. Secondly, analysing the current nature of the South African labour market.

As of the second quarter of 2018, the South African labour force consisted of 22.2 million people, of which 6 million were unemployed. In the second quarter of 2018, 39.3% of people aged 15 to 34 were unemployed. The high youth unemployment rate has been further exacerbated by the demographic makeup of the country, with 53.5% of the working age population aged between 15 and 34 (StatsSA, 2018b).

The South African labour market has traditionally been dominated by the primary sector, however, since 1970, there has been a shift towards a more capital intensive, secondary and tertiary sector (Bhorat et al., 2014b:1). This has led to a demand for better educated and more highly skilled workers to match the growth in capital intensity (Bhorat et al., 2014a:317). The South African labour market has struggled to meet this subsequent demand, with only 20.5% of the employed population having qualified from a tertiary institution in 2014 (Reddy et al., 2016:38). The skills shortage that exists within the labour market has been attributed to, amongst others, the apartheid system. The denial of quality education to the Black population of South Africa, is a substantial factor (Mateus et al., 2016:64). Van Broekhuizen, (2016:27) draws the comparison between historically disadvantaged, traditionally Black institutions (HDIs), and historically advantaged, traditionally White institutions (HADs) and the subsequent employability prospects of students, which are still to this day affected by which category of institution they attended.

## Labour Demand

### Structural Changes

A structural change is an example of the changing nature in the fundamentals governing an aspect of the economy, in this case labour demand. Specifically, we observe a disproportionate expansion of higher-skilled vacancies in comparison to that of lower-skilled vacancies within the economy. Testimony to the changing nature of labour demand in South Africa, [Bhorat & Hodge (1999:155)](https://www.zotero.org/google-docs/?fkbEvT), argue that the changing structure of labour demand, occurs from a shift in production methods resulting from “capital deepening or technological change”. This is further solidified by Edwards (2004), arguing technological adoption has increased “the skill intensity of production”. Furthermore, [Bhorat and Hodge (1999)](https://www.zotero.org/google-docs/?STRR2X) attest that changes in the nominal wage rate and labour market rigidity during the 1980’s, within the mining sector, brought about a demand for increased production efficiency, changing the structure of labour demanded within that sector. Other examples of changes can be seen with the rapid adoption of IT hardware, creating a movement from primary to secondary and tertiary sectors, incidentally increasing demand for higher-skilled employees. Reddy et al.(2016) categorize this as a long-term structural shift toward a more service-oriented economy. Finally, Bhorat et al. (2014b:20) note that within-sector shifts dominated between-sector shifts in the country, as a whole. These different micro and macro-economic factors cause “a rising share of more skilled labour” and a “declining share of the lower skilled occupations” (Bhorat & Hodge, 2005).

### Technological Impact on Demand for Labour

The growth of available technology and with the fourth industrial revolution upon us, there is much concern about the impact it could have on predominantly unskilled countries, like South Africa. Automation is already affecting jobs traditionally handled by humans. Even in fields where automation has not yet occurred, technology is changing the nature of work. While technology will decrease the number of jobs available in some occupations, it will create a demand for higher skilled jobs, and the creation of some which may have not existed beforehand. (Mbilini, le Roux & Parry, 2019).

### Globalisation

The rise of trade liberalisation in South Africa, through import penetration, exporting of raw material and foreign direct investment, has “raised the skill intensity of production” [(Edwards, 2004:45)](https://www.zotero.org/google-docs/?ocLAQU), altering the structure of labour demand in the country. Lawrence (2004) suggests that this trade liberalisation accounts for a “trade-induced technological change”, especially for the relatively skill-intensive export sector. This trend of “labour-saving technologies” (Jenkins, 2008) is also consistent within “middle-income economies” (Lawrence, 2004) like Latin America and is particularly prevalent in the international market for raw materials. Moreover, import penetration has been associated with “defensive investment” (Jenkins, 2008), the movement to more efficient production methods favouring higher-skilled labour, and reducing the demand for lower-skilled workers. Lastly, foreign direct investment taking the “form of mergers and acquisitions” are biased towards higher-skilled workers and is “more skill intensive, capital intensive, productive and export-orientated than domestic owned firms” (Lawrence, 2004). This causes a further decrease in demand for lower-skilled employees which is further exacerbated by technological transfers enabling a rise in “labour productivity through the shedding of labour” (Lawrence, 2004).

## Labour supply

### Higher Education (HE) landscape

Prior to 2004, the South African higher education landscape consisted of 36 Higher Education Institutions (HEIs), comprising of 21 general academic universities and 15 technikons. Historically, this landscape has been fragmented in terms of function, governance, funding, and therefore, the quality of education provided. Since the democratisation of South Africa, various policy changes have been implemented, including the amalgamation of the 36 HEIs into 11 traditional universities, 6 comprehensive universities, and 6 universities of technology. Following from these policy changes, a substantial rise in the number of annual graduates from HEIs has been observed, with a count of 40,000 graduates in the year 1986 rising to 165,000 in 2012 and 203 076 in 2016 (DHET, 2018:21). Despite this growth, a steady decline in the portion of graduates with a National Qualification Framework (NQF) exit-level of seven or higher (university degree holders), to those with NQF exit-levels of five or six (diploma and/or certificate holders) has been observed. This change is indicative of a decline in the growth of skilled labour and in this case, the level of skill is defined through the proxy of educational qualification.

Considering graduate production by field of study, in the most recent data available, 29.1% of graduates were from the Science, Engineering and Technology (SET) fields, followed by  27.8% of graduates in Business and Management, 22.4% in all other Humanities and 20.7% in Education (DHET, 2018:21). Reddy et al. (2016:89) note that, given the need to enrol higher numbers of individuals in the SET field, the fact that they make up the largest portion of graduates is a positive outcome. Although there is an increase in demand for skilled labour, it is interesting to note that a paradox exists, whereby there is an increase in the unemployment rate of graduates. A survey for example, shows that only 60% of students chose a degree based on employment probability (Pauw, Oosthuizen & van der Westhuizen, 2008:52), with Mncayi & Dunga (2016) noting that there is an oversupply of qualifications for skills currently not in demand.

### Emigration of Skilled Workers

Mateus et al. (2014) argue that a major contributor to the skill mismatch in South Africa is the loss of higher skilled individuals to emigration. The reasons skilled workers leave the country is divided into push and pull factors. Push, also referred to as internal factors, come from within the country, such as crime, affirmative action, poor education standards and inadequate government provisions for health care. Pull, also referred to as external factors, come from the receiving country and include wage differentials, improvement in quality of life, better education opportunities, intellectual freedom, and political stability.

Since 2003 South Africa no longer keeps statistics on emigration. Because of this absence, Kaplan and ﻿Höppli (2017) conducted a study on South African born people living in five major English-speaking countries (England, Australia, New Zealand, Canada and the USA). They argue that owing to high skills requirements for gaining access to these countries, any South African born individual living in such a country would indeed count as a loss of skills. Kaplan and ﻿Höppli (2017) refer to this as the ‘brain drain’ and is furthermore likely to accelerate in coming years.

### Unionisation and Rigidity

Festus, Kasongo, Moses, & Yu (2016:597) suggest the notion of market rigidity to “significantly influence the efficiency and equilibrium” of the economy, and especially that of the labour market. An example can be seen when considering the rising wage rates within sectors as a result of unionisation and labour brokers. This increase may lead to a production reformation which ultimately sees the shedding of lower skilled ‘expensive’ workers for more efficient methods of production, often with the use of technological advancements. In addition, public demonstration associated with unionisation may also increase wage-rates, thereby aiding in a structural shift towards technological adoption in the pursuit of capital efficiency (Festus et al., 2016).

## Towards a Definition for Skills Mismatches

According to Reddy et al. (2016:16) skills are socially constructed and therefore difficult to define, however, in practical terms, educational qualifications may be used as a proxy. A skills mismatch is defined by Pellizzari & Fichen (2013:6) as the difference between the skills possessed by a worker and those required to perform a job. There is evidence of skill mismatches on a global scale, with Mateus et al. (2016:1) claiming that countries, employers and organisations continuously express unhappiness with regards to having a shortage of skilled workers in various sectors of their economy.

Skills mismatch can be divided into three different types: *demand mismatch*, *educational supply mismatch* and *qualification-job mismatch* (Reddy et al., 2016). A demand mismatch occurs when the skills demanded in an economy are not appropriate with what’s available in the labour force. For example, in South Africa there is a demand for higher skilled labour but an oversupply of low skilled labour. An educational supply mismatch occurs when the skills in demand in the economy are not being supplied by the qualifications being produced by the education system. For example, in a scenario where a country has an undersupply of computing graduates, but education institutes continue to produce skills that are in oversupply. A qualification-job mismatch occurs when those in the labour market are employed in a field that does not correspond to their educational qualification (e.g., a civil engineer working in the finance sector) (Reddy et al., 2016).

## Skills Mismatch in South Africa

The shift in the South African economy to a more capital intensive, service-driven structure has led to a shift towards a strongly skills-biased labour demand (Bhorat et al., 2014b:1). Mateus et al. (2016) claim that South Africa is experiencing a shortage of skilled labour and suggest that the Apartheid system, poor post-apartheid education, and the emigration of skilled workers are the primary contributing factors. Supporting this claim, is the statement that the increase in skilled and semi-skilled employment, is considerably less than the increase in the supply of labour with skills, suggesting that a mismatch exists (Dias & Posel, 2007:26). In other words, there is a supply of skilled graduates, however the skills they possess are not those in demand by the labour market.

### Fields of Study and Graduate Unemployment

Statistics in this area may also be misleading on the extent of the graduate unemployment because of the different definitions for ‘graduate’. For instance, various studies group different qualification types together (e.g., grouping college graduates with diplomas and university graduates with degrees) (van Broekhuizen, 2016). However, given this, graduate unemployment is still high. Mncayi & Dunga, (2016) suggest that one of the reasons for the graduate unemployment problem is that graduates do not consider employment prospects when deciding on their field of study. As a result, there are higher levels of unemployment in graduates from certain fields of study (e.g. humanities or language) and an oversupply of skills not demanded by the economy. Furthermore, there is a high level of demand and many vacancies for certain types of skills but a shortage of people with the qualifications to fulfil that demand (Bhorat & Kimani, 2017; Mncayi & Dunga, 2016). Mncayi & Dunga (2016:414) when analysing data from 2012 found that while there were 600,000 unemployed graduates, the private sector had 800,000 jobs available. The research shows that field of study plays a major role in the determination of employability of graduates. While this is certainly an important finding, one needs to note that people with higher education have a higher employment percentage than those with no higher education (Mncayi & Dunga, 2016).

### Quality of Education

Data from 2010 to 2014 also shows that participation in Technical and Vocational Education and Training (TVET) colleges and universities has increased (Reddy et al., 2016). It has been suggested that individuals with at least a matric level education have a decreasing probability of unemployment with increased levels of education (Dias & Posel, 2007). This is supported by the findings of Van Broekhuizen & Van der Berg (2012:53), stating that graduates, who they define as: “individuals with bachelor’s degrees or equivalents and higher educational qualifications” have a strong decline in unemployment probability. Dias & Posel (2007), however, also refer to the fact that the more educated are not entirely insulated from the growth of unemployment prevalent in South Africa and suggest a possible reason for this may be that potential employers are concerned about the subsequent quality of education that students receive. In terms of primary and secondary education, Pauw, Oosthuizen, & Van Der Westhuizen (2008) asserts that 82% of graduates accepted into tertiary institutions were functionally illiterate, and more than 60% were unable to cope with the level of mathematics and science offered at the institution. Furthermore, noting the heterogeneity in quality of education received at tertiary institutions*,* Van Broekhuizen (2016:26) suggests that the reputation of the particular HEI an individual attended may provide a stronger signal for the potential skills of the individual than the actual qualification held. This implies that people need to consider not only their field of study, but also the institution they attend (﻿Bhorat et al., 2017).  Reddy et al. (2016) explicitly state that the quality of education in South Africa remains elusive, “leading to low progression through programmes in all-educational institutions, as well as low completion rates from schools, TVET colleges, and universities,” ultimately exacerbating the skills mismatch that already exists.

# Research Design

The study set out to investigate the existence of a skill mismatch and, if so, the nature of this mismatch in South Africa’s context. Education was considered a proxy for skills and thus the supply of graduates was used to represent skills supply. The labour market data collected was used to represent skills demand. The following sections will provide more detail about the data sources and structure of the study.

## Data Sources, Processing, and Analysis

Any investigation of labour market dynamics in South Africa is constrained by the availability, coverage, and completeness of relevant data sources. This section begins with an exposition of the data sources used in this analysis and, following this, provides an overview of the procedures adopted to process, combine, and analyse the resulting datasets.

### Data Sources

The analysis presented in this study made use of two distinct sources covering South African labour market trends and graduate characteristics for the period under consideration.  The first source, the *Labour Market Dynamics in South Africa* (LMDSA) datasets (2010 - 2017), consisting of pooled (yearly) data produced on the basis of the rotating panel household sample surveys —the *Quarterly Labour Force Surveys* (QLFS)— conducted by *Statistics South Africa* (StatsSA) for 2010-Q1 to 2017-Q4.  These surveys collect ‘data on the labour market activities of individuals aged 15 years and above’ residing within the country from a sample of approximately 30,000 households per wave.  The survey covers a large set of variables which include respondents’ current occupations, industries, and employment statuses. The second source of data was produced using the DHET’s *Higher Education Management Information System* (HEMIS) through the powerHEDA dashboard. This dashboard enables querying of a data warehouse containing detailed records from HEMIS for all public higher education institutions in South Africa, including the *Classification of Educational Subjective Matter* (CESM) categories,  graduates, and enrolments.   While *LMDSA* datasets were available for the period 2008 - 2017, owing to changes from the 1982 *CESM* classification system to the 2008 classification system (persisting in to 2009), consistent HEMIS data was only available for 2010 graduations. Consequently, in the analysis to follow, *LMDSA* and *CESM* data were considered for the period 2010 to 2017.

## Data Processing and Analysis

The *LMDSA* data was downloaded from the DataFirst repository hosted by the University of Cape Town (UCT). Eight datasets were downloaded, one for each year for the period 2010 to 2017. The relevant variables were then extracted from each year (e.g. occupation, field of study and education level) before being combined into a single set spanning the eight-year period. The *CESM* data is produced in a form that does not require extensive pre-processing other than the removal of irrelevant artefacts produced during the export process.

### Higher Education Percentage

As this study focuses on a skills mismatch, only ‘skilled’ occupations were considered. As previously discussed, skills can be difficult to define because they are a social construct. Therefore, the level of education was considered a proxy for skills, as was done by Reddy et al. (2016:16), and occupations were filtered as such. The levels of education considered for this filter included ‘*Bachelor’s Degree and Post Graduate Diploma’, ‘Bachelor’s Degree’, ‘Bachelor’s Degree and Diploma’, ‘Higher Degree (Masters, Doctorate)’, ‘Higher Degree (Masters/PhD)’, ‘Honours Degree’, ‘Post Higher Diploma (Masters; Doctoral Diploma)’,* and *‘Diploma with Grade 12/Std 10’.* The collection of these levels is hereafter referred to as ‘Higher Education (HE) levels’, and an individual that has received a HE level is referred to as a ‘graduate’*.* The proportion of graduates within an occupation is referred to as the HE percentage of that occupation. Occupations with an HE percentage of less than 30% were not considered as a skilled occupation, and hence did not form part of the study. This procedure was carried out independently for each year that was considered. For example, in 2010 Nursing’s HE percentage was below the 30% threshold, however, in 2011 it was above 30%, the occupation would be removed from the 2010 data and would remain in the 2011 data.

### Categorizations of Occupations

Following the classification of graduates and the subsequent removal of occupations below the HE percentage threshold of 30%, the occupations that remained in each of the years investigated (2010 - 2017) were considered. These occupations were individually placed into occupation categories that were judged (the basis of this judgement is discussed in the following paragraph) to best describe them using a more general term. These occupation categories are hereafter referred to as ‘bins’. For example, the occupations ‘Accountants and related occupations’, ‘Bookkeepers’, and ‘Government tax and excise officers’ were placed into the ‘Accounting’ bin.

When matching these occupations to bins, there existed multiple occupations that could be assigned to a bin with high confidence – such as the ‘Economists’ occupation to the ‘Economics’ bin. However, there were also occupations with which a relative amount of uncertainty existed as to which bin was most relevant to that occupation, and therefore required careful consideration. In order to best make these placements, various factors were considered, such as the field/s of study relating to the occupation, and the occupations HE percentage (e.g. if an occupation had a relatively low/high HE percentage, it would not be placed in a bin where the other occupations that had a comparatively opposite score). For example, ‘Petroleum and natural gas refining plant operators’ was considered for the ‘Chemical engineers’ bin, however, upon observation of the HE percentage of the ‘Petroleum and natural gas refining plant operators’ occupation, it was found to be relatively low when compared to that of occupations in the ‘Chemical engineers’ bin, and was therefore found to be more appropriate to be placed in the ‘Labourer’ bin. *See Table 1.*

### Average of Higher Education Scope

Following the binning process, the *average* HE percentage for each bin over the years considered was then calculated. Bins with an average HE percentage of less than 30% overall were removed from the study. This was done in order to provide a list of bins that may be considered as higher-skilled.

### Exclusions

Certain occupations did not occur as regularly as others within South Africa, resulting in some bins with far less people than others. Due to the nature of inferences made in accordance to labour demand and supply, bins that had very few participants in them could not be used for any extrapolation, as any change would reflect disproportionately in comparison to bins with relatively more participants. In addition, inaccuracies can occur when using a small percentage of the population to make inferences about the rest of the country. Due to the aforementioned reasons, the decision was made to exclude bins that had on average less than a hundred participants for the time period considered. This means that 16 bins in total were removed and 10 remained. Refer to Table 1 in section 4.1 for a more detailed overview of the bins that were included and excluded.

### Binning CESM

The *CESM* categories had to be matched to the occupation bins created to determine differences in demand and supply. In this instance, the second order *CESM* data is considered to be labour supply. This was done because the first order (21 categories) was considered too broad and the third order too specific (1041 categories). To match the *CESM* data to the bins the authors manually assigned fields of study for which there existed a high degree of confidence to a bin (e.g. mapping ‘Accounting And Related Services’ and ‘Taxation’ to the Accounting bin). Fields of study that could not easily be matched to a bin were evaluated using the *LMDSA* data. Using the fields of study variables in the *LMDSA* data, it was possible to determine the sectors people with qualifications in particular fields of study worked in. For example, most people that graduated with ‘Afrikaans Language And Literature’ worked in the education sector and therefore fell into the ‘Education’ bin. Similarly, most people that studied ‘Public Administration’, work in education and were therefore mapped to the Education bin. The second order *CESM* data originally had 245 categories, and 156 of the original categories, were matched to our 10 bins. The *CESM* categories that were matched to the bins were done according to their similarity of the bin.

The combination of datasets was executed with the aim of comparing and contrasting the two datasets in order to better understand the difference between the demand for skills in the labour market (LMDSA) and the supply of skills to the labour market (CESM) in a given year. This comparison was considered best when making use of annual proportions. Specifically, we defined annual proportions as the number of workers/graduates that fell within a bin as a proportion of that year’s total professional workforce (LMDSA) or that year’s total graduates for the bins considered (CESM). We defined the professional workforce as the workers within the categories used within our study which met both the HE threshold and participant criteria. Proportions were used to normalise data between the two repositories. This is necessary as the size of the data sets differs considerably in that *LMDSA* data represents a sample of the South African population (and is therefore relatively small), whereas *CESM* data represents the South African graduate population as a whole (and is therefore relatively larger). For example, for the year 2010, the number of workers within the ‘Education’ bin as a proportion of the total professional workforce was 25.16%, and the number of graduates within the ‘Education’ bin as a proportion of the total graduates for the bins considered was 32.57%.

### Unemployment

To further contextualise any possible mismatches shown in the various employment and education bins, we considered the level of unemployment within a specific bin for each of the years considered. For example, the *Accounting* bin’s unemployment was calculated by representing unemployed accountants as a proportion of the total sample within the accounting bin. In addition, the occupation nursing was included within the medical field of study within the *LMDSA* data, and since this was used to generate each unemployment graph, as opposed to occupations, a separate figure was not created for nursing and is instead contained within the aforementioned bin.

# Analysis & Results

In the following sections we present our analyses of the datasets, first individually, before we combine the datasets to consider any possible mismatches. We present our combined analysis along two lines. First, we consider categories for which an oversupply of graduates is evident. Second, we consider categories for which it appears there is an undersupply of graduates. These designations were determined by the difference between an occupation’s demand and supply; hence occupations where the *CESM* observations are higher than that of *LMDSA*, the occupation will be understood to be an oversupply, and vice-versa. Finally, a section denoting yearly rates will be incorporated.

## Overview of Data Considered

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Included** | **Higher Education Score (%)** | ***n*** | **Excluded** | **Higher Education Score (%)** | ***n*** |
| Accounting | 35,44 | 437 | Architecture | 47,46 | 84 |
| Computing | 46,80 | 234 | Biologists | 54,17 | 13 |
| Education | 57,21 | 2687 | Chemists | 40,91 | 9 |
| Human Resources | 38,13 | 228 | Civil Engineer | 43,15 | 63 |
| Insurance/Finance | 30,57 | 676 | Dental | 45,21 | 33 |
| Law | 52,79 | 227 | Dietary | 57,14 | 8 |
| Management/Logistics | 30,92 | 1206 | Economics | 71,43 | 15 |
| Medical | 42,09 | 402 | Information Science | 42,99 | 46 |
| Nursing | 34,87 | 544 | Maths | 56,41 | 22 |
| Social Work | 44,98 | 112 | Mining Engineer | 40,00 | 16 |
|  |  |  | Scientists | 66,67 | 24 |
|  |  |  | Social Science | 70,00 | 7 |
|  |  |  | Theology | 42,35 | 83 |
|  |  |  | Vet | 50,00 | 15 |
|  |  |  | Writing/Journalism | 57,14 | 48 |
|  |  |  | Other Professionals | 50,00 | 9 |

Figures 1, 3, 5, 7, 9, 11 and 13 represent both datasets comparatively for each occupation, grouped by either an oversupply or undersupply, in addition, the categories selected for visual representation are those both above the *HE* threshold and containing more than 100 participants on average throughout the years considered. The proportioned data contained within *CESM* is represented by an orange line, and all proportioned data contained within *LMDSA* is represented by a blue line. Lastly, all dataset observations have been normalized by using a proportion basis aggregate, allowing for comparison. Figures 2, 4, 6, 8 and 10 represent the yearly unemployment rate for each category considered. This is representative of the unemployment within each category, compared as a proportion to its employed proportion. Therefore, this considers for example, the unemployed accountants as a proportion to the employed accountants.

## Oversupply

Within the study, 4 out of 10 occupations were considered to be in oversupply and hence 40% of all occupations considered; specifically, *Accounting, Computing, Law* and *Medical.* The corresponding relations are categorized as having a skill mismatch, tending strongly toward an oversupply of graduates within the economy, compared with a demand for employment. This is highlighted by a larger proportion of students graduating from tertiary institutions, than those working within occupations requiring that degree, across only those categories analysed. In addition, the visual representations show the proportioned labour force as a blue dotted line, and the red dotted line as the proportioned graduates; both across only the categories considered.

### Proportion of Candidates: Accounting

The *CESM* data is representative of a marginally downward sloping trend, decreasing from 22% in 2010 to 20% in 2017. Throughout the *QLFS* data, there are more fluctuations in the yearly proportion of workers. Comparatively, the *QLFS* and *CESM* data point to an oversupply of accounting graduates, with a convergence occurring between the datasets in 2017, with a difference of 11 percentage points. Furthermore, it is interesting to note that the highest difference in proportion tending towards an oversupply, in our data, appears within the accounting category. Lastly, according to the yearly unemployment rates, a relatively small upward trend is experienced in 2015, however, this decreases back down to 0% within the category itself thereafter and for all other years considered. A close up of text on a white background

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### Proportion of Candidates: ComputingA picture containing text Description automatically generated

The *CESM* data remains fairly constant throughout the years considered, before sloping downward after 2015, with a low experienced in 2016, however, a proceeding upward trend is observed thereafter. Throughout the *QLFS* data, a downward trend is observed until 2013, whereby an increase is observed before a decline in 2015, however, the convergence between 2015 and 2016 is stronger than all other years, with a divergence experienced by both data sets in 2017. Comparatively, theaverage difference between both the demand and supply within the economy is 4,1 percentage points, however, the category is still categorized as a mismatch tending toward an oversupply of graduates. Lastly, according to the yearly unemployment, there exist two spikes in unemployment, both in 2014, the larger of the two, and in 2016. In 2015, the unemployment rate within the category is 15%, and 4% in 2016. It is also interesting to note that the unemployment rate in 2013, 2015 and 2017 is 0% within the occupation itself, although this may be the result of an artefact within the *QLFS* surveys.

A close up of a mans face

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### Proportion of Candidates: LawA screenshot of a cell phone Description automatically generated

The *CESM* remains constant until 2014, before experiencing an upward trend until 2016 with no difference between that and 2017. Within the *QLFS* data, an overall upward trend is experienced through increasing and constant movements between all years considered, with the highest constant points observed from 2015 throughout. Comparatively, the largest gap between demand and supply is experienced in 2010, 2011, 2016 and 2017, by 8 percentage points. Lastly, according to the yearly unemployment graphs, in the year 2015 unemployment within Law dropped to 0%, before increasing back to 1.3% for all preceding years.

A close up of a mans face

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### Proportion of Candidates: Medical

The *CESM* data is proportionally constant throughout the years considered. According to the *QLFS* data though, the difference between maximum and minimum points is 4 percentage points, with an increasing trend experienced between 2010 and 2012, and a decreasing trend until 2016, before an increase in 2017. Comparatively, in 2017 convergence is occurring, with a decrease in the number of graduates, and an increase in the demand for such labour in the job market. Lastly, according to the yearly unemployment data, medicine experiences a spike in 2015 of just over 2.5 before moving back down to 0% in the preceding year. There is also an upward trend experienced in 2017 to its high of 6.33%.A close up of a piece of paper

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## Undersupply

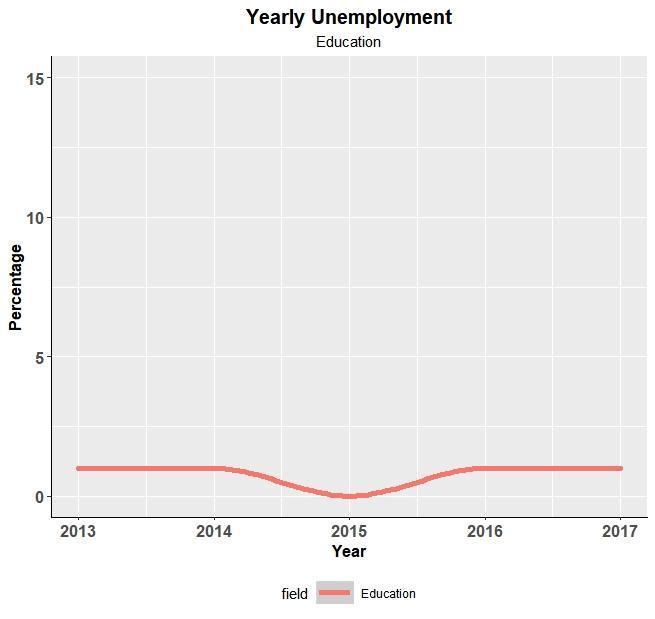
Within the study, 3 out of 10 occupations were considered to be in undersupply and hence 30% of all occupations considered; specifically, *Education, Insurance/Finance* and *Nursing.* The corresponding relations are categorized as having a skill mismatch, tending strongly toward an undersupply of graduates within the economy, compared with a demand for employment. This is highlighted by a smaller proportion of students graduating from tertiary institutions, than those required within working occupations requiring that degree, across only those categories analysed. In addition, the visual representations show the proportioned labour force as a blue dotted line, and the red dotted line as the proportioned graduates; both across only the categories considered.

### Proportion of Candidates: Education

A close up of a map

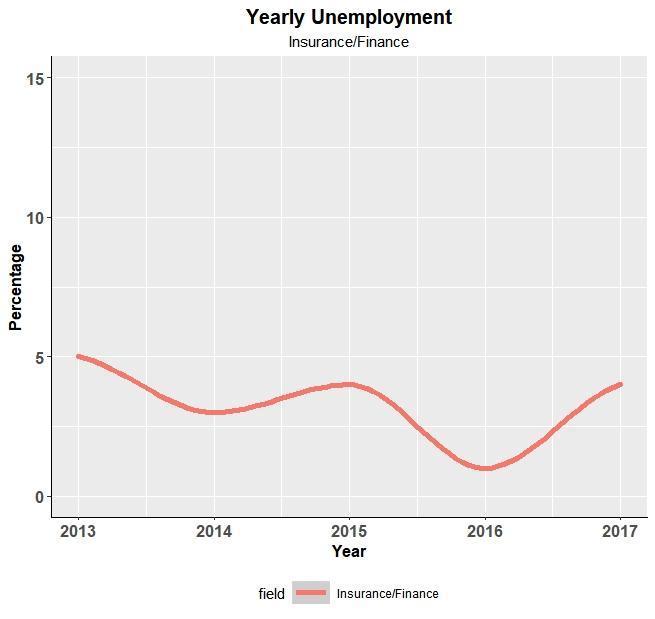
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The *CESM* data is initially increasing at a decreasing rate until 2014, before a sharp decline in 2015. Although, fluctuations appear as minimal movements with a change of only 3 percentage points, where in comparison the *QLFS* data experienced movements of 11 percentage points between its high in 2011 and low in 2016. In addition, the *QLFS* data has an overall downward trend whilst the *CESM* data is relatively constant, indicating both a decrease in the amount of employment within the category indicative of the *QLFS* data, and a convergence between both datasets. Moreover, the yearly unemployment within the category remains fairly low and constant, and although there is a large initial difference indicating a large skill gap of an undersupply, narrowing from 2016 (on the employment side), there is still very little movement in unemployment for educators within the economy.



### Proportion of Candidates: Insurance/FinanceA close up of text on a white background Description automatically generated

The *CESM* data remains constant throughout all years considered, with 1% movement both upward and downward throughout. The *QLFS* data has an initial downward trend, moving to its low in 2012 of 8% of the overall proportion. In addition, another interesting artefact within the *QLFS* data, is the sudden increase from 2015 to 2016, indicating a sudden increase in demand from an increase in employment (of 4%) whilst graduates remain constant; this however tapers off in 2017.  Moreover, a downward trend is observed in the yearly unemployment rates, however, the total movement from 2013 to 2017 is only a decrease of 1 percentage point.



### Proportion of Candidates: NursingA close up of a map Description automatically generated

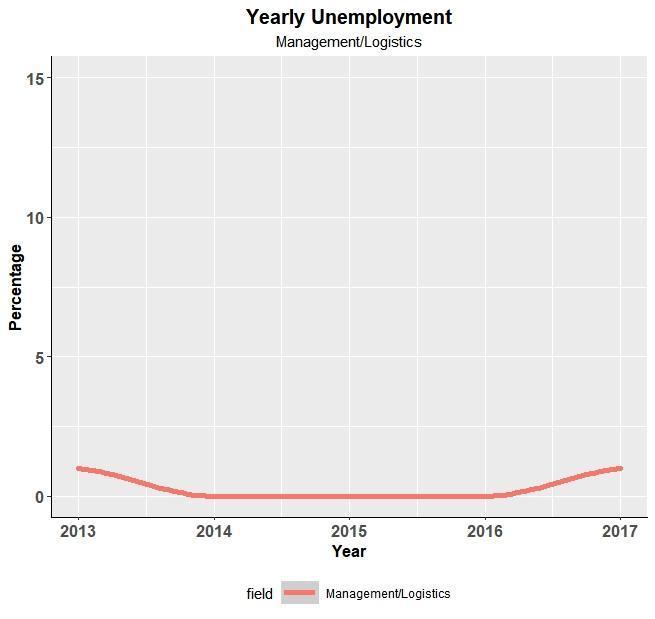
There is little movement within the *CESM* data, with a fluctuation of 1% in various years; however, comparatively, there is little movement in *QLFS* data, with fluctuations of 3%. Although *CESM* is constant until year 2013, *QLFS* starts off with a downward trend. In addition, whilst *CESM* remains constant from 2016, another downward trend is experienced within the *QLFS* dataset, indicative convergence through a decrease in employment and thus a decrease in demand.

## Equilibrium

Within the study, 3 out of 10 occupations were considered to be in equilibrium and hence 30% of all occupations considered; specifically, *Management/Logistics, Social Work* and *Human Resources.* The corresponding relations are categorized as *not* having a skill mismatch. Specifically, the *QLFS* and *CESM* data have a very high level of correlation, indicative of a possible equilibrium between labour demand and graduate supply throughout the years considered. In addition, the visual representation, shows the proportioned labour force as a blue dotted line, and the red dotted line as the proportioned graduates; both across only the categories considered.

### Proportion of Candidates: Management/LogisticsA close up of a map Description automatically generated

The *CESM* data experiences an upward trend, increasing from 17% in 2010, to 20% in 2017. However, although observing fluctuations within the *QLFS* data, the convergence of both datasets indicates equilibrium, with the category experiencing fluctuations general economic cycles. This may also be an artefact experienced only by the *QLFS* data (employment may be more elastic to cyclic changes than tertiary output, which may also experience a higher impact lag), and hence why fluctuations are more turbulent within this dataset; justifying to a further extent an equilibrium between job supply and demand within Management/Logistics. Moreover, unemployment within this category is 0% between 2014 and 2016 with a small trend upward in 2017.



### Proportion of Candidates: Social WorkA close up of text on a white background Description automatically generated

Both the *CESM* and *QLFS* data are comparatively similar and hence indicative of an equilibrium within the demand and supply of skilled labour within this category. Within the *CESM* dataset, there is a small trend upward in 2014 by 1%, and thereafter remains constant. Within the *QLFS* dataset, there are several fluctuations throughout the years considered, however concludes at a higher percentage proportion in 2017 than every other year than 2011.

A close up of a map

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### Proportion of Candidates: Human ResourcesA picture containing text Description automatically generated

The *CESM* data is representative of an upward trend to a high in 2012 of 7% of the proportion, before declining to a low of 4% in 2017, with a sharp upward movement in 2012, and a strong convergence thereafter. However, the *QLFS* data is relatively consistent, and converges after 2014. Moreover, it is interesting to note that the data also declines in 2017, in the same proportion as that of the *CESM* data. However, in all years considered (excluding that of 2012), there is a difference of 2% or less, indicating an equilibrium between skills demanded and skills supplied. Although, according to the unemployment graphs, relatively high unemployment is experienced within the occupation; an increasing movement to 2014 is experienced, before a decline is experienced till 2016  and then a sharp increase to its highest point in 2017 of 14%.  A close up of a map

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# Discussion

## Overview of Discussion

The discussion will critically assess what is being seen in the data and supplement it with further research. Three fields were considered to have no skill mismatches and thus were categorised as being in equilibrium; specifically, *Management/Logistics, Social Work* and *Human Resources*. The remaining seven fields were either categorised as being in undersupply or oversupply.

### Medical

As discussed above, a mismatch appears to exist within the medical bin. At first, this mismatch seems unlikely, as there is a known shortage of medical practitioners in South Africa (Business Tech: South Africa is facing a doctor shortage - here’s why, 2019; Eyewitness News: Doctor shortages not unique to SA, 2013; Medical Brief: SA’s shortage of medical doctors - a bleak picture, 2016; Zihindula, G. et al., 2019). However, upon further investigation, according to (ENCA: No jobs for trainee pharmacists, doctors despite shortage, 2017), “experts believe there has been an increase in the number of trainees, but the public health system simply can’t absorb them- despite a critical shortage of staff at public health facilities.” It is stated that this is not so much a problem of oversupply, but rather an issue of scheduling. In other words, there is indeed a number of medical workers being supplied to the labour market, however this supply simply cannot be absorbed by the market itself, leading to the shortage that we observe. Minister of Health Dr Zweli Mkhize has cited a lack of funding as a cause (Business Tech: South African healthcare workers say they are emigrating because of the NHI, 2019). This shortage is likely compounded by the fact that the emigration of healthcare professionals is a problem often cited (Labonté et al., 2015; Business Tech: South African healthcare workers say they are emigrating because of the NHI, 2019; George et al., 2013). This emigration however has appeared to be decreasing in recent years, perhaps contributing to the convergence that we see towards the latter stages of Figure X the graph (Labonté et al., 2015).

### Social Work

The findings for social work are interesting, when researching the current state of social workers within the South African context, there appears to be a shortage, with acting director of the Department of Social Development Nelisiwe Vilakazi stating that “3000 social graduates who received scholarships from the department” were unable to be employed (Nkosi, 2018). This suggests that a similar issue to that of the medical field exists, in that there is in fact a need for more social workers, but the inability of the labour market to absorb them, with lack of funding cited as the reason for this(SA news: Hope for unemployed social workers, 2019).

### Accounting

The mismatch that exists for the Accounting bin is an interesting observation. There exists less demand in the labour market than there is supply, i.e. there is an oversupply of skills. This is interesting as, according to de Jager & van der Spuy (2017:1), the South African Institute of Chartered Accountants (SAICA) frequently reports that there is a shortage of CA(SA)’s in South Africa. This is not a universal view, however, with Van Wyk (2014) investigating the phenomenon of newly qualified CA(SA)’s struggling to find jobs, stating that “the current state of the labour market, the role of audit firms, having sufficient experience, as well as personal choice and perceptions” have an impact. This view is supported by de Jager & van der Spuy (2017:6) concluding that in their article that “South Africa seems likely to have an oversupply of newly qualified CA(SA)s.” Our data seems to support this interpretation of the phenomenon.

### Nursing

As previously stated, a shortage of graduates in the nursing bin exists. This finding is supported through Comiskey *et al.* (2015:647), stating that “within South Africa nursing education outputs do not meet demands.” According to Geyer (2016) there has been an increase in the urgency to generate nurses in South Africa in order to address the issue of an increasing burden of disease, with a number of policy changes reflecting this. However, the labour market is unable to absorb graduates, with an article in News24 addressing the issue of qualified nurses unable to find work, stating that the government is funding studies, however, there exists no funding for posting graduates (Mkize, 2019).

### Management/Logistics

The equilibrium observed could be caused by a variety of factors, such as the fact that the Management/Logistics bin likely consists of professionals with a wide variety of skills that can be applied across many of our bins considered, consequently professionals from other bins could apply their skills in the Management/Logistics bin. Therefore, the natural fluctuation that occurs could see many individuals both leaving and entering this Management/Logistics bin throughout the years considered, resulting in the volatile trend observed. Although this equilibrium could be interpreted as a positive, as supply appears to be meeting demand, it could be somewhat misleading due to the nature of the Management/Logistics bin as described above. The equilibrium viewed here could be a contributing factor to mismatches that exist in other fields, as graduates from those fields could be applying their skills in the Management/Logistics bin, and not in that of the bin their field of study would suggest they should be working in.

### Law

The data indicates that there is a high oversupply of lawyers in South Africa, relative to the number of individuals working in law-related occupations. However, a dive into what has been discussed in the news and other studies shows that it is more complicated than just a problem of too many law graduates. Gravett (2018) finds that many law graduates may not be employed in the market due to law firms believing they do not meet their skill quality requirements or do not possess certain necessary skills. This problem led to Wits University removing their four-year straight LLB program and therefore requiring people to first finish a prior undergraduate degree to complete a postgraduate LLB program (Maseko, 2016).

Gravett (2018) highlights that stakeholders within the law field (for e.g. Law Society of South Africa) have expressed concerns of the ability of law graduates to transfer theoretical skills, learned at education institutes, into practical application of the law. The debate between whether law should be taught from an academic or practical basis in South Africa, has been discussed extensively in the literature. This power struggle is not unique to the South African legal profession. The USA’s legal sector went through a similar debate for over a decade, finally in 1987 concluding that practical skills were essential to the profession. Since then there has been no debate, within the USA's legal sector, on the importance of producing law graduates that have both academic and practical skills. While South Africa and the USA are vastly different countries that have major differences in social, political and economic climates, Gravett (2018) argues there is still much that can be learned from their experiences within the law field.

The data and further research indicate that the law field in South Africa is experiencing a type of education supply mismatch. Whereby, the labour market is demanding law graduates that have practical skills, but the institutes are graduating lawyers that have focused their studies in acquiring academic skills. This is not to say that the academic skills or academic lawyers are not important, but that it is necessary to combine these skills with practical skills.

### Education

While the data indicate a trend of convergence between the supply the demand for education-related graduates and occupations this could be influenced by teachers leaving the South African labour market. The data shows that the number of people working within the education sector in South Africa has been on a steady decline since 2013. While a number of factors can be linked to this decline, much of it can be connected to the migration of South African educators. In October 2018, the New Zealand Minister of Education made a statement that they would be hiring teachers from a number of countries (South Africa included) to deal with their shortage of teachers (Gous, 2018). This is part of a well discussed trend of skilled South African’s leaving the country due to a number of push and pull factors.

The steady decline in the number of teachers can also be partly accredited to the violence against teachers. Teachers feel unsafe and vulnerable at work due to them being threatened by students that will even use weapons. The effects of these incidents are not isolated to the school or area where they occur but affect the whole education community. Eventually educators reach a point where they can no longer deal with violence or the feeling of the vulnerability and leave the profession (Masweneng, 2018). The violence against teachers has also exacerbated the emigration problem. Teachers feel unsafe in South Africa, and the opportunity to work in a safe environment, for a better salary, in a different country eventually leads to them emigrating. (Dlamini, 2019).

The South African education system is divided into two main sectors. The first of these is public schooling which get funding from the government but have been allowed to charge fees that add to the subsidy provided by government (Ahmed & Sayed, 2009). The ability of these schools to hire teachers is mainly dictated by government funding and/or their ability to extend budget

### Insurance/Finance

The graph shows that the insurance and finance skills are in undersupply and have been for the entire period considered. In 2014, the Western Cape government worked together with UCT to conduct an assessment report on financial services sector (Department of Economic Development and Tourism, 2014). They assessed the entire sector within the province, including skills deficits and difficulties in recruitment of skilled personnel. The Department of Economic Development and Tourism (2014) found that, within the financial services sector, there was a large list of skill deficits. Many of the skills on the list are deficits that many sectors or the economy as a whole are experiencing (e.g. IT skills). However, there are a large number of skill deficits that are specific to the sector and can only be developed through education or work experience (e.g. actuarial skills). Recruitment/retention of skilled personnel was also found to be a major problem within the sector. This was specifically seen in skills with high demand such as IT skills. Due to this demand, people with these skills have a wide variety of job options and the financial sector is often the least attractive of these options (Department of Economic Development and Tourism, 2014). While this report was specific to the Western Cape, it does follow the trends discussed in the analysis.

The DHET (2019) report of the supply and demand of skills in South Africa further supports what has been found in the data. They made use of 2016 data to analyse surplus and shortage of skills at an industry level. The Banking Sector Education and Training Authority (BANKSETA) and the Insurance Sector Education and Training Authority (INSETA), the sectors which best suit our finance/insurance bin, were found to have shortages.

### Computing

The computing bin was categorised as having an oversupply of graduates. This goes against what many believe and what is reported in much of the media. However, the MICT SETA (Media, Information and Communication Technologies Sector Education and Training Authority) published a Career Opportunity Guide in 2012. MICT SETA estimated an oversupply for the period of 2011 to 2013 in the “Information and Communications Technology” subsector (the sub sector that best matches our computing bin) (MICT SETA, 2012). The report’s findings support what is being seen in the computing graph where the mismatch occurs in 2011, 2012 and 2013. The graph shows a mismatch in 2014 but is also the year that convergence between the supply and demand begins.

The MICT SETA (2018) conducted the Sector Skills Plan 2019 to 2024. The findings show that emigration of workers is not a concern for the “Electronics, Information Technology and Telecommunications (ICT)” subsector, but highlight that many companies recruit people to be deployed in projects being run in other countries. These people are deployed in the country for the extent of the project. While these workers are still part of the South African labour force, they are not captured by the StatsSA labour market survey. Therefore, the computing profession may play a bigger role in the labour market than what is reflected in the data.

# Limitations

The dataset that is used to denote demand of skills is a representation of South Africa. As stated throughout the study, South Africa a relatively low skilled country with a high unemployment rate and an oversupply of low skilled workers. Due to the data being a sample used to represent the South African labour market, there are few skilled workers captured in the data. This means that there are limits to studying the movement of skilled personnel within the labour market. The limitations are part of the reason that many jobs could not be analysed and had to be removed from the study. The removal of the bins means that those fields were not analysed for a skills mismatch.

The representational nature of the *LMDSA* dataset means that occupations are abstracted to a high level. This makes it useful when doing a high-level analysis on the South African labour market but creates a problem when compared to the much more detailed CESM dataset. This problem means that some fields of study from the *CESM* data could not be matched to *LMDSA* occupations and were therefore not analysed for a mismatch.

The lack of formal data being recorded on emigration of skilled workers creates another limitation. While much of the literature highlights the South African brain drain as major hindrance on the economy, the extent of the effects cannot be fully analysed. More research and better data are needed to know the full magnitude of the effects.

This study considered higher education as a proxy for skills and while it was considered the best fit, skills are socially constructed and difficult to define. Therefore, education is not a perfect representation and there undoubtedly exist skilled professions that do not require higher education.

# Conclusion

The study set out to determine whether a skills mismatch exists within the South African economy, and to what extent, if any, the mismatch occurs within the various industries meeting our research criteria. In addition, an understanding of South Africa’s labour market landscape was integral to our research, and topics relating to South Africa’s economy, the labour market, market rigidity, technological change/adoption and direct skill supply and demand were considered within the literature review. Research suggests, structural changes in labour demand, influenced primarily by technological impact, globalization and market rigidity, are priming the economy toward a more efficient and capitally strategic landscape; hallmarked by technological adoption and high unemployed between unskilled workers. In addition, labour supply is consequently affected by both the HE landscapes, emigration and historical aspects (e.g. Apartheid); with the former determined by degree choice misalignment and the preceding quality of tertiary institutions within the country.

Our research is indicative of a potential skill mismatch across various industries. Specifically, the study furthered the research by using the labour market survey data to represent demand and the graduate data to represent labour supply. The findings from the analysis and discussion indicate an apparent skill mismatch within the economy, however also alluded to various complex mechanisms governing it’s structure. In particular, the discussion found certain anomalies which paved the way for further analysis into unemployment trends to be analysed alongside the derived skill demand. It was also found that public good fields (e.g. social work or medical) were mainly affected by governments inability to afford the required personnel. In other words, the skills are needed but unaffordable.

The mismatches did not exist in all occupation categories, with an equilibrium occurring in *Management/Logistics, Social Work* and *Human Resources.* Remaining occupations were considered to either  be in oversupply such as *Law, Accounting, Computing and Medical*; or undersupply such as *Education, Insurance/Finance* and *Nursing.*

This study highlights that the labour market struggles to indicate it’s needs  sufficiently, and that intervention is needed to make sure that people are aware of what demanded skills in the economy are. Tertiary institutes and government need better communication and regular skills studies are required so the country as a whole better understands the skills that are needed. This will mean university applicants can better align their field of study. Finally, having a large portion of industries experiencing a skill’s mismatch is an inefficient way for the labour market, it’s participants and the economy as a whole to operate. Operating at an inefficient level of skill production leads to higher graduate unemployment and is ultimately a huge hindrance on economic growth and on future growth prospects.

# References

Ahmed, R., Sayed, Y. (2009) Promoting access and enhancing education opportunities? The case of ‘no‐fees schools’ in South Africa. Compare: A Journal of Comparative and International Education 39, 203–218.

Banerjee, A. et al. (2008) Why has Unemployment Risen in the New South Africa. Economics of Transition, 16(4), pp. 716-739.

Bhorat, B. H. (2010) ‘The Role of International Trade , Technology and Structural Change in Shifting Labour Demands in South Africa The Role of International Trade , Technology and Structural Change in Shifting Labour Demands in South Africa’, *Changes*, (17).

Bhorat, H. (2004) Labour Market Challenges in the Post-Apartheid South Africa. South African Journal of Economics, pp. 940-977.

Bhorat, H., Cassim, A. & Tseng, D. (2014) Higher Education, Employment and Economic Growth. *LMIP Report*, 5. Available at: http://www.lmip.org.za/sites/default/files/documentfiles/HSRC LMIP Report 5 web final\_0.pdf.

Bhorat, H., Goga, S. & Stanwix, B. (2014) Skills-biased labour demand and the pursuit of inclusive growth in South Africa, *WIDER Working Paper* 2014/130.

Bhorat, H. & Hodge, J. (1999) ‘Decomposing Shifts in Labour Demand in South Africa’, *South African Journal of Economics* 67(3), 155–168.

Bhorat, H. & Hodge, J. (2005) Decomposing Shifts in Labour Demand in South Africa. South African Journal of Economics, 67(3), pp. 348-380.

Bhorat, H., Lilenstein, A. and Lilenstein, K. (2017) ‘Youth Transitions from Higher Education into the Labour Market’.

Bhorat, H. and Kimani, E. (2017) ‘The role of Post-school Education and Training institutions in predicting labour market outcomes’.

*Business Tech: South African healthcare workers say they are emigrating because of the NHI.* (2019) [Online]. Available: <https://businesstech.co.za/news/business/350061/south-african-healthcare-workers-say-they-are-emigrating-because-of-the-nhi/>. [2019, November 1].

*Business Tech: South Africa is facing a doctor shortage - here’s why.* (2019) [Online]. Available: <https://businesstech.co.za/news/government/346538/south-africa-is-a-facing-a-doctor-shortage-heres-why/>. [2019, November 10].

Comiskey, C.M. et al. (2015) Scaling up nurse education: An evaluation of a national PhD capacity development programme in South Africa, in the context of the global shortage of nursing graduates. *Nurse Education Today*, 35(5), pp.647–652.

de Jager, P. & van der Spuy, P. (2017) The Supply of CAs(SA): A Malthusian Trap? *Accounting Perspectives in Southern Africa, 4(1).*

Department of Higher Education and Training. (2019) *Skills Supply and Demand in South Africa*. Pretoria. Department of Higher Education and Training.

DHET. (2018) Statistics on Post-School Education and Training in South Africa:  2016, Technical report, Department of Higher Education and Training., Pretoria

Dias, R. & Posel, D. (2007) *Unemployment, Education and Skills Constraints in Post-Apartheid South Africa*,

Dlamini, P. (2019) Underpaid teachers exposed to danger on the job are now leaving SA [WWW Document]. CityPress. URL <https://city-press.news24.com/News/underpaid-teachers-exposed-to-danger-on-the-job-are-now-leaving-sa-20190806> (accessed 11.4.19).

Edwards,  L. (2001)  ‘Globalisation and the skills bias of occupational employment in South Africa’, South African Journal of Economics 69 (1), 40–71.

*ENCA: No jobs for trainee pharmacists, doctors despite shortage*. (2017) [Online]. Available:<https://www.enca.com/south-africa/no-jobs-for-trainee-pharmacists-doctors-despite-shortage>. [2019, September 20].

*Eyewitness News: Doctor shortages not unique to SA*. (2013) [Online]. Available: <https://ewn.co.za/2014/05/13/Doctor-shortages-not-unique-to-SA>. [2019, November 10].

Festus, L., Kasongo, A., Moses, M. & Yu, D. (2016) The South African labour market, 1995-2015. Development Southern Africa, pp. 579-599.

George, G., Atujuna, M. & Gow, J. (2013) Migration of South African health workers: the extent to which financial considerations influence internal flows and external movements. *BMC Health Serv Res* 13, 297.

Geyer, N. (2016) A universal truth: Are we heading for no health care? *Professional Nursing Today*, 20(4), pp.23–26.

Gous, N. (n.d.) New Zealand recruiting South African teachers to tackle shortage [WWW Document]. TimesLIVE. URL <https://www.timeslive.co.za/news/south-africa/2018-11-12-new-zealand-recruiting-south-african-teachers-to-tackle-shortage/> (accessed 11.4.19).

Jenkins, R. (2008) Trade, Technology and Employment in South Africa. The Journal of Development Studies, pp. 60-79.

Kaplan, D. and Höppli, T. (2017) ‘The South African brain drain: An empirical assessment’, *Development Southern Africa*. Taylor & Francis, 34(5), pp. 497–514.

Labonté, R. et al. (2015) Health worker migration from South Africa: Causes, consequences and policy responses. *Human Resources for Health*, 13(1), pp.1–16.

Lawrence, E. (2004) A Firm Level Analysis of Trade, Technology and Employment in South Africa. Journal of International Development, pp. 45-61.

Maseko, N. (n.d.) Law - Can I do the LLB undergraduate degree at University of Wits law school? [WWW Document]. University of the Witwatersrand. URL <http://universityofthewitwatersrand.zendesk.com/hc/en-us/articles/202800061-Law-Can-I-do-the-LLB-undergraduate-degree-at-University-of-Wits-law-school-> (accessed 11.4.19).

Masweneng, K. (n.d.) Teachers are ditching the profession - and we’re all responsible for it‚ say experts [WWW Document]. TimesLIVE. URL <https://www.timeslive.co.za/news/south-africa/2018-03-20-teachers-are-ditching-the-profession-and-were-all-responsible-for-it-say-experts/> (accessed 11.4.19).

Mateus, A.D., Allen-Ile, C. & Iwu, C.G. (2014) Skills Shortages in South Africa: Interrogating the Repertoire of Discussions. *Mediterranean Journal of Social Sciences*, 5(6), pp.63–73.

Mbilini, S.N., le Roux, D.B., Parry, D.A. (2019) Does automation influence career decisions among South African students?, in: Proceedings of the South African Institute of Computer Scientists and Information Technologists 2019 on ZZZ - SAICSIT ’19. Presented at the South African Institute of Computer Scientists and Information Technologists. (2019) ACM Press, Skukuza, South Africa, pp. 1–10.

Mcguinness, S., Pouliakas, K. and Redmond, P. (2017) ‘Discussion Paper Series How Useful Is the Concept of Skills Mismatch ?’, (10786), pp. 1–30.

*Medical Brief: SA’s shortage of medical doctors - a bleak picture*. (2016) [Online]. Available: <https://www.medicalbrief.co.za/archives/sas-shortage-medical-doctors-bleak-picture/>. [2019, November 10].

Meyer, F. D. (2014) Job Creation, a Mission Impossible? The South African Case. Mediterranean Journal of Social Sciences, 5(16), pp. 65-77.

Mkize, Vuyo. (2019) *State-trained nurses sit idle while SA faces severe staff shortages* [Online]. Available: <https://city-press.news24.com/News/state-trained-nurses-sit-idle-while-sa-faces-severe-staff-shortages-20190116>. [2019, November 1].

Mncayi, P. and Dunga, S. H. (2016) ‘Career choice and unemployment length: A study of graduates from a South African university’, *Industry and Higher Education*, 30(6), pp. 413–423.

Moleke,  P. (2010)  The graduate labour market, in M. Letseka,  M. Cosser, M. Breier & M. Visser, eds, ‘Student Retention and Graduate Destination:  Higher Education and Labour Market Access and Success’, HSRC Press, Cape Town, pp. 87–95.

Nkosi, Bongani. (2018) *Thousands of social work graduates still unemployed* [Online]. Available: <https://www.iol.co.za/news/south-africa/gauteng/thousands-of-social-work-graduates-still-unemployed-14097150>. [2019, November 1].

Pauw, K., Oosthuizen, M. & van der Westhuizen, C. (2008) ‘Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox’, *South African Journal of Economics* 76 (1), 45–57.

Pellizzari, M. & Fichen, A., (2013) A New Measure of Skills Mismatch ADULT SKILLS ( PIAAC ). , (153).

Pitan, O.S. & Adedeji, O.S. (2012) Skills Mismatch among University Graduates in the Nigeria Labor Market. *US-Chia Education Review*, 1, pp.90–98.

Powell, L. (2012) From Reconstruction to Deconstruction - The Role of Research in South African Skills Development. pp. 1-29.

Rasool, F. and Botha, C. J. (2011) ‘The nature, extent and effect of skills shortages on skills migration in South Africa’, *SA Journal of Human Resource Management*, 9(1), pp. 1–12.

Reddy, V., Bhorat, H., Powell, M., Visser, M. & Arends, A. (2016) Skills Supply and Demand in South A, Technical report, Human Sciences Research Council, Pretoria

*SA news: Hope for unemployed social workers*.(2019) [Online]. Available: <https://www.sanews.gov.za/south-africa/hope-unemployed-social-workers>. [2019, October 21].

Services, U. I. (2018) ‘Statssa2018’, (October).

Van Broekhuizen, H. & Van der Berg, S. (2012) Graduate unemployment in South Africa : A much exaggerated problem Stellenbosch Economic Working Papers : 22 / 12 Graduate unemployment in South Africa : pp.1–53.

Van Broekhuizen, H. (2016) Graduate unemployment and Higher Education Institutions in South Africa. Stellenbosch Economic Working Papers. University of Stellenbosch [Online]. Available: <https://www.ekon.sun.ac.za/wpapers/2016/wp082016/wp-08-2016.pdf> [2019, March 15].

Van Wyk, D. (2014) The CA(SA) cake is only so big. Available: http://www.accountancysa.org.za/the‐ casa‐cake‐is‐only‐so‐big/ [2016, 13 June].

Verhaest, D., Sellami, S. and van der Velden, R. (2017) ‘Differences in horizontal and vertical mismatches across countries and fields of study’, *International Labour Review*, 156(1), pp. 1–23.

Visser, M. & Kruss, G. (2009) Learnerships and Skills Development in South Africa: a Shift to Prioritise the Young Unemployment. Journal of Vocational Education and Training, 61(3), pp. 357-374.

Zihindula, G. et al. (2019) A review on the contributions of NGOs in addressing the shortage of healthcare professionals in rural South Africa. *Cogent Social Sciences*, 0(0), pp.1–18.