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DEPARTMENT OF ECONOMICS

Investigating underemployment in South Africa

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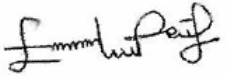
A full dissertation submitted in partial fulfilment of the requirements for the Doctorate Degree of
Economics

Supervisor: Derek Yu

November 2018

DECLARATION

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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ABSTRACT

Labour economists in South Africa have extensively researched on almost all aspects of the unemployment phenomenon, specifically, the levels and extent of unemployment as well as the causes of unemployment have received a lot of empirical attention. One category of the labour force, namely the underemployed, has mostly been ignored in empirical studies. An investigation into the prevalence and rate of underemployment is essential because unemployment alone underestimates the magnitude of a country's available excess labour capacity.

The study focuses on various conceptual and empirical issues, including the definition of underemployment, the extent of underemployment in South Africa, demographic characteristics of the underemployed, an empirical estimation of the total earnings effect of underemployment, the duration of underemployment, and the possible policy options to tackle underemployment. To achieve its research objectives, the study conducts various descriptive and econometric analyses, using the data from the 1995-2016 labour force surveys and the first four waves of NIDS conducted in 2008-2015.

The first empirical chapter examines the nature, extent, incidence, and likelihood of underemployment in South Africa. The study shows that a greater proportion of underemployed workers are Africans, women, urban residents, and individuals aged between 25 and 44. Moreover, a majority of time-related and income-based underemployed workers are involved in elementary jobs and domestic work while the overeducated are mostly managers and workers in elementary occupations.

The prevalence of overeducation and income-based underemployment is higher than the incidence of time-related underemployment. It is observed that some workers are affected by more than one type of underemployment. The results from the various probit models reveal that the likelihood of experiencing underemployment is higher for females (except for overeducation), Africans, informal sector employees, workers in the private households industry, and the self-employed.

The second empirical chapter mainly analyses the wage effects of educational mismatch in the South African labour market. The descriptive statistics revealed that Africans and elementary workers dominate the share of overeducated and undereducated workers, whereas Gauteng and KwaZulu-Natal are associated with the highest concentration of mismatched workers. Moreover, the proportion of overeducated workers is negatively related to years of work experience while the likelihood of workers being undereducated increases in line with the years of experience.

The empirical findings from the estimated wage models indicate that residing in an urban area, working in the public or the formal sector, and self-employment are associated with relatively higher earnings. Conversely, female workers and workers from the African, Coloured and Indian population groups earn less than male and White workers respectively. In general, overeducated workers receive substantively lower wages than what they would earn if they were employed in a job which adequately match their education. Conversely, the rate of return to undereducation is negative, but the undereducated benefit from a wage premium relative to being well-matched.

The final empirical chapter examines the dynamics of income-related underemployment and overeducation using panel data. It is found that income-related underemployment is short-lived, and it mostly affects individuals at the bottom-end of the income distribution. Close to 60 percent of overeducated workers find adequately matched jobs six years later, and most workers who move out of the overeducation spell change occupation from low skilled to high skilled jobs.

The results from the random effects probit model show that the probability of experiencing overeducation or income-related underemployment is higher for workers from the African and Coloured population groups, casual workers, and informal sector workers. Moreover, the estimated results from the multinomial logit model reveal that while age decreases the odds of moving from overeducation to adequate education, work experience allows workers to move out of overeducation.

JEL: J21, J23, J42, J60

KEYWORDS: Time-related underemployment, Income-related underemployment, Employment, Skills under-utilisation, Educational mismatch, Overeducation, Labour market, South Africa.

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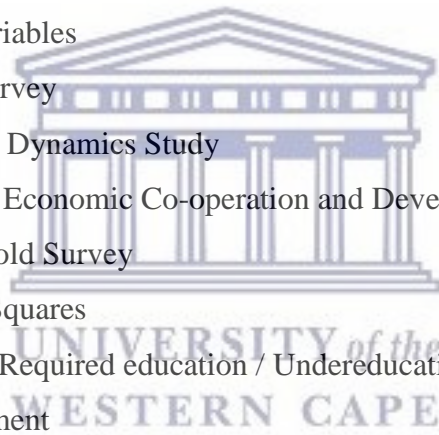
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LIST OF ABBREVIATIONS

BCEA	Basic Conditions of Employment Act
BP	Blanchard and Phillippo
CH	Caballero and Hammour
D&H	Duncan and Hoffman
DOT	Dictionary of Occupational Titles
HILDA	Household, Income and Labour Dynamics in Australia
ICLS	International Conference of Labour Statisticians
IES	Income and Expenditure Survey
ILO	International Labour Organisation
IQ	Intelligent Quotient
IV	Instrumental Variables
LFS	Labour Force Survey
NIDS	National Income Dynamics Study
OECD	Organisation for Economic Co-operation and Development
OHS	October Household Survey
OLS	Ordinary Least Squares
ORU	Overeducation / Required education / Undereducation
P-E	Person-Environment
P-G	Person-Group
P-J	Person-Job
P-O	Person-Organisation
P-V	Person-Vocation
QLFS	Quarterly Labour Force Survey
SALDRU	Southern Africa Labour and Development Research Unit
SASCO	South African Standard Classification of Occupations
SPF	Stochastic Production Frontiers
Stats SA	Statistics South Africa
TBVC	Transkei-Bophuthatswana-Venda-Ciskei
UK	United Kingdom



USA United States of America
V&V Verdugo and Verdugo



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CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

An efficient labour market ensures that a country's human resources are employed in the most effective manner to achieve full employment, if possible. Full employment entails the use of available labour resources in the most efficient way. Such efficiency can be achieved by matching workers with the most suitable jobs for their skillset as well as making the most productive use of their labour hours. The full employment of labour can lead to the creation of a decent society where there are jobs with decent wages and better working conditions. Moreover, the enhancement in labour income improves living standards and lowers the poverty rate of a country. In contrast, the underutilisation of labour resources in the form of unemployment, hidden unemployment and underemployment negatively affect earnings and consequently, the standard of living. Underemployment constitutes an important aspect within the quality of work framework¹ since it identifies workers who are inadequately employed. For many workers, the problem is not the lack of employment possibilities but rather the absence of adequate employment opportunities. The study of underemployment, thus, helps analyse the ability of the economy to provide full employment opportunities to all persons who are willing and available to work (Brown and Pintaldi, 2006:43).

In most labour markets, available human capital is usually underutilised because of the persistent imbalances between demand for and supply of labour (Wilkins and Wooden, 2011:13). Numerous studies in South Africa have been undertaken in an attempt to understand the extent of the imbalances within the labour market and devise policy measures to address such disparities. Nonetheless, these studies have largely focused on unemployment, while those that have dealt with employment levels have mostly focused on the profile and characteristics of the employed with little emphasis on underemployment. As highlighted by Laurie (1997:1), estimates of employment and unemployment do not sufficiently describe the labour market performance of most countries. Employment aggregates as they are may not sufficiently reflect whether the

¹ The International Labour Organisation's framework for measuring job quality includes dimensions such as adequate earnings and productive work; decent hours; stability and security of job; fair treatment in employment; social protection; safe work environment; etc. (ILO, 2012).

available labour resources are fully utilised or not. It is because even in the face of growing employment levels, there could still be excess capacity in the labour market due to the presence of underemployment (Berger, Bollinger and Coomes, 2003:1). Therefore, to fully reflect the different aspects of the labour market situation, employment and unemployment estimates need to be complemented with other measures such as underemployment. Wilkens and Wooden (2011:30) consider underemployment as an economic inefficiency which stems from the inability of the employed to fully use their skills or time more productively. Underemployed, is therefore, conceptualised based on the inability of worker to find jobs that offer sufficient work hours, the underutilisation of workers' skills, and working in low-paying jobs.

Even though unemployment statistics provide a good starting point to evaluate the performance of the labour market, it is imperative to take into consideration the lack of decent work amongst the employed. Sparreboom and De Gier (2008:3) emphasise that workers are considered as vulnerable if they are at risk of lacking decent work. Bazillier, Boboc and Calavrezo (2016:265) as well as Lass and Wooden (2017:1) state that the increase in the number of atypical job contracts and job turnover are two common trends that have been observed throughout Europe in recent decades. On the other hand, most developing countries have higher rates of employment in the informal sector where there is a lack of social protection and enforceable employment contracts (Heintz and Posel, 2008:26). The proliferation of employment arrangements such as fixed-term contracts, part-time jobs, temporary work and a concomitant decrease in full-time as well as permanent employment can be described by the concept of "employment vulnerability". The International Labour Organisation (ILO) (2010:18) regards vulnerable employment in terms of the risk of working under inadequate conditions, such as difficult working environments and inadequate earnings, which in turn undermine workers' rights to better employment conditions.

All countries, regardless of size, need adequate statistics on underemployment. For instance, Schucher (2017:73) postulates that most graduates in China are not worried about unemployment per se but are rather concerned about unsatisfying job opportunities, declining likelihood of upward career mobility, and starting salaries that are lower than expected. Underemployment statistics are particularly relevant in a developing country context because many workers in these economies engage in some forms of labour market activities, no matter how inadequate they may

be, just to be able to make a living (Husmanns, 2007:17). The OECD (2014:3) also reveals that many emerging economies are faced with chronically high levels of underemployment, such that a number of workers in these economies are unable to fully utilise their skills as they are trapped in low-paying occupations and informal jobs. Even in advanced economies, underemployment statistics is pertinent because of the increase in non-standard employment practices in these countries (Husmanns, 2007:17).

Underemployment is closely linked to unemployment because insufficient work opportunities can force people to either work below their occupational competencies or seek part-time employment, thereby working fewer hours just to earn some form of income for survival. Julian, Hall and Yerger (2010:19) argue that the persistently high rates of unemployment can be associated with higher rates of underemployment, because a weaker demand for labour can force individuals to settle for inadequate employment conditions. It is therefore assumed that the provision of partial unemployment benefits to part-time workers can make part-time jobs more attractive, which can motivate the unemployed to seek part-time jobs and ensure active labour market participation. Subsidising part-time workers with partial unemployment benefits can incentivise people to move out of unemployment but such benefits may also hinder part-time workers from opting for full-time employment (Ek and Holmlund, 2011:4).

Despite the prevalence of underemployment in South Africa, relatively little empirical and policy attention has been devoted to this phenomenon. This study thus aims to fill the existing research gap in this area. It is expected that there would be more research into the problem of underemployment as labour market statistics evolve and expand in coverage.

1.2 Problem Statement

Regardless of whether it is perceived or real, underemployment can have adverse consequences. The perception of underemployment can have a huge influence on workers' attitudes and behaviour. It can lead to job dissatisfaction, low level of job involvement, and poor mental health (Lee, 2005: 172). Feldman (1996:396) posits that the underemployed have lower job satisfaction, lack work commitment, and are inadequately motivated to work effectively. The underemployed

have negative attitudes towards work because the extrinsic and intrinsic rewards they receive, in terms of earnings and feelings of accomplishment, are generally inadequate (Feldman, 1996:396). When workers are involuntarily unable to fully utilise their acquired skills, they usually become dissatisfied and alienated from work (Glyde, 1977:257).

Underemployment also has significant social costs and economic implications. It leads to wastage of knowledge and skills in the workplace (Livingstone, 1999:177). Employers should be concerned about underemployment because it can cause employee disengagement (Kazan, 2012:2). Employers generally seek workers who are self-motivated and engaged in their work. Having an engaged workforce is a key competitive advantage for many high-performance organisations because engaged employees can impact positively on customer services and employee retention. Kazan (2012:2) states that the costs of underemployment to an organisation are as follows: low productivity, high turnover, low morale and loyalty, high customer churning and workplace stress. Moreover, the underemployed may not be able to improve and fully develop their acquired skills since they do not get the needed on-the-job training which compliments their skill. Therefore, for the young and entry-level employees, the consequence of underemployment is the lack of opportunities to gain the necessary work experience to be able to fully develop their careers in their chosen fields (Ruiz-Quintanilla and Claes, 1994:6).

Overeducation, which is one of the types of underemployment (to be discussed in Chapter Two), is a cause of concern for individuals, because of a possible wage penalty, and for policymakers, due to the waste of available labour resources (Caroleo and Pastore, 2013:2). McGuinness (2006:388) suggests that at the individual level, the underemployed are likely to earn lower return on their human capital investment since a proportion of their educational investment becomes idle and unproductive. Cutillo and Di Pietro (2006:143) also accentuate that there is a consensus across the literature that overeducated individuals earn relatively less income in relation to their appropriately educated peers. This conclusion appears to be at odds with the traditional human capital theory which stipulates that, at least in the long term, workers' earnings are exclusively based on their human capital investments. It therefore seems that underemployment can have a significantly negative impact on an individual's returns to human

capital investment in the form of lower earnings. However, the impact of underemployment on income has been scarcely researched in South Africa.

Apart from causing tremendous hardships to the affected individuals and households, underemployment presents a waste of human resources. At the macroeconomic level, underemployment is potentially costly because it can lower national welfare (McGuinness, 2006:387) and reduce a country's output potential (OECD, 2014). Although there is a lack of empirical evidence regarding the impact of underemployment on productivity, the general presumption is that the underemployed are not motivated enough to achieve better performance and hence their productivity will be low (Feldman, 1996:398).

Within the South African labour market, underemployment has received little empirical attention compared to unemployment. Given its possible detrimental consequences, it is important to investigate the prevalence and extent of underemployment in the South African labour market. This study is designed to address the following research questions:

- (1) What are the socio-economic indicators and demographic characteristics associated with the various types of underemployment, compared with the fully employed?
- (2) What is the impact of underemployment on earnings?
- (3) Is underemployment a temporary or chronic phenomenon?

1.3 Objectives of the Study

The general objective of the study is to examine the prevalence, trends and effects of underemployment in South Africa. In particular, the following specific research objectives have been identified:

- (1) To determine the demographic and work characteristics of the underemployed as well as the socio-economic indicators of, and the trends in underemployment;
- (2) To compare the earnings of underemployed and other employed with the aid of various econometric techniques;
- (3) To examine whether underemployment is a short-term or long-term phenomenon using panel data.

1.4 Significance of the Study

Much of the empirical attention within the South African labour market has been devoted to employment and unemployment. More precisely, work activities of the employed, the extent of unemployment, causes of unemployment, and econometric analysis on the likelihood of unemployment by various demographic characteristics have been extensively researched (e.g. Kingdon and Knight, 2004 and 2007; Banerjee, Galiani, Levinsohn, McLaren and Woolard, 2008; Borat, 2009; Yu, 2013). Underemployment, on the other hand, has hardly been researched. From a policy point of view, the achievement of a low unemployment rate has remained an important macroeconomic goal since the political transition. However, the attainment of this laudable goal might not always lead to an efficient outcome because some individuals may be employed below their desirable hours of work, income and skills endowments. It is possible that some of the employed may be involuntarily working shorter hours, in low-income occupations, or in activities in which their labour resources are not fully utilised as a result of educational mismatch². Since underemployment is increasingly becoming a growing component of labour market inefficiency, it deserves more empirical attention. This study would improve the research of the underemployment phenomenon in South Africa.

Moreover, it may be possible that the policies aimed at addressing unemployment may not be appropriate in dealing with underemployment. Therefore, it is worthwhile to discover how significantly different the underemployed are from the unemployed in terms of demographic characteristics and how distinct the determinants of these two labour market outcomes are. This study would provide some answers to that effect by thoroughly examining the underemployment phenomenon in South Africa. Statistics on underemployment captures the extent to which available labour hours and the human capital endowments of those who are partially employed are underutilised. Information on underemployment is therefore essential for macroeconomic policy formulation and human resource development planning. The study would help evaluate whether the employment opportunities that the economy generates fall within the ILO's decent work framework in terms of adequate earnings, productive work and decent work hours.

² Educational mismatch occurs when the educational achievements of workers outweigh the demand for skills (Korpi and Tåhlin, 2009:183).

It is also necessary to ascertain why the underemployed choose to stay in jobs in which their skills or labour hours are not fully utilised and their income expectations are not met. For the sake of public policy formulation, it is imperative to identify the barriers within the labour market which prevent individuals from working in jobs that make the most efficient use of their skills and labour hours or pay adequate remuneration. This study would outline some of the causes of underemployment in South Africa and identify individuals who are most likely to be affected by this labour market anomaly.

It is widely claimed that overeducation does not only cause market inefficiency, but it also punishes workers in the form of wage penalties. The findings of this study will help determine if indeed the overeducated and the income-related underemployed in South Africa receive lower earnings as portrayed by the global literature on the subject. The study would therefore help evaluate the exact wage effect of the underemployment phenomenon in South Africa. Furthermore, the lower earnings associated with underemployment can also have an impact on poverty. The results of the study would highlight how underemployment contributes to poverty.

1.5 Structure of the Study

This study is structured into seven chapters. Chapter One provides the background by discussing labour market inefficiencies in general and underemployment in particular. The chapter also highlights the purpose, research questions and objectives of the study. The importance of the empirical study of underemployment in the South African context is also discussed.

Chapter Two is organised into three parts: the first part focuses on the definitions and types of underemployment, while the second part discusses various theories of underemployment such as the market segmentation theory, human capital theory and the career mobility theory; the final part of the chapter reviews the empirical findings of recent local and international studies.

Chapter Three concentrates on the research methodology of the study by analysing the empirical models and discussing the data used in the study. Chapter Four addresses the first research objective by exploring the extent, nature and prevalence of underemployment as well as the

demographic characteristics of the three main categories of underemployed individuals in South Africa. Chapter Five addresses the second research objective by examining the earnings differences between the underemployed (focusing on the overeducated underemployed) and the fully-employed. Chapter Six examines the underemployment dynamics in South Africa to ascertain whether it is a transitory or permanent condition, with particular focus on underemployment according to the overeducation and income definitions.

Finally, Chapter Seven concludes the study by providing a synthesis of the main findings and their policy implications. Apart from making some policy recommendations, the chapter also suggests other areas that require further research.



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CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The official unemployment aggregates underestimate the actual number of individuals who seek full-time jobs. Glyde (1977:245) is therefore of the view that a more comprehensive measure of labour market failure, in the form of an underutilisation of human resources, should include the level of underemployment. People who are underemployed are not too distinct from those that are unemployed since both groups are associated with an inefficient utilisation of labour resources. While the unemployed lack the opportunities to use their human capital at all, the underemployed are in some form of employment but their human capital is not fully utilised (Hussmanns, 2007:17). As emphasised by Berger et al. (2003:1), the underemployed would generally want to change jobs if they could be hired in alternative employment which offers them longer working hours, matches their skills and possibly pays higher wages. This chapter starts off by analysing the underemployment literature with emphasis on the definition of some important concepts, including the types of underemployment in Section 2.2. This is followed by Section 2.3, which discusses the theories underpinning the underemployment phenomenon such as human capital theory, career mobility theory, job competition theory and assignment theory. Both local and international past empirical studies are reviewed in Section 2.4 to ascertain the extent of work which has already done and the gaps that still need to be filled. Section 2.5 concludes the chapter.

2.2 Definition of Concepts

The concept of underemployment came up for discussion for the first time in 1925 at the 2nd International Conference of Labour Statistician (ICLS). However, the first international statistical definition was only adopted in 1957 (Brown and Pintaldi, 2006:43). As pointed out by Wilkins (2004:4), a formal resolution to clarify the definition of underemployment was later adopted in 1966 at the 11th ICLS. In 1998, a more comprehensive measurement of underemployment was the subject of discussion at the 16th ICLS (Greenwood, 1999:1).

Consequently, the international standards for the statistical measurement of underemployment were revised at the 16th ICLS with the hope of making underemployment easily identifiable.

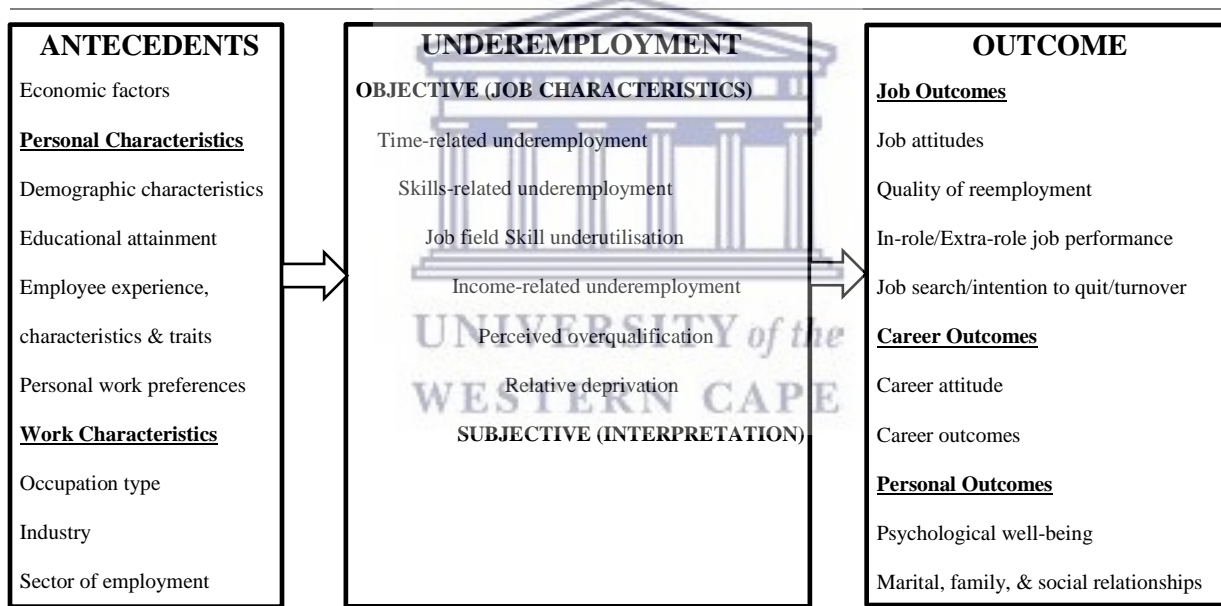
Underemployment is primarily defined by economists and sociologists in terms of lower wages, overeducation, and intermittent employment (Lee, 2005:174). Feldman (1996:388) particularly outlines the following dimensions of underemployment:

- (1) Individuals who possess a higher qualification than their jobs require;
- (2) Workers who are involuntarily working in fields which are outside the scope of their formal education;
- (3) People who have more extensive work experiences than their jobs require;
- (4) Individuals who are involuntarily employed in part-time, temporary or intermittent positions;
- (5) Workers who earn less in their current employment than they did in their previous jobs or earn less than the average income of individuals with equivalent qualification and experience.

Underemployment provides a useful avenue to conceptualise the lack of employment adequacy, a term that explains the degree to which workers are employed in full-time positions which pay a living wage (Slack and Jensen, 2002:212). Moreover, underemployment is a relative concept, which means that individuals are regarded as underemployed in relation to some standards (Glyde, 1977:250). The underemployed work fewer hours than their preferred number of hours or work in jobs that require less formal education and work experience than what they possess. Thus, they receive lower wages and fewer benefits relative to those who are fully employed. Measuring underemployment is important for both developing countries and advanced economies (Laurie, 1997:1). The lack of unemployment relief programmes in most developing countries constraint unemployed individuals to engage in marginal economic activities which make them susceptible to underemployment. Likewise, in most advanced countries, employed persons experience inadequate employment situations which push them into the underemployment pool.

As indicated in Figure 2.1, there are certain factors which are correlated with underemployment. Workers' susceptibility to underemployment is linked to economics factors, job characteristics and personal characteristics. For instance, economic factors like recessions are likely to result in underemployment. Also, personal characteristics such as education, experience and demographic characteristics may influence the prevalence of underemployment. Underemployment can be measured or explained either objectively (for example, time-related underemployment or overeducation measured per the job analysis and realised matches approaches) or subjectively (such as perceived overqualification). Furthermore, underemployment has been linked with consequences such as poorer job attitudes, negative effects on performance and psychological well-being, and a positive correlation with turnover.

Figure 2.1: Antecedents and consequences of underemployment

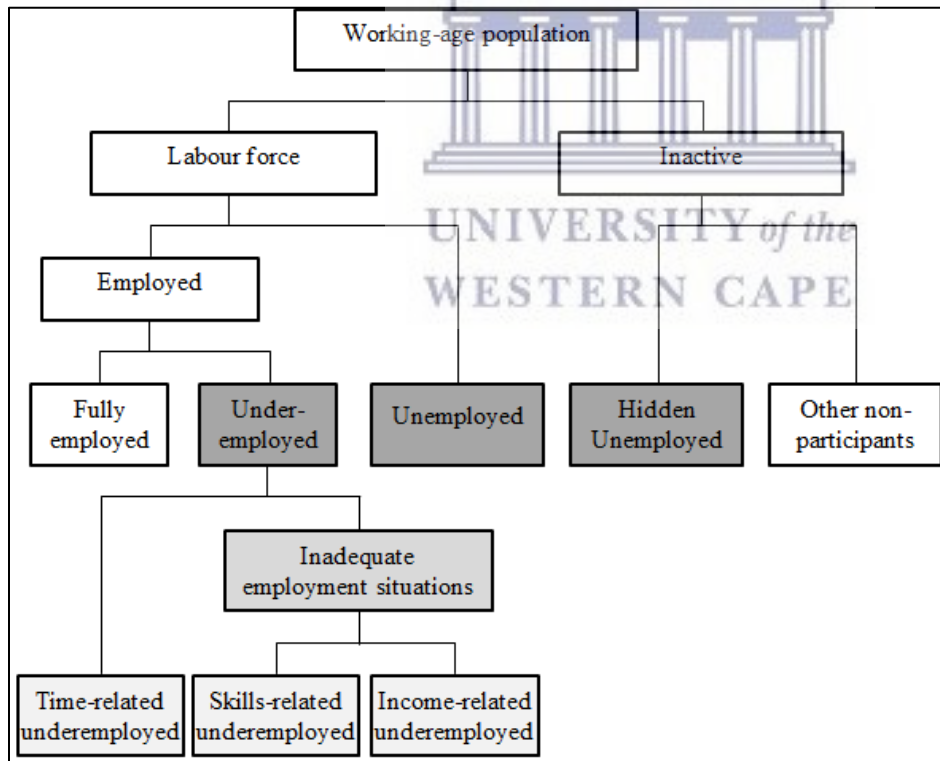


Source: Adapted from Mckee-Ryan and Harvey (2011:971)

The underutilisation of labour force can be distinguished into three main forms, namely: (1) jobless active people (unemployed); (2) individuals who work fewer hours than what they desire; (3) workers who underuse their skills (Ponthiere, 2008:98). The last two forms of labour underutilisation stated above constitute time-related underemployment and skill-related underemployment respectively. Figure 2.2 gives an illustration of the conceptual framework pertaining to the underutilisation of labour. As the figure depicts, the three main groups that

constitute labour underutilisation are the unemployed, the underemployed and the hidden unemployed. Hidden unemployment (also known as disguised unemployment) involves persons who are jobless but are excluded from official unemployment figures. For example, the hidden unemployed include people who no longer actively look for work because they returned to school for further studies or they decided to stay home with their children. The hidden unemployed, although not active in the labour force like the unemployed and the underemployed, still form part of the labour underutilisation framework because of their desire for work. The underemployed, on the other hand, do participate in the labour force but they either work fewer hours or employ in inadequate situations which they desire to change for reasons that their capabilities are not fully applied and their well-being is not maximise. Some studies (e.g. Ruiz-Quintanilla, 1994; Findeis, Shields and Shrestha, 2009) even consider underemployed as those who are unemployed but looking for work.

Figure 2.2: Labour force underutilisation framework



Source: Adapted from Wilkins and Wooden (2011:15).

There is a close association between unemployment and underemployment. Unemployed job seekers may consider part-time jobs or short-term contracts as a temporary solution if full-time jobs are not readily available (Kyyrä 2010: 911). Cahuc and Carcillo (2011:3) posit that part-time or short-term employment may seem to be a good initiative to keep unemployment levels down during recessions. However, in instances where part-time wages are relatively low compared to unemployment benefits, individuals may prefer to remain unemployed rather than being part-time employed (Kyyrä 2010: 911). For this reason, many countries (including USA, some European countries and all Nordic countries) have unemployment insurance systems that extend eligibility to involuntary part-time workers by providing them with partial benefits (Kyyrä 2010:911). Incorporating part-time and short-term workers into an unemployment insurance system can thus provide a justification for these types of employment (Cahuc and Carcillo, 2011:15).

When unemployed job seekers are offered the opportunity to combine unemployment insurance benefits with part-time work, it can incentivise claimants to maintain their participation in the labour market. Godøy and Røed (2014:1) postulate that such initiative could be considered as a strategy for reducing the overall length of the job search period. This is because part-time work may serve as a stepping stone to find regular employment, especially in instances where employers use temporary or part-time jobs as a screening device or where the networks formed during part-time employment make it easier to find full-time jobs. On the contrary, providing unemployment insurance benefits to underemployed workers may distract them from engaging in more rigorous job search activities (Godøy and Røed, 2014:1). It may also raise the reservation wages of the claimants since the combined unemployment insurance benefits and the part-time wages may be relatively more attractive.

Kyyrä (2010:911) argues that subsidising part-time and short-term employment via the unemployment compensation system can enhance labour market efficiency if such jobs facilitate subsequent transitions into full-time work. Active labour market participation via part-time jobs can help maintain and upgrade professional skills, weaken the stigmatisation linked to extended periods of being unemployed, and provide contacts with potential employers (Kyyrä 2010: 913).

However, subsidised part-time employment may lead to a lock-in effect since some workers may no longer be proactive in searching for full-time jobs (Kyyrä 2010: 913).

There are several but identical classifications of underemployment across the literature. In all these classifications, two key elements underline the definition of underemployment (Feldman, 1996:387). First, underemployment is a type of employment that is either of a lesser quality or quantity. Second, underemployment is defined relative to some standard such as the employment situation of other workers with similar credentials.

The 16th ICLS in 1998 categorises underemployment into time-related definition and inadequate employment situations. Prior to 1998, time-related underemployment was regarded as visible underemployment while inadequate employment situations were termed as invisible underemployment (Brown and Pintaldi, 2006:44). While time-related underemployment refers to a case of insufficiency in the volume of work due to limited hours, inadequate employment situations entails a variety of other limitations in the labour market (Wilkins and Wooden, 2011:15).

2.2.1 Time-related underemployment

Time-related underemployment refers to a situation where an employed person's actual hours of work are insufficient relative to the number of hours that the individual is willing and available to work (Hussmanns, 2007:18). Tam (2010:8) also defines time-related underemployment as the mismatch between workers' preferred and actual number of working hours. Time-related underemployment is also sometimes referred to as quantitative or visible underemployment. Quantitative underemployment pertains to hours of work and refers to individuals who, due to the nature of their employment contract, work fewer hours or work for shorter periods than they prefer (Ruiz-Quintanilla and Claes, 1994:5). Similarly, visible underemployment relates to individuals who work relatively fewer hours than the normal working hours, although they are available and interested in working full-time (Ruiz-Quintanilla and Claes, 1994:5). Visible underemployment affects workers who are not in full-time employment and prefer to work more hours than they do in their current jobs (Jensen and Slack, 2003:23).

Feldman (1996:388) points out the fact that underemployment involves individuals who are voluntarily engaged in part-time, temporary, or intermittent employment. An involuntary part-time or under-used labour force is associated with workers who prefer to work full-time but are employed in jobs associated with inadequate work hours (Kazan, 2012:1). This dimension is embedded in the time-related definition. Brown and Pintaldi (2006:44) accentuate that some OECD countries define time-related underemployment as involuntary part-time employment.

In relation to time-related underemployment, an individual must be willing and available to work additional hours while also satisfying the condition that his/her actual hours worked are less than the expected threshold (Wilkins, 2007:251). Defining the threshold or the ideal hours of work is a difficult task. An approach that is usually adapted is to use work hours of full-time employees as the threshold (Wilkins, 2007:252). This implies that full-time workers cannot be underemployed. Thus, underemployment is often regarded as involuntary part-time employment as mentioned above. Note that the ILO definition of underemployment does not take into consideration full-time workers who would still like to work more hours (Wilkins, 2007:253).

The primary economic reasons why workers may involuntarily work fewer hours include unfavourable business conditions and the inability to find full-time employment (Walling and Clancy, 2012:16). Hussmanns (2007:18) as well as Wilkins and Wooden (2011:15) explain that for individuals to be considered as time-based underemployed during a particular reference period, they must satisfy the following conditions simultaneously, as outlined by the ILO:

- (1) Show that they were willing to work additional or extra hours;
- (2) Demonstrate that they were available to work for those additional hours; and
- (3) Prove that they had worked fewer hours relative to a predetermined threshold.

On the basis of the ILO's criterion, the willingness of an employed person to work more hours during the reference week constitute the starting point in identifying the time-related underemployed. The second important aspect of the definition of time-related underemployment is the availability of the underemployed persons to work the additional hours they desire. After confirming a person's willingness and availability, the next step is to determine a threshold of adequate work hours below which the person can be considered as time-related underemployed.

The 1998 resolution of the ILO states that the choice of a threshold should be at the discretion of national statistical agencies.

As emphasised by Yu (2009:20), Statistics South Africa (Stats SA) defines the time-related underemployed as workers who:

- (1) Are willing and available to work extra hours;
- (2) During the reference week worked fewer than 35 hours; and
- (3) Are able to start an extra work in the next four weeks if the additional work is available.

The Stats SA definitions incorporates all the conditions outlined by the ILO and even adds another dimension, which is the ability of the underemployed worker to take up extra work in the next four weeks if the work is available. Stats SA also specifies the referent threshold of adequate hours of work, which the ILO left open for national statistical agencies to decide, at 35 hours. This detailed definition of time-related underemployment by Stats SA only became available in 2008 after the Quarterly Labour Force Survey (QLFS) was adopted (this is discussed in detail in Chapter Three).

2.2.2 Inadequate employment situations

The ILO defines inadequate employment situations as any situation where the workers have a desire and are available to change their current work situation because it limits their capabilities and well-being. This type of underemployment is also regarded as qualitative or invisible underemployment. Individuals are classified as qualitatively underemployed when they are in jobs that are below their levels of qualification and experience (Ruiz-Quintanilla and Claes, 1994:5). Ruiz-Quintanilla and Claes (1994:5) also explain that invisible underemployment takes the form of insufficient compensation for labour or the inability of workers to efficiently use their competencies and educational qualifications. Invisible underemployment affects workers in full-time employment who work in positions which underutilise their skills and/or offer low economic returns (Jensen and Slack, 2003:23). These workers usually earn less than the ideal remuneration.

The two essential elements of the adequate employment situations' definition are: (1) the willingness to change work situations; and (2) the presence of a reason why individuals are not able to either fully use their capabilities or maximise their well-being. As pointed out by Glyde (1977:246), underemployment is defined by the Gordon Committee³ as the employment of individuals in work situations that requires less qualifications than their highest acquired qualification and at jobs that pay less than what their skills would normally entitle them to. The three sub-categories of inadequate employment situations are skills-related underemployment, income-related underemployment, and excessive working hours. This study focuses on the first two sub-categories. The excessive working hours category is a direct opposite of time-related underemployment and hence will not be the focus of this study.

2.2.2.1 Skills-related underemployment

Skills-related underemployment is defined as an involuntary employment condition where the skills of workers, regardless of whether they work full-time or part-time, are underutilised and consequently undervalued relative to what is earned by other individuals who have made similar investment in developing their skills (Glyde, 1977:246). Wilkins and Wooden (2011:25) postulate that skill-related underemployment occurs when the skills possessed by the worker exceeds the skill requirements of his/her job. Skill-related underemployment is thus based on a direct comparison between the skills possessed by workers on the supply side of the labour market and the skill requirements of jobs on the demand side (Glyde, 1977:249). The focus is on how efficiently workers utilise their present skills, not past or potential skills.

The credential- and performance gap can be regarded as the two dimensions of skill-related underemployment. Credential gap pertains to the mismatch between the educational attainments of workers and the entry requirements of established jobs (Livingstone, 1999:172). It occurs when there is a surplus of education, that is, the credentials attained exceeds credentials required (Livingstone, 1999:173). In this case, workers have higher credentials than what their jobs require for entry. Performance gap, on the other hand, explains the difference between the educational attainments of jobholders and the actual task requirement of their occupations

³ Gordon Committee was a U.S. President's Committee that was instituted to appraise employment and unemployment statistics and produced its report in 1962.

(Livingstone, 1999:172). It occurs when an employee's skill level is higher than the skills required to perform his/her tasks (Livingstone, 1999:174).

Glyde (1977:247) also identifies two forms of skills-related underemployment, namely intra-skill and inter-skill underemployment. Intra-skill underemployment occurs when certain individuals in a particular skill group are unable to adequately utilise their skills compared to others in the same group who have equivalent ability and occupational development. This type of underemployment has nothing to do with the general marketability of the workers' skills but may be caused by factors such as discrimination and employers' perceived costs of search. In contrast, inter-skill underemployment occurs when the skills of the average individual, within a particular skill category, are underutilised relative to the typical individual from other skill groups. McGuinness (2006:387) states that when labour demand is insufficient in employing workers with a particular kind of skills, they may be forced to seek employment in jobs for which they are overeducated. Shifts in labour demand and supply across occupations, imperfect information, and lags in labour market adjustments are some of the sources of inter-skill underemployment.

Overeducation⁴, a term which is often used to describe skills-based underemployment, is extensively discussed in the underemployment literature. Rubb (2003:389) defines overeducation as a situation where an individual has a higher educational attainment than the qualification that is required to perform in his/her job. Employees are regarded as overeducated if their skills exceed the skills needed to perform their current jobs (Dekker, De Grip and Heijke, 2002:112; Büchel and Van Ham, 2003:483; Kazan, 2012:1). Thus, overeducation entails a mismatch between a worker's acquired skills and skills required for the job (Haddad and Habibi, 2017:46).

There are two types of mismatch, namely horizontal mismatch and vertical mismatch. Horizontal mismatch occurs when there is a disparity between a worker's field of study and the content of his/her job (Verhaest et al., 2017:1), while vertical mismatch occurs when the skills or education of a worker is either more than or less than the level required for the job Haddad and Habibi (2017:46). Overeducation can thus be considered as a vertical mismatch.

⁴ Overeducated workers are regarded as underemployed based on the skills-related definition. Thus, overeducation is used interchangeably with skills-related underemployment throughout this study.

Leuven and Oosterbeek (2011:6) claim that overeducation can arise when highly educated individuals compete for a limited number of skilled jobs, which puts a downward pressure on wages. The general assumption is that, in order to keep up with the rapidly growing requirements of a knowledge economy, people have to intensify their learning efforts. As pointed out by Livingstone (1999:163), the pursuit of a knowledge society, which is able to cope with the growing demands of the knowledge economy, has led to an unprecedented high rate of formal schooling and informal learning. Better-educated individuals are employed in more prestigious occupations and earn higher wages than their less well-educated counterpart (Dolton and Silles, 2008:125). However, the occupational structure of the labour market does not always have the absorptive capacity for the proliferated number of educated individuals, leading to overeducation.

The upsurge in educational attainments without appropriate job opportunities to apply the acquired skills gives rise to the overeducation phenomenon. Livingstone (1999:164) argues that we are already in an era where the stock of acquired knowledge outweighs the knowledge requirements of the economy. Many young workers are considered to be overeducated at the start of their careers (Battu, Belfield and Sloane, 1999; Dolton and Vignoles, 2000; Sloane, 2014). Livingstone (1999:164) asserts that high levels of adult learning and educational attainment coexist with rapidly growing rates of underemployment. The main problem that leads to the rise of the education-job gap is the relative withering of good jobs with decent remuneration. According to Büchel and Van Ham (2003:483), a shortage of appropriate jobs is deemed to be the underlying reason for the overeducation of some workers. Rubb (2003:390) argues that overeducation exists partly because certain individuals prefer to be in some form of employment, even if it is a second-best employment, rather than being unemployed. Moreover, the persistence of overeducation can be explained by structural discrepancies in the relative supply of and demand for qualified workers (Büchel and Mertens, 2000:15).

Overeducation is sometimes seen as a rational choice for entry-level workers to gain the necessary work-related experience to be able to move up the career ladder in the future. However, overeducation may also delay one's transition to an adequate job (Baert, Cockx and Verhaest, 2013:124). For some individuals, overeducation cannot be regarded as a temporary situation to gain experience and move on to adequate jobs, but a long-term phenomenon. Baert et al.

(2013:135) expound that certain individuals may be trapped into overeducation due to factors such as reduced job search intensity, a negative signal of overeducation to employers, job-specific human capital investment and cognitive decline.

The methods used in the measurement of overeducation can be grouped into two, namely the subjective approach and the objective approach. Under the subjective approach, workers can either be asked to make a comparison between their own assessment of the minimum requirements of their jobs and their educational qualifications (McGuinness, 2006:396) or asked to state directly whether they perceive themselves to be underemployed (Wilkins and Wooden, 2011:26). Perceived underemployment is regarded as an individual's opinion that he/she is employed in an inferior or lower-quality type of employment where his/her skills and ability are not fully utilised (Lee, 2005:172). The objective approach, on the other hand, relies on objective measures such as comparing workers' actual level of educational attainment with the specified requirements of the job or the qualification attained by peers employed in the same occupation. The objective approach can further be divided into the normative and statistical methods (Guironnet, 2008:3). Both methods use aggregate information and ignore the heterogeneous nature of the roles of individual workers in an occupation. For both the subjective and the objective approaches, required education is used as the basis for defining overeducation or undereducation. Across the literature, the approaches that are used in measuring required education are grouped into three broad categories, namely worker self-assessment, job analysis and realised matches methods.

Worker self-assessment method: With this approach, the worker subjectively specifies the level of education that is required for the job (Hartog, 2000:132; Tsai, 2010:607; Leuven and Oosterbeek, 2011:9; Morgado, Sequeira, Santos, Ferreira-Lopes and Reis, 2016:163). Hartog (2000:132) points out that the specification of the required level of education may either be direct or indirect. Across the literature, two distinct techniques have been adopted to measure overeducation based on the self-assessment method. The first technique asks workers which educational level is required to be considered for employment into the job while the second technique asks them to state the level of education that is required to actually perform the tasks assigned to the job (Guironnet, 2008:3). The worker self-assessment approach has the advantage

of drawing on all up-to-date local information and precisely deals with the respondent's job rather than aggregate information based on a collection of jobs (Hartog, 2000:132). Pecoraro (2013:4) states that this method is less prone to measurement errors as it deals precisely with the workers' jobs and not with some kind of aggregates, such as the average qualification of workers. A possible drawback of this approach is that respondents can easily inflate the status of their position by overstating the requirements of their job (Hartog, 2000:132). In addition, there may be variations in workers' responses even though the workers may be in the same occupation (Tsai, 2010: 607).

Job analysis method: This method uses the evaluation of occupations which is provided by expert job analysts (Tsai, 2010:607; Leuven and Oosterbeek, 2011:11). The worker's employment situation is compared with the standard match specified by professional job analysts in an occupational classification, such as the Dictionary of Occupational Titles (DOT)⁵ in the United States (Morgado et al., 2016:163). Hartog (2000:132) emphasises that job analysis involves a systematic evaluation of the level of education required for the job titles within a given occupation. This approach, as stated by Hartog (2000:132), is conceptually attractive, due to its objectivity, clear definitions and detailed measurement instructions. This measure is also attractive because it is based on the experts' knowledge of the job (Leuven and Oosterbeek, 2011:11). Verdugo and Verdugo (1992:692), however, assert that the validity and reliability of the job analysis approach is doubtful because per the DOT handbook only a single job analyst goes to the job site to discuss the requirements with the employer. Another disadvantage this approach is that occupational classifications are expensive to carry out and are therefore not updated frequently (Hartog, 2000:132).

Realised matches or statistical approach: In this approach, the measurement of required education is derived from the general or usual educational attainments of workers within a certain occupation. Hartog (2000:133) explains that realised matches measure allocation and actual assignment practices based on hiring standards and labour market conditions. Educational mismatch is measured by comparing a worker's level of education to the mean or mode of the

⁵ The DOT, a publication by the United States Department of Labor, was created by job analysts who visited numerous worksites in the US to observe and record information pertaining to the various types of jobs.

educational attainment of workers in the same occupation (Hartog, 2000:132; Tsai, 2010:609; Morgado et al., 2016:163). Leuven and Oosterbeek (2011:11) explain that the required level of schooling for an individual is inferred from the mean of completed schooling for all individuals who are employed in that occupation. As Verdugo and Verdugo (1989:632) and McGuinness (2006:396) accentuate, an overeducated worker is someone whose education is more than one standard deviation above the mean level of education in his/her occupation. Tsai (2010:609) on the other hand states that a relatively new technique which falls under realised matches is to measure required schooling using the most frequent level of education (mode) within an occupation as used by Kiker, Santos and De Oliveira (1997). Based on the mode measure, a worker is overeducated if he/she has more amount of schooling than the mode of completed education within his/her occupation (Leuven and Oosterbeek, 2011:11). An advantage of the realised matches approach, as pointed out by Morgado et al. (2016:165), is that it guarantees international comparison of results.

2.2.2.2 Income-related underemployment

Wilkins and Wooden (2011:16) emphasise that income-related underemployment has been scarcely researched. A more comprehensive analysis of underemployment should, however, take income-related underemployment into consideration. It is because both the time-related and skills-based definitions do not take into account individuals who are in inadequate employment situations for the reason that they receive lower income. Brown and Pintaldi (2006:55) argue that the time-related definition does not include individuals who work more hours but earn less income while the skills-related definition does not consider highly-skilled individuals who are employed in highly-skilled occupations but earn low income.

Findeis et al. (2009:9) postulate that the underemployed also include workers who earn low income, putting them in the category of the working poor. Income-related underemployment captures individuals who are willing and available to change their current work situation to increase their income (Sauders, 2015:19). Wilkins and Wooden (2011:16) state that per ILO's definition, income-related underemployment is only possible when an employed person's income is lower than it would otherwise be because of certain arrangements at the workplace.

Brown and Pintaldi (2006:55) state that there is the need for an adequate income threshold, which is an objective measure, below which individuals can be regarded as being income-related underemployed. Clogg, Sullivan and Mutchler (1986:377) explain that when measuring income-related underemployment, the previous years' work-related earnings for all full-time workers are adjusted for weeks worked and compared to a normative weekly wage. The normative week wage is defined as 1.25 times the poverty threshold. Workers are classified as low-income underemployed when their weekly earnings are below the normative weekly wage (Clogg et al., 1986:377). Nord (1989:410) as well as Findeis et al. (2009:11) also define income-related underemployment as the inability of participants in the labour force to earn above 125 percent of the individual poverty-level income during the previous year. Clogg et al. (1986:377) point out that although using the previous year's earnings might not be ideal, they are the only available income data. Clogg et al. (1986:377) explain that the purpose of using the 1.25 multiplier is to adjust the poverty threshold for the conservative bias introduced by adopting individual rather than household scores.

Some economists on the other hand prefer the use of a relative measure where the key variable is income loss relative to the individual's previous income (Sauders, 2015:19), but panel data is required for this type of analysis. For example, Feldman (1996:388) suggests that one of the dimensions of underemployment is categorised as individuals who earn 20 percent or less than what they earned previously. For new graduates, the earning should be 20 percent or less than the average income of graduating cohort in the same major or occupation.

2.2.3 Other types of underemployment

Labour hoarding⁶ (despite not covered by the ILO guidelines) occurs when employers do not utilise all the labour resources that pay for (Wilkins and Wooden, 2011:17). Wilkins and Wooden (2011:17) explain that when there is a decline in demand due to economic recession, firms do not always decrease their labour input in line with the fall in production. Employers instead either reduce employees' work hours or leave the work hours unchanged but productivity of these hours declines. Unlike the other types of underemployment, it is the employer rather than the employee that bears the costs of labour hoarding.

⁶ Labour hoarding is not analysed further in this study.

Labour hoarding may exist because of the reluctance of some employers to get rid of trained and experienced workforce, who may be needed when demand picks up in future (Wilkins and Wooden, 2011:17). Moreover, labour hoarding can arise when there are legal restrictions on firms to reduce their labour requirements or when technological impediments make it difficult to limit the employment of labour in proportion to output. Wilkins and Wooden (2011:17) assert that labour hoarding may not necessarily be inefficient since the costs associated with hiring and training workers are fixed and quasi-fixed. Therefore, it may be efficient in the long run to hoard labour during temporary periods of low aggregate demand in the economy.

It must be emphasised that it is possible for some workers to experience more than one type of underemployment at the same time.⁷ For example, a person who works part-time in a position which does not fully utilise his/her acquired skills may be seeking a new job that offers more working hours and allows him to fully apply his/her skills. This scenario represents an overlap between time-related underemployment and skills-related underemployment.

2.3 Theoretical literature

This section discusses some of the labour market theories in connection with underemployment. These theories include the dual labour market hypothesis, human capital theory and career mobility theory, job competition theory and assignment theory.

2.3.1 Labour market segmentation

Heintz and Posel (2008:26) define labour market segmentation as the existence of impediments to mobility within the labour market that hinder workers from easily switching to highly remunerated jobs. Segmented labour market models divide the labour market into a high-wage sector, which comprises of stable employment with good working conditions and substantial returns to the investment in human capital, and a low-wage sector with the opposite characteristics (Dickens and Lang, 1988: 129). The concept of a dual labour market is based on the hypothesis that the labour market consists of two separate parts, namely the primary segment

⁷ Brown and Pintaldi (2006:52) confirmed this overlap using information from an Italian labour force survey.

with good jobs and the secondary segment with bad jobs⁸ (McNabb and Psacharopoulos, 1981:442; Dekker et al., 2002:107). Golub and Hayat (2015:141) rather classify the two segments as the formal sector and the informal sector. Moreover, Heintz and Posel (2008:28) refer to the two distinct sectors of a dual market as a formal and informal sector; a rural and an urban sector; or a “modern” and a “traditional” sector.

Labour market dualism can also be explained by the Lewis (1954) model, which is characterised by a large traditional sector with subsistence incomes and a relatively small modern sector which pay much higher wages (Golub and Hayat, 2015:143). Wachter (1974:638) argues that this model is based on three general hypotheses: firstly, the economy consists of two segments, namely the primary high-wage sector and secondary low-wage sector. In addition, the distinction between good jobs and bad jobs is the most important criteria rather than the distinction between skilled and unskilled workers. Thirdly, workers in the secondary segment experience job instability and high turnover rates.

Several studies, amongst others, Harrison (1971) as well as Bosanquet and Doeringer (1973), have tested and confirmed the validity of the dual labour market hypothesis. Golub and Hayat (2015:137) confirm that the labour markets in most African countries are characterised by sharp dualism with very small formal employment. The primary and secondary segments are differentiated by job characteristics such as employments stability, remuneration and job contents. It is envisaged that the two segments have different mechanisms that govern wage and employment determination (Wachter, 1974:639; McNabb and Psacharopoulos, 1981:442).

The primary sector is characterised by good working conditions, high average earnings, the availability of fringe benefits, and greater opportunity for internal promotion (McNabb and Psacharopoulos, 1981:442). Dickens and Lang (1988:129) accentuate that jobs in the primary sector are rationed which means that some individuals with the right qualification, and who have the desire to work in the primary sector may not be able to obtain jobs in the sector. According to Dekker et al. (2002:107) the primary segment can be subdivided into internal labour markets and professional markets. Workers within the primary segment benefit from job security and

⁸ Acemoglu (2001:2) refers to good jobs as high-wage jobs and bad jobs as the low-wage ones.

employment stability (McNabb and Psacharopoulos, 1981:442). Dekker et al. (2002:107) posit that although overeducation might exist in the primary segment's entry-level jobs, it diminishes with time through internal promotions.

In contrast, the secondary segment is predominantly made up of low-paid jobs and characterised by less chance of promotion, inadequate fringe benefits, and high turnover rates (McNabb and Psacharopoulos, 1981:442). There may be enough jobs in the secondary sector to employ all workers, but such jobs are unstable and generally unattractive (Wachter, 1974:638). Dekker et al. (2002:107) emphasise that overeducation might be more prominent in the secondary labour market due to the assumed "dead end" feature of the jobs in this segment. Since jobs in this segment are low-paying and intermittent in nature, workers may also be prone to income-based and time-related underemployment (Wachter, 1974:639; Golub and Hayat, 2015:137). Wachter (1974:651) claims that firms in the secondary segment provide little specific or on-the-job training and the possibilities for career advancement are relatively limited. The limited opportunities for career advancement decrease the worker's incentive to remain in the job or perform exceptionally well. In addition, employers in this segment are less reluctant to lay off workers as the firm hardly make any investments in their workers. Hence, high levels of turnover and frictional unemployment are possible features of this segment (Wachter, 1974:651).

Education and experience have significantly positive relationships with earnings in both sectors. However, the impact of these two factors is relatively smaller in the secondary sector (McNabb and Psacharopoulos, 1981:446). There is a significant gap between formal sector and informal sector earnings with the former being relatively higher (Golub and Hayat, 2015:141). Wachter (1974:651) postulates that the wage determination process in the secondary segment ignores the major differences in human capital among workers. As a result, human capital theory cannot be used as the basis for predicting labour market success in the secondary segment (McNabb and Psacharopoulos, 1981:442). There is also no reward for human capital in the secondary sector because employers act as if all employees have equal capabilities and level of productivity (McNabb and Psacharopoulos, 1981:444). Employers in the secondary sector hire workers without prior screening because they anticipate high turnover. As a result, individual wages are not a function of workers' personal characteristics (Wachter, 1974:653).

In contrast, human capital investments play an important role in the primary segment since variations in education, training and learned experience are partly responsible for the differential access to job clusters (McNabb and Psacharopoulos, 1981:444). Golub and Hayat (2015:141) list two possible explanations which are accountable for the large differentials in earnings between the formal and the informal sectors for Africans. Firstly, labour is heterogeneous and there is an increasing number of the labour force having low human capital and limited skills, and secondly, there is a low demand for labour coupled with labour market segmentation. The labour heterogeneity argument claims that income differential is explained by the differences in human capital and other worker characteristics. The segmentation argument places an emphasis on the demand side of the labour markets and claims that there is a shortage of good jobs and these jobs are rationed.

Due to the distinctive nature of employment conditions and job stability across the two segments, workers in the two sectors develop different and incompatible behaviour traits that hamper mobility between sectors (McNabb and Psacharopoulos, 1981:445). Wachter (1974:639) argues workers in the secondary sector are essentially trapped as there is a limited economic mobility across the two segments. Therefore, workers who are confined to the secondary segment are hindered from the primary segment not so much by their lack of human capital but largely due to institutional restraints on the demand side and the lack of good jobs (Wachter, 1974:638).

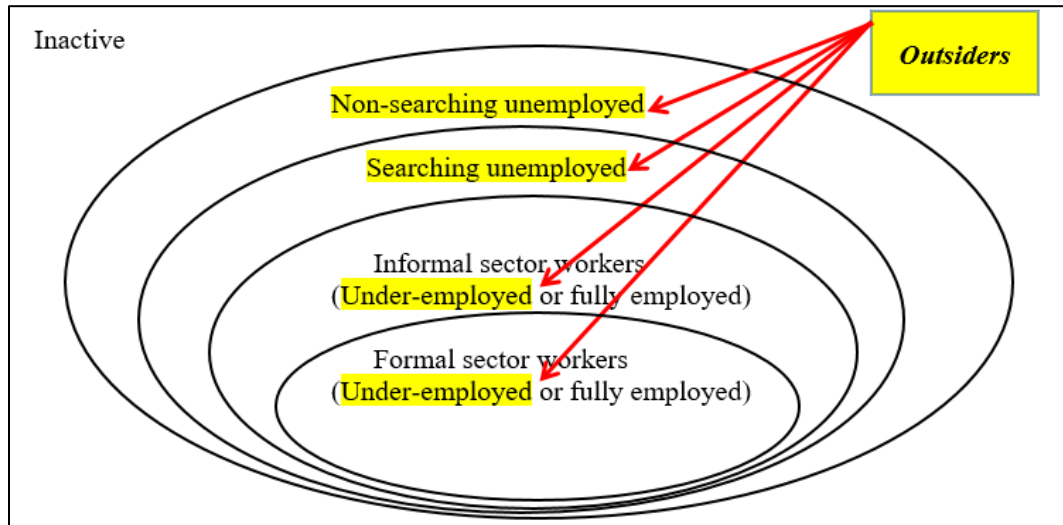
The availability of decent employment opportunities or good jobs is closely linked to economic development (Golub and Hayat, 2015:136). The dualists claim that the main problem with the labour market is the scarcity of good jobs and hence the central aim of public policy should be the creation of more goods jobs in either the private or public sector (Wachter, 1974:639). Furthermore, the dualists argue that the problem of underemployment cannot be solved by aggregate demand policies and manpower training (Wachter, 1974:640). The expansion of aggregate demand will only result in the creation of more bad jobs. Education is also not the appropriate solution because secondary sector workers already have the required human capital but the only reason why underemployment exists is the lack of access to good jobs.

Wachter (1974:652) asserts that one of the shortcomings of the dualism theory is the absence of an operational definition of good or bad jobs in the dual labour market literature. This means that there is no agreed-upon empirical dichotomisation of the labour market. McNabb and Psacharopoulos (1981:443) also emphasise that there is no precise direction regarding the dividing line between the primary and secondary sectors. Moreover, contrary to the dualist view, Okun (1960:208) argues that there is a downgrading of labour in a slack economy and an upgrading of jobs in a high-pressure economy. When the economy is in a downward trend, primary segment workers try to avoid being unemployed by accepting to work in the secondary sector. This increases the likelihood of underemployment in the economy. Likewise, the movement towards full employment involves a shift in the composition of output and employment in favour of sectors and industries that offer high-quality employment in the primary segment (Okun, 1960:208). Therefore, in an expanding economy, workers move from the secondary segment into more productive jobs in the primary segment. Therefore, the rate of underemployment is most likely to decline during an economic expansion.

As outlined in Figure 2.3, the South African labour market is segmented into formal sector and informal sector⁹ employment, as well as searching unemployed and non-searching unemployed (also known as discouraged workseekers). Deakin (2013:1) explains that labour market segmentation entails the division or structuring of the labour market in line with the nature of employment relationships or contractual agreements. The distinction between formal sector and informal sector employment constitutes labour market segmentation. The segmentation of labour market should take underemployment into consideration as workers in both the formal and informal sectors may be either fully employed or underemployed. It can be inferred from the above discussion on labour market dualism that underemployment exists in both sectors. However, it is relatively more prevalent in the informal sector, which is characterised by the preponderance of bad jobs associated with shorter work hours, low wages and skills underutilisation.

⁹ Further information on the approaches to measuring the informal sector in South Africa can be obtained from the following literature: Muller 2003; Devey, Skinner and Valodia 2006; Heintz and Posel 2008; Essop and Yu 2008; Yu 2010).

Figure 2.3: Labour market segmentation in South Africa

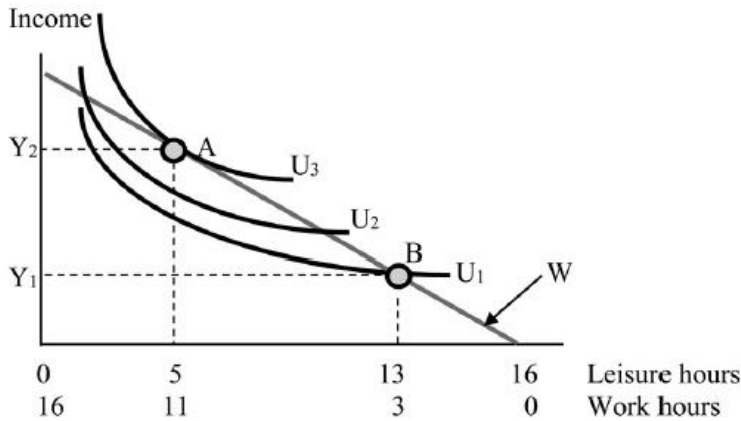


Source: Adapted from Fourie (2011:12)

2.3.2 The theory of individual labour supply

Underemployment can be explained using budget line and indifference curve analysis. Zero non-labour income and the availability of 16 hours per day for work and leisure are assumed in the following discussion. First, as Figure 2.4 depicts, an individual prefers to work 11 hours per day which is at equilibrium point A where the budget line is tangent to indifference curve U_3 . This individual would earn an income of Y_2 when fully employed. Even though the individual is willing and able to work for longer hours, he/she is only offered employment that requires him/her to work three hours per day (at point B which is on a lower indifference curve U_1). At point B, the individual's available labour hours are underutilised and as a result he/she is inadequately compensated. This individual thus only earns a total labour income of Y_1 which is relatively lower than Y_2 when he/she is fully employed.

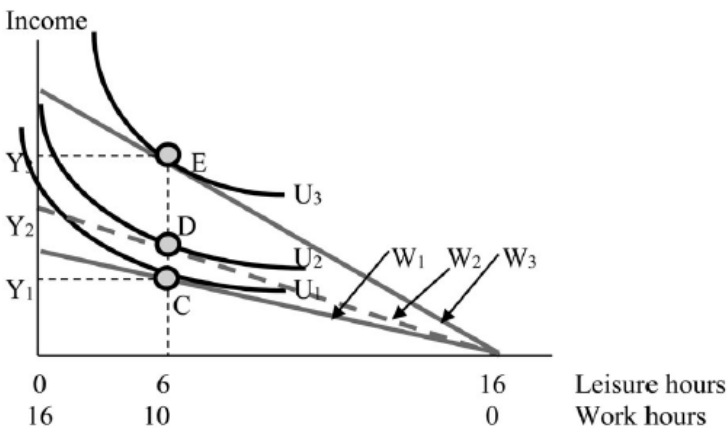
Figure 2.4: Time-related underemployment



Source: Adapted from Beukes, Fransman, Murozvi and Yu (2016:22)

Figure 2.5 illustrates underemployment based on skills underutilisation. A skilled work-seeker (e.g. a Bachelor's Degree holder) wants to be employed in a position that matches his/her level of qualification at point E and attains a utility of U_3 . In the higher-wage employment being paid W_3 per hour, the individual receives an income of Y_3 . However, the inability to find a job that matches his/her level of skills, forces the individual to seek an alternative employment in a semi-skilled position associated with a lower wage of W_1 (for example, a position that only requires a Matric certificate), which underutilises the worker's skills and pays a lower income (Y_1). Instead of equilibrium point E, such individual ends up at point C which offers a lower utility (U_1) although work hours remain the same.

Figure 2.5: Skills-related underemployment



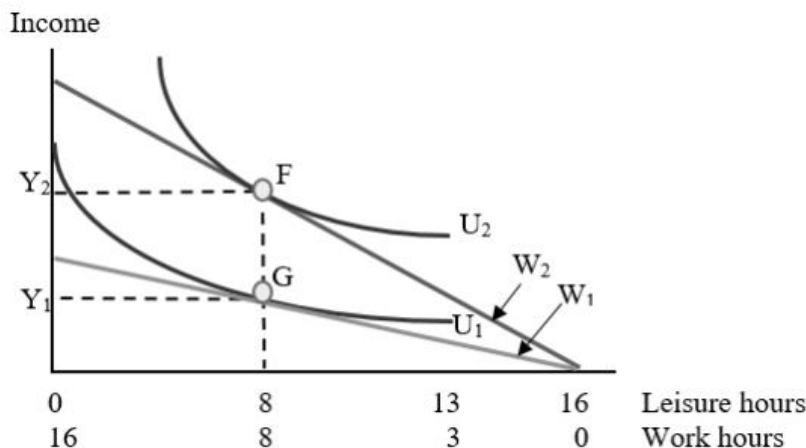
Source: Adapted from Beukes et al. (2016:22)

Assuming there is another individual (represented by the dotted budget line) with a post-Matric diploma who finds a job that matches his/her level of qualification. This person would earn an income of Y_2 (hourly rate is W_2 – which is lower than W_3 but higher than W_1) and attains a utility level of U_2 .

The above analysis indicates that the person with a post-Matric diploma who is fully employed earns a higher income (Y_2) than the Bachelor's degree holder who is underemployed (earning Y_1). This outcome contradicts the general premises of the human capital theory, which suggests that each additional year of education increases the expected labour earnings. It is however envisaged that the existence of overeducation may be a sign of other human capital deficit (to be discussed in Section 2.3.3). An overeducated employee may use additional schooling to compensate for deficiencies in other aspects of human capital, such as lack of work experience and on-the-job training (Dolton and Silles, 2008: 129).

Figure 2.6 explains income-related underemployment. Assuming two individuals both have the same qualification (Bachelor's degree holders) and work the same number of hours. The work hours of these two individuals are assumed to be above the threshold of adequate work hours, and hence they cannot be classified as time-related unemployed. Both are employed in positions that require a Bachelor's degree, so they also cannot be classified as underemployed under the overeducation definition. The first individual works in a firm which pays the ideal wage rate (W_2). He/She thus receives an income of Y_2 at point F while attaining a utility level of U_2 .

Figure 2.6: Income-related underemployment



On the other hand, the contractual arrangements at the firm of the second individual put him/her in a situation where he/she earns less than appropriate income (that is, a lower wage rate at W_1). This second individual is therefore income-based underemployed because as shown at point G, he/she receives lower income (Y_1) than he/she is otherwise supposed to be (Y_2). This also seems to be at odds with the expectations of the human capital theory. However, as explained in Section 2.3.3, it may be possible that the second individual is in this position due to the lack of ability or having less informal human capital (to be shown in Figure 2.10). Some workers accept jobs for which they are overqualified simply because they have relatively lower ability or some other unobserved characteristics which lead to lower earnings (Tsai, 2010:610).

2.3.3 Human capital theory

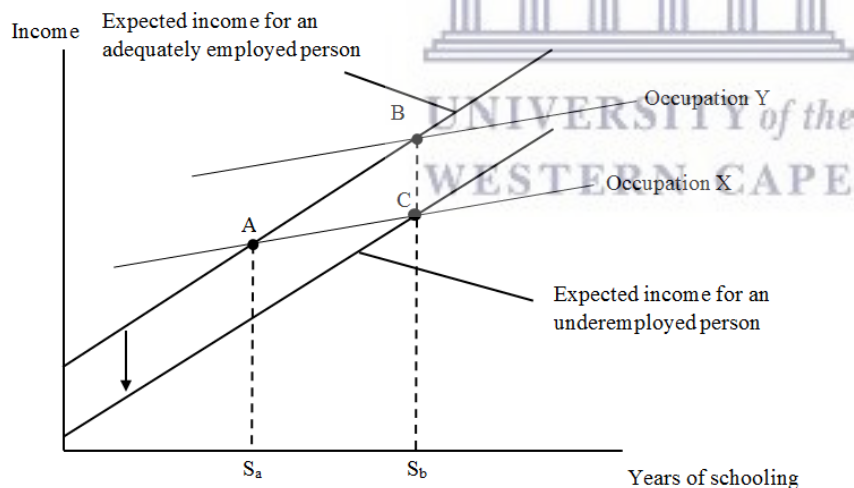
Education is regarded as a consumer good, which offers utility to the consumer, as well as a capital good that can be used as an input in the production process (Olaniyan and Okemakinde, 2008:479). Education as a capital good relates to the concept of human capital. As pointed out by Olaniyan and Okemakinde (2008:479), human capital theory stipulates that education increases workers' productivity and efficiency by enhancing their level of cognitive stock of human capability. Becker (1962:9) explains that human capital investment consists of activities that influence future earnings by embedding resources in people. Olaniyan and Okemakinde (2008:479) also define human capital as a personal investment which individuals make themselves to enhance their future economic productivity and returns thereof.

The basic justification the model offers for the emphasis on human capital investment is the presumed economic returns of such investment at both the macro and micro levels. It is a well-documented fact that the relationship between earnings and human capital investment is a positive one (Rubb, 2003:389). As Olaniyan and Okemakinde (2008:481) explain, education augments an individual's human capital, thereby resulting in greater output for society and improved earnings for the worker. Polachek (1981:60) posits that variations in human capital among individuals imply differences in earning power. Public perception about the financial reward from schooling has increased the demand for higher education in many developing countries (Olaniyan and Okemakinde, 2008:479). Some individuals may not realise the expected

returns from schooling because of overeducation, for instance (Sicherman, 1991; Cohn and Khan, 1995; Groot, 1996; Daly, Büchel and Duncan, 2000; Dolton and Vignoles, 2000).

The positive relationship that exists between education and earnings is deemed to originate from two sources. Education qualifies people for higher-paying jobs while it also increases productivity in a job (Gill and Solberg, 1992:685). Figure 2.7 demonstrates a situation where the returns to education are positive both within and across occupations. Assuming the required level of schooling for occupation X and the higher-paying occupation Y are S_a and S_b , respectively. Both occupations are represented by upward-sloping lines because there are positive returns to education. Anyone in occupation X with a greater level of schooling than S_a is overeducated and likewise, someone in occupation Y who has a level of schooling greater than S_b is overqualified. The adequately employed person in occupation X is positioned at point A. The adequately educated individual in occupation Y, at point B, has the same level of education as the person in occupation X who is overeducated (at point C).

Figure 2.7: Positive returns to schooling



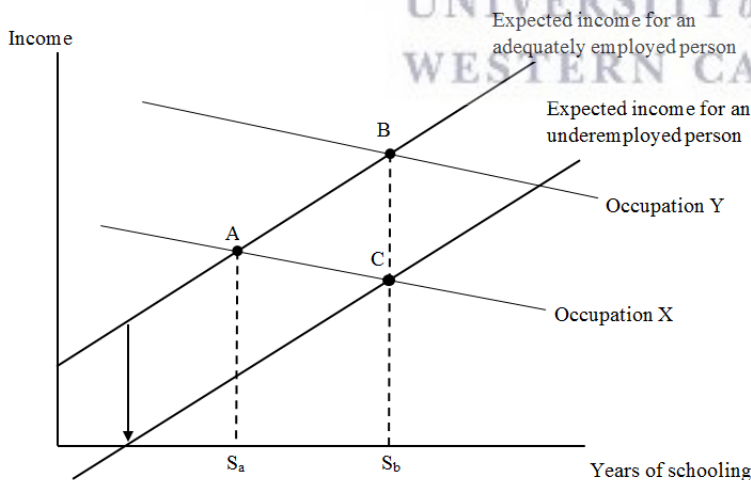
Source: Gill and Solberg (1992:687).

It must be emphasised that the overeducated individual in occupation X receives an income that is higher than the income received by the adequately employed in the same occupation. However, compared to his/her counterpart with equivalent qualification who works in occupation Y, the overeducated person in occupation X earns less income. This means that, on average, people

employed in lower-paying occupations can expect to earn less than those in higher-paying occupations. Gill and Solberg (1992:686) thus postulate that the reduced earnings received by the underemployed relative to the adequately employed are solely due to the underemployed being in a lower-paying occupation.

Gill and Solberg (1992) also argue that the returns to schooling within occupations could be negative as illustrated in Figure 2.8. Both occupation X and Y are represented by lines that slope downward because of the assumed negative returns to education. Individuals in occupation X and Y who have a level of schooling greater than S_a and S_b respectively are considered as overeducated. At point C, there is an overeducated individual in occupation X whose level of schooling is the same as that of a person who is adequately employed in occupation Y (at point B) but such individual receives relatively less income. Moreover, as a result of being underemployed, the overeducated individual (point C) receives less income than his/her peer who is adequately employed (at point A) within the same occupation. Therefore, compared to the adequately employed, the sign of the overeducation variable's coefficient will be negative regardless of whether the returns to schooling are either positive or negative.

Figure 2.8: Negative returns to schooling



Source: Gill and Solberg (1992:687).

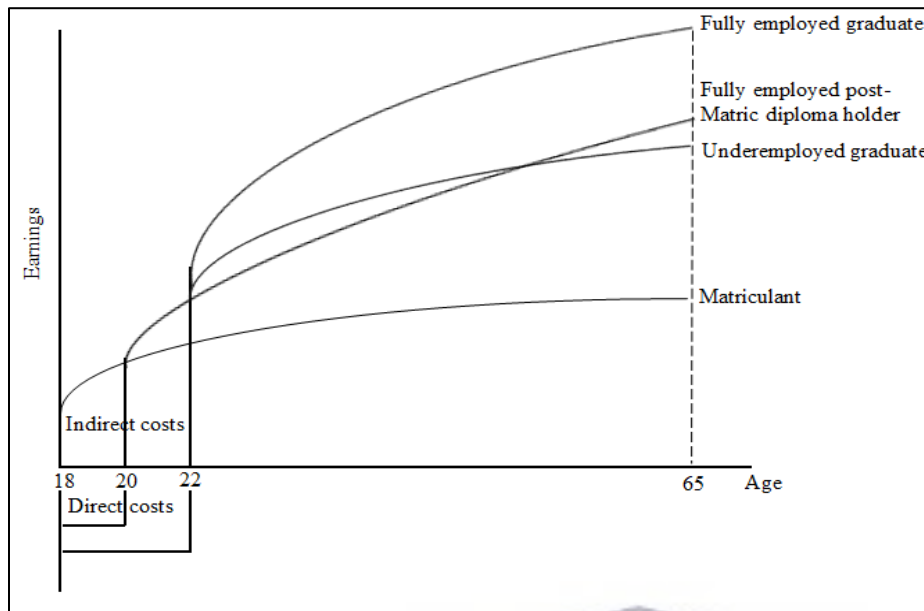
The human capital theory suggests that workers are paid their marginal productivity by employers who fully utilise such productivity (Tsai, 2010:607). Therefore, overeducation leads

to an inefficient outcome because the capabilities of the affected workers are underutilised. Traditionally, underemployment has been regarded as an exception to the human capital theory due to its failure to adequately reward the investment in education. Kiersztyn (2013:79) asserts that it is difficult to explain overeducation using the human capital model because, theoretically, overeducation should not exist in a properly functioning labour market. However, a rapid and substantial increase in the supply of better-educated workers can lead to a decrease in their relative wage, and subsequently result in employers hiring more qualified workers into positions which were previously meant for individuals with relatively lower level of education (Borghans and de Grip, 2000; Kiersztyn, 2013).

The human capital model fails to address the discrepancy between individuals' increasing learning efforts and the diminishing number of commensurate jobs opportunities for these individuals to apply their knowledge (Olaniyan and Okemakinde, 2008:481). Kiersztyn (2013:79) explains that overeducation emanates from disequilibrium in the labour market and will eventually be eliminated as workers reduce their investment in human capital in response to the lower returns to education, and employers increase the demand for better-educated workers by adjusting the production processes of their firms to accommodate such workers.

Figure 2.9 presents an illustration of the human capital theory taken into consideration the impact of underemployment. Education generally enhances an individual's stock of human capital and consequently leads to an increase in productive capabilities and higher earnings. Therefore, even though the pursuit of a higher education entails both direct costs (cost of university education) and indirect costs (sacrificed earnings), it eventually leads to future incremental earnings. As the figure depicts, the human capital theory does not consider the existence of underemployment. This is because the returns to educational investment are lower for the underemployed graduate compared to his/her fully-employed counterpart. Moreover, it is possible that a person with only a post-Matric diploma who is fully employed may eventually earn more income than an underemployed graduate. It therefore means that the underemployed do not receive the full returns to educational investment as the human capital theory claims.

Figure 2.9: Potential earnings streams



Source: Adapted from Barker (2007:207).

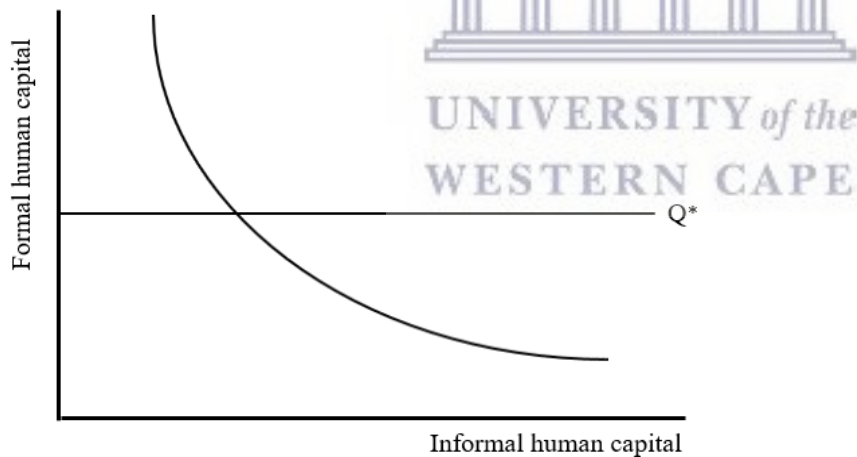
Recent studies (such as Leuven and Oosterbeek, 2011), however, stipulate that the human capital theory is valid in explaining underemployment. Hartog (2000:140) argues that from a human capital perspective, overeducation may be the outcome of a deliberate choice by a worker when a low-level job is potentially a good investment opportunity. Caroleo and Pastore (2013:2) also assert that the lack of work-related skills of graduates as well as the inability of the school-to-work transition system to harness the skills demanded by employers, rather than the excess supply of graduates, may be the reason for the existence of overeducation. Moreover, the increasing trend in educational attainments is not solely based on the anticipated returns to education as the human capital theory predicts. Muysken and Ter Weel (1999:18) explain that educational decisions, to some extent, are forward-looking since education can be used to directly reduce search duration. Workers perceive that higher educational attainments present more job opportunities.

Furthermore, human capital is not only embodied in the level of acquired education but also includes generic work experience as well as the experience that is specifically acquired on a particular type of job. Caroleo and Pastore (2013:3) point out that overeducation signals the lack of work-related human capital component, rather than the underutilisation of human capital.

Overeducation may therefore exist due to the lack of appropriate work experience and this makes young people highly prone to its incidence. Some individuals may attain a higher education to compensate for the lack of work-related human capital. On this basis, overeducation may be attributed to the omitted variables problem.

The trade-off between education and other human capital components is shown in Figure 2.10. The isoquant represents workers with similar productivity but have different combinations of experience (informal human capital) and education (formal human capital). The line Q^* represents the average level of qualification. Above the average qualification (Q^*), an individual is regarded as overeducated. Even though such individuals may have more formal education than the average qualification, they have less informal human capital (work experience). Therefore, some workers may appear to be overeducated and underpaid (in models that do not control for experience) relative to the average level of qualification. Alternatively, other individuals whose level of qualification is below the average may be considered as underemployed.

Figure 2.10: Human capital trade-off



Source: McGuinness (2006:390).

2.3.4 Career mobility theory

Human capital studies traditionally use earning functions to determine the labour income effects of human capital investments (Dekker et al., 2002:106). Other studies (such as Sicherman and Galor, 1990) emphasise that the reward for investment in human capital can be in the form of upward career mobility. Investment in human capital raises the future earnings of individuals

through two channels: directly via the potential returns to education and indirectly through the improvement in individuals' career path (Sicherman and Galor, 1990:172). The returns to schooling may be in the form of higher wages in some types of occupation while in others, the returns may be a higher probability of advancing to occupations that pay higher wages. The career mobility theory can therefore help explain the observed variations in returns to education across different occupations (Sicherman and Galor, 1990:177). This theory primarily relates to the overeducation and considers it as a temporary phenomenon.

Unlike the human capital theory, the career mobility theory affects both the supply and demand sides of the labour market, because overeducation can be a rational choice for both employees and employers (Büchel and Mertens, 2000:1). Individuals may use their first job as a stepping stone to a better position in the future. Sicherman and Galor (1990) formulated the stepping stone hypothesis to explain why young workers accept jobs that are inadequately matched to their qualifications. Baert et al. (2013:124) explain that an individual's current job, despite possibly making him temporarily overeducated, could be the shortest pathway to a future job that matches his/her attained educational credentials. In the career mobility model, overeducation can be considered as a short-term mismatch which occurs at the beginning of one's career (Büchel and Mertens, 2000:1).

It is envisaged that part of the returns to education is in the form of a higher likelihood of occupational upgrading either within or across firms (Sicherman and Galor, 1990:170). Dekker et al. (2002:112) emphasise that upward career mobility is concentrated in the internal labour market, a subsection of the primary segment. An individual's optimal career path may entail intrafirm mobility, which represents promotion, and interfirm mobility, which is movement across firms (Sicherman and Galor, 1990:171). Intrafirm career mobility is at the discretion of the employer while interfirm career mobility is determined by the employee. Intrafirm mobility is uncertain and depends on schooling, ability, and job experience (Sicherman and Galor, 1990:171).

Some individuals may decide to start their career paths in lower-level firms where the direct returns to education are lower, provided there is a higher probability of promotion and a greater

likelihood of obtaining higher future earnings. The career mobility model stipulates that if a specific occupation offers lower returns to schooling at the beginning of a person's career, the effect on the likelihood of promotion either within or across firms will be higher (Sicherman and Galor, 1990:177). Sicherman (1991), Robst (1995) and Rubb (2003) arrived at conclusions that are consistent with the career mobility theory. This observation can help partially explain the phenomenon of overeducation. The theory predicts that it will be rational for some people to spend a portion of their working life in occupations where their acquired skills are higher than the required level of qualification.

The career mobility model predicts a positive effect of tenure on occupational mobility (Sicherman and Galor, 1990:178). According to the theory, people acquire skills and experience in a particular occupation to move to another occupation with higher returns to schooling. In relation to this theory, underemployment may only exist in the short run, during the initial stages of one's career.

2.3.5 Job competition theory

This theory focuses primarily on skills-related underemployment or overeducation. The job competition theory by Thurow (1975) suggests that within a particular job queue, workers are ranked according to the likely training costs for the firm and the costs are assumed to be lower for workers with higher education. Individuals compete for jobs opportunities in the labour market based on their relative training costs. The model suggests that job characteristics may be the only determinants of earnings, thus the marginal product of labour is linked to the job rather than to individual characteristics (McGuinness, 2006:391). Muysken and Ter Weel (1999:18) explain that, based on Thurow's theory, education is one of the most essential attributes that is needed to increase employment opportunities. Weiss (1995:133), on the other hand, states that better-educated workers may also have other attractive unobserved characteristics, such as better health, a lower propensity to turnover and a better work attitude. The theory also suggests that wages are solely decided by the demand side of the labour market (Tsai, 2010:607). Tsai (2010:607) elaborates that, based on the job competition theory, overeducation in the labour market is an outcome of an increase in workers' educational attainment since education enables workers to maintain their position in the labour queue.

In this model, excess schooling is regarded as a consequence of the competition for jobs in the labour market where the demand for highly educated individuals is rigid (Caroleo and Pastore, 2013:3). This rigidity motivates the accumulation of education by individuals to reach the best position in the queue for jobs. Accordingly, workers might use education as a means to signal their ability and productivity as predicted by Spence's job screening model (Spence, 1993). Employers might also use it to screen job applicants (Muysken and Ter Weel, 1999:18). Weiss (1995:134) refers to the signalling approach and the screening approach as "sorting" approach. Based on the signalling approach, underemployment may prevail because individuals accept employment into positions where the occupational requirements are below their educational credentials to get the opportunity to demonstrate their abilities to their employers. The signalling approach suggests that as employers learn more about the true productivity of the worker, underemployment based on the overeducation approach would eventually decrease (Cutillo and Di Pietro, 2006:144). However, the job competition model also assumes that it is difficult for workers in low-skill occupations to move into high-skill positions since most actual job skills are acquired through on-the-job training and experience (Kiersztyn, 2013:79). Thus, overeducation is likely to be a long-term phenomenon.

The job competition model is compatible with the crowding-out hypothesis, which is based on the notion that when jobs become scarce, higher skilled workers take up the positions previously filled by low-skilled workers (Humburg et al., 2017:26). This pushes the latter into lower skilled jobs or even into unemployment. Devereux (2002:425) emphasises that during economic downturns, low-skilled workers are more likely to be laid off because training and hiring costs are lower for such workers according to the adjustment cost hypothesis. In recessionary times, it becomes difficult for individual workers to secure jobs in high-ranked occupations, and the effect is particularly larger for low-skilled workers (Devereux, 2002:428).

2.3.6 Assignment theory

This theory by Sattinger (1993) deals with the assignment of heterogeneous workers to heterogeneous jobs (Hartog, 2000:140). This theory, focusing on skills-related underemployment, suggests that the productivity of workers is positively correlated with their level of education and that wages are influenced by the characteristics of workers and jobs (Tsai, 2010:607).

McGuinness (2006:393) asserts that the central contribution of the assignment model is that the distribution of earnings can only be adequately explained by considering both individual and job characteristics. However, workers with identical qualifications are assumed to have different levels of performance depending on the job they are in (Tsai, 2010:607). Hartog (2000:140) states that the worker's attributes do not always align with the level required in the job. Therefore, overeducation arises because of a bad match between the qualification of the worker and the requirements of the job.

Sattinger's assignment theory stipulates that overeducation which emanates from imperfect information is temporary in the career development of the worker since it can be adjusted by deliberate search. However, if the job structure is not responsive to changes in the supply of workers with varying levels of education, overeducation might turn out to be relatively persistence (Tinbergen, 1984; Sloane, 2003; and Kiersztyn, 2013). Caroleo and Pastore (2013:3) state that this theory attempts to reconcile the human capital theory and job competition theory. The assignment theory, just like the job competition model, assumes that there are limited jobs in the economy and hence remuneration is not dependent on the human capital endowment of the worker but rather on the specificity of the job. On the other hand, like the human capital theory, the assignment model assumes that individuals with a given investment in human capital are able to compete for the best jobs and as such wages will most likely be influenced by the individuals' human capital capacity.

Teulings (1995:298-302) proposes a new specification of the wage function in an assignment model. Hartog (2000:141) refers to this specification as the "zipper allocation". This specification ranks workers, based on their skills, from top to bottom while jobs are also ordered from top to bottom based on complexity. Equilibrium allocation zips the workers' skill and job complexity together from top to bottom. The worker with the best quality goes to the most complex job as the zipper slides down to match the two sides. The process continues until one side is exhausted, culminating in either underemployed workers or vacant jobs at the bottom.

2.3.7 Other theories of underemployment

The theories discussed below, apart from the relative deprivation theory, may primarily be used to explain skills-related underemployment or overeducation.

Heterogeneous skill theory: The heterogeneous skill theory by Green and McIntosh (2002) can explain the existence of wage penalty for overeducated workers. It is argued that the existence of a wage penalty between the overeducated and the adequately educated worker can be attributed to some sort of omitted human capital components. According to this theory, the wage penalty associated with overeducation is due to the vast skill variations among workers with similar educational qualifications (Nieto and Ramos, 2016:220). Overeducated workers do not necessarily suffer a wage penalty, but their lower earnings commensurate with their skill level. Nieto and Ramos (2016:221) emphasise that the heterogeneous skill theory captures the human capital difference between workers. Cutillo and Di Pietro (2006:144) explain that some individuals with lower ability or less working experience may be less productive compared to their peers with identical educational attainment and in similar jobs.

Job search model: This model assumes unemployment is largely a voluntary choice because individuals only accept a job offer when the associated remuneration is higher than their reservation wage. Caroleo and Pastore (2013:4) explain that the most skilled graduates usually have higher reservation wages and prefer to wait in the unemployment pool for the best job offer while the least skilled ones tend to settle for the first job offer even if it leaves them underemployed. Hence, the least skilled workers are more likely to be underemployed.

Job matching model: Overeducation can also be explained using the job matching model which was developed by Johnson (1978) and Jovanovis (1979). Dolton and Silles (2008:129) assert that imperfect information about the worker's productivity causes a poor employer-employee match. Information about a worker's actual productivity becomes more precise as the tenure of employment increases (Dolton and Silles, 2008:129). Therefore, a worker may temporarily accept a job which demands less qualification than what he/her has acquired in order to reveal his/her productivity as the employment tenure increases. In the long term, overeducation will be eliminated as new information becomes available (Dolton and Silles, 2008:129).

Person-job (P-J) fit: Lauver and Kristof-Brown (2001:454) posit that employees' attitudes and behaviours are linked to the concept of person-environment (P-E) fit, which is concerned with the degree of compatibility between an individual and his/her environment (Sekiguchi, 2004:179). The specific types of fit that fall under the P-E fit include person-vocation (P-V) fit, person-organisation (P-O) fit, person-job (P-J) fit, and person-group (P-G) fit.

P-J fit is regarded as the degree of congruence between an individual's ability and the demands of his/her job (Lauver and Kristof-Brown, 2001:445; Sekiguchi, 2004:179; Mckee-Ryan and Harvey, 2011:971). To achieve a good fit between individuals and their environment, individuals must have self-awareness and environmental awareness (Singh and Greenhaus, 2004:202). That is, individuals must be aware of their abilities, values, and beliefs while also being cognisant of the demand, opportunities, and constraints within the environment. Sekiguchi (2004:184) emphasises that the common operationalisation of P-J fit includes needs-supplies perspective and demand-abilities perspective. Needs-supplies fit occurs when the resources supplied by the environment meet the needs of the individual while demand-abilities fit is achieved when an individual has the abilities to meet the demands of the environment. The main antecedents of P-J fits are applicant self-selection and employee selection practices (Sekiguchi, 2006:184).

Relative deprivation theory: The theory argues that people feel relatively deprived when they compare their living standard to that of a reference group (Bernburg, 2010:494). Smith and Pettigrew (2015:1) define relative deprivation as the judgment that an individual or his/her in-group is disadvantaged in comparison with a relevant referent, and that this judgment is accompanied by feelings of anger, resentment, and entitlement. This definition of relative deprivation is associated with four basic elements; an individual who goes through relative deprivation: (1) first makes a cognitive comparison; (2) then makes a cognitive assessment that he/she or his/her in-group is disadvantaged; (3) views the disadvantage to be unfair; (4) and finally, he/she resents the perceived unjust and undeserved disadvantage. All four requirements must be met before relative deprivation can be deemed to be operating (Smith, Pettigrew, Pippin and Bialosiewicz, 2012:204). Workers are considered to be underemployed based on their beliefs that they deserve better jobs than the ones they already have. This theory relates to subjective underemployment. Relative deprivation theory has been adopted in some studies (Feldman,

Leana, and Turnley, 1997; Feldman, Leana, and Bolino, 2002; Mckee-Ryan, Virick, Prussia, Harvey, and Lilly, 2009) to capture the subjective experience of underemployed workers.

2.4 Review of past empirical studies

This section explores past empirical literature on underemployment. More specifically, the section discusses past trends and rates of underemployment as well as the determinants and consequences of this labour market phenomenon. The section first analyses the international literature on underemployment in sub-section 2.4.1 to get a global perspective before reviewing the studies that have been conducted locally in sub-section 2.4.2.

2.4.1 International studies

Globally, academic research and public policy discussion on negative labour market outcomes have primarily focused on unemployment to the neglect of underemployment (Wilkins, 2006:371; Nunley, Pugh, Romero, and Seals, 2014:1). Glyde (1977:246) explains that underemployment has been hardly researched because it is more elusive both conceptually and empirically. Feldman (1996:404) is of the view that underemployment has received less policy consideration as a separate and distinct labour market issue because it is typically considered as a second-order labour market problem. Nevertheless, there have been a number of international studies on underemployment in recent times and this section reviews some of these studies.

2.4.1.1 The trend and incidence of underemployment

The underemployment rate has been increasing for several countries. For example, there has been a substantial growth in underemployment in Australia over the last couple of years. Thus, since 2002 the proportion of the labour force participants who are underemployed has exceeded those who are unemployed (Wilkins, 2007:248). A study by OECD (2014:6) also suggests that time-related underemployment accounted for a significant share of the labour force in many advanced and emerging countries in 2013. The underemployment rate was quite high for countries like Argentina, Indonesia, Mexico and Australia. Using the worker self-assessment and the job analysis approaches, Hartog (2000:133) concludes that the incidence of overeducation

has increased in the Netherlands, Spain and Portugal. Using the quantitative approach, Julian et al. (2010:17) also observe a high incidence of underemployment in rural Pennsylvania.

Feldman (1996) adopts a multidimensional conceptualisation of underemployment in terms of education, work duties, field of employment, wages, and permanence of the job. Feldman (1996:386) points out that the degree of underemployment in the USA is highlighted by events surrounding three groups of people. Firstly, the labour force of USA has grown remarkably and as a result, a significant number of the workforce is involuntarily engaged in part-time or temporary work due to the lack of alternative employment opportunities. Secondly, underemployment in the USA has remained high among previously laid-off workers who have been re-employed in new jobs. Feldman, Leana and Bolino (2002:453) emphasise this trend by confirming that some downsized workers in the USA experience underemployment when they get re-employed. Usually when workers get laid-off, they are forced to accept alternative employment conditions which may be inferior to their previous jobs (Feldman, 1996:386). Thirdly, there has been an increasing trend in the rate of underemployment among recent high school and college graduates in the US. The reason for this trend is that the number of highly experienced workers competing for entry-level positions in the labour market has significantly increased.

Guironnet (2008:7) measures overeducation in France in terms of the difference between potential income, determined on the basis of the production frontier, and real income. Guironnet (2008) observes that the rate of overeducation of employed individuals was lower compared to previous studies that used the traditional measurements of overeducation, such as the self-assessment, job analysis and realised matches approaches (2008:20). In 1987 and 1999, the incidence of overeducation in France was 18 percent and 30 percent respectively but the results from the traditional measures estimated 27 percent and 35 percent for the two respective years (Guironnet, 2008:20).

Felstead and Green (2013) analyse the patterns and trends regarding the underutilisation of skills, overqualification and skills mismatch of the employed in Britain using three distinctively defined indicators of skills underutilisation. The authors find that in 2012, approximately 5.9 million jobs

in Britain required no qualifications but only 1.5 million economically active individuals had no qualifications (Felstead and Green, 2013:11). Felstead and Green (2013:12) explain that this excess arose because there was a substantial fall in the number people with no qualification relative to the number of jobs which do not require any qualifications. Furthermore, while about 8.2 million economically active individuals had at least a Bachelor's degree, only 6.8 million jobs required first degree as an entry credential (Felstead and Green, 2013:10). During the 1986-2012 period, while the demand for graduates increased by 4.8 million, the labour supply of degree holders increased by 5.9 million (Felstead and Green, 2013:13).

Montt (2017) conducts simultaneous regressions to estimate the relationship between field-of-study mismatch and overeducation using data from a cross-national survey. On average across the 23 countries that formed part of the study, 11 percent of the respondents are overqualified in their field while 13 percent are overqualified and working in a field other than their field of specialisation. In Ireland, Spain, France, Japan and Canada, over 40 percent of workers who are mismatched in terms of field-of-study are also overqualified (Montt, 2017:10).

The literature reviewed in this section demonstrates that there is a high incidence of underemployment across most developed nations in North America and Europe. The incidence of underemployment is high for previously laid-off workers who seek re-employment as well as new entrants in the labour market. The rising trends in underemployment is attributable to the increase in educational attainments which has resulted in an over-supply of graduates relative to the demand for degree holders in the job market.

2.4.1.2 Determinants of underemployment

The prevalence of underemployment is dependent on several factors. A number of international studies have examined the demographic characteristics as well as the socio-economic predictors of the underemployed. The literature identifies economic factors, job characteristics, career history, and demographic features as some of the variables that contribute to underemployment. Demographic and personal variables such as race, age, gender, and educational attainment are regarded as some of the predictors of underemployment.

As far as the economic climate is concerned, underemployment can be linked to the overall state of the economy. For instance, economic recession, as well as uncertainties regarding government regulation of labour costs, is likely to cause underemployment (Feldman, 1996:391). Similarly, Tam (2010:8) is of the view that the cyclical pattern of economic growth may contribute to underemployment. Wilkins and Wooden (2011:31) also allude to the fact that time-related underemployment has a strong association with business cycle conditions. Based on job characteristics, Wilkins (2007:255) posits that underemployment is predominant among part-time workers in Australia. Among part-time workers, the rate of underemployment is high for males compared to their female counterparts, about 46 percent for males and approximates 30 percent for females (Wilkins, 2007:255).

Field-of-study mismatch¹⁰ is one of the reasons behind qualification mismatch (overeducation) because the absence of employment opportunities in a particular field may force jobseekers in that field to downgrade to find a job (Montt, 2017:2). Most graduates would want to avoid employment that is both at a lower qualification level relative to the qualification attained and in a field that is outside their area of specialisation. Montt (2017:5) posits that in fields that experience high levels of saturation¹¹ and/or low levels of transferability¹², recent graduates may prioritise to find employment in such fields, even if it leaves them overqualified (Montt, 2017:5).

Cam (2014) examines the socio-economic predictors of time-related underemployment in Britain using a logistic regression modelling. Cam (2014:15) argues that household type is a strong predictor of underemployment. There is a greater likelihood of underemployment among singles with no dependent children compared to couples with dependent children. Moreover, the likelihood of being underemployed is approximately two times higher for workers who work in smaller establishments than it is for their peers in larger firms (Cam, 2014:17). The probability of underemployment is also higher in distribution, hotels and restaurants compared to sectors such as education, health and public administration (Cam, 2014:17). The risk of being underemployed

¹⁰ Field-of-study mismatch occurs when an individual is employed in a field that is different from his/her field of study (Montt, 2017:1).

¹¹ A field is regarded as saturated when there are more graduates in the corresponding occupational group than the jobs available (Montt, 2017:7).

¹² A field is said to exhibit skills transferability when workers within that field can find employment in other fields without having to downgrade (Montt, 2017:8).

is considerably smaller for individuals employed in managerial, senior official and professional positions compared to those in elementary positions (Cam, 2014:19). Also, union membership reduces the likelihood of underemployment. Cam (2014:17) observes that temporary workers are nearly twice more likely to be underemployed than their counterparts in permanent jobs while part-time employees are more than five times likely to be underemployed (Cam, 2014:17). Cam (2014:15) also finds that, with the exception of women aged from 25 to 34 years old, young people are more likely to be underemployed.

Slack and Jensen (2002) use time-related underemployment as a measure of economic hardships to examine the economic disadvantages encountered by racial and ethnic minorities in non-metropolitan parts of USA. On the basis of race and geographical type, Slack and Jensen (2002:214) reveal that underemployment in the USA is high among racial and ethnic minorities as well as rural dwellers.

Ruiz-Quintanilla and Claes (1994) adopt a multiple regression analysis to investigate the factors that contribute to the quantitative underemployment of the youth during their early career. The authors use longitudinal or panel data from six European countries, namely, Belgium, England, the Netherlands, Italy, Portugal and Spain. Ruiz-Quintanilla and Claes (1994:15) assert that initial underemployment has a significantly positive impact on later underemployment. A career starter's perception of labour market outlook has a significant impact on later underemployment (Ruiz-Quintanilla and Claes, 1994:16). Moreover, individuals with less formal education have a higher probability of becoming underemployed during the early part of their career (Ruiz-Quintanilla and Claes, 1994:15). Ruiz-Quintanilla and Claes (1994:15) argue that age does not have a significant impact on underemployment. Ruiz-Quintanilla and Claes (1994:15) also stipulate that gender places a role in the existence of underemployment and accentuate that females are more likely to be underemployed during the early part of their careers.

Other studies (e.g. Leuven and Oosterbeek, 2011; Cam, 2014; OECD, 2014) also confirm that females are associated with a higher probability of being underemployed under both the time-related and overeducation approaches. Frank (1978:361) attributes this observation to the fact that women have less control over the choice of location and therefore they usually have to

compromise by accepting jobs that pay less when moving to a new location with their husbands. This means that when a married man moves to a new location in line with his labour market prospect, the wife merely follows him even if she fails to find a suitable employment in the new location. Contrary to most studies, Cohn and Ng (2000:161) conclude that females in Hong Kong are less likely to be overeducated and more likely to be adequately educated compared to males.

Julian et al. (2010) estimate the marginal impact of general economic conditions and other personal characteristics on the level of underemployment in the Appalachian regions of the USA using linear regression models. The authors distinguish the underemployed as involuntary part-time workers, discouraged workers, and other marginally attached workers. Some of the factors that account for the observed higher rural underemployment rates are the declining importance of manufacturing and natural resources sectors, geographic isolation, lagging education attainment and lower levels of public services support. Julian et al. (2010:18) also find that as the share of the workforce that is below 20 years of age and those above 55 years rises, the underemployment rate also rises. Moreover, a rise in the number of people with further education beyond a Bachelor's degree also increases the rate of underemployment. The rate of unemployment may have a positive correlation with underemployment. As pointed out by Julian et al. (2010:19), a one percentage point increase in unemployment rate increases the rate of underemployment by 0.172 percentage point in rural areas and 0.322 percentage point urban areas of the non-Appalachian regions.

Dolton and Silles (2008) examine the effect of overeducation on earnings in the United Kingdom (UK) graduate labour market. Dolton and Silles (2008:132) claim that the type of degree has an impact on the likelihood of being underemployed after an individual has been in the labour market for some time. Graduates from the faculties of science, humanities and arts have a higher chance of being overeducated compared to their colleagues from the engineering, business and education faculties (Dolton and Silles, 2008:132). Graduates who are employed in occupations that are traditionally more commensurate with graduate education, such as professional and managerial positions, are less likely to be overeducated (Dolton and Silles, 2008:132). Overeducation is less likely among graduates who work in the education and the self-regulating professions sectors (Dolton and Silles, 2008:132) because credentials are vital in these sectors.

Haddad and Habibi (2017) examine the incidence of overeducation¹³ among graduates in Iran using multinomial logit models, and observed that the likelihood of being overeducated is higher for women and public-sector workers while experience decreases the odds of overeducation. Likewise, Caroleo and Pastore (2013:10) claim that women are about 13 odds points more likely to be overskilled. Caroleo and Pastore (2013:12) also posit that the quality of education, measured according to university ranking, is a key determinant of overeducation. Individuals with a degree in languages, physical education, political and social sciences, psychology, geology and biology are associated with a higher likelihood of being overeducated or overskilled compared to those with a degree in engineering, architecture and medicine (Caroleo and Pastore, 2013:12).

Experience in the labour market has a significant impact on the incidence of overeducation. Korpi and Tåhlin (2009:187) posit that each year of additional schooling is on average associated with 1.7 years less experience compared to otherwise similar workers in Sweden. This indicates that there is an inverse relationship between formal education and work-related experience. Generally, the incidence of overeducation declines with increasing age and experience (Hartog, 2000:135). Cohn and Ng (2000:162) confirm that the percentage of overeducated individuals falls as experience increases.

Bonnal, Lira and Addy (2009) analyse the interaction between skills-related underemployment (using the self-assessment method) and local labour market conditions in the USA using a variant of Heckman's (1979) two-step selection model and a bivariate probit model. Bonnal et al. (2009:330) argue that the probability of perceived underemployment increases with age. The demand for job growth, changing job attitudes and improving worker productivity are some of the factors that can explain such observation. Similar to the conclusion reached by Cam (2014), Bonnal et al. (2009:330) find that employees who are married are relatively less likely to be underemployed. This can be explained by the motivation to maximise income due to the size of the household and the number of dependents (Bonnal et al., 2009:330). Workers from African-Americans and Hispanics ethnic groups are more prone to underemployment compared to White workers, with a rate of 32.2 percent for the former and 22.3 percent for the latter (Bonnal et al.,

¹³ Overeducation is measured using the statistical method by adopting both mean-based and mode-based approaches.

2009:331). In line with Becker's seminal exposition of the human capital theory, Bonnal et al. (2009: 330) found that the likelihood of being underemployed falls as the level of educational attainment increases. The authors included productivity growth in the definition of underemployment. However, this productivity effect is subjectively determined.

Verhaest, Sellami and Van der Velden (2017), also using the multinomial logit model, investigate whether horizontal and vertical mismatches can be explained by differences in institutions and labour market imbalances. Verhaest et al. (2017:15-16) claim that overeducation increases due to the structural oversupply of skilled workers, and observe that graduates from study programmes that are considered to be above-average quality have a lower likelihood of experiencing overeducation (measured using the self-assessment method) in their current jobs. Moreover, females and older graduates from engineering, manufacturing and construction are more likely to be overeducated while graduates with degrees that do not provide access to a PhD programme have a lower likelihood of being affected by overeducation (Verhaest et al., 2017:15). Verhaest et al. (2017:15) also find that individuals who have better study results have a greater chance of finding adequately matched jobs five years after graduation.

Humburg, De Grip and Van der Velden (2017) adopt pooled probit models to explore the relationships between graduates' skills and the risk of being overeducated¹⁴ five years after graduation or unemployed in 17 European countries. More precisely, the study examines whether the protective effects of higher skills level against overeducation and unemployment increases as the excess supply of labour expands. Humburg et al. (2017:35) find that a one-standard-deviation increase in field-specific and academic skills reduces the risk of experiencing overeducation by 1.0 and 1.4 percentage points respectively. The authors also assert that the protective effects of these two against the risk of overeducation are higher when the degree of oversupply of graduates is higher.

Schucher (2017) studies the employment situation of China's youth, and claims that the Chinese economy has failed to create an adequate number of high-quality jobs for the increasing pool of educated youth. The lagging demand for graduates, coupled with their high expectations for

¹⁴ Overeducation is measured using the subjective approach.

decent employment, has given rise to voluntary underemployment. The underemployed consists of post-secondary graduates, including young migrants (Schucher, 2017:90). Schucher (2017:91) also explains that many Chinese graduates would either prefer to have a secure state job or be underemployed in a large city rather than being employed in a relatively well-paid blue-collar job in a smaller city. Approximately a quarter of Chinese graduates start jobs that do not match their high expectations, leading to frustrations and a high turnover rate (Schucher, 2017:91).

Nord (1989) examines the relationships between labour force participation, services sector employment, and low-income underemployment using a three-equation simultaneous system. The results of the three-stage least squares indicate that underemployment increases the labour force participation rate as more secondary workers are pushed into the labour market as they seek to support their households (Nord, 1989:417). Nord (1989:417) also finds that the growing concentration of low-paying and unstable services sector jobs leads to greater underemployment as the percentage of employment in the service industry increases. Moreover, high-school dropout rates are found to be significantly associated with a higher rate of underemployment (Nord, 1989:417).

Overall, the determinants of time-related underemployment, across the literature, include gender, firm size, race, industry type, education, age, and union membership. The likelihood of becoming time-related underemployed is high for persons who work in smaller firms, those in elementary positions, temporary workers, female workers and workers below 20 years of age as well as those above 55 years. However, the risk of being in time-related underemployment is considerably smaller for managers, senior officials, professionals, and workers who belong to a union. Moreover, some of the key determinants of overeducation that are highlighted in the literature are experience, type of qualification, quality of education, and gender. In general, the probability of being overeducated is higher for science, humanities and arts graduates; graduates from institutions and programmes that are considered to be below-average quality; persons with less work experience; and women. On the contrary, professionals and managers as well as individuals who have a degree in engineering, education, business, architecture, and medicine have a lower chance of experiencing overeducation.

2.4.1.3 Duration of underemployment

Rubb (2003) investigates whether overeducation is a short-run or a long-run phenomenon in the USA using panel data. It is reasonable to assume that overeducation is a short-run phenomenon for individuals according to the career mobility theory. However, Rubb (2003:392) concludes that the overeducation phenomenon is not solely short-run in nature because approximately 75 percent of workers who are overeducated in a year particular year will remain overeducated in the following year. For a large number of individuals, overeducation is not a transitory phenomenon and this confirms that the career mobility theory is not completely valid (Caroleo and Pastore, 2013:10).

Clark, Joubert and Maurel (2017) provide an analysis of the career dynamics of overeducated USA workers. More specifically, the study uses panel data to analyse the transitions into and out of overeducation. Clark et al. (2017:9) observe that the incidence of overeducation declines over the first 12 years of the respondents' career by about 12 percentage points but it still remains significantly high for more than 10 years after entry into the labour market. Overeducation is fairly persistent at the individual level since about 66 percent of overeducated workers remain in overeducated employment after one year (Clark et al., 2017:3). Clark et al. (2017:12) also posit that the probability of exiting overeducation, after being overeducated for three years, drops from 39 to 20 percent and further declines to 15 and 10 percent after five and 10 years, respectively.

Baert et al. (2013: 123) examine whether young Belgian graduates, who accept jobs that require a lower level of education than what they have attained, either accelerate or delay the transition into jobs that adequately match their qualification. They find that overeducation at the start of a career retards the transition to an adequate job and may not be a stepping stone to an ideal job.

Kiersztyn (2013) adopts a random effects logistic regression model to assess whether overeducation in Poland is a permanent or transient phenomenon using the Polish panel survey between 1988 and 2008. Kiersztyn (2013:89) concludes that Poland has a high persistence of overeducation. This is because more than 50 percent of overeducated workers remain in the overeducation spell for five years, and the overeducated are also about four times more likely to stay in that situation across two consecutive panel waves (Kiersztyn, 2013:89).

Meroni and Vera-Toscano (2017) investigate the persistence of overeducation among recent graduates in thirteen European countries to determine whether overeducation is a trap or a stepping stone using a dynamic treatment framework. The authors (2017:128) postulate that initial overeducation has no effect on the likelihood of having a job five years later. Regardless of the absence of employment effects, overeducation at the start of one's career may not necessarily be a stepping stone to adequate employment. Meroni and Vera-Toscano (2017:128-130) are of the view that overeducation is a permanent phenomenon because individuals who take up jobs in which they are overeducated have less likelihood of ending up in matched jobs later in their career. The authors also observe that overeducation is a trap, irrespective of whether the first job is permanent or a fixed-term contract, although the impact is greater for permanent workers.

Acosta-Ballesteros, Osorno-del Rosal and Rodríguez-Rodríguez (2018) examine the impact of initial mismatch on workers' future career in Spain using an extension of the recursive bivariate probit model. Acosta-Ballesteros et al. (2018:126) find that overeducation is a trap because being overeducated in the first job significantly increases the risk of being overeducated in a later job. Specifically, young workers who are mismatched in their first job are 40.2 percentage points more likely to be overeducated in a subsequent job relative to those who are well matched at the start of their career. Acosta-Ballesteros et al. (2018:133) also conclude that the fields of study that provide students with work-oriented skills are associated with a lower risk of initial overeducation, less overeducation perseverance, and a slighter likelihood of experiencing overeducation later. By decomposing the total impact of initial overeducation into pure effect and workers' characteristics effect, Acosta-Ballesteros et al. (2018:129) observe that at least 61 percent of the increase in the probability of current overeducation is due to the pure effect of initial overeducation.

Dolton and Silles (2008:132) by assessing overeducation in the UK market find that graduates who are overeducated in their first job are more likely to experience overeducation in the future, by about 16 to 18 percentage points. On the contrary, Pecoraro (2013:17), based on data from the Swiss Household Panel Survey, postulates that about 50 percent of Swiss graduates who are

overeducated at the initial stages of their career achieve upward career mobility a few years after graduation by moving to appropriately matched jobs.

Frei and Sausa-Posa (2012) analyse the persistence of subjective overqualification in Switzerland between 1999 and 2006 using panel data. Frei and Sausa-Posa (2012:1841) observe that overqualification is transitory for most individuals since over 60 percent of workers who are overqualified in a particular year move out of the overqualification phenomenon in the following year while approximately 90 percent escape overqualification after four years. Moreover, 42 percent of overqualified workers move into adequately matched jobs in the subsequent period (Frei and Sausa-Posa, 2012:1841). Using a multinomial logit model to examine the transition between overqualification and adequate qualification, Frei and Sausa-Posa (2012:1842-1843) find that, for adequately qualified workers, a high level of education increases the risk of becoming overqualified in a subsequent period, whereas a low level of education and longer tenure of employment reduces this risk. In addition, regarding the probability of overqualified workers becoming adequately qualified a period later, only low education was found as a significant determinant in enhancing the likelihood of escaping the overqualification spell.

Carroll and Tani (2013) examine the incidence and the earnings effects of overeducation among recent graduates in Australia using panel data as well as the job analysis method to measure overeducation. In analysing the transition into and out of overeducation between 2007 and 2010, Carroll and Tani (2013:213) find that a significant number of graduates who are overeducated in their first job become adequately matched three years later. For instance, 80 percent of male graduates (25 years and below) who were overeducated in 2007 became well-matched in 2010. This seems to suggest that the first job could be used as a stepping stone into appropriate employment. Conversely, 46 percent of male graduates over the age of 25 years who are overeducated in their first job remain mismatch three years later. Moreover, a small number of graduates who are initially adequately educated become overeducated three years later.

In summary, most of the studies on the duration of underemployment (such as, Rubb, 2003; Dolton and Silles, 2008; Baert et al., 2013; Kiersztyn, 2013; Clark et al., 2017; Meroni and Vera-Toscano, 2017; and Acosta-Ballesteros et al., 2018) conclude that overeducation is not a

transitory phenomenon as the career mobility theory postulates. According to these studies, overeducation may not be a stepping stone to an adequate job but a trap since most individuals remain overeducated for a longer period. A few other studies (such as, Frei and Saussa-Posa, 2012; Pecoraro, 2013; and Carrol and Tani, 2013), however, observe that overeducation at the start of a career serves as a stepping stone to appropriately matched jobs, which validates the career mobility theory.

2.4.1.4 The impact of underemployment on earnings

Across the literature, overeducation has been found to cause wage penalties. Cohn and Khan (1995) analyse the wage effects of overeducation in the USA using the Overeducation-Required education-Undereducation (ORU)¹⁵ earnings functions specified by Verdugo and Verdugo (1989) and Sicherman (1991). Cohn and Khan (1995:72) stipulate that although the returns to schooling are positive for overeducated workers, the returns are lower relative to those of workers with the required education. Likewise, Büchel and Mertens (2000:15) argue that although overeducated workers in Germany may be expected to have better career opportunities, it does not translate into higher rates of wage growth. Using earnings as an indicator, Büchel and Mertens (2000:18) find that German overeducated workers have worse career prospects than their adequately employed counterparts.

Hartog (2000) uses the ORU earnings function to investigate the consequences of overeducation on individual earnings in five countries, namely, Spain, Netherlands, Portugal, USA and UK. Hartog (2000:135) concludes that the returns to overeducation are positive. However, the returns received by the overeducated worker are relatively smaller than that of the worker with an adequate education. The returns to required education are typically about two times greater than the returns to overeducation. Hartog (2000:135) further accentuates that these findings are not sensitive to the measure of overeducation because all the three measurements of overeducation that were used produced identical results for Portugal and USA. Korpi and Tåhlin (2009) also use the ORU model to examine the impact of educational mismatch on wages and wage growth in Sweden. In 2000, approximately 35 percent of all workers had a level of schooling at least two years in excess of their job requirements (Korpi and Tåhlin, 2009:184). On average, the

¹⁵ To be explained in detail in Chapter Three.

overeducated are penalised early in their career by receiving an inferior rate of returns to education from which they are unlikely to recover from (Korpi and Tåhlin, 2009:192).

Dolton and Silles (2008) investigate the impact of overeducation on the earnings of graduates in UK. After using instrumental variables to control for measurement errors in the wage equation, it is estimated that overeducation reduces earnings by 35 to 40 percent (Dolton and Silles, 2008:138). However, overeducated graduates may still earn more than what they would have earned if they had not acquired their qualification (Dolton and Silles, 2008:138).

Cutillo and Di Pietro (2006) investigate the impact of overeducation on the earnings of Italian graduates using a double selection approach which is based on individuals' decision to work and their choice of occupation. By employing a bivariate probit selectivity model, Cutillo and Di Pietro (2006:144) control for individuals' decision to work as well as their choice of accepting to be in positions for which they are overeducated. The findings confirm that overeducated workers receive lower earnings relative to their appropriately educated peers. The wage penalty for overeducated workers ranges from 37.8 to 39.6 percent (Cutillo and Di Pietro, 2006:163). The authors further observe that the wage differential between overeducated and appropriately educated workers that is obtained from the double sensitivity approach is significantly higher than the estimates from the OLS approach. The reason for this observation is that the OLS method is biased by the endogeneity of overeducation.

Brynin and Longhi (2009) examine whether overeducation is a major or a minor mismatch in Britain, Norway, Italy and Germany using a modified Mincerian wage function¹⁶ as well as an ORU specification. The overqualified worker receives a wage premium when compared to others who are adequately employed in the same job but suffer a wage penalty relative to appropriately placed workers with the same qualification (Brynin and Longhi, 2009:114).

Cohn and Ng (2000) examine the incidence and wage effects of over-schooling in Hong Kong using both the Mincerian wage equation and the ORU specification by Sicherman (1991). The

¹⁶ The authors consider qualification attained rather than the years of education in the formulation of the earnings function. Overeducation is calculated from a direct comparison of qualifications held and required, at all appropriate educational levels.

authors, however, do not consider the issue of possible sample-selection bias in their wage equations. The rate of return to over-schooling is positive but lower than the rate of return to adequate education (Cohn and Ng, 2000:166). The authors also argue that the wages of overeducated workers are substantially lower than the wages they would have earned if they were employed in a job that adequately matches their level of education. However, the wage penalty of overeducation declines for both males and females as labour market experience increases (Cohn and Ng, 2000:166).

Daly et al. (2000) examine the premia and penalties that are associated with surplus and deficit education respectively based on evidence from the USA and Germany. Daly et al. (2000:174) claim that experience and completed education have a significantly positive impact on earnings in Germany as well as in the USA. Using an ORU wage function, Daly et al. (2000:174) find that both surplus and adequate education have a significant positive effect on earnings. However, the reward to surplus education is lower than the reward to adequate education for both genders in the two countries.

Vahey (2000) analyses the returns to educational mismatch in Canada using the ORU model and the subjective self-assessment method to measure overeducation. Vahey (2000:226) argues that the returns to educational mismatch are sensitive to both gender and the educational requirements of the job. For jobs that require a Bachelor's degree, there is an evidence of positive returns to overschooling for male workers. For the other required levels of education, the relationship is insignificant (Vahey, 2000:226). Moreover, Vahey (2000:226) finds that the impact of overeducation on earnings is insignificant for women. A possible explanation for the observed disparity in the returns to overeducation across gender is the fact that women are more susceptible to geographical constraints in their job search due to family considerations.

Montt (2017) estimates wage regressions for each of the 23 countries involved in his study to analyse the wage penalties associated with field-of-study mismatch and overqualification. Montt (2017:10) finds that the wage penalty associated with field-of-study mismatch is higher when workers are also overqualified. On average, respondents from all countries earn 25 percent less relative to their well-matched peers when they are both field-of-study mismatched and

overqualified (Montt, 2017:10). Moreover, in countries such as Austria, Germany, Canada, the Netherlands, Belgium and Estonia, the wage penalty for field-mismatched workers only exist among those who are overqualified. In most of the participating countries, workers who are mismatched in terms of field-of-study but well-qualified in their jobs do not experience a statistically significant wage penalty (Montt, 2017:11). This suggests that field-of-study mismatch need not be considered negative per se, if it not accompanied by overqualification.

Clark et al. (2017) use panel data to estimate augmented wage regressions for the purpose of examining whether initial overeducation is associated with lower earnings later in one's career in the USA. The authors find that there is a negative association between wages and overeducation at the beginning of one's career, and the effect appears very persistent over time among those with 14 and 16 years of completed education. Moreover, staying in an overeducated employment for longer periods is correlated with lower current and future wages. The authors (Clark et al., 2017:24) also observe that the estimated wage penalty associated with past overeducation spells does not diminish after correcting for possible unobserved ability bias. These results point to the existence of scarring effects from past overeducation.

Lass and Wooden (2017) use panel data for Australia to estimate the wage differential between workers in temporary jobs and those employed permanently by adopting a quantile regression framework. Lass and Wooden (2017:16) find that among casual employees, there is a wage penalty at the very bottom of the wage distribution, but towards the top of the distribution, a wage premium develops. Compared to casual workers, temporary agency workers appear to be in a better wage situation. The authors also observe that while agency workers at the bottom of the distribution do not receive a wage penalty, those at the top receive a wage premium that is more pronounced than that for casual workers. Casual and temporary employees receive a modest wage premium because the Australian Industrial Law requires that casual workers should be given additional payment on top of their regular wage rate to compensate for the absence of other entitlements that are available to non-casual employees (Lass and Wooden, 2017:2). The results show that fixed-term contract workers, on the contrary, receive wages that are very similar to permanent workers throughout the wage distribution (Lass and Wooden, 2017:16).

Guironnet (2008) studies the impact of surplus schooling on earnings in France. The author measures surplus schooling using stochastic production frontiers (SPF) approach where overeducation is measured by means of efficiency score between schooling and earnings. Using the modified earnings function, Guironnet (2008:20) observes that the wage penalty associated with overeducation is slightly lower when compared with the estimates from traditional measures of overeducation, such as job analysis and statistical methods.

Dockery and Miller (2012) use the 2006 population census data as well as the Household, Income and Labour Dynamics in Australia (HILDA) survey data to examine educational mismatch and credentialism¹⁷ in the Australian labour market by adopting the ORU model. Dockery and Miller (2012:40) find that the returns to education are ten percent for workers with the required level of education, five percent for overeducated workers, and minus six percent for those who are undereducated. The authors argue that much of the disparity between the returns for adequately matched workers and those who are either overeducated or undereducated may not be due to educational mismatch per se but can be attributed to fixed individual effects.

The studies discussed above fail to account for unobservable difference among workers as emphasised by the heterogeneous skill theory. Tsai (2010:606) argues that the failure to adequately control for productivity differences in previous studies may account for the significantly high wage penalties associated with overeducation. As emphasised by Leuven and Osterbeek (2011:18), overeducation and ability are negatively correlated. Workers with lower abilities are more likely to be overeducated because their likelihood of finding a job that adequately matches their level of education is relatively lower (Tsai, 2010:606). This gives credence to Sicherman's (1991) assertion that the lack of other components of human capital, such as experience, lower ability and on-the-job training may account for the high incidence of overeducation. Tsai (2010:607) argues that individual-specific factors, such as ability, determine the pay difference between well-matched and mismatched workers.

¹⁷ Credentialism is regarded as the increase in education standard for specific jobs over time, and such increase may not be necessary for the effective achievement of the tasks related to those jobs (Dockery and Miller, 2012:8).

Pecoraro (2013:2) states that most existing studies have depended on cross-sectional evidence in the estimation of the wage effects of overeducation and have therefore neglected that overeducation and unobserved ability may be correlated. McGuinness (2006:391) claims that overeducated workers may be less able compared to appropriately matched workers, thus the lower wages they receive may be a reflection of lower ability. Therefore, the omission of unobserved ability overstates the associated wage penalty of overeducation (Bauer, 2002; Chevalier, 2003; Frenette, 2004; Verhaest and Omey, 2009; and Tsai, 2010). Overeducation may not always imply skills mismatch because of the possibility that some overeducated may have a lower level of skills.

Tsai (2010:607) uses longitudinal data to assess how time-invariant productivity difference can bias the estimated wage effect of overeducation in the USA. Tsai uses three estimation techniques, namely OLS, random effects and fixed effects models. For both the mean and mode measures, the OLS results show that overeducated workers earn significantly less compared to those who have the required level of education. The estimated wage differentials are about four percent and two percent for each year of surplus education for the mean and mode measures respectively (Tsai, 2010:610). The fixed effects estimates give credence to the argument that individual heterogeneity plays a crucial role in the context of overeducation. Tsai (2010:611) observes that the magnitude as well as the significance of the impact of overeducation on earnings becomes smaller. The magnitude declines from four percent to less than one percent. Tsai (2010:613) therefore states that when individual heterogeneity is controlled for, the cost of overeducation is nearly zero since overeducated workers earn almost the same amount as their adequately employed counterparts. Tsai (2010:611) argues that the wage penalty attributed to overeducation is simply a reflection of empirical misspecification.

Pecoraro (2013) analyses the incidence and the wage effects of educational mismatch among graduates in Switzerland using an extended specification of the Mincerian wage equation. Using data from the Swiss Household Panel Survey, Pecoraro attempts to solve the problem of omitted ability bias which can be found in most of the literature on the wage effect of overeducation. The study however uses the self-assessment measurement of overeducation which is highly subjective. Pecoraro (2013:24) finds that perceived overeducation is associated with a significant

wage penalty. Overeducated graduates earn approximately 10 percent less than their adequately educated colleagues (Pecoraro, 2013:21). Moreover, graduates who are genuinely overeducated¹⁸ are less rewarded compared to those who are apparently overeducated¹⁹ (Pecoraro, 2013:24). The results from the fixed effects model show that only genuinely overeducated graduates encounter a sizable wage loss. Genuinely overeducated graduates are faced with a wage penalty of 14.6 percent (Pecoraro, 2013:21). This indicates that apparent overeducation is due to the lack of other unobserved aspects of the human capital endowment, such as innate ability.

Caroleo and Pastore (2013) analyse the determinants and wage effects of educational mismatch among Italian graduates using a simplified variation of the ORU wage function by Verdugo and Verdugo (1989). Caroleo and Pastore (2013:13) indicate that the unconditional wage gap between the overeducated and the adequately educated worker ranges from 21 to 25 percent. After controlling for the level and the quality of human capital, the wage penalty significantly reduces by about 50 percent (Caroleo and Pastore, 2013:14). This is an indication that the productivity levels of some overeducated individuals may be lower than the average level.

Bauer (2002) evaluates the wage effect of educational mismatch in Germany using a panel dataset for the period 1984-1998. The author adopts the Verdugo and Verdugo as well as the Duncan and Hoffman wages models. The results of the wage effects of educational mismatch using pooled OLS is similar the general conclusion across the literature; it is observed that compared to well-matched workers with the same level of education, overeducated workers earn less and undereducated workers get a wage premium. However, after controlling for unobserved heterogeneity using panel estimation techniques, Bauer (2002:228) finds that the wage differences between well-matched and mismatched workers reduces significantly, and totally disappears in most cases.

Nieto and Ramos (2016) analyse whether the wage penalty of overeducated workers in Spain is explained by the individuals' skills heterogeneity theory using the Mincer wage equation, ORU equation, as well as the Verdugo and Verdugo equation. Nieto and Ramos (2016:231) find that

¹⁸ Genuinely overeducated graduates are those with more skills than their job requires (Pecoraro, 2013:5).

¹⁹ Apparently overeducated graduates are those who report that they are overeducated but have the level of skills that is just suitable for their job (Pecoraro, 2013:5).

although skill is an important determinant of wages, individuals' skills heterogeneity does not completely explain the wage penalty of overeducated workers. The results show that skills variations among workers only account for 18 percent of the lower wage of overeducated workers relative to their well-matched counterparts (Nieto and Ramos, 2016:231). It should, however, be noted that this study only relies on numerical and literacy skills and fails to take into account cognitive skills, such as problem-solving skills, that may be pertinent at the workplace.

There are very limited studies on the impact of educational mismatch in developing countries. Haddad and Habibi (2017) analyse the incidence of overeducation²⁰ among graduates in Iran and its impact on earnings using Mincer earnings function. The results obtained from the earnings function regression show that overeducation does not lead to a higher wage for employees in the private sector due to the negative relationship that exists between the two variables (Haddad and Habibi, 2017:66). The opposite, however, occurs in the public sector.

Finally, Bedir (2014) uses the 2012 Egyptian labour market panel survey data to assess the impact of educational mismatch on wages in Egypt by employing both the ORU specification and the Verdugo and Verdugo model. Bedir (2014:35) observes that there is a trade-off between overeducation and the years of experience because the incidence of overeducation declines as the years of experience increases. The results also indicated that the returns to education are positive but contrary to the findings in other studies, these returns are higher than the returns to adequate education (Bedir, 2014:40).

In summary, a significant part of the literature on the impact of educational mismatch on earnings is suggestive of the fact that there is a wage penalty associated with overeducation (for example, Cohn and Khan, 1995; Hartog, 2000; Cohn and Ng, 2000; Büchel and Mertens, 2000; Cutillo and Di Pietro, 2006); Korpi and Tåhlin, 2009; Clark et al., 2017). Other studies (such as, Bauer, 2002; Tsai, 2010; Pecoraro, 2013; and Caroleo and Pastore, 2013) argue that when individual heterogeneity is taken into account, the wage penalty associated with overeducation reduces significantly. Badir (2014), on the other hand, observed that overeducated workers in Egypt receive a wage premium.

²⁰ Overeducation is measured using the statistical method by adopting both mean-based and mode-based approaches.

2.4.1.5 Other empirical studies

Wilkins (2007) uses probit regressions to empirically estimate whether time-related underemployment in Australia is accompanied by adverse outcomes in terms of job satisfaction and life satisfaction, which are usually associated with unemployment. Wilkins (2007:249) examines the differences and similarities between the underemployed and the unemployed using personal outcomes such as income quality of working life, and life satisfaction. According to Wilkins (2006:371), underemployment can affect workers in both part-time and full-time employment. The adverse effects of part-time underemployment, for both male and female workers based on the measure of subjective well-being, are not distinctively different from those associated with unemployment (Wilkins, 2007:264). Even though, conventionally, only part-time underemployed workers are likely to suffer adverse consequences, Wilkins (2007:264) posits that full-time underemployed male workers also reported adverse outcomes for income and life satisfaction. The author, however, does not attempt to identify the underlying economic processes determining the underemployment status.

Godøy and Røed (2014) examine the impact of unemployment insurance benefits on the return-to-work process in Norway using a competing risks model²¹ of unemployment duration. More specifically, the study analyses how taking up a part-time job while concurrently receiving unemployment insurance will impact on the duration and outcome of unemployment insurance spells using panel data. The authors find that the provision of partial benefits to part-time workers has a positive impact on the transition to regular employment but the hazard rate to bad jobs is greater than it is for good jobs. Moreover, being in part-time employment (time-related underemployment) while searching for another job reduces the time it takes to find full-time employment and the effects seem to be relatively larger for low-quality jobs (Godøy and Røed, 2014:17). The transitions from part-time to full-time employment mainly occur within the first month of part-time work; this is an indication that employers may use a brief period of part-time employment as a screening device when recruiting. The authors conclude that unemployment

²¹ A competing risks model is used to analyse unemployment durations in economics (Van den Berg, 2005:2). It is used to examine how an unemployed individual faces the possibility to exit from unemployment to one of several possible states. For example, the model can be used to analyse the transition from unemployment into either high-quality employment, low-quality work or partial employment.

insurance systems should incorporate time-related underemployed job seekers since it reduces the duration of unemployment.

Kyyrä (2010) examines the role of partial unemployment benefits and its impact on the transition to regular employment in the context of the Finnish labour market using a timing-of-event model²². It is argued that subsidising part-time and short-term jobs act as a stepping stone towards regular and more stable employment. Subsidised short-term employment has a positive effect on the hazard rate to regular employment for both men and women during and after the spell of partial benefits (Kyyrä 2010: 924). The author also finds that both the instant and delayed effects of subsidised short-term contracts are significantly strong. The strong instant effect is consistent with the notion that employers use temporary employment as a screening device. Compared to subsidised short-term employment, subsidised part-time jobs are less effective in enhancing the chances of finding full-time work. In addition, while the results are not statistically significant for women, subsidised part-time jobs have a positive long-run effect on men, regarding the transition to full-time employment (Kyyrä 2010: 929).

2.4.2 Local studies

Despite the prevalence of underemployment in South Africa, relatively little empirical and policy attention has been devoted to this phenomenon. This section reviews the rare local studies on underemployment. First, even though Altman (2003) mainly analyses whether South Africa experienced jobless or job-creating growth between 1994 and 2001 using the OHS and LFS datasets, she also briefly examines underemployment by assuming the underemployed as workers in the informal sector, domestic services and subsistence agriculture. Altman (2003:9) states that the prevalence of underemployment can be used to measure the quality of work because the underemployed usually desire to work longer hours and have enhanced contract flexibility with improved remuneration and benefits. The proportion of workers who are underemployed according to this approach increases from 14 to 21 percent between 1994 and 2001 (Altman, 2003:17).

²² It is a causal multivariate model which is used to analyse how an event at a point in time affects the duration of a certain variable of interest (Abbring and Van den Berg, 2003:1491). For example, such a model can be used to examine the effect of training on unemployment duration or the effect of promotion on tenure.

Moleke (2005) conducts a primary survey on the employment experience of 2 672 graduates who obtained their qualifications at South African universities between 1990 and 1998. Underemployment is measured using the overeducation approach. The findings indicate that 33.3 percent of graduates are in jobs that require lower-level ability; out of these people, 42.7 percent come from the Humanities and Arts faculty while the Economic and Management Sciences as well as Natural Sciences Faculties contribute 39.4 and 36.5 percent respectively (Moleke, 2005:7). Moleke (2005:8) also finds that graduates from these three study fields are most likely to be skills-related underemployed because they are not necessarily trained for a profession or a specific career. The results, however, show that underemployment is a short-term phenomenon since most of the respondents who were initially underemployed in their first jobs changed jobs to move to higher-level positions. Most of the graduates experiencing upward career mobility come from the abovementioned three study fields. Precisely, 35 percent of those who indicate that they have moved to a higher-level position are graduates from Economics and Management Sciences while 23 percent come from Humanities and Arts (Moleke, 2005:21).

Altman and Potgieter-Gqubule (2009) analyse the status and policy challenges of the youth labour market in South Africa. Using the QLFS data for the third quarter of 2008, the authors (2009:28) find that the individuals who are more likely to be time-related underemployed are women, Africans, and youth workers aged 15-24 years. KwaZulu-Natal is the province with the highest proportion of time-based underemployed, but this share is the lowest in Gauteng. Moreover, the share of underutilised labour (which includes the time-related underemployed, unemployed and discouraged work seekers) is 23.7 percent in 2008.

The descriptive statistics derived by Yu (2009:21), using 2008 QLFS data, shows that out of the approximately 4.5 percent of the employed in South Africa who are considered to be underemployed based on the time-related definition, 85 percent of them are Africans. Also, workers with higher formal educational attainments are less likely to be time-related underemployed compared to those with low levels of education or unskilled labour (Yu, 2009:21). This study only focuses on descriptive statistics and does not make use of any econometric model estimation.

Mathebula (2013) conducts multivariate logistic regressions to analyse the determinants of time-related underemployment using the 2012 QLFS data. He finds that the probability of experiencing this type of underemployment is relatively higher for the employed who live in urban areas, with low level of education and work in sectors such as community; social and personal services; insurance; financial intermediation; real estate; and business services (Mathebula, 2013:3). The author also finds that the likelihood of underemployment is 1.59 times higher for women relative to men.

Niyimbanira (2016) carries out logistic regressions to examine time-related underemployment in the Bushbuckridge municipality in Mpumalanga based on a sample of nearly 22 000 individuals. The study uses data from a survey administered by the Provincial Department of Social Development. The results indicate that women aged younger than 30 years are relatively more likely to be underemployed (Niyimbanira, 2016:126). Niyimbanira (2016:127) also finds that the probability of becoming underemployed decreases as educational attainment improves.

Beukes et al. (2016) conduct probit regressions using the 2008 and 2014 QLFS data to analyse the extent of time-related and skills-based underemployment (measured as the level of education which is more than one standard deviation above the mean in each broad occupation category). It is found that the incidence of underemployment is significantly higher for workers who are African females, reside in urban areas, employed in the informal and public sectors, and reside in the provinces of Gauteng, KwaZulu-Natal and Western Cape (Beukes et al., 2016:13-15). In a follow-up study, Beukes et al. (2017:41) claim that the rate of time-related underemployment ranges between 2.7 to 6.2 percent during the 1995-2016 period while the rate of overeducation, based on the statistical approach (one standard deviation above the mean), ranged between 6.5 and 15.0 percent. Moreover, a greater number of underemployed workers are found in industries such as private households, community services, financial intermediation, manufacturing as well as wholesale and retail trade. The authors also conclude that workers coming from the Education, Training and Development; Business, Commerce and Management; Engineering and Health Care study fields are more susceptible to being underemployed.

Muller (2009) uses the 2001-2004 Labour Force Survey (LFS) data to investigate the wage differential between part-time and full-time female workers in South Africa adopting the OLS regression approach. She uses the ICLS recommended definition of time-related underemployment to measure involuntary part-time workers. The results indicate that, on average, female part-time workers tend to be older and have significantly lower levels of education than their full-time counterparts. Muller (2009:30) also observes that more than half of women who work fewer than 35 hours a week work in the informal sector. Expounding on wage differentials, Muller (2009:32) argues that the monthly wages of full-time workers are two times more than those for part-time workers, on average. Muller (2009:39) also finds that part-time female workers receive a wage premium, which is contrary to many other studies on the earning function of part-time work. However, after estimating an OLS regression for the separate samples of part-time and full-time female wage workers, the results indicate the presence of wage penalty for part-time workers. Likewise, the results of the Oaxaca-Blinder decomposition analysis point to a wage penalty of between three and five percent to part-time employment; however, there is a wage premium for part-time workers when an adjustment is made for the difference in endowments between part-time and full-time workers (Muller, 2009: 40-41).

Finally, Schoeman, Botha and Blaauw (2010) analyses the role labour conflict plays in the persistence of macro underemployment in South Africa using a partial equilibrium analysis. Using the 2006 Blanchard and Phillipso (BP) as well as 1997 Caballero and Hammour (CH) models, Schoeman et al. (2010:286) find a positive and significant relationship between the capital/output ratio (used as a proxy variable for underemployment) and relational conflict as well as strike frequency. This signifies that the switch to capital is more likely to occur as the frequency of strike increases and this shift to capital-intensive technology leads to underemployment. That is, underemployment occurs when labour is replaced with capital due to the persistence of labour conflicts. It is also difficult to switch back to labour once capital-intensive techniques have been adopted because of the fixed nature of capital (Schoeman et al., 2010:286). Hence, structural underemployment may persist in the long run. This study does not consider underemployment at the micro-level.

In summary, local studies on underemployment remain scanty in depth and coverage. The few available studies indicate that underemployment mostly affects women, Africans, young workers, workers residing in urban areas, workers with low level of education, informal sector workers, public sector employees, and workers in Gauteng, KwaZulu-Natal and Western Cape. Moreover, overeducation is found to be a short-term phenomenon, and the likelihood of being overeducated is higher for graduates from Humanities, Economic and Management Sciences as well as Arts faculties. It must however be emphasised that most of the South African studies lack rigorous empirical analysis. The past studies have so far failed to address the wage effects of overeducation, the transitory or chronic nature of underemployment using panel data, and the incidence of income-based underemployment.

2.5 Conclusion

There is a consensus across the literature that it is inadequate to focus exclusively on the rate of unemployment as the measure of labour underutilisation. Apart from the underutilisation of available labour resources, underemployment is accompanied by adverse consequences for the affected workers. Underemployment therefore deserves greater attention as a major economic and social problem. Developing appropriate policies to tackle underemployment requires an understanding of the personal characteristics of the underemployed.

Underemployment arises because wages will neither be solely dependent on the nature of the job (competition and the assignment models) nor on the investment in education and other human capital attributes (human capital model). While some studies question the adequacy of the human capital theory in explaining underemployment, others argue that the theory may still be consistent with the observed facts if overeducation proves to be a short-term phenomenon and /or dissipates when workers' heterogeneity is controlled for.

Globally, there are quite a number of studies examining the nature, extent, and the consequences of time-related underemployment and overeducation. In particular, the relationship between earnings and overeducation has been thoroughly researched while other studies have also

explored the dynamics of underemployment using panel data. Income-based underemployment, however, remains seriously under-researched.

In South Africa, empirical research on underemployment is very limited. The few available local studies on underemployment have been mostly descriptive in nature and have not adequately examined the significant difference between the various groups of underemployed and the fully employed as well as the consequences of underemployment. It is also worth mentioning that there is no local empirical study on underemployment that uses panel data to ascertain whether underemployment is a short-term or a long-term phenomenon. Moreover, none of the past local empirical studies examined underemployment according to the income-based definition.

Almost all the local studies, except Muller (2009), only focus on data for a specific quarter without pooling the data for a number of quarters together for a more comprehensive analysis. In addition, apart from Muller who analysed the wage gap between part-time and full-time female workers, there have been no other studies assessing the wage effects of underemployment. Furthermore, there are no local studies that investigate whether underemployment is a transitory or chronic phenomenon. This study therefore aims to address the above identified gaps in the literature and expand on the research of the underemployment phenomenon in South Africa.



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CHAPTER THREE: METHODOLOGY AND DATA

3.1 Introduction

This chapter provides some context, in terms of the measurement of underemployment, the sources of data and empirical models, for the three empirical chapters that follow. The data for the study comes from numerous household-level surveys that are representative of the entire nation. Regarding the first research objective, the study carries out comprehensive descriptive and econometric analysis, where tables and graphs are constructed from the available labour force survey data to determine the nature and extent of underemployment and analyse the demographic profile of the underemployed. Probit regressions and multinomial logit models are also estimated to ascertain the likelihood of a worker being underemployed. The labour market segmentation theory's proposition that underemployment is prevalent in the secondary (informal sector) will be tested.

For the second and third objectives of the study, other multivariate approaches are adopted. In particular, the study makes use of the earning function (or wage effect model) to evaluate the second objective, whereas probit model and random effects probit model are adopted to assess the third objective. By estimating a wage effect model for the purpose of addressing the second research objective, the earnings of the underemployed (with particular focus on those under the overeducation approach) can be contrasted with that of individuals who are fully employed. Therefore, this helps determine how the earnings of the underemployed are significantly different from that of the fully employed. The validity of the human capital theory, the job competition theory and the assignment theory will be tested. For the third research objective, numerous descriptive statistics and panel data regressions are conducted to examine the duration of underemployment, with specific focus on the income-based underemployed and overeducation. It will be assessed whether overeducation is transitory as the career mobility theory and the matching theory suggest or whether initial overeducation has a scarring effect on workers career prospects in the future as predicted by the signalling theory.

3.2 Measurement of underemployment

This study examines underemployment in South Africa based on the two main types of underemployment, namely time-related underemployment and the inadequate employment situations, discussed in Chapter Two. The two sub-categories of inadequate employment situations, which are skills-related and income-related underemployment, will both be considered in this study. It must be emphasised that time-related underemployment was only adequately defined by Stats SA in 2008 following the introduction of the QLFSs.

For time-related underemployment, the Stats SA definition, which is based on the three key criteria in the QLFS previously discussed in section 2.2.1, is adopted. The three key questions were also asked in the Labour Force Surveys (LFSs), albeit the question pertaining to the third criterion was framed slightly different between the LFSs and QLFSs. It is therefore possible to derive time-related underemployment from the 2000-2007 LFS data. In the 1995-1999 October Household Surveys (OHSs), respondents were asked: (1) how many hours they actually worked during the reference week; and (2) whether they would like to work more hours. Between 1995 and 1998, respondents were only allowed to answer the second question if they worked less than 35 hours²³ during the last seven days. The question on the third criterion (being able to start an extra work) was not asked in the OHSs. Thus, time-related underemployment can only be derived from the first two criteria, which makes it equivalent to the ILO definition. The reluctant omission of the third criterion in the OHSs may have slightly over-estimated the 1995-1999 time-related underemployment.

Regarding skills-related underemployment, this study uses the two objective approaches discussed in Chapter Two, namely, the job analysis method and the realised matches method. Information on occupation and educational qualification of the employed is available in all labour force surveys conducted from 1995 to date. The information on workers' actual qualification is therefore compared with the educational requirements of their jobs to derive the number of workers who are underemployed. The information on the educational requirements of

²³ Alternatively, the 40 hours threshold, as outlined in the Basics Conditions of Employment Act (BCEA), will be used for comparative analysis.

each broad occupation classification (shown in Table A10) is obtainable from the South African Standard Classification of Occupations (SASCO).

A drawback of the job analysis method in the context of South Africa is that the required qualifications in each occupation has not be revised or updated over the years despite the increase in the educational attainments of the general population over the years. Therefore, the empirical estimations of this study will be based on the realised matches method. In relation to the realised matches approach, the study adopts both the mean and mode methods with more focus on the former. It must be emphasised that it is not possible to use the self-assessment method because there is currently no national survey that subjectively ask respondents to state whether they are underemployed or perceive themselves to be underemployed.

The number of people who are income-related underemployed is derived using an objective approach where an individual's earnings is compared with a predetermine threshold of income deemed adequate. This study follows an approach similar to the one adopted by Findeis et al. (2009:11) to determine the income threshold, that is, less than 125 percent of the individual poverty threshold. The income threshold adopted in this study is calculated using the 2010/2011 Income and Expenditure Survey (IES). Using December 2016 as the based month, the monthly lower bound poverty line per capita equals R689.00, whereas R861.25 represents 125 percent of the individual poverty line. The second income-based approach involves the use of panel data, where a person is defined as underemployed if he earns 20 percent less than the previous period.

3.3 Data

This study uses cross-sectional data for the period between 1995 and 2016 as well as panel data from 2008 to 2015. The sources of the cross-sectional data are the 1995-1999 OHS, 2000-2007 LFSs and 2008-2016 QLFSs, conducted by Statistics South Africa (Stats SA). These surveys contain extensive information relating to individual employment status and earnings. The panel data, on the other hand, consists of the first four available waves of the National Income Dynamics Study (NIDS), conducted by the Southern African Labour and Development Research Unit (SALDRU), based at the University of Cape Town.

The OHS, which was introduced in 1993, was designed to collect comprehensive information on labour force participation, the work activities and earnings of employed in both the formal and informal sectors. The survey was conducted annually until 1999, before it was replaced with the biannual LFS in 2000. The sample size of most of the OHSs was approximately 30 000 households in 3 000 clusters. Muller (2009:7) emphasises that the 1993 OHS is not compatible with subsequent OHSs because it omitted the Transkei-Bophuthatswana-Venda-Ciskei (TBVC) states from its sample. In addition, the sampling techniques in 1993 and 1994 were also very different from those used in successive OHSs so the two former surveys are not analysed in this study.

The first biannual LFS took place in March 2000 while the last one took place in September 2007. The LFSs have sample size between 26 000 and 29 000 households (Yu, 2009:4). Stats SA introduced the QLFSs in 2008 to replace the biannual LFSs. The household-level sample size of the QLFS is between 26 000 and 27 000 (Yu, 2009:4). The revisions that have been made over the years in the three categories of surveys make comparability of data across the different datasets difficult (Muller, 2009:7; Yu, 2009:4).

The NIDS dataset, which is used in Chapter Six of this study, is a nationally representative South African panel data that tracks respondents over time. NIDS data contains information on education, labour market and income. As a result, it can be used to analyse overeducation and income-based underemployment in South Africa. It must be emphasised that the NIDS dataset does not contain the relevant information to examine time-based underemployment. At the time of writing, four waves of NIDS were available. The first wave of NIDS was conducted in 2008, the second in 2010/2011, the third in 2012, and the fourth in 2014/2015. Wave 1 consisted of 7 296 households and 28 226 individuals, wave 2 was made up of 9 127 households and 34 085 individuals, wave 3 comprised of 10 219 households and 37 397 individuals, and wave 4 included 11 895 households and 42 337 individuals (Chinhema, Brophy, Brown, Leibbrandt, Mlatsheni, and Woolard, 2016:6). The first four waves of NIDS are used to examine the transition into or out of underemployment to determine whether it is transient or persistent.

Finally, it is worth noting that total labour income in the NIDS dataset is made up of the sum of nine different possible sources of income. This is because NIDS takes into consideration the possibility that certain individuals may have multiple sources of labour income. Total labour income is categorised into primary and secondary jobs; casual work; self-employment; 13th cheque; profit share; extra payment on a piece-rate basis; other bonuses from the primary job; other sources; and helping a friend with their business.

3.4 Empirical models

This section discusses the empirical models that are adopted in Chapters Four, Five and Six to answer the three main research questions of the study.

3.4.1 Incidence and likelihood of underemployment

This section discusses the models that are used to analyse the likelihood of underemployment in relation to the first research objective. The notion that underemployment exist in the informal sector according to the labour market segmentation theory will be tested. The two models of interest are probit and multinomial logistic models.

A probit model is used to ascertain the relative impact that various factors have on underemployment likelihood compared to other employed individuals. A probit model is used to estimate parameters when a dichotomous dependent variable is regressed on one or more continuous or categorical variables (Seagraves, 2012:42). Probit regression models are useful when modelling binary outcomes and predicting the probability of an event (Cam, 2014:11). A number of studies in underemployment (including, Wilkins, 2006 and Muller, 2009, Beukes et al., 2016) adopted probit models. A probit model is preferred to the alternative, which is logit model, because it assumes that the error terms are normally distributed (Bolduc, 1999:64). Following Seagraves (2012) and Muller (2009), the probit model will be estimated as:

$$\Pr(Y_i = 1|X_i) = \Phi(X_i\beta), \quad (1)$$

Y_i , the dependent variable, is a binary categorical variable which takes the value of one if the individual is underemployed and zero if the individual is not underemployed. X_i is a vector of

explanatory variables including age, gender, occupation type, educational attainment, etc. β is a vector of parameters and Φ is the standard cumulative normal distribution.

Hassan, Zhiyu and Mahani (2016:1) explain that multinomial logit models are the multiclass extension of binary logistic models. The model was proposed by Luce (1959) to analyse the theory of psychological choice behaviour. The econometric analysis of the model has been investigated by McFadden (1973) as well as Nerlove and Press (1973). A multinomial logit model is used to examine the relationships between a polytomous response variable and a set of explanatory variables (So and Kuhfeld, 1995:665). The response variable can either have an ordered (ordinal) or unordered (nominal) structure. Davidson and Mackinnon (2004:460) as well as Williams (2017:1) stipulate that multinomial logit models are widely used in applied research to deal with unordered responses.

Suppose there are M categories in a dependent variable, with one of them being chosen as the reference category. The probability of membership in other categories is then compared to the probability of membership in reference group. A calculation of $(M-1)$ equations for each category relative to the reference category is required to describe the relationship between the dependent variable and the independent variables (Williams, 2017:1). Therefore, for each category, there will be $(M-1)$ predicted log odds relative to the reference group. Where the first category is picked as the reference, then for $m = 2, \dots, M$, the logistic model can be expressed as:

$$\ln \frac{\Pr(Y_i = m)}{\Pr(Y_i = 1)} = \alpha_m + \sum_{k=1}^k \beta_{mk} X_{ik} = Z_{mi} \quad (2)$$

Where X_i is a vector of variables and β_m is a vector of parameters.

When there are more than two categories, each of the $(M-1)$ log odds needs to be exponentiated. Thus, the expression for $m = 2, \dots, M$ can be written as:

$$\Pr(Y_i = m) = \frac{\exp(Z_{mi})}{1 + \sum_{h=2}^M \exp(Z_{hi})} \quad (3)$$

In multinomial logit models, the errors are assumed to be independently and identically distributed with the extreme value distribution (McFadden, 1977:6). Another important structural

property of this model, known as independence of irrelevant alternatives, is that the relative odds for any two alternatives are not dependent on the attributes or the availability of any other alternative (Hausman and McFadden, 1984:1221). In other words, for any two responses, l and j , the ratio of the probabilities does not depend on other alternative but depends solely on the explanatory variables (W_{tl} and W_{tj}) and the parameters (β^l and β^j) associated with those two responses as indicated by the expression below:

$$\Pr(Y_t = l) = \frac{\exp(W_{tl}\beta^l)}{\exp(W_{tj}\beta^j)} \quad (4)$$

3.4.2 Impact of underemployment on earnings

As discussed in Chapter Two, the human capital theory suggests that each additional year of schooling is compensated with higher returns to education. However, some individuals may not be able to receive the full returns to their human capital investment due to underemployment. According to Sicherman and Galor (1990:171) a certain level of human capital (H_s) is acquired by an individual who goes through the educational system for a number of years (t_s).

$$\text{Thus, } H_s = H_s(t, a) \quad (5)$$

That is, the level of human capital is an increasing function of the individual's ability (a) and years of education (t). Schooling, on the job training, medical care and vitamin consumption are some of the many ways to invest in human capital (Becker, 1962: 9).

Mincer (1974) designed a model that explains the relationship between earnings and education. The Mincer wage equation is derived from the human capital theory which implies that supply-side characteristics are the sole determinants of the returns to education (Bedir, 2014:26). Therefore, within the Mincer framework, wage is assumed to be dependent on education and experience. In the Mincerian model, log of wages is expressed as a function of linear term of schooling and both linear and quadratic terms of experience (Bhatti, 2012:20). Following Heckman, Lochner, and Todd (2005:8) as well as Bhatti (2012:20), the Mincerian wage function can be expressed as:

$$\ln W_t = \beta_0 + \beta_1(\text{Schooling})_t + \beta_2(\text{Experience})_t + \beta_3(\text{Experience})_t^2 + \varepsilon_t, \quad (6)$$

Where $\ln W_t$ represents log of wages and ε_t is the error terms. β_1 constitutes the returns to schooling while β_2 and β_3 are the returns to experience.

Earnings: The log of earnings is the dependent variable in the Mincerian model and is defined as an individual's total income at a given period. According to the human capital theory, earnings are supposed to be positively related to the number of years of education and experience.

Education: This is an independent variable in the Mincerian model and is measured as the years of formal schooling. According to the human capital theory, additional years of education entail a cost which is captured by forgone earnings. The decision to acquire more education is based on the expected future returns to education.

Experience: Experience is another independent variable, which captures post-school investment in human capital. It entails post-school skill acquisition such as on-the-job training. The quadratic term in experience is meant to allow for the possible decline in post-schooling human capital acquisition.

Across the literature, the wage effect of overeducation is assessed using two main modified specifications of the semi-log Mincer wage model. The first specification, generally referred to as ORU, is attributed to Duncan and Hoffman²⁴ (1981). In this model, years of completed education (S) is decomposed into three components, namely, required schooling (S^r), surplus schooling (S^o) and deficit schooling (S^u). The model is expressed as:

$$\ln W_i = X_i\delta + \gamma_1 S_i^r + \gamma_2 S_i^o + \gamma_3 S_i^u + e_i \quad (7)$$

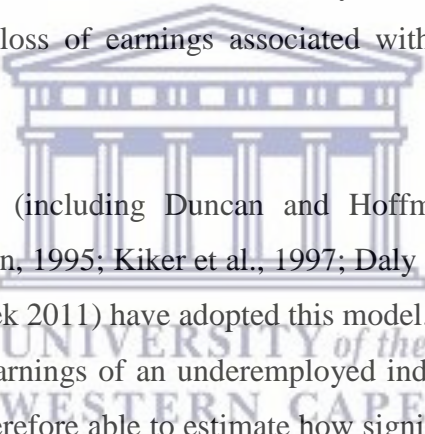
$$S^o = S - S^r, \quad S > S^r \{0, \text{otherwise}\}$$

$$S^u = S^r - S, \quad S < S^r \{0, \text{otherwise}\}$$

Where $\ln W_i$ is the natural log of hourly wages of the worker, X_i is a vector of variables (excluding education) relating to the worker's characteristics, δ is a vector of coefficients, and e_i is a random error term. S_i^r represents the required years of schooling within an occupation (this is the mean years of education for the worker's occupation), S_i^o is the years of surplus schooling

²⁴ This is referred to as the D&H model for the rest of the study.

(this is the number of years of a worker's education is in excess of the required schooling for his/her occupation), and S_i^u is the measure of underschooling (this is the number of years a worker's education is below the required schooling for his/her occupation). Thus, the total years of education have been decomposed into three variables. That is, $S_i = S_i^r + S_i^o - S_i^u$. Moreover, γ_1 , γ_2 and γ_3 are the rates of return to required education, over- and undereducation respectively. γ_2 is the returns to an additional year of overeducation, relative to co-workers who have the required level of education while γ_3 is the loss of earnings due to a year of education below the educational requirement, relative to co-workers who are adequately matched (Kiker, Santos, and De Oliveira 1997:118). It is therefore suggested that $\gamma_1 > \gamma_2 > 0$ and $\gamma_3 < 0$. It is expected that $\gamma_2 < \gamma_1$ because overeducated workers receive lower returns relative to workers who have the required years of education for their occupation. In other words, the returns to an additional year of required education is higher than the returns to an extra year of education beyond the required level. Alternatively, there is a loss of earnings associated with an additional year of deficit schooling.



Several past empirical studies (including Duncan and Hoffman, 1981; Rumberger, 1987; Sicherman, 1991; Cohn and Khan, 1995; Kiker et al., 1997; Daly et al., 2000; Bauer, 2002; Rubb, 2003; and Leuven and Oosterbeek 2011) have adopted this model. The ORU is preferred because it enables one to compare the earnings of an underemployed individual with that of their well-matched counterparts. One is therefore able to estimate how significantly different the income of mismatched workers is from that of adequately educated individuals.

The validity of the human capital theory can be tested using the Duncan and Hoffman specification by imposing equal returns to all disaggregated forms of attained education. That is, $\gamma_1 = \gamma_2 = \gamma_3$. Likewise, since the job competition model assumes that only required education affects wages, its validity can be tested by checking whether the returns to overeducation and the returns to undereducation are not significantly different from zero. That is, $\gamma_2 = \gamma_3 = 0$. One plausible scenario takes place when the returns to required education are significant but the coefficients of overeducation and undereducation are insignificant. Moreover, one can impose the restriction that $\gamma_1 \neq \gamma_2 \neq \gamma_3$ to test the assignment theory since the theory assumes that wages are not entirely determined by the requirements of the job.

There is another empirical specification of the wage function known as the Verdugo and Verdugo²⁵ (1989) model. It is specified as:

$$\ln W_i = X_i\delta + \beta_1 Edu_i + \beta_2 OE_i + \beta_3 UE_i + \varepsilon_i \quad (8)$$

Where $\ln W_i$ is the log of wages, X_i represents a vector of variables, Edu_i is the years of completed schooling, OE_i is a dummy variable which equals one if the worker is overeducated²⁶ (otherwise, 0), UE_i is also a dummy variable which equals one if the worker is undereducated²⁷ (otherwise, 0), and ε_i is the error term. β_2 and β_3 indicate the degree to which the wages of overeducated and undereducated workers respectively differ from that of similar workers with the same level of education who are adequately matched in their jobs. Thus, in the V&V model, mismatched workers are compared to adequately matched workers who have similar observed characteristics.

Kiker et al. (1997:118) explain that within a particular job, overeducated workers would earn more than their co-workers who have the required level of education. However, overeducated workers would earn less than workers who have the same qualification but employed in jobs that required a higher educational level as the one they possess. On the other hand, undereducated workers would earn less than their co-workers who are adequately matched but would receive a higher remuneration compared to workers with equivalent qualification who are employed in jobs where the educational requirement matches their acquired education. In most past studies (e.g. Verdugo and Verdugo, 1989; Sicherman, 1991; Cohn and Khan, 1995; Bauer, 2002, and Rubb, 2003), it was found that $\beta_2 < 0$ and $\beta_3 > 0$. The negative coefficient associated with the overeducation variable in the V&V model does not necessarily imply that there are negative returns to overeducation. It rather suggests that workers have lower wages in jobs in which they are overeducated compared to being in jobs in which their acquired education matches the

²⁵ This is referred to as the V&V model for the remainder of the study. In the V&V model, required education is defined as the mean education for the worker's occupation if the worker's education is within plus/minus one standard deviation of the mean education for his/her occupation.

²⁶ A worker is overeducated if his/her schooling is above the mean education plus one standard deviation of the average for his/her occupation.

²⁷ An undereducated worker is one whose years of education are below the mean education minus one standard deviation of the average for his/her occupation.

required education. Therefore, overeducated workers suffer a wage penalty relative to well-matched workers with the same level of education. On the other hand, the positive coefficient associated with undereducation suggests that undereducated workers benefit from a wage premium compared with well-matched workers with the same level of education.

The conventional approach to estimate the above wage functions is to use an Ordinary Least Square (OLS) regression. However, using an OLS regression to estimate the returns to education raises a number of concerns. Some argue the simple OLS estimates might tend to over/underestimate the wage penalty associated with educational mismatch. This is because there is the possibility of endogeneity bias due to unobserved heterogeneity between overeducated workers and the rest of the sample (Caroleo and Pastore, 2018:1007). There may also exist a simultaneous causality bias, which occurs when there is a bidirectional (two-way) relationship between education and earnings (Bedir, 2014:27). In other words, while education affects earnings, earnings can also affect the decision to invest in education. At the same time, there might be sample selection bias because of the issue of unobserved heterogeneity between the employed and the unemployed (Caroleo and Pastore, 2018:1007). Caroleo and Pastore (2018:1008) explain that OLS estimates do not account for the possible unobserved differences between mismatched workers and the unemployed, who may also become mismatch if employed.

In the overeducation literature, endogeneity bias is generally addressed by means of longitudinal data, adopting instrumental variables (IV) estimates, and by controlling for the quality of human capital (ability). This study is not able to adopt any of the three approaches to address endogeneity bias because the OHS, LFS and QLFS datasets used in analysing the wage functions do not have a longitudinal dimension; these datasets do not contain any suitable instrumental variables and neither do they contain any indicator to measure ability.

The Heckman (1979) sample selection procedure has been proposed as an empirical model to deal with the issue of sample selection bias. Nieto and Ramos (2016:228) posit that the Heckman two-step specification addresses the omitted heterogeneity of the non-employed by taking into account the possibility that the employed may not be a random subsample of the sample that is being considered. The first step is to estimate employment likelihood conditional on labour force

participation using a probit model, and then calculate the inverse Mills ratio (λ). The second step involves an estimation of the wage regression where λ is included as a regressor. Ignoring the unemployed in the wage equation might cause a bias on the returns to education as well as on the wage effect of educational mismatch (Sloan et al. 1999; Dolton and Vignoles 2000; Cuttillo and Di Pietro, 2006). This study therefore adopts the Heckman specification to control for the possible sample selection bias emanating from measuring overeducation only among the employed without taking into consideration the different characteristics of the unemployed.

3.4.3 Duration of underemployment

Chapter Six examines the duration of overeducation and income-related underemployment by tracking workers across different waves of NIDS to ascertain whether to remain in or move out of overeducation and income-related underemployment. With regard to overeducation, the aim is to determine whether initial overeducation serves as a stepping stone to well-matched jobs in the future as the career mobility and matching theories suggest or whether it entails a scarring effect on workers' future career prospects in line with the signalling theory. For income-related underemployment, the study assesses the status of workers across the four waves to determine the prevalence of this type of underemployment. The chapter also analyses the transitory or chronic nature of overeducation and income-related underemployment. Both overeducation and income-related underemployment are defined as transitory if the phenomenon lasts between one to two periods. They are, however, defined as chronic if workers remain either overeducated or income-related underemployed for at least three periods.

The study, in Chapter Six, adopts both pooled probit regression models which ignore the panel nature of the data, and random effects probit models which exploit the panel dimension of the data to examine the likelihood of the two types of income-related underemployment and overeducation. Bland and Cook (2018:1) state that a random effects probit model is suitable for panel data analysis where the dependent variable is binary, and the individual-level heterogeneity and the explanatory variables are statistically independent. On the contrary, a pooled probit model works only if there is no unobserved heterogeneity. Gibbons and Bock (1987) developed a random effects model to estimate the trend in binary variable measured repeatedly in the same

subjects. Arulampalam (1999:597) explains that random effects probit models impose the restriction that there is a constant correlation between successive error terms for the same individual. However, by pooling the data and ignoring this particular correlation structure, a static model can be estimated to obtain consistent parameter estimates (Arulampalam, 1999:597).

An unbalanced panel data can be modelled using the following equation:

$$y_{it}^* = x_{it}\beta + u_{it}, \quad (9)$$

$$y_{it} = 1 \quad \text{if } y_{it}^* > 0, \text{ and } 0 \text{ otherwise}$$

On the other hand, the latent variable representation of the random effects model can be expressed as follows:

$$y_{it}^* = x_{it}\beta + c_i + u_{it}, \quad (10)$$

$$y_{it} = 1 \quad \text{if } y_{it}^* > 0, \text{ and } 0 \text{ otherwise}$$

Where y_{it}^* is the unobserved latent variable, y_{it} is the observed binary dependent variable, x_{it} is a $1 \times K$ vector of explanatory variables, β is a $1 \times K$ vector of coefficients, c_i is a mean-zero error term specific to the individual level of the panel, and u_{it} is the independent and identically distributed idiosyncratic error term which follows a normal distribution. Also, for random effects models, the conditional distribution $f(u_i, x_{it})$ does not depend on x_{it} . That is, $Cov(u_i, x_{it}) = 0$.

Finally, a response probability of an unobserved effects (random effects probit) model can be represented by the following equation.

$$P(y_{it} = 1 | x_{it}, c_i) = \Phi(x_{it}\beta + c_i) \quad (11)$$

There are some key assumptions in equation (11), namely:

- x_{it} and c_i are independent
- y_{i1}, \dots, y_{iT} are independent conditional on (x_i, c_i)
- c_i follows a normal distribution with zero mean and constant variance [$c_i | x_i \sim N(0, \sigma_c^2)$]
- x_{it} are strictly exogenous

Furthermore, following Frei and Soussa-Poza (2012), Chapter Six adopts multinomial logit models²⁸ to analyse the transitions between overeducation and adequate education. Using pooled data, workers labour market status in period t is compared with their status in period $(t + 1)$ based on various determinants, such as gender, race, experience, etc. The multinomial model which is used to examine the transitions between overeducation and adequate education include five outcome categories, namely adequately educated; overeducated; undereducated; unemployed or inactive; unclassified employed. Overall, two multinomial logit models are estimated. The first multinomial logit regression examines the transition from adequate education to overeducation. In other words, the aim is to determine the probability of adequately matched individuals in period t becoming overeducated in period $(t+1)$ using those who are well-matched in period $(t+1)$ as a reference category. The second regression focuses on overeducated individuals in period t and the likelihood of them becoming well-matched in period $(t+1)$ using overeducated individuals in period $(t+1)$ as the base category.

3.5 Limitations

This section discusses the data as well as the empirical model limitations that were encountered while conducting this study. One of the data limitations relates to the fact that the NIDS panel data could not be used to examine either the transient or the permanent nature of time-related underemployment. This is because these surveys do not include the pertinent questions which are required to define and capture the time-related underemployed. Although the OHS, LFS, and QLFS datasets contain the relevant information to identify the time-related underemployed, these surveys do not have a longitudinal (panel) dimension. As a result, none of the labour force survey data can be used to analyse the dynamics of time-related underemployment.

Another data limitation worth noting is the unavailability of earnings data in the 2008 and 2009 QLFS. The questions pertaining to earnings were not asked in 2008 and 2009, and thus make it impossible to analyse the earnings of the underemployed for this period. Moreover, at the time of writing, the 2017 earnings data is not yet available. Hence, the 2017 QLFS data is excluded from this study.

²⁸ Refer to Section 3.4.1 for a discussion of multinomial model.

Endogeneity is one of the issues stated in the literature which is deemed to affect the estimation of the returns to education. This stems from an omitted variable (ability) bias where the education variable in the wage equation is correlated with the residual (ε), $\text{cov}(x, \varepsilon) \neq 0$. The omission of unobserved ability may overstate the wage penalty associated with overeducation (Bauer, 2002; Chevalier, 2003; Frenette, 2004; Verhaest and Omey, 2009; and Tsai, 2010). Since ability is difficult to measure, past studies have relied on proxies such as intelligent quotient (IQ) and/or cognitive skills test scores. Others have adopted an instrumental variable (IV) approach by using parents' education to address the bias associated with the omission of ability. However, neither of these approaches can be employed in this study because none of the datasets contains any proxy for ability and there are no suitable instrumental variables available.

3.6 Conclusion

This chapter outlines the definitions of the three types of underemployment that this study adopts and discusses the type as well as the sources of data for the study. Specifically, the study adopts the Stats SA's definition to measure time-related underemployment, the realised matches method (mean plus one standard deviation) to measure skills-related underemployment, as well as the "125 percent above the poverty line" and "earning 20% less than previous period" approaches to determine income-based underemployment. With respect to the type of data, the study uses cross-sectional data which is based on labour force surveys conducted by Stats SA from 1995 to 2016 as well as the four waves of NIDS panel data conducted by SALDRU from 2008 to 2015.

The chapter also explains the models that are used to achieve the objectives of the study. Probit models and multinomial logistic models are used to analyse the incidence and likelihood of underemployment while the Heckman (1979) specification is adopted to estimate the impact of overeducation on earnings. Overall, three wage equations are specified, namely, the Mincer wage model, the Duncan and Hoffman (D&H) model as well as the Verdugo and Verdugo (V&V) model. Finally, random-effects models which control for individual unobservable heterogeneity are used to assess the longitudinal dimension of underemployment in the South African labour market. Furthermore, using pooled data from 2008 to 2015, the study adopts multinomial logit models to examine the transitions between overeducation and adequate education.

CHAPTER FOUR: UNDEREMPLOYMENT: INCIDENCE AND LIKELIHOOD

4.1 Introduction

This chapter examines the nature, extent and incidence of underemployment in South Africa based on both the time-related and inadequate employment situations definitions. This chapter thus analyses the profile of the three main groups of the underemployed, namely, time-related, skills-related and income-based underemployed. The characteristics of underemployed are examined while a comparative analysis is conducted to determine the differences in incidence and rate across the three forms of underemployment. Among the characteristics analysed are age, gender, race, occupation, industry type, settlement type, and province. The chapter also explores the likelihoods of falling into underemployment among diverse groups of workers.

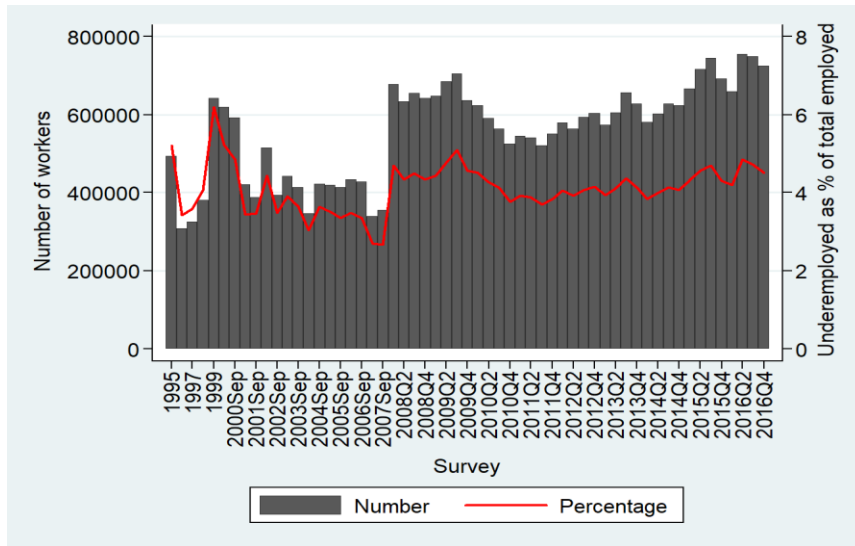
4.2 Descriptive statistics

Figure 4.1 presents the number and percentage of workers who are regarded as underemployed according to the time-related definition²⁹ in 1995-2016. For the period under consideration, the number of time-related underemployed workers ranges between 0.31 million and 0.76 million, representing between 2.7 percent to 6.2 percent of the total number of employed workers. Between 1995 and 1999, the data for time-related underemployed workers may not be completely accurate because the third question was not asked. The sharp rise in the number as well as the percentage of underemployed workers from the first quarter of 2008 can be attributed to the effects of the 2007 financial crisis. This is suggestive of the fact that economic recession increases the rate of time-related underemployment as emphasised Wilkins and Wooden (2011). As expected, using the BCEA's 40 working hours per week as the threshold for defining time-related underemployment reduces the number as well as the percentage of time-related underemployed workers as shown in figure A1, although a similar trend is observed as in the Stat SA definition.

²⁹ According to Stats SA's definition, time-related underemployed workers are those who:

- (1) Are willing and available to work extra hours;
- (2) During the reference week worked fewer than 35 hours; and
- (3) Are able to start an extra work in the next four weeks if the additional work is available.

Figure 4.1: Number and percentage of time-related underemployed workers

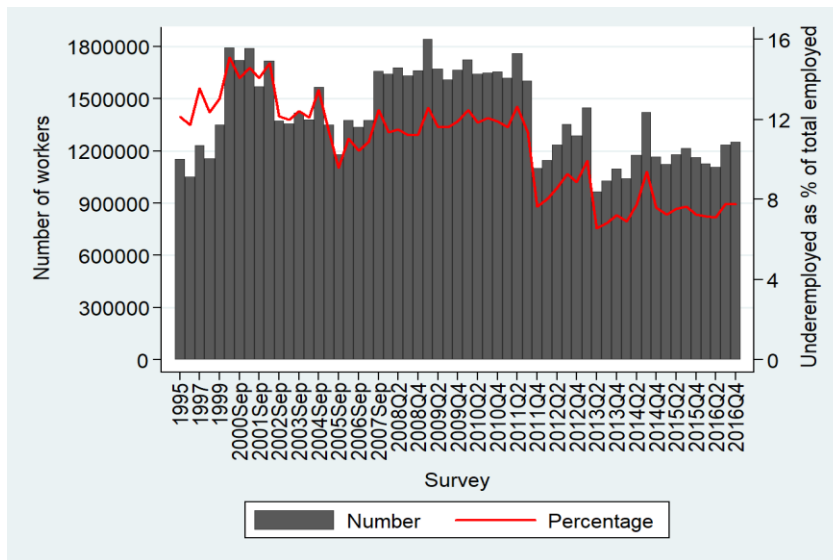


For comparative analysis, the number and percentage of overeducated workers based on the job analysis approach are provided in the Appendix in Figure A2. The figure shows that the number as well as the percentage of overeducated workers based on the job analysis approach is much higher, with the percentage ranging between 13.8 to 28.7 percent. There is an indication of a rising trend in overeducation from 1995 to 2016 but this could be attributed to the fact that the occupational classification has remained the same across the years (see Table A4), despite the general increase in educational attainment. Hence, for the remainder of the study, the job analysis approach will not be investigated further.

Using the mean plus one standard deviation approach³⁰, Figure 4.2 shows that the number and percentage of overeducated workers are significantly greater than the number of time-related underemployed workers, ranging between 0.96 million to 1.84 million. The percentage of overeducated workers is the highest in March 2000 (at 15.1 percent) and lowest during the second quarter of 2013 (at 6.6 percent). After two sharp declines in September 2005 and in the fourth quarter of 2011, the proportion of overeducated workers has remained relatively stable from the first quarter of 2014 to the fourth quarter of 2016, ranging between 7.2 and 7.8 percent.

³⁰ An overeducated worker is defined as someone whose level of education is more than one standard deviation above the mean years of education for his/her occupation.

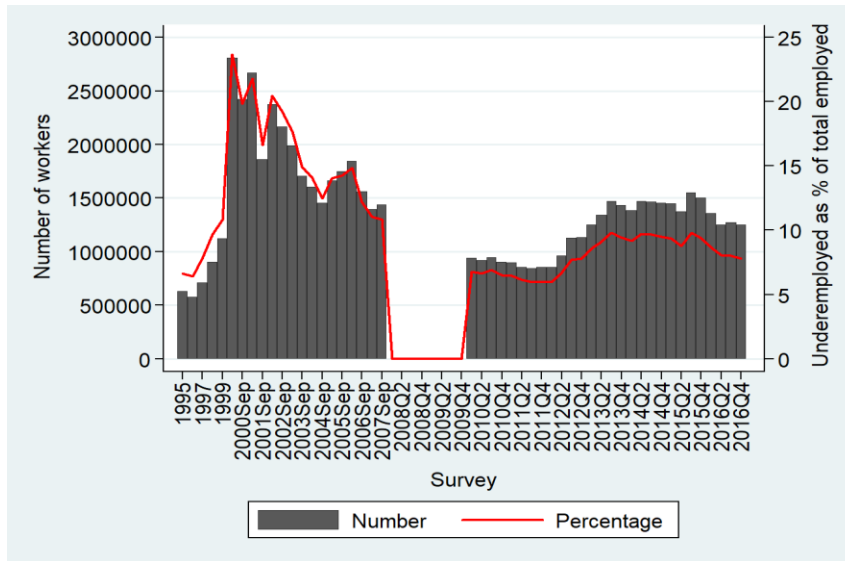
Figure 4.2: Number and percentage of overeducated workers (statistical method-mean)



The number and the percentage of overeducated workers based on the mode plus one standard deviation method are shown in Figure A3 as additional information. Relative to the mean method, the number of overeducated workers based on the mode method appears to be very high from 1995 to March 2002, ranging between 1.97 million and 3.71 million. This can be attributed to the fact that the mode years of education for three occupations (skilled agriculture and fishery workers, elementary workers, and domestic workers) was zero, which in turn increased the number of overeducated workers significantly. After March 2002, however, the number as well as the percentage of workers who are deemed to be overeducated according to the mode method became slightly lower than those of the mean method. The share of overeducated workers, based on the mode method, declines from 28.4 percent in March 2002 to 5.8 percent during the last quarter of 2016. For the remainder of this study, empirical findings will be derived by adopting the mean plus one standard deviation approach.

As far as the income-based approach (earning less than 125 percent of poverty threshold) is concerned, the number of underemployed workers ranges between 0.58 million and 2.81 million, representing between 5.9 to 23.7 percent during the period. In Figure 4.3, the share of income-based underemployed workers is higher across the LFS data compare to the OHS and QLFS datasets.

Figure 4.3: Number and percentage of income-based underemployed workers



Note: Question on earnings was not asked in QLFS 2008-2009.

Overall, the underemployment rate at the end of the fourth quarter of 2016 is about 18 percent as shown in Table A1. Although the total number of underemployed workers increases from 2.11 million in 1995 to 2.88 million in the fourth quarter of 2016, the underemployment rate declines from 22 to 18 percent. The highest underemployment rate is about 38 percent in March 2000.

Furthermore, Figure 4.4 shows the composition of workers who fall under the various categorisation of underemployment in selected years. In all four periods, the prevalence of overeducation and income-based underemployment is higher than that of the time-related classification. About 50 percent of all underemployed workers are affected by overeducation only in 1995 and 2002 respectively. In 2010, 55 percent of underemployed workers are classified as overeducated only, but this proportion drops to 40% in 2016. Figure 4.4 also depicts that some workers are distinguished as underemployed under more than one classification at the same time. For example, about 11 percent of workers are underemployed across two definitions concurrently in 2016. A very small number of workers (about 0.27 percent in 1995 and 0.34 percent in 2016) are affected by all three types of underemployment.

Figure 4.4: The share of underemployed workers by category, selected years

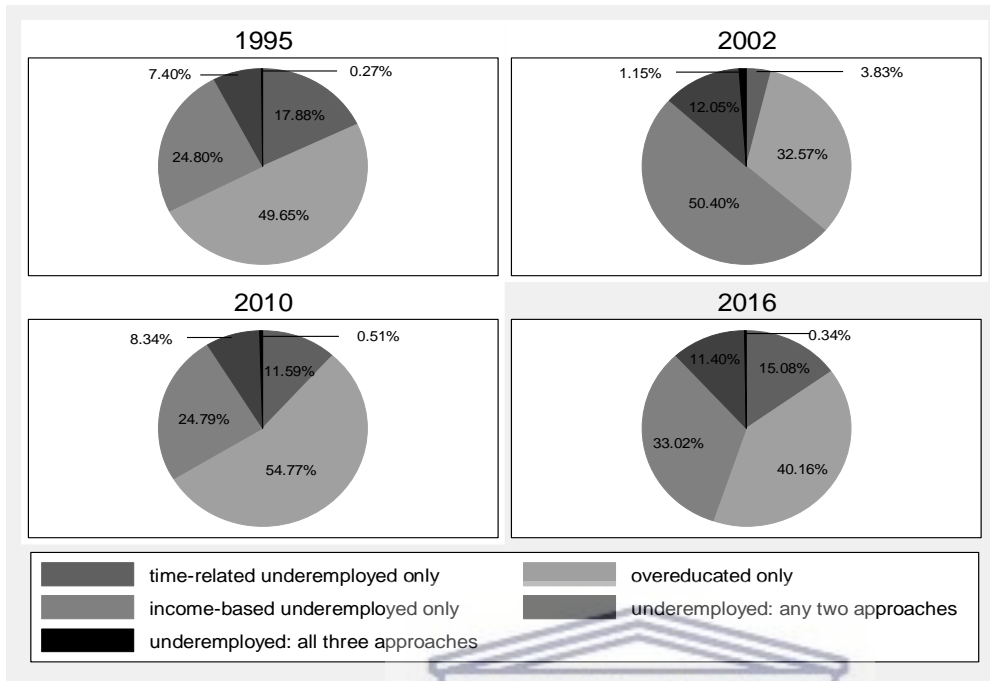


Table 4.1 and Table A2 present the demographic profile of the underemployed in selected years. Among the four racial groups, the African share remains the greatest across all the three definitions. However, the proportion of underemployed African workers is relatively lower under the overeducation approach, averaging 60 percent, but higher under the income-based method (about 90 percent). The white population is more susceptible to overeducation than the other two types of underemployment but less prone to income-based underemployment. The proportions of time-related (except in 2010 and 2016) and income-related underemployed are significantly different from those of the fully employed across all four racial groups while the percentage of overeducated Indians is not statistically different from their fully employed counterparts. With regard to gender, the female share of underemployed workers is relatively higher at about 60 percent under the time-related and income-based definitions across all four periods. However, men represent more than half of the overeducated in 1995, 2002 and 2010.

The average age of underemployed workers for the period under consideration ranged between 34 and 40 years across all the three types of underemployment. A higher proportion of the underemployed as well as the fully employed are between 25 to 44 years, and the share of

income-related underemployed in this age category is significantly different from that of their fully employed colleagues.

Among the three types of underemployment, the overeducated have the highest mean education years, ranging from 12 to 15 years. Interestingly, overeducated workers are significantly more educated on average than the fully employed. The income-based underemployed are rather associated with the lowest mean years of education (between five and nine years). Moreover, workers with primary and secondary education constitute the highest proportion of the time-related and income-related underemployed across all the observed periods while workers with a degree and secondary school certificate are the most overeducated. The proportion of overeducated degree holders has increased from approximately 15 percent in 1995 to 71 percent in 2016. This upsurge in educational attainment and the inability of the economy to create the employment opportunities commensurate to the increased supply of graduate has led of the overeducation phenomenon.

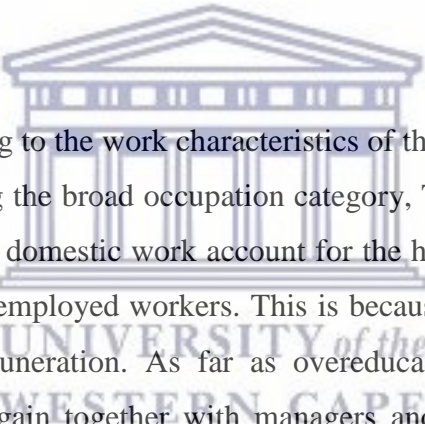
It can also be seen in Table A2 that more than 50 percent of overeducated workers are either married or co-habiting and are household heads. On the other hand, except in 1995, most time-related and income-based underemployed workers are unmarried, divorced or widowed. Many of the time-related underemployed and overeducated workers are found in urban areas in the Gauteng, KwaZulu-Natal, Western Cape and Eastern Cape provinces. On the other hand, the income-based underemployed workers primarily reside in the KwaZulu-Natal, Eastern Cape, Limpopo, Free State and Gauteng province.

Table 4.1: Demographic characteristics of the underemployed, selected years

Variable	Overeducation				Time-related				Income-related				Fully employed				Unemployed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Race																				
African	0.611	0.630*	0.638*	0.601*	0.674*	0.859*	0.878*	0.864*	0.883*	0.931*	0.940*	0.877*	0.631	0.604	0.692	0.740	0.835*	0.872*	0.866*	0.883*
Coloured	0.093*	0.080*	0.073*	0.059*	0.106*	0.086*	0.094	0.101	0.098*	0.050*	0.048*	0.059*	0.128	0.136	0.120	0.112	0.107*	0.078*	0.096*	0.082*
Indian	0.036	0.044	0.037	0.052	0.026*	0.008*	0.010*	0.006*	0.003*	0.004*	0.002*	0.018*	0.041	0.046	0.041	0.034	0.021*	0.022*	0.010*	0.012*
White	0.260*	0.243*	0.252*	0.288*	0.194	0.047*	0.018*	0.030*	0.017*	0.015*	0.009*	0.046*	0.200	0.213	0.147	0.113	0.037*	0.026*	0.028*	0.023*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Gender																				
Male	0.591*	0.601	0.542*	0.497*	0.392*	0.413*	0.404*	0.420*	0.301*	0.403*	0.351*	0.446*	0.646	0.626	0.594	0.582	0.455*	0.469*	0.511*	0.507*
Female	0.409*	0.399	0.458*	0.503*	0.608*	0.587*	0.596*	0.580*	0.699*	0.597*	0.649*	0.554*	0.355	0.374	0.406	0.418	0.545*	0.531*	0.489*	0.493*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Age																				
15 to 24 years	0.165*	0.149*	0.081	0.042*	0.107	0.173*	0.102	0.084	0.193*	0.170*	0.101	0.090	0.108	0.096	0.088	0.085	0.318*	0.330*	0.282*	0.239*
25 to 34 years	0.445*	0.463*	0.326	0.294	0.336	0.315	0.297	0.300	0.296*	0.276*	0.297	0.268*	0.334	0.330	0.325	0.312	0.405*	0.396*	0.414*	0.401*
35 to 44 years	0.251*	0.239*	0.338*	0.344	0.290	0.256*	0.300	0.291	0.265*	0.248*	0.259*	0.281	0.311	0.295	0.300	0.310	0.180*	0.171*	0.198*	0.235*
45 to 54 years	0.106*	0.106*	0.182	0.209	0.171	0.190	0.220	0.254*	0.169	0.189	0.231	0.239*	0.176	0.197	0.203	0.202	0.075*	0.082*	0.087*	0.102*
55 to 65 years	0.034*	0.043*	0.072	0.111	0.096*	0.067*	0.081	0.071	0.078	0.116*	0.112*	0.122*	0.072	0.082	0.084	0.090	0.021*	0.022*	0.019*	0.023*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>33.46*</i>	<i>33.77*</i>	<i>37.99</i>	<i>40.05</i>	<i>37.46</i>	<i>36.22*</i>	<i>38.47</i>	<i>38.78</i>	<i>35.92*</i>	<i>37.51</i>	<i>39.08</i>	<i>39.94</i>	<i>37.14</i>	<i>37.96</i>	<i>38.16</i>	<i>38.56</i>	<i>30.25*</i>	<i>30.29*</i>	<i>31.02*</i>	<i>32.26*</i>
Education																				
None	0.000	0.000	0.000	0.000*	0.108*	0.107*	0.049	0.048*	0.254*	0.180*	0.087*	0.048*	0.078	0.051	0.028	0.020	0.069	0.039*	0.020*	0.013
Primary	0.000	0.000	0.000	0.000*	0.195*	0.307*	0.246*	0.236*	0.523*	0.418*	0.319*	0.240*	0.241	0.200	0.128	0.104	0.270*	0.223*	0.125	0.097
Matric	0.615*	0.678*	0.409*	0.106*	0.447*	0.526*	0.635	0.646*	0.213*	0.383*	0.539*	0.621*	0.565	0.574	0.677	0.706	0.624*	0.689*	0.791*	0.806*
Matric + Cert./Dip.	0.238*	0.072*	0.116	0.181*	0.169*	0.038*	0.041*	0.039*	0.006*	0.007*	0.020	0.047*	0.074	0.105	0.128	0.099	0.025*	0.032*	0.047*	0.053*
Degree	0.147*	0.250*	0.475*	0.713*	0.075*	0.012*	0.008*	0.024*	0.002*	0.004*	0.012	0.031*	0.034	0.056	0.026	0.059	0.006*	0.010*	0.009*	0.025*
Other	0.000	0.000	0.000	0.000*	0.006	0.011	0.021	0.009	0.002*	0.008*	0.024	0.014	0.010	0.013	0.014	0.012	0.006	0.006	0.007	0.006
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>12.07*</i>	<i>12.63*</i>	<i>13.87*</i>	<i>15.04</i>	<i>9.08</i>	<i>7.72*</i>	<i>8.81*</i>	<i>8.99*</i>	<i>4.72*</i>	<i>6.11*</i>	<i>7.86*</i>	<i>9.00*</i>	<i>8.74</i>	<i>9.53</i>	<i>10.20</i>	<i>10.63</i>	<i>8.41</i>	<i>9.09</i>	<i>10.06</i>	<i>10.</i>

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

As Table 4.1 also depicts, the demographic characteristics of the underemployed are not too distinct from those of the unemployed. Just like what was found in the case of the underemployed, a greater proportion of unemployed individuals are Africans. In fact, the percentage of Africans who are unemployed is very similar to the percentage of those who were time-related underemployed. There are more unemployed females than males in 1995 and 2002, an observation which is identical to the ones found under time-related and income-based underemployment. However, the percentage of unemployed males relative to females is higher in 2010 and 2016 just as it was in the case of overeducation. The unemployed are found to be relatively younger than the underemployed. The average age of the unemployed (between 30 and 32 years) is lower than the mean age of underemployed workers (between 34 and 40 years). Moreover, similar to what was observed for the underemployed, a considerable proportion of unemployed individuals resides in urban areas and mostly lives in Gauteng and KwaZulu-Natal as shown in Table A2.



The summary statistics pertaining to the work characteristics of the underemployed are presented in Tables 4.2 and A3. Regarding the broad occupation category, Table 4.2 portrays that workers involved in elementary jobs and domestic work account for the highest proportion of both time-related and income-based underemployed workers. This is because such jobs may be temporary in nature and offer lower remuneration. As far as overeducation is concerned, elementary occupations (except in 2016) again together with managers and technicians have the highest share of overeducated workers while for most of the periods, workers involved in skilled agriculture and professionals account for the lowest proportion of underemployment across all the three approaches. The vast majority of underemployed workers work in the private sector across all the three definitions (between 68 and 99 percent). This suggests that the private sector employs highly educated workers and offers a lot of part-time employment relative to the public sector. Furthermore, many of the workers across all the three definitions of underemployment have more than 20 years of work-related experience, with most of them reporting years of work experience in excess of 25 years. Overall, income-related underemployed workers enjoy the highest mean years of work-related experience of about 25 years while the overeducated report the lowest mean years of experience (between 15 to 19 years).

In relation to the broad industry category of employment, community services, private households, as well as wholesale and retail trade are the industries accounting the highest share of time-related underemployment as shown in Table A3. Likewise, overeducated workers are mostly found in manufacturing, community services, private households, financial intermediation, and wholesale and retail sectors, while private households, community services, as well as wholesale and retail sectors represent most of the income-based underemployed workers. Also, the average tenure of underemployed workers is highest (between five to nine years) under the overeducation approach across all four periods. Overall, workers with tenure between 10 to 15 years are less affected by underemployment while those who have been employed in their current job for not more than three years constituted the highest proportion of the underemployed in all three categories.

With regard to the skills level of workers, most overeducated workers, except in 2016, are involved in unskilled occupations. Likewise, more than 60 percent of time-related underemployed workers are found in unskilled jobs in 2010 and 2016. Moreover, less than 10 percent of income-related underemployed workers are involved in highly skilled jobs, as the majority are employed in unskilled occupations. In relation to the sector of employment, a sizeable proportion of underemployed workers (between 56 to 82 percent) can be found in the tertiary sector. Also, the informal sector and domestic workers dominate the workers who are time-related underemployed, mostly because the jobs in these sectors are predominantly casual. Domestic workers constitute about 90 percent of income-related underemployed workers in 1995, but in 2016, it is the formal sector that employs about 52 percent of these workers.

Finally, Table A3 shows that most overeducated and income-related underemployed workers report usually working above 40 hours and above per week while a greater proportion of time-related underemployed work 30 hours or less per week. As expected, the time-related underemployed have the lowest mean usual weekly work hours. Except in 1995, a considerable proportion of overeducated and income-related workers indicate that they are not willing to work longer hours. The above observation gives credence to the fact that the overeducated and income-related underemployed workers are full-time employees.

Table 4.2: Work characteristics of the underemployed, selected years

Variable	Overeducation				Time-related				Income-related				Fully employed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Occupation																
Managers	0.057	0.132*	0.168*	0.160*	0.044	0.021*	0.020*	0.027*	0.008*	0.003*	0.012*	0.016*	0.056	0.069	0.080	0.090
Professionals	0.000	0.000	0.050*	0.052*	0.066*	0.008*	0.010*	0.013*	0.001*	0.001*	0.011*	0.012*	0.040	0.063	0.064	0.052
Technicians	0.042*	0.055*	0.182*	0.193*	0.211*	0.051*	0.056*	0.055*	0.006*	0.016*	0.043*	0.045*	0.123	0.138	0.108	0.088
Clerks	0.117	0.031*	0.037*	0.097	0.106*	0.058*	0.037*	0.019*	0.013*	0.019*	0.026*	0.055*	0.129	0.128	0.126	0.112
Service workers	0.063*	0.015*	0.022*	0.042*	0.094*	0.087*	0.126	0.116*	0.042*	0.097*	0.157	0.116*	0.128	0.127	0.160	0.169
Skilled agriculture	0.008*	0.093*	0.002	0.007	0.011	0.195*	0.001*	0.000	0.011*	0.206*	0.007	0.006	0.013	0.022	0.006	0.004
Trade workers	0.055*	0.039*	0.062*	0.115	0.077*	0.136	0.111	0.089*	0.033*	0.081*	0.101	0.083*	0.135	0.154	0.128	0.127
Operators	0.166*	0.169*	0.030*	0.052*	0.049*	0.021*	0.013*	0.030*	0.025*	0.040*	0.040*	0.079	0.119	0.107	0.101	0.086
Elementary	0.388*	0.344*	0.378*	0.069*	0.194*	0.221*	0.338*	0.422*	0.393*	0.324*	0.382*	0.468*	0.219	0.152	0.175	0.225
Domestic workers	0.105*	0.122*	0.069	0.113*	0.148*	0.203*	0.287*	0.230*	0.469*	0.213*	0.221*	0.120*	0.037	0.035	0.052	0.047
Other/Unspecified	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.000
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Years of work experience																
1 to 3 years	0.012*	0.003	0.009	0.007	0.006	0.004	0.026*	0.010	0.005	0.001	0.004	0.002	0.004	0.002	0.002	0.002
4 to 10 years	0.018*	0.011	0.005	0.011	0.015	0.006	0.010	0.003	0.008	0.004	0.006	0.002	0.006	0.008	0.008	0.010
11 to 15 years	0.034*	0.023*	0.026*	0.017	0.021	0.019	0.031	0.029	0.013	0.004*	0.014	0.022	0.014	0.012	0.011	0.016
16 to 20 years	0.037*	0.041	0.044	0.030	0.016	0.006*	0.039	0.027	0.015	0.009*	0.042	0.024	0.019	0.018	0.022	0.022
21 to 25 years	0.121*	0.075*	0.093	0.096*	0.051	0.029	0.105	0.126*	0.050	0.027*	0.098	0.095	0.052	0.046	0.074	0.069
26 to 30 years	0.343*	0.304*	0.301	0.267	0.230	0.159*	0.449*	0.458*	0.269*	0.125*	0.346	0.303	0.206	0.206	0.305	0.299
Above 30 years	0.436*	0.544*	0.523*	0.572	0.661	0.778*	0.340*	0.347*	0.640*	0.830*	0.490*	0.552	0.699	0.707	0.579	0.582
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>15.40*</i>	<i>15.13*</i>	<i>18.11*</i>	<i>19.01*</i>	<i>22.37</i>	<i>22.33</i>	<i>22.80</i>	<i>23.49*</i>	<i>25.20*</i>	<i>25.36*</i>	<i>25.18*</i>	<i>24.89*</i>	<i>22.37</i>	<i>22.39</i>	<i>21.90</i>	<i>21.90</i>
Private/public sector																
Private	0.838*	0.921*	0.778*	0.756*	0.676*	0.962*	0.917*	0.831	0.977*	0.988*	0.868	0.771*	0.775	0.823	0.868	0.865
Public	0.162*	0.079*	0.222*	0.244*	0.324*	0.038*	0.083*	0.169	0.023*	0.012*	0.132	0.229*	0.225	0.177	0.132	0.135
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

Table 4.3: Household characteristics of the underemployed, selected years

Variable	Overeducation				Time-related				Income-related				Fully employed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Household size																
1 to 2 members	0.204	0.327	0.301	0.326	0.160*	0.212*	0.285	0.290*	0.168*	0.241*	0.224*	0.268*	0.195	0.299	0.301	0.343
3 to 6 members	0.599	0.527	0.601	0.612*	0.609	0.549	0.523	0.492	0.587	0.480*	0.530*	0.519	0.600	0.560	0.567	0.538
7 to 10 members	0.181	0.118	0.081*	0.057*	0.215*	0.187*	0.161*	0.170*	0.222*	0.214*	0.202*	0.164*	0.186	0.121	0.111	0.102
Above 10 members	0.016	0.028	0.017	0.005	0.016	0.052*	0.032	0.047*	0.024	0.065*	0.043*	0.049*	0.019	0.020	0.021	0.017
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>4.64</i>	<i>4.02</i>	<i>3.84</i>	<i>3.44</i>	<i>4.88</i>	<i>5.00*</i>	<i>4.37</i>	<i>4.50</i>	<i>5.06</i>	<i>5.12*</i>	<i>4.82*</i>	<i>4.58</i>	<i>4.72</i>	<i>4.07</i>	<i>4.01</i>	<i>3.82</i>
Number of children																
None	0.367	0.454	0.445	0.514	0.315	0.308*	0.365*	0.385*	0.259*	0.314*	0.316*	0.375*	0.342	0.432	0.448	0.485
1 to 2 children	0.452	0.380	0.435	0.401	0.440	0.377	0.430	0.396	0.421	0.344*	0.407	0.413	0.429	0.400	0.403	0.386
3 to 5 children	0.170*	0.152	0.110*	0.079*	0.226	0.276*	0.171*	0.193*	0.289*	0.284*	0.240*	0.186*	0.212	0.155	0.135	0.119
Above 5 children	0.011	0.014	0.010	0.005	0.019	0.039*	0.034	0.026*	0.031	0.058*	0.036*	0.026*	0.017	0.012	0.014	0.010
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>1.34*</i>	<i>1.18</i>	<i>1.10</i>	<i>0.89</i>	<i>1.60</i>	<i>1.86*</i>	<i>1.47</i>	<i>1.47</i>	<i>1.89</i>	<i>2.00*</i>	<i>1.73*</i>	<i>1.47</i>	<i>1.51</i>	<i>1.21</i>	<i>1.16</i>	<i>1.05</i>
Number of adults																
0 to 2 adults	0.507	0.598	0.599*	0.650*	0.488	0.511*	0.574	0.525*	0.508	0.514*	0.492*	0.513*	0.501	0.572	0.559	0.587
3 to 5 adults	0.401	0.340	0.356	0.338	0.439	0.403	0.353	0.384	0.425	0.406*	0.438*	0.399	0.418	0.372	0.390	0.369
Above 5 adults	0.092	0.062	0.044	0.013*	0.074	0.086	0.072	0.091*	0.066	0.080*	0.070*	0.087*	0.081	0.055	0.051	0.044
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>3.07</i>	<i>2.65</i>	<i>2.56</i>	<i>2.34</i>	<i>3.01</i>	<i>2.90</i>	<i>2.74</i>	<i>2.86</i>	<i>2.96</i>	<i>2.86</i>	<i>2.88</i>	<i>2.90</i>	<i>3.01</i>	<i>2.69</i>	<i>2.69</i>	<i>2.58</i>
Number of elderly persons																
None	0.816	0.850	0.861	0.845	0.782*	0.803*	0.858	0.838	0.826	0.782*	0.813*	0.818	0.834	0.867	0.861	0.844
1 elder	0.138	0.109	0.099	0.099	0.160	0.160*	0.129	0.144	0.137	0.171*	0.161*	0.152	0.131	0.104	0.112	0.125
2 elders	0.046	0.040*	0.035	0.055*	0.056*	0.034	0.013	0.018	0.036	0.046*	0.026	0.029	0.034	0.028	0.026	0.029
More than 2 elders	0.001	0.001	0.005	0.000	0.002	0.003	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.002
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>0.23</i>	<i>0.19</i>	<i>0.18</i>	<i>0.21</i>	<i>0.28</i>	<i>0.24</i>	<i>0.15</i>	<i>0.18</i>	<i>0.21</i>	<i>0.27</i>	<i>0.21</i>	<i>0.21</i>	<i>0.20</i>	<i>0.16</i>	<i>0.17</i>	<i>0.19</i>
Dependency ratio (mean)	0.57*	0.52	0.53	0.50	0.74*	0.81*	0.62*	0.60*	0.81*	0.85*	0.74*	0.60*	0.64	0.53	0.50	0.48
Number of employed (mean)	1.98	1.79	1.79	1.78	1.91	1.84	1.69	1.76	2.00	1.86	1.66	1.75	1.87	1.75	1.75	1.73
Number of unemployed (mean)	0.18	0.29	0.16	0.15	0.15	0.40	0.30	0.32	0.14	0.31	0.25	0.33	0.18	0.32	0.26	0.27

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

Table 4.3 shows the household characteristics of the underemployed. First, between 52 to 61 percent of underemployed workers across all the three definitions come from a household with three to six members, with the mean household size hovering between four and five in general. The average number of children per household is between one and two, while the mean number of adult members is ranged between two and three across all three categories of underemployed. Furthermore, the dependency ratio is relatively higher under the time-related and income-related definitions. Finally, there are about two employed household members on average across all three categories of underemployed individuals.

The employment conditions of underemployed workers are summarised in Table 4.4. It must be emphasised that these conditions were not addressed in the OHSs, hence the table only focuses on the results in 2002, 2010 and 2016. The question regarding job length was only asked in the LFSs, and as expected, most of the time-related underemployed workers are hired as either casual or temporary workers while about 73 percent of the overeducated enjoy permanent employment. For the income-related underemployed, 45 percent are permanent while 35 percent are temporary.

Overall, the overeducated enjoy superior working conditions; generally, they have written and permanent contracts, and are more likely to be entitled to a pension fund, paid leave, unemployment insurance fund contributions by employers as well as medical aid. Finally, while the majority of overeducated workers are employed by bigger establishments made up of 50 or more workers. In contrast, the time-related and income-related underemployed workers consist mostly of those working in enterprises with fewer than four workers. This is consistent with the findings of Cam (2014) that workers in small-sized firms are susceptible to be time-related underemployed. The results seem to suggest that bigger firms attract highly skilled individuals to fill up positions that require a relatively lower qualification while smaller establishment usually employ workers on part-time basis.

Table 4.4: Employment conditions of the underemployed, selected years

Variable	Overeducation			Time-related			Income-related			Fully employed		
	2002	2010	2016	2002	2010	2016	2002	2010	2016	2002	2010	2016
Job length[#]												
Permanent	0.725*	NA	NA	0.221*	NA	NA	0.445*	NA	NA	0.820	NA	NA
Fixed period contract	0.045	NA	NA	0.030	NA	NA	0.026*	NA	NA	0.045	NA	NA
Temporary	0.147*	NA	NA	0.339*	NA	NA	0.345*	NA	NA	0.087	NA	NA
Casual	0.076*	NA	NA	0.408*	NA	NA	0.167*	NA	NA	0.043	NA	NA
Seasonal	0.007	NA	NA	0.002	NA	NA	0.017	NA	NA	0.005	NA	NA
<i>Total</i>	<i>1.000</i>			<i>1.000</i>			<i>1.000</i>			<i>1.000</i>		
Contract duration[#]												
Limited	NA	0.094	0.087*	NA	0.283*	0.299*	NA	0.199*	0.233*	NA	0.110	0.132
Permanent	NA	0.728*	0.784*	NA	0.137*	0.081*	NA	0.218*	0.343*	NA	0.685	0.635
Unspecified	NA	0.178	0.129*	NA	0.580*	0.619*	NA	0.582*	0.425*	NA	0.205	0.233
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Contract type[#]												
Written	NA	0.847*	0.869*	NA	0.340*	0.440*	NA	0.421*	0.660*	NA	0.811	0.813
Verbal	NA	0.153*	0.131*	NA	0.660*	0.560*	NA	0.579*	0.340*	NA	0.189	0.187
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Firm size												
1 worker	0.239*	0.102	0.117*	0.574*	0.458*	0.384*	0.529*	0.385*	0.225*	0.109	0.087	0.078
2 to 4 workers	0.128	0.081*	0.077*	0.194*	0.191*	0.198*	0.229*	0.202*	0.126	0.116	0.111	0.114
5 to 9 workers	0.089	0.081*	0.055*	0.074*	0.083	0.065*	0.070*	0.084	0.077	0.105	0.106	0.096
10 to 19 workers	0.095*	0.143	0.104*	0.034*	0.067*	0.119*	0.052*	0.07*	0.146	0.144	0.156	0.152
20 to 49 workers	0.117*	0.206*	0.175	0.038*	0.067*	0.088*	0.061*	0.084*	0.139*	0.177	0.171	0.189
50 or more workers	0.332	0.386	0.472*	0.086*	0.134*	0.146*	0.059*	0.168*	0.287*	0.348	0.368	0.372
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

Table 4.4: Continued

Variable	Overeducation			Time-related			Income-related			Fully employed		
	2002	2010	2016	2002	2010	2016	2002	2010	2016	2002	2010	2016
Entitled to pension funds [#]												
Yes	NA	0.600*	0.715*	NA	0.022*	0.023*	NA	0.102*	0.244*	NA	0.490	0.496
No	NA	0.400*	0.285*	NA	0.978*	0.977*	NA	0.898*	0.756*	NA	0.510	0.504
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Entitled to paid leave [#]												
Yes	NA	0.739*	0.837*	NA	0.099*	0.139*	NA	0.185*	0.366*	NA	0.679	0.691
No	NA	0.261*	0.163*	NA	0.901*	0.861*	NA	0.815*	0.634*	NA	0.321	0.309
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Employer contributes to UIF [#]												
Yes	NA	0.501*	0.593*	NA	0.176*	0.180*	NA	0.199*	0.347*	NA	0.606	0.648
No	NA	0.499*	0.407*	NA	0.824*	0.820*	NA	0.801*	0.653*	NA	0.394	0.352
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Entitled to medical aid [#]												
Yes	NA	0.522*	0.630*	NA	0.006*	0.014*	NA	0.061*	0.163*	NA	0.326	0.295
No	NA	0.478*	0.370*	NA	0.994*	0.986*	NA	0.939*	0.837*	NA	0.674	0.705
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>
Income tax deducted [#]												
Yes	NA	0.660*	0.778*	NA	0.088*	0.009*	NA	0.150*	0.296*	NA	0.561	0.561
No	NA	0.340*	0.222*	NA	0.912*	0.991*	NA	0.850*	0.704*	NA	0.439	0.439
<i>Total</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>		<i>1.000</i>	<i>1.000</i>

[#] All questions were asked to employees only, except for the firm size question.

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

NA: Information is not available.

In this study, all earnings data are presented in constant 2016 December prices. First, Table A4 shows the mean and median as well as the standard error of the mean pertaining to the monthly real earnings of underemployed and the fully employed workers.³¹ In almost all periods, overeducated workers earn more than their fully employed counterparts. Moreover, among the three types of underemployed workers, the overeducated enjoy substantially higher mean and median earnings while the income-related underemployed are associated with the lowest mean and median earnings. Finally, on an hourly basis, the overeducated earn between R36 to R107, the time-related underemployed earn between R17 and R73, whereas the income-related underemployed earn between R2 to R6, on average, as shown in Table A5.

To conclude, the characteristics of the three groups of underemployed are summarised as follows:

- Time-related underemployed are predominantly lowly educated female African urban residents who were aged 25-44 years at the time of the survey. Most of them are involved in unskilled occupations (particularly elementary occupations and domestic work) in the tertiary sector, working about 20 hours per week on average at small enterprises with fewer than four workers. They earn about R2 500 per month.
- Overeducated workers are mainly Africans (despite the fact that the White share is about 25 percent – much higher when compared with the other two groups of underemployed) aged 25-44 years living in the urban areas of Gauteng. On average, they are more educated than the fully employed. The majority of them are involved in semi-skilled or high-skilled formal sector activities in the tertiary sector. They work more than 40 hours per week on average and earn more than R10 000 per month on average (higher than the mean monthly earnings of the fully employed). The working conditions of the overeducated workers are the best when compared to the other two groups of underemployed. This is because the overeducated generally have full-time or permanent contracts and therefore enjoy better conditions of employment. Moreover, the overeducated also work in larger establishments that usually offer adequate packages.
- Income-based underemployed are predominantly lowly educated female Africans aged about 40 years, living in KwaZulu-Natal and Gauteng. They are most likely to be engaged

³¹ Only individuals whose monthly earnings were between R0 and R83 333 were considered. Nonetheless, it must be emphasised that the OHS 1995-1999 estimates may be higher because of the very high earnings reported by some respondents (Burger and Yu, 2006:3). Furthermore, earnings will be investigated more thoroughly in Chapter Five.

in private sector unskilled, elementary occupations in the tertiary sector, working about 40 hours per week on average. Their mean monthly earnings are about R500.

4.3 Multivariate analysis

This section discusses the results of the probit and multinomial logistic regressions using the OHS 1995, LFS 2002 September, QLFS 2010 third quarter (instead of QLFS 2009, as it was mentioned in Chapter Three that earnings questions were not asked in 2008-2009) and QLFS 2016 third quarter surveys. First, Table 4.5 displays the probit regression results on the likelihood of being time-related underemployed³². As the table shows, the effect of age on time-related underemployment is minimal and inconsistent across the four selected years. While the relationship between age and time-related underemployment likelihood is convex in 1995 (albeit minimal), it is concave in 2002. Holding other variables constant, females, African and Coloured workers are more likely to be time-related underemployed relative to males and White workers respectively. The observation that female workers are relatively more likely to be time-related underemployed is consistent with past studies (such as, Ruiz-Quintanilla and Claes, 1994; Leuven and Oosterbeek, 2011; and Cam, 2014). However, by using the 40 hours per week threshold, females were found to be minimally less likely to be time-related underemployed (in 2002) as shown in Table A6. Moreover, the results in Table A6 indicate that the sign of the coefficients of the racial variables are similar to the ones found in Table 4.5, although the magnitudes were smaller.

Compared to workers who reside in Western Cape, those from Eastern Cape in general are significantly more likely to be underemployed, whereas those living in Gauteng (1995 and 2010) are relatively less likely to be underemployed³³. This could be explained by the fact that Gauteng has several larger establishments that offer considerably more full-time employment opportunities while the Eastern Cape province may relatively have more smaller firms that

³² Time-related underemployment was measured using the Stats SA definition. According to Stats SA's definition, time-related underemployed workers are those who:

- (1) Are willing and available to work extra hours;
- (2) During the reference week worked fewer than 35 hours; and
- (3) Are able to start an extra work in the next four weeks if the additional work is available.

³³ Based on the 40 hours threshold, workers who reside in Gauteng, KwaZulu-Natal, Northern Cape, Free State, and Mpumalanga are significantly more likely to be time-related underemployed.

generally offer less permanent contracts. The results for the other provinces are mixed across the four periods.

Table 4.5 also depicts that the probability of being time-related underemployed is lower for workers from the mining, manufacturing³⁴, and communication sectors compared to those from the skilled agriculture industry. On the contrary, workers from the construction, wholesale and retail, finance, community services, and private households industries have a significantly greater likelihood of being time-related underemployed. This is probably because the former group of industries generally offer more full-time employment to their workers while the latter group may have more part-time employees.

While employees³⁵ (relative to the self-employed) are significantly less likely to be time-related underemployed, workers in the informal sector have a higher probability of becoming time-related underemployed compared to those in the formal sector. The observation that workers in the informal sector are relatively more vulnerable to becoming time-related underemployed is consistent with the labour market segmentation theory. The theory suggests that the informal sector is predominantly filled with bad and intermittent jobs that have shorter work hours. Furthermore, public sector workers are significantly less likely to be under-employed in 1995 and 2002. The contrasting findings for the informal sector and the public sector can be attributed to the fact that whereas the former is general made up of temporary employment, the latter offer more full-time positions. Finally, apart from odd 1995 results, workers with primary education and matriculants are more prone to time-related underemployed than degree holders. Ruiz-Quintanilla and Claes (1994) also observed that individuals with less formal education are at risk of being time-related underemployed.

³⁴ Table A6 produced a contrary result.

³⁵ The results in Table A6, on the contrary, show that employees have a lower likelihood of being time-related underemployed (2016 estimate only).

Table 4.5: Probit regressions on the likelihood of being time-related underemployed

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
Age	-0.0042**	(0.0018)	0.0035**	(0.0017)	0.0025	(0.0024)	-0.0026	(0.0026)
Age squared	0.0001***	(0.0000)	-0.0001***	(0.0000)	-0.0001*	(0.0000)	-0.0000	(0.0000)
Female	0.0361***	(0.0030)	0.0122***	(0.0026)	0.0161***	(0.0030)	0.0195***	(0.0034)
African	0.0089**	(0.0040)	0.0258***	(0.0041)	0.0280***	(0.0059)	0.0169**	(0.0075)
Coloured	0.0005	(0.0051)	0.0204**	(0.0087)	0.0262**	(0.0124)	0.0372**	(0.0151)
Indian	-0.0129**	(0.0063)	0.0087	(0.0125)	0.0036	(0.0150)	-0.0158	(0.0142)
Experience	0.0006	(0.0013)	-0.0021*	(0.0011)	-0.0013	(0.0015)	0.0032*	(0.0017)
Experience squared	-0.0000	(0.0000)	0.0000***	(0.0000)	0.0000**	(0.0000)	0.0000	(0.0000)
Eastern Cape	0.0222***	(0.0061)	0.0119**	(0.0058)	-0.0064	(0.0058)	0.0460***	(0.0105)
Northern Cape	0.0245***	(0.0087)	-0.0162***	(0.0048)	-0.0009	(0.0071)	0.0123	(0.0111)
Free State	-0.0116**	(0.0052)	-0.0111**	(0.0047)	-0.0004	(0.0065)	0.0512***	(0.0132)
KwaZulu-Natal	0.0046	(0.0055)	-0.0147***	(0.0042)	-0.0022	(0.0060)	0.0096	(0.0080)
North West	0.0084	(0.0068)	0.0032	(0.0059)	-0.0286***	(0.0041)	-0.0077	(0.0089)
Gauteng	-0.0185***	(0.0045)	-0.0076	(0.0046)	-0.0105**	(0.0053)	0.0153**	(0.0075)
Mpumalanga	-0.0104*	(0.0057)	0.0061	(0.0060)	-0.0114**	(0.0056)	0.0271**	(0.0106)
Limpopo	0.0093	(0.0072)	-0.0143***	(0.0044)	-0.0183***	(0.0050)	0.0187**	(0.0094)
Mining	-0.0154*	(0.0079)	-0.0317***	(0.0035)	-0.0270**	(0.0114)	-0.0398***	(0.0084)
Manufacturing	-0.0074	(0.0056)	-0.0048	(0.0048)	-0.0027	(0.0086)	-0.0238***	(0.0067)
Water & electricity	-0.0240*	(0.0134)	N/A ⁺		-0.0106	(0.0236)	-0.0172	(0.0201)
Wholesale & retail	0.0136	(0.0089)	0.0086	(0.0069)	0.0332**	(0.0132)	0.0085	(0.0098)
Construction	0.0113*	(0.0059)	-0.0050	(0.0043)	0.0059	(0.0087)	-0.0107	(0.0077)
Communication	-0.0023	(0.0081)	-0.0115**	(0.0059)	-0.0108	(0.0088)	-0.0039	(0.0101)
Finance	0.0164*	(0.0087)	-0.0033	(0.0062)	0.0081	(0.0103)	0.0042	(0.0097)
Community services	0.0567***	(0.0125)	0.0127*	(0.0071)	0.0180*	(0.0106)	0.0074	(0.0092)
Private households	0.0519***	(0.0105)	0.0659***	(0.0091)	0.1476***	(0.0216)	0.1457***	(0.0200)
Employee	-0.0028	(0.0057)	-0.0567***	(0.0060)	-0.0205***	(0.0060)	-0.0305***	(0.0068)
Informal	0.0678***	(0.0111)	0.0162***	(0.0044)	0.0404***	(0.0067)	0.0589***	(0.0075)
Public	-0.0178**	(0.0073)	-0.0182***	(0.0042)	0.0075	(0.0065)	0.0479***	(0.0083)
None	-0.0127	(0.0147)	0.0217	(0.0215)	0.0371	(0.0316)	0.0063	(0.0233)
Primary	-0.0315***	(0.0094)	0.0295*	(0.0164)	0.0532**	(0.0247)	0.0442**	(0.0221)
Matric	-0.0323***	(0.0076)	0.0254**	(0.0107)	0.0320***	(0.0110)	0.0301***	(0.0094)
Matric + Cert/Dip	0.0008	(0.0066)	0.0276*	(0.0157)	0.0192	(0.0155)	0.0124	(0.0129)
Observations	30 353		24 758		19 544		18 130	
LR Chi-square	962.94		1 066.57		984.06		1 124.95	
Prob. > Chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.0739		0.1375		0.1463		0.1596	
Observed prob.	0.0556		0.0365		0.0413		0.0486	
Predicted prob. (at \bar{X})	0.0443		0.0202		0.0231		0.0258	

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$ + Omitted because of perfect collinearity

Reference groups: male; white; Western Cape; skilled agriculture; self-employed; formal sector; private sector; degree

Table 4.6 presents the probit regression results regarding the likelihood of being overeducated³⁶. The results show that age has a significantly positive effect on the probability of being overeducated. It must, however, be emphasised that the relationship between age and overeducation likelihood is convex (although minimal) in 1995, 2002 and 2010. As a result, the effect of age on the likelihood of underemployment increases as the worker advances in age. On the contrary, there is a non-linear concave relationship between overeducation likelihood and experience. This is an indication that workers with a certain amount of experience are less likely to be overeducated, as alluded to by Hartog (2000) and Korpi and Tåhlin (2009).

According to the 2002 results, females are about one percent less likely than males to be overeducated. This is similar to the results of Cohn and Ng (2000) but contrary to the findings of Caroleo and Pastore (2013), Haddad and Habibi (2017), and Verhaest et al. (2010). Moreover, in comparison to their White counterparts, workers from African and Coloured origins are significantly more likely to be overeducated. In other words, White workers are most likely to be employed in jobs that adequately match their qualifications. This can be explained by the fact that employers perceive the quality of education among Africans and Coloured to be lower, and therefore only hire these individuals if they have more years of education than what the job requires.

Holding all other variables constant, the probability of experiencing overeducation is lower for workers who reside in the Eastern Cape, Free State, North West, Gauteng, and Limpopo relative to those residing in the Western Cape. Also, considering the industry of employment, workers who are employed in sectors such as mining, manufacturing, water and sanitation, whole and retail, construction, communication, finance, and community services are significantly less likely to be overeducated compared to those employed in the skilled agriculture industry. Conversely, compared to workers from the skilled agriculture industry, those from the private households industry are about seven to 20 percent more likely to be overeducated.

³⁶ An overeducated worker is defined as someone whose level of education is more than one standard deviation above the mean years of education for his/her occupation.

Finally, informal sector workers have approximately between 3 to 6 percent higher probability of becoming overeducated compared to those in the formal sector. This is in line with the labour market segmentation theory which suggests that overeducation is more prominent in the secondary labour market. On the other hand, public sector workers, in general, are less susceptible to overeducation, which is contrary to the findings of Haddad and Habibi (2017).

Table 4.6: Probit regressions on the likelihood of being overeducated

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
Age	0.0446***	(0.0029)	0.0562***	(0.0031)	0.0568***	(0.0049)	0.0548***	(0.0029)
Age squared	0.0001***	(0.0000)	0.0001**	(0.0000)	0.0003***	(0.0001)	-0.0000	(0.0000)
Female	0.0006	(0.0035)	-0.0102***	(0.0035)	-0.0024	(0.0037)	0.0013	(0.0028)
African	0.0776***	(0.0043)	0.0891***	(0.0043)	0.0655***	(0.0047)	0.0191***	(0.0035)
Coloured	0.0479***	(0.0068)	0.0573***	(0.0083)	0.0626***	(0.0098)	0.0205***	(0.0073)
Indian	-0.0131*	(0.0069)	0.0296***	(0.0101)	-0.0068	(0.0109)	0.0085	(0.0080)
Experience	-0.0527***	(0.0017)	-0.0609***	(0.0018)	-0.0686***	(0.0028)	-0.0537***	(0.0017)
Experience squared	-0.0001***	(0.0000)	-0.0001**	(0.0000)	-0.0004***	(0.0001)	0.0001	(0.0000)
Eastern Cape	-0.0282***	(0.0055)	-0.0284***	(0.0060)	-0.0126*	(0.0075)	0.0072	(0.0060)
Northern Cape	-0.0068	(0.0089)	0.0053	(0.0089)	-0.0123	(0.0090)	0.0033	(0.0094)
Free State	-0.0078	(0.0066)	-0.0232***	(0.0070)	0.0045	(0.0083)	0.0005	(0.0073)
KwaZulu-Natal	-0.0075	(0.0058)	-0.0091	(0.0063)	-0.0019	(0.0073)	0.0087	(0.0056)
North West	-0.0228***	(0.0066)	-0.0199***	(0.0068)	0.0015	(0.0090)	-0.0058	(0.0073)
Gauteng	-0.0193***	(0.0054)	-0.0196***	(0.0057)	-0.0030	(0.0066)	0.0050	(0.0046)
Mpumalanga	-0.0077	(0.0070)	-0.0103	(0.0072)	0.0095	(0.0084)	0.0049	(0.0068)
Limpopo	-0.0369***	(0.0065)	-0.0305***	(0.0066)	-0.0100	(0.0084)	0.0060	(0.0061)
Mining	-0.0492***	(0.0067)	-0.0717***	(0.0053)	-0.0542***	(0.0087)	0.0239*	(0.0143)
Manufacturing	-0.0246***	(0.0062)	-0.0719***	(0.0048)	-0.0573***	(0.0078)	-0.0091	(0.0096)
Water & electricity	-0.0354***	(0.0112)	-0.0875***	(0.0063)	-0.0851***	(0.0074)	0.0092	(0.0145)
Wholesale & retail	-0.0534***	(0.0065)	-0.0967***	(0.0037)	-0.0630***	(0.0073)	0.0099	(0.0115)
Construction	-0.0638***	(0.0052)	-0.1049***	(0.0045)	-0.0694***	(0.0087)	-0.0161*	(0.0095)
Communication	-0.0535***	(0.0061)	-0.0791***	(0.0045)	-0.0779***	(0.0063)	-0.0061	(0.0103)
Finance	-0.0834***	(0.0041)	-0.1208***	(0.0028)	-0.0967***	(0.0056)	-0.0443***	(0.0065)
Community services	-0.0875***	(0.0091)	-0.1630***	(0.0044)	-0.1182***	(0.0074)	-0.0540***	(0.0075)
Private households	0.2081***	(0.0150)	0.1061***	(0.0117)	0.0725***	(0.0163)	0.2050***	(0.0300)
Employee	0.0226***	(0.0058)	-0.0394***	(0.0060)	-0.0111*	(0.0064)	0.0110***	(0.0040)
Informal	0.0502***	(0.0102)	0.0261***	(0.0064)	0.0627***	(0.0078)	0.0384***	(0.0064)
Public	-0.0619***	(0.0088)	-0.0461***	(0.0061)	0.0039	(0.0072)	-0.0045	(0.0048)
Observations	30 353		24 758		19 544		18 130	
LR Chi-square	6 240.49		7 262.68		6 329.60		5 838.86	
Prob. > Chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.3010		0.4170		0.4547		0.6105	
Observed prob.	0.1076		0.1123		0.1147		0.0740	
Predicted prob. (at \bar{X})	0.0176		0.0052		0.0021		0.0002	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; self-employed; formal sector; private sector

Table 4.7 presents the probit regression results pertaining to the likelihood of a worker being underemployed based on the income-related definition. There is a significant, non-linear but convex relationship between age and income-based underemployment likelihood. On the other hand, experience in general is associated positively with income-related underemployment likelihood, an indication that experience increases the chance of becoming income-related underemployed. Women as well as Africans and Coloureds are more likely to fall into income-related underemployment.

Compared to workers in the Western Cape, those residing in the Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga, and Limpopo have a greater probability of being income-based underemployed. Moreover, while workers in the private households industry are more susceptible to income-related underemployment, those in the mining, manufacturing, water and electricity, wholesale and retail. Construction, communication, finance and community services sectors have a lesser likelihood of becoming income-related underemployed compared skilled agriculture workers. The results also show that informal sector workers, relative to their colleagues in the formal sector, are more likely to be income-related underemployed. Again, this finding is consistent with the labour segmentation theory which suggests that jobs in the informal sector are low-paying. On the other hand, the chances of becoming income-related underemployed are lower for employees compared to the self-employed.

Except in 1995, workers with primary education and matriculants are significantly more likely to be income-related underemployed compared to graduates. On the contrary, compared to graduates, workers with post-matric qualifications are less likely to be affected by income-related underemployment. Finally, the results of the probit regressions on the likelihood of a worker being underemployed in any of the three approaches are presented in Table 4.8. It must be stated that the results in Table 4.8 are very similar the ones in Table A7 which focuses solely on the sample of Africans. Holding all other variables constant, it can be deduced that age has a significant relationship with underemployment probability. However, the relationship between age and underemployment likelihood is convex in 1995, linear in 2002, and concave in both 2010 and 2016.

Table 4.7: Probit regressions on the likelihood of being income-related underemployed

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
Age	-0.0141***	(0.0017)	-0.0263***	(0.0027)	-0.0150***	(0.0029)	-0.0095***	(0.0033)
Age squared	0.0000**	(0.0000)	0.0002***	(0.0000)	0.0001**	(0.0000)	-0.0000	(0.0000)
Female	0.0602***	(0.0036)	0.0816***	(0.0046)	0.0563***	(0.0040)	0.0315***	(0.0044)
African	0.0291***	(0.0065)	0.1416***	(0.0093)	0.0628***	(0.0080)	0.0125	(0.0090)
Coloured	0.0183**	(0.0086)	0.0862***	(0.0137)	0.0484**	(0.0190)	0.0198	(0.0141)
Indian	-0.0003	(0.0146)	0.0380*	(0.0216)	-0.0124	(0.0213)	-0.0014	(0.0165)
Experience	0.0082***	(0.0012)	0.0104***	(0.0018)	0.0095***	(0.0018)	0.0096***	(0.0022)
Experience squared	0.0000	(0.0000)	-0.0000	(0.0000)	-0.0000	(0.0000)	0.0000	(0.0000)
Eastern Cape	0.0752***	(0.0081)	0.2094***	(0.0120)	0.0615***	(0.0131)	0.1654***	(0.0197)
Northern Cape	0.0694***	(0.0099)	0.1189***	(0.0123)	0.0171	(0.0125)	0.1043***	(0.0224)
Free State	0.1235***	(0.0103)	0.2220***	(0.0129)	0.0618***	(0.0136)	0.1834***	(0.0240)
KwaZulu-Natal	0.0168**	(0.0070)	0.1101**	(0.0108)	0.0417***	(0.0116)	0.1275***	(0.0177)
North West	0.0640***	(0.0096)	0.1239***	(0.0121)	0.0277**	(0.0127)	0.1065***	(0.0219)
Gauteng	0.0041	(0.0077)	0.0437***	(0.0110)	-0.0127	(0.0089)	0.0972***	(0.0144)
Mpumalanga	0.0292***	(0.0081)	0.1175***	(0.0120)	0.0471***	(0.0130)	0.1385***	(0.0211)
Limpopo	0.0340***	(0.0094)	0.1927***	(0.0129)	0.0699***	(0.0143)	0.1356***	(0.0201)
Mining	-0.0779***	(0.0033)	-0.2023***	(0.0047)	-0.0495***	(0.0105)	0.0041	(0.0162)
Manufacturing	-0.0608***	(0.0034)	-0.1633***	(0.0053)	-0.0219***	(0.0080)	-0.0133	(0.0098)
Water & electricity	-0.0698***	(0.0091)	-0.1661***	(0.0164)	-0.0209	(0.0255)	-0.0356*	(0.0202)
Wholesale & retail	-0.0483***	(0.0046)	-0.1374***	(0.0062)	0.0070	(0.0102)	0.0061	(0.0110)
Construction	-0.0527***	(0.0036)	-0.1428***	(0.0052)	-0.0173**	(0.0080)	-0.0164*	(0.0090)
Communication	-0.0639***	(0.0045)	-0.1684***	(0.0061)	-0.0157	(0.0103)	-0.0224**	(0.0106)
Finance	-0.0699***	(0.0043)	-0.1495***	(0.0068)	-0.0150	(0.0093)	-0.0169*	(0.0096)
Community services	-0.0574***	(0.0083)	-0.1400***	(0.0074)	-0.0134	(0.0091)	0.0094	(0.0106)
Private households	0.0448**	(0.0079)	0.0287**	(0.0072)	0.0846***	(0.0123)	0.0389***	(0.0124)
Employee	-0.0165**	(0.0064)	-0.1647***	(0.0077)	-0.0184***	(0.0070)	-0.0007	(0.0075)
Informal	0.0302***	(0.0093)	0.0725**	(0.0070)	0.0683***	(0.0081)	0.0360***	(0.0082)
Public	-0.0300***	(0.0103)	-0.0875***	(0.0097)	0.0416***	(0.0094)	0.0656***	(0.0094)
None	-0.0486***	(0.0142)	0.0642**	(0.0323)	0.0057	(0.0257)	-0.0348*	(0.0185)
Primary	-0.0292*	(0.0155)	0.0673***	(0.0258)	0.0468**	(0.0235)	0.0332	(0.0223)
Matric	-0.0341**	(0.0140)	0.0514***	(0.0192)	0.0298**	(0.0137)	0.0334***	(0.0110)
Matric + Cert/Dip	-0.0351***	(0.0111)	-0.0192	(0.0224)	-0.0302**	(0.0118)	-0.0026	(0.0123)
Observations	30 353		24 758		19 544		18 130	
LR Chi-square	6 834.91		10 740.20		2 298.08		1 111.15	
Prob. > Chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.3976		0.4244		0.2109		0.1071	
Observed prob.	0.0818		0.2077		0.0800		0.0830	
Predicted prob. (at \bar{X})	0.0174		0.0826		0.0378		0.0615	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; self-employed; formal sector; private sector; degree

Controlling for other variables, females are significantly more likely than males to be underemployed. The probability of a female worker being underemployed, however, decreased from approximately seven percent in 1995 to 4 percent in 2016. The average marginal effects estimate for all four periods show that Africans are between two to 15 percent more likely to be underemployed compared to Whites. Just like their African counterparts, the Coloured population has a greater likelihood of being underemployed relative to White workers. The results, however, depict that Indians have a relatively lower probability of being underemployed when compared to White workers. Also, underemployment likelihood significantly declines with experience, but the effect diminishes as a worker accumulates more experience, which an indication that the two variables have a convex relationship.

Workers who reside in the Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Mpumalanga and Limpopo have a higher likelihood of experiencing underemployment compared to their counterparts in the Western Cape. As far as the industry of employment is concerned, workers in the mining, manufacturing, water and electricity, wholesale and retail, construction, communication, finance, and community services industries have a significantly lower probability of being underemployed compared those who work in the skilled agricultural sector. Workers in the private households industry are, however, more likely to fall into underemployment.

Table 4.8 also shows that self-employed individuals are significantly more likely to be underemployed than employees. Compared to individuals who are employed in the formal sector, informal sector workers are between 10 to 14 percent more likely to be underemployed. Moreover, public sector employees have a significantly higher probability of being in the underemployment pool relative to their counterparts in the private sector based on estimates from the 2010 and 2016 data. The opposite is, however, observed from the 1995 and 2002 results. On the basis of educational qualification, individuals with primary education, matriculants, and those who have post-secondary school certificate are less likely to be underemployed relative to those with a university degree.

Table 4.8: Probit regressions on the likelihood of being underemployed in at least one approach

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
Age	0.0160***	(0.0030)	0.0234***	(0.0034)	0.0388***	(0.0042)	0.0145***	(0.0043)
Age squared	0.0001***	(0.0000)	0.0000	(0.0000)	-0.0001**	(0.0000)	-0.0001**	(0.0000)
Female	0.0663***	(0.0052)	0.0554***	(0.0056)	0.0491***	(0.0057)	0.0418***	(0.0058)
African	0.0924***	(0.0067)	0.1533***	(0.0087)	0.1064***	(0.0086)	0.0245**	(0.0098)
Coloured	0.0388***	(0.0092)	0.0286**	(0.0121)	0.0611***	(0.0146)	0.0339**	(0.0148)
Indian	-0.0218*	(0.0116)	0.0124	(0.0171)	-0.0560***	(0.0171)	0.0003	(0.0189)
Experience	-0.0279***	(0.0021)	-0.0355***	(0.0023)	-0.0382***	(0.0028)	-0.0121***	(0.0030)
Experience squared	0.0000*	(0.0000)	0.0001***	(0.0000)	0.0001***	(0.0000)	0.0001***	(0.0000)
Eastern Cape	0.0509***	(0.0097)	0.1288***	(0.0121)	0.0283**	(0.0129)	0.1244***	(0.0152)
Northern Cape	0.0618***	(0.0133)	0.0675***	(0.0136)	-0.0049	(0.0143)	0.0692***	(0.0196)
Free State	0.1045***	(0.0112)	0.1322***	(0.0132)	0.0343**	(0.0135)	0.1320***	(0.0187)
KwaZulu-Natal	0.0134	(0.0092)	0.0599**	(0.0113)	0.0243**	(0.0122)	0.0772***	(0.0138)
North West	0.0239**	(0.0112)	0.0633***	(0.0126)	-0.0107	(0.0133)	0.0431**	(0.0175)
Gauteng	-0.0158*	(0.0090)	0.0028	(0.0108)	-0.0134	(0.0109)	0.0675***	(0.0117)
Mpumalanga	0.0069	(0.0106)	0.0645***	(0.0127)	0.0305**	(0.0136)	0.0945***	(0.0166)
Limpopo	0.0057	(0.0117)	-0.1026***	(0.0132)	0.0322**	(0.0140)	0.0784***	(0.0154)
Mining	-0.1329***	(0.0082)	-0.2489***	(0.0072)	-0.0444**	(0.0181)	0.0293	(0.0230)
Manufacturing	-0.0786***	(0.0074)	-0.1900***	(0.0072)	-0.0405***	(0.0126)	-0.0310**	(0.0139)
Water & electricity	-0.0781***	(0.0181)	-0.2130***	(0.0173)	-0.0934***	(0.0243)	0.0275	(0.0333)
Wholesale & retail	-0.1075***	(0.0088)	-0.2213***	(0.0074)	-0.0327**	(0.0137)	0.0132	(0.0156)
Construction	-0.1171***	(0.0066)	-0.2178***	(0.0062)	-0.0577***	(0.0120)	-0.0460***	(0.0129)
Communication	-0.1167***	(0.0085)	-0.2189***	(0.0079)	-0.0788***	(0.0129)	-0.0281*	(0.0157)
Finance	-0.1455***	(0.0069)	-0.2599***	(0.0062)	-0.1010***	(0.0106)	-0.0523***	(0.0127)
Community services	-0.1045***	(0.0137)	-0.2800***	(0.0078)	-0.0919***	(0.0120)	-0.0312**	(0.0136)
Private households	0.2586***	(0.0157)	0.0952***	(0.0111)	0.2042***	(0.0181)	0.2293***	(0.0207)
Employee	-0.0084	(0.0096)	-0.2216***	(0.0094)	-0.0490***	(0.0099)	-0.0229**	(0.0097)
Informal	0.1046***	(0.0141)	0.1057***	(0.0094)	0.1410***	(0.0108)	0.1125***	(0.0108)
Public	-0.1062***	(0.0130)	-0.1263***	(0.0108)	0.0310***	(0.0113)	0.0397***	(0.0104)
None	0.0111	(0.0299)	0.0958**	(0.0334)	-0.0718**	(0.0279)	-0.1487***	(0.0127)
Primary	-0.1520***	(0.0143)	-0.0974**	(0.0187)	-0.1691***	(0.0134)	-0.1594***	(0.0115)
Matric	-0.1919***	(0.0125)	-0.1933***	(0.0134)	-0.4164***	(0.0141)	-0.3692***	(0.0163)
Matric + Cert/Dip	-0.0260**	(0.0105)	-0.2089***	(0.0093)	-0.2480***	(0.0043)	-0.1656***	(0.0055)
Observations	30 353		24 758		19 544		18 130	
LR Chi-square	5 164.86		8 198.31		4 096.35		2 586.11	
Prob. > Chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.1594		0.2675		0.2020		0.1501	
Observed prob.	0.2254		0.3111		0.2138		0.1824	
Predicted prob. (at \bar{X})	0.1912		0.2553		0.1749		0.1503	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; self-employed; formal sector; private sector

Tables 4.9-4.12 display the multinomial logit estimates of the determinants of underemployment in the same four surveys respectively. The coefficients represent the ratio of relative risk for a unit change in the explanatory variable. It measures the risk of each underemployment status category compared to the based category (fully employed).

For all four periods, it was found that age increases the relative probability of being overeducated only and being underemployed in any two or in all three categories of underemployment while the relative odds of being income-related underemployed decreases by age. However, as one advances in age, the effect of age on the probability of being underemployed diminishes. This is an indication that compared to young workers, older workers are at a lesser risk of being underemployed. Experience, on the other hand, decreases the relative odds of being overeducated and being underemployed in more than one category but increases the relative likelihood of being income-related underemployed. The effect of experience, however, diminishes as workers accumulate more of it.

The multinomial logit regression results for 1995 are displayed in Table 4.9. As expected, being female increases the relative probability of time-related and income-based being underemployed (compared to being fully employed). More precisely, based on the 1995 estimates, females are about 94 percent and 227 percent more likely to be underemployed according to the time-related and income-related definitions respectively. Likewise, the relative odds of being underemployed (in more than one category at the same time) rather than being fully employed is higher for females than males.

The estimates for the other years (2002, 2010, and 2016) give credence to the above findings. For example, the 2010 results in Table 4.11 indicate that being female increases the relative odds of being time-related underemployed, income-related underemployed, and being concurrently underemployed in any two approached by 24 percent, 148 percent, and 134 percent respectively. On the other hand, in 2002 (as shown in Table 4.10), it is found that women have about 23 percent lower relative likelihood of being overeducated while in 2016, being female increases the odds of being overeducated by 8 percent.

Table 4.9: Multinomial logit regression on underemployment status (1995)

Independent variable	Relative risk ratio							
	Overeducation only		Time-related under-employment only		Income-related under-employment only		Underemployed in any two or all three approaches	
Age	1.7861***	(0.0792)	1.1140***	(0.0444)	0.7478***	(0.0254)	1.2535***	(0.0701)
Age squared	1.0021***	(0.0006)	0.9992*	(0.0004)	1.0017***	(0.0004)	1.0000	(0.0007)
Female	1.0160	(0.0504)	1.9368***	(0.1255)	3.2738***	(0.2463)	3.0830***	(0.3662)
African	2.8094***	(0.1717)	1.1965**	(0.1049)	3.9832***	(0.9520)	1.7699***	(0.2742)
Coloured	1.7346***	(0.1422)	0.9930	(0.1115)	2.8205***	(0.7044)	1.0995	(0.1995)
Indian	0.8541	(0.0904)	0.7212*	(0.1249)	0.6917	(0.4319)	0.4824*	(0.1844)
Experience	0.5005***	(0.0131)	0.9123***	(0.0200)	1.1758**	(0.0240)	0.7074***	(0.0232)
Experience squared	0.9984***	(0.0006)	1.0010***	(0.0003)	0.9995	(0.0003)	1.0020***	(0.0005)
Eastern Cape	0.6667***	(0.0618)	1.6495***	(0.1933)	4.0602***	(0.5516)	1.5029**	(0.2527)
Northern Cape	0.8518	(0.1169)	1.7863***	(0.2762)	3.4780***	(0.5271)	1.9025***	(0.4041)
Free State	0.9301	(0.0924)	1.0916	(0.1528)	7.7780***	(1.0757)	1.3324	(0.2485)
KwaZulu-Natal	0.8784	(0.0730)	1.2408*	(0.1512)	1.5205***	(0.2337)	0.8905	(0.1617)
North West	0.7006***	(0.0759)	1.2113	(0.1754)	3.1220***	(0.4931)	1.4536*	(0.2900)
Gauteng	0.7707***	(0.0633)	0.7112**	(0.0954)	1.0835	(0.1966)	0.4841***	(0.1032)
Mpumalanga	0.9109	(0.0926)	1.0177	(0.1526)	1.9700***	(0.3092)	0.6504*	(0.1517)
Limpopo	0.5747***	(0.0695)	1.5391***	(0.2184)	2.0798***	(0.3608)	0.7673	(0.1966)
Skilled agriculture	4.7669***	(0.5729)	0.7592	(0.1328)	18.495***	(9.4315)	5.1384***	(1.3234)
Mining	2.3236***	(0.3203)	0.5034***	(0.1334)	0.5069	(0.3900)	0.1460*	(0.1498)
Manufacturing	3.6642***	(0.3620)	0.6875**	(0.1155)	3.1582**	(1.6571)	1.0086	(0.2822)
Water & electricity	2.9302***	(0.5768)	0.4536	(0.2373)	1.1973	(1.3572)	0.0000	(0.0009)
Wholesale & retail	2.1128***	(0.3045)	0.9679	(0.1962)	4.5730***	(2.4919)	1.6301	(0.5921)
Construction	1.7932***	(0.1768)	0.9267	(0.1380)	4.9751***	(2.5504)	1.1217	(0.2740)
Communication	2.1301***	(0.2744)	0.7020	(0.1530)	1.3248	(0.8636)	0.7408	(0.3101)
Community services	1.0340	(0.1848)	1.9397***	(0.3962)	4.8214***	(2.8228)	1.7843*	(0.6250)
Private households	43.198***	(6.5946)	1.8516***	(0.3806)	39.911***	(20.8449)	27.425***	(7.9839)
Employee	1.3177***	(0.1166)	0.8925	(0.1168)	0.8504	(0.1115)	0.8085	(0.1328)
Informal	1.5476***	(0.1842)	2.5508***	(0.3573)	1.7573***	(0.3319)	4.1261***	(0.8574)
Public	0.4580***	(0.0760)	0.8505	(0.1418)	0.2902***	(0.0982)	0.2238***	(0.0720)
Constant	0.0000***	(0.0000)	0.0064***	(0.0042)	0.0586***	(0.0429)	0.0005***	(0.0005)
Observations	30 353							
LR Chi-square	13 124.39							
Prob. > Chi-square	0.0000							
Pseudo R squared	0.2653							

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.10 Base category: fully employed
Reference groups: male; white; Western Cape; finance; self-employed; formal sector; private sector

Table 4.10: Multinomial logit regression on underemployment status (2002)

Independent variable	Relative risk ratio							
	Overeducation only		Time-related under-employment only		Income-related under-employment only		Underemployed in any two or all three approaches	
Age	2.0081***	(0.1150)	0.9939	(0.0822)	0.7008***	(0.0204)	1.7991***	(0.1010)
Age squared	1.0027***	(0.0007)	0.9997	(0.0010)	1.0025***	(0.0003)	0.9947***	(0.0007)
Female	0.7682***	(0.0456)	1.4313***	(0.1841)	2.2438***	(0.1168)	2.4412***	(0.2110)
African	3.5067***	(0.2823)	2.5080***	(0.5752)	6.8080***	(1.0781)	11.238***	(2.5158)
Coloured	1.8574***	(0.2062)	1.4219	(0.3938)	3.0950***	(0.5565)	5.0631***	(1.3540)
Indian	1.3745**	(0.1945)	1.3323	(0.5875)	2.0016**	(0.5747)	1.1829	(0.6557)
Experience	0.4438***	(0.0152)	0.9583	(0.0425)	1.1678***	(0.0190)	0.6168***	(0.0186)
Experience squared	0.9974***	(0.0007)	1.0007	(0.0007)	0.9994**	(0.0003)	1.0054***	(0.0005)
Eastern Cape	0.6005***	(0.0734)	0.7545	(0.1794)	7.6105***	(0.9045)	4.9936***	(0.8908)
Northern Cape	1.0986	(0.1527)	0.3789**	(0.1533)	3.7864***	(0.4862)	1.8777***	(0.4556)
Free State	0.7268**	(0.0970)	0.5290**	(0.1656)	9.7666***	(1.2271)	3.4411***	(0.6990)
KwaZulu-Natal	0.9128	(0.0964)	0.4355***	(0.1081)	3.4789***	(0.4164)	1.8420***	(0.3426)
North West	0.7889*	(0.0974)	0.9319	(0.2223)	3.9105***	(0.5049)	2.5786***	(0.5188)
Gauteng	0.7241***	(0.0722)	0.5911**	(0.1296)	1.6619***	(0.2253)	1.3051	(0.2615)
Mpumalanga	0.8400	(0.1039)	0.8948	(0.2175)	3.3616***	(0.4326)	3.2217***	(0.6245)
Limpopo	0.5163***	(0.0718)	0.4164***	(0.1270)	6.6720***	(0.8437)	3.1840***	(0.6270)
Skilled agriculture	18.008***	(2.4724)	0.3627**	(0.1604)	7.7543***	(1.1711)	28.138***	(8.1826)
Mining	4.7786***	(0.7301)	0.1590**	(0.1199)	0.1914***	(0.0573)	0.2611	(0.2713)
Manufacturing	5.7801***	(0.6380)	1.1643	(0.3359)	0.9134	(0.1478)	2.1940***	(0.6661)
Water & electricity	2.5034***	(0.7384)	0.0000	(0.0003)	0.5791	(0.3535)	0.0000	(0.0010)
Wholesale & retail	1.9079***	(0.3586)	1.5833	(0.5086)	1.1052	(0.1919)	3.2457***	(1.0497)
Construction	2.7587***	(0.3098)	1.3811	(0.3675)	1.3348*	(0.1994)	2.2612**	(0.6441)
Communication	3.7973***	(0.5265)	1.1661	(0.4214)	0.4933***	(0.1108)	1.9574*	(0.7011)
Community services	0.4850***	(0.0713)	2.1097***	(0.6092)	1.2815	(0.2180)	1.2683	(0.4121)
Private households	56.418***	(8.5384)	4.1431***	(1.2433)	9.5416***	(1.4488)	109.55***	(31.5194)
Employee	0.6034***	(0.0533)	0.4517***	(0.0864)	0.2424***	(0.0174)	0.0924***	(0.0108)
Informal	1.5285***	(0.1534)	1.8676***	(0.3359)	2.2521***	(0.1716)	2.4603***	(0.2976)
Public	0.5440***	(0.0734)	0.3313***	(0.0900)	0.2026***	(0.0353)	0.3484***	(0.1050)
Constant	0.0000***	(0.0000)	0.0485**	(0.0623)	4.1563***	(1.9853)	0.0000***	(0.0000)
Observations	24 758							
LR Chi-square	17 261.35							
Prob > Chi-square	0.0000							
Pseudo R squared	0.3633							

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Base category: fully employed

Reference groups: male; white; Western Cape; finance; self-employed; formal sector; private sector

Table 4.11: Multinomial logit regression on underemployment status (2010)

Independent variable	Relative risk ratio							
	Overeducation only		Time-related under-employment only		Income-related under-employment only		Underemployed in any two or all three approaches	
Age	2.4248***	(0.2093)	1.0173	(0.0781)	0.6899**	(0.0302)	1.5376***	(0.1477)
Age squared	1.0063***	(0.0011)	0.9993	(0.0009)	1.0028***	(0.0005)	0.9953***	(0.0011)
Female	0.9800	(0.0641)	1.2412**	(0.1341)	2.4761***	(0.1863)	2.3447***	(0.2979)
African	3.4513***	(0.3616)	3.8878***	(1.3017)	8.5796***	(3.1004)	2.6329***	(0.8907)
Coloured	2.5627***	(0.3526)	3.1410***	(1.1242)	4.4690***	(1.7325)	1.2718	(0.5080)
Indian	0.8057	(0.1637)	1.5533	(0.8704)	1.3254	(0.8206)	0.4849	(0.3807)
Experience	0.3329***	(0.0173)	0.9908	(0.0421)	1.2432***	(0.0308)	0.7526***	(0.0390)
Experience squared	0.9929***	(0.0012)	1.0006	(0.0007)	0.9984***	(0.0004)	1.0041***	(0.0008)
Eastern Cape	0.8633	(0.1248)	0.7641	(0.1639)	2.8025***	(0.5281)	1.1229	(0.3056)
Northern Cape	0.8292	(0.1442)	0.8799	(0.2094)	1.4594*	(0.3194)	1.1914	(0.3601)
Free State	1.0538	(0.1507)	0.7608	(0.1685)	2.4319***	(0.4758)	1.8277**	(0.4724)
KwaZulu-Natal	1.0547	(0.1362)	0.6741*	(0.1400)	1.9534***	(0.3725)	1.5004	(0.3797)
North West	1.0761	(0.1706)	0.2667***	(0.0833)	1.8820***	(0.3863)	0.5264*	(0.1828)
Gauteng	1.0263	(0.1208)	0.6945*	(0.1357)	0.8525	(0.1729)	0.5301**	(0.1469)
Mpumalanga	1.1442	(0.1625)	0.5187***	(0.1236)	1.9660***	(0.3895)	1.4802	(0.3929)
Limpopo	0.8229	(0.1306)	0.4821***	(0.1163)	2.7012***	(0.5226)	1.1440	(0.3177)
Skilled agriculture	12.132***	(2.3451)	0.4493*	(0.2087)	1.5746**	(0.3203)	2.9154***	(1.0677)
Mining	3.9928***	(0.8062)	0.2973	(0.3048)	0.5017	(0.2230)	0.0000	(0.0008)
Manufacturing	3.7472***	(0.4976)	1.0739	(0.2761)	1.0490	(0.2013)	0.6212	(0.2452)
Water & electricity	0.9508	(0.3770)	0.8688	(0.8920)	1.0179	(0.6312)	0.0000	(0.0008)
Wholesale & retail	2.9858***	(0.5084)	1.4351	(0.3763)	1.5044**	(0.2927)	2.9172***	(0.8996)
Construction	2.9576***	(0.3660)	1.0059	(0.2293)	1.1170	(0.1912)	1.4657	(0.4114)
Communication	1.9452***	(0.3247)	0.5096*	(0.1925)	1.1520	(0.2604)	0.7995	(0.3493)
Community services	0.7780*	(0.1133)	1.8868***	(0.4580)	1.1931	(0.2229)	0.5299*	(0.1768)
Private households	28.146***	(4.5518)	9.8541***	(2.2978)	4.2789***	(0.7504)	19.646***	(5.6095)
Employee	0.8889	(0.0941)	0.4706***	(0.0761)	0.8244*	(0.0919)	0.6224**	(0.1227)
Informal	2.6600***	(0.2908)	3.0445***	(0.5077)	3.0790***	(0.3401)	3.4925***	(0.7049)
Public	1.2059	(0.1581)	0.5390**	(0.1321)	1.4609***	(0.2050)	4.6938***	(1.2136)
Constant	0.0000***	(0.0000)	0.0139***	(0.0171)	0.6671	(0.5190)	0.0000***	(0.0000)
Observations	19 544							
LR Chi-square	8 771.76							
Prob > Chi-square	0.0000							
Pseudo R squared	0.2908							

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.10 Base category: fully employed
Reference groups: male; white; Western Cape; finance; self-employed; formal sector; private sector

Table 4.12: Multinomial logit regression on underemployment status (2016)

Independent variable	Relative risk ratio							
	Overeducation only		Time-related under-employment only		Income-related under-employment only		Underemployed in any two or all three approaches	
Age	5.1610***	(0.5271)	0.9152	(0.0651)	0.8172***	(0.0373)	1.0455	(0.0873)
Age squared	0.9998	(0.0012)	1.0002	(0.0008)	1.0009*	(0.0005)	0.9987	(0.0009)
Female	1.0830	(0.1025)	1.3033**	(0.1377)	1.5334***	(0.1078)	1.9385***	(0.2332)
African	1.9591***	(0.2594)	2.1161**	(0.6790)	1.5667**	(0.2789)	0.9803	(0.2685)
Coloured	1.8728***	(0.3954)	3.6122***	(1.2544)	1.8435***	(0.4000)	0.9273	(0.3253)
Indian	1.4632	(0.3556)	0.7962	(0.5277)	1.2620	(0.3659)	0.3303	(0.2511)
Experience	0.1882***	(0.0120)	1.0838**	(0.0440)	1.1662***	(0.0305)	1.0089	(0.0472)
Experience squared	1.0010	(0.0012)	0.9995	(0.0006)	0.9995	(0.0004)	1.0009	(0.0007)
Eastern Cape	1.3330	(0.2553)	1.7248***	(0.3534)	5.6383***	(1.0885)	4.3299***	(1.2018)
Northern Cape	1.1812	(0.3744)	1.3682	(0.3759)	3.8590***	(0.8659)	1.3921	(0.5530)
Free State	1.0838	(0.2712)	2.2750***	(0.5315)	6.2048***	(1.3125)	4.1928***	(1.2835)
KwaZulu-Natal	1.2466	(0.2210)	1.0307	(0.2253)	4.5760***	(0.8988)	2.6020***	(0.7476)
North West	0.9005	(0.2349)	0.6824	(0.2212)	4.0193***	(0.8981)	1.2400	(0.4869)
Gauteng	1.1729	(0.1741)	1.4704**	(0.2816)	3.6590***	(0.7023)	1.9366**	(0.5493)
Mpumalanga	1.1605	(0.2618)	1.6661**	(0.3823)	4.9074***	(1.0189)	2.6106***	(0.8143)
Limpopo	1.1526	(0.2319)	1.3124	(0.2961)	4.8200***	(0.9823)	2.5931***	(0.7833)
Skilled agriculture	6.0644***	(2.2078)	0.4082**	(0.1720)	1.3589*	(0.2443)	2.0026**	(0.6025)
Mining	15.699***	(4.6282)	0.1879	(0.1913)	1.6201**	(0.3924)	0.6260	(0.4650)
Manufacturing	4.4216***	(0.8656)	0.5196**	(0.1380)	1.2703	(0.2052)	0.4323**	(0.1691)
Water & electricity	8.8121***	(3.2376)	1.2391	(0.9172)	0.8280	(0.4393)	0.4374	(0.4547)
Wholesale & retail	11.161***	(2.5956)	0.8606	(0.1954)	1.5217***	(0.2428)	1.5311	(0.3990)
Construction	3.2921***	(0.6471)	0.6728**	(0.1318)	1.1685	(0.1670)	0.7125	(0.1843)
Communication	5.7348***	(1.3180)	0.8514	(0.2273)	1.1183	(0.2231)	0.4840	(0.2229)
Community services	0.8037	(0.1422)	1.2465	(0.2560)	1.7157***	(0.2497)	0.7809	(0.1912)
Private households	264.67***	(59.5734)	9.4034***	(1.8790)	2.1819***	(0.3413)	8.4851***	(2.0768)
Employee	1.5610***	(0.2405)	0.4918***	(0.0720)	1.0020	(0.1152)	0.7185	(0.1495)
Informal	2.0308***	(0.3982)	4.0925***	(0.6403)	1.6818***	(0.1777)	2.8367***	(0.5365)
Public	0.9036	(0.1513)	0.7079	(0.1657)	1.5081***	(0.1656)	6.6989***	(1.2513)
Constant	0.0000***	(0.0000)	0.0349***	(0.0381)	0.3873	(0.2505)	0.0000***	(0.0000)
Observations			18 130					
LR Chi-square (112)			7 156.04					
Prob > Chi-square			0.0000					
Pseudo R squared			0.2782					

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.10 Base category: fully employed
Reference groups: male; white; Western Cape; finance; self-employed; formal sector; private sector

Tables 4.9-4.12 show that the relative probability of being underemployed rather than fully employed is higher for Africans and Coloured than for Whites. For example, in 2016, Africans are about 96 percent more likely to be overeducated, 112 percent at odds of being time-related underemployed, and 57 percent more likely to be income-related underemployed. Likewise, compared to Whites, the Coloured population group are about 87 percent at odds of being overeducated, 84 percent more likely to be underemployed under the income-related approach and approximately 261 percent more likely to be time-related underemployed as the 2016 results indicate. Indians, on the other hand, are associated with a lower relative probability (barely significant at 10% level) of being time-related underemployed and being underemployed in any two or in all approaches concurrently compared to Whites (based on 1995 estimates). However, Indians are found to have a higher probability of being overeducated and income-related underemployed (based on 2002 estimates).

Living in the Eastern Cape, Free State, North West, Gauteng, and Limpopo rather than in the Western Cape significantly reduces the relative odds of being overeducated according to the estimates for 1995 and 2002. Likewise, the relative probability of being time-related underemployed is higher in the Eastern Cape, Northern Cape, KwaZulu-Natal, Gauteng, and Limpopo compared to the Western Cape based on the 1995 results. However, the estimates for 2002 show that those workers residing in Northern Cape, Free State, KwaZulu-Natal, Gauteng, and Limpopo are less likely than those in the Western Cape to be time-related underemployed. Moreover, compared to workers in the Western Cape, those who reside in KwaZulu-Natal, North West, Gauteng, Mpumalanga, and Limpopo are more likely to be fully employed than underemployed according to the time-related definition based on the results for 2010.

Furthermore, except for Gauteng in 1995 and 2010, living in a province other than the Western Cape significantly increases the relative odds of being income-related underemployed as opposed to being fully employed. In addition, compared to the Western Cape, the relative probability of being underemployed in more than one category is higher when a worker resides in the Eastern Cape, Northern Cape, and North West but lower when the worker lives in Gauteng or Mpumalanga according to the 1995 estimates. In 2016, the relative likelihood of being

underemployed in any two or in all approaches is higher in the Eastern Cape, Free State, KwaZulu-Natal, Gauteng, Mpumalanga and Limpopo.

Considering the industry of employment, except for the community services sector and for the water and electricity sector in 2010, working in a sector other than the financial sector significantly increases a worker's relative probability of being overeducated (compared to the fully employed). Likewise, while workers in the wholesale and retail, community services and private households sectors in general are relatively more likely to be time-related underemployed, those in the mining and manufacturing sectors (1995 and 2002 estimates) as well as those in the communication and skilled agriculture sectors (2010 estimates) have lower relative odds of experiencing time-related underemployment compared to their colleagues in the financial sector.

Moreover, working in sectors such as skilled agriculture, manufacturing, mining, wholesale and retail, construction, community services and private households rather than in the financial sector is associated with a higher relative probability of being income-related underemployed. Workers in skilled agriculture, mining, community services, private households, manufacturing, wholesale and retail, water and electricity, construction and communication sectors are more likely to be underemployed in more than one category concurrently.

Being an employee rather than self-employed significantly increases the relative probability of being overeducated by 32 and 56 percent according to the estimates for 1995 and 2016 respectively. The 2002 results, however, reveal that employees are 40 percent less likely to be overeducated relative to be fully employed. The relative odds of being underemployed based on the time-related and income-related definitions as well as being underemployed in more than one category is generally lower for employees than for self-employed individuals.

Compared to their colleagues in the formal sector, workers who work in the informal sector are relatively more likely to be overeducated, underemployed under both the time-related and income-based definitions, and concurrently underemployed in any two or in all three approaches. Furthermore, working in the public sector rather than in the private sector is associated with a significantly lower relative probability of being overeducated (1995 and 2002 estimates) or time-

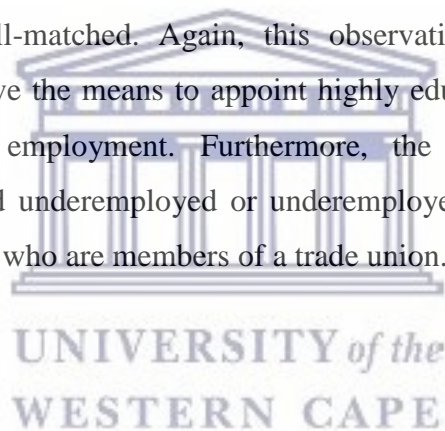
related underemployed (2002 and 2010 estimates). While the 1995 and 2002 results indicate that public sector workers have a lower relative probability of being income-related underemployed and underemployed in more than one category at the same time. The 2010 and 2016 estimates, however, depict contrary findings.

Finally, the multinomial log regressions for 2010 and 2016 are re-run in Tables A8 and A9 respectively by including additional explanatory variables. Most of the results in Tables A8 and A9 are similar to ones reported in Tables 4.11 and 4.14. With regards to the new explanatory variables, the results show that being in a permanent contract significantly reduces the relative risk of underemployed. Moreover, compared to their counterparts in larger firms, workers in smaller establishments are at odds of being time-related underemployed than being fully employed. However, employees of larger forms have a higher relative risk of experiencing overeducation than being well-matched. Again, this observation can be explained by the possibility that larger firms have the means to appoint highly educated while small-sized firms may generally offer casual employment. Furthermore, the odds of being time-related underemployed, income-related underemployed or underemployed in one that one category is considerably lower for workers who are members of a trade union.

4.4 Conclusion

This chapter provides a detailed descriptive and econometric analysis of underemployment as a labour market deficiency by incorporating all three dimensions of the underemployment, namely time-related, overeducation, and income-based definitions. The discussions in the chapter mainly focused on addressing the first research objective of the study. The chapter began with an in-depth descriptive analysis of all the three types of underemployment before dealing with the econometric estimations regarding the likelihood of underemployment.

The underemployed and the unemployed share similar characteristics. As far as the demographic characteristics of the underemployed are concerned, a greater proportion of such workers are found to be Africans, females, workers age between 25 and 44 years at the time of the survey, and those who resided in urban areas. In the area of education, most of the time-related and



income-based underemployed workers have a primary or secondary education. Moreover, while overeducated workers have the highest average years of education, income-related underemployed workers are the least educated.

An examination of the work-related characteristics of the underemployed revealed that the highest proportions of time-related and income-based underemployed workers are those involved in elementary jobs and domestic work while the overeducated are mostly workers in elementary occupations as well as managers. Likewise, a greater number of underemployed workers are found in the private sector and in the tertiary sector. Furthermore, workers who have been employed for not more than three years as well as those with more than three years of work-related experience were more prone to underemployment. Overall, overeducated workers enjoy better working conditions than their counterparts affected by any of the other two types of underemployment.

It was also observed that the prevalence of overeducation and income-based underemployment is higher than the incidence of time-related underemployment. Furthermore, some workers are affected by more than one type of underemployment. Overall, the likelihood of experiencing underemployment is higher for females (in the case of time-related and income-based underemployment), Africans, informal sector employees, workers in the private households industry, and the self-employed.

The chapter also briefly examines the earnings profile of the underemployed across all the three definitions and it is found that on average, the overeducated earn the highest (their mean earnings are higher when compared to the fully employed), followed by the time-based underemployed while the income-based underemployed earn the least. In the next chapter, the relationship between earnings and underemployment will be thoroughly analysed, with particular focus on the comparison between the overeducated, undereducated and adequately educated workers.

CHAPTER FIVE: THE EFFECTS OF OVEREDUCATION ON EARNINGS

5.1 Introduction

This chapter examines the impact of overeducation in the South African labour market by analysing the earnings of overeducated workers. The positive relationship between earnings and investment in human capital via educational attainment is well documented in the labour economics literature since Becker (1964). In recent times, some studies have pointed out the limitations in the returns to schooling. It is stipulated that education beyond what is required to perform one's job is remunerated at a lower rate (albeit a positive rate) compared to the rate at which required education is remunerated. Section 5.2 compares the characteristics of overeducated workers with those of the undereducated and adequately educated workers. The section also assesses the number as well as the percentage of overeducated, undereducated and adequately matched workers. An econometric analysis of the wage effects of overeducation using the Mincer wage equation and the ORU model is carried out in Section 5.3, before Section 5.4 concludes the chapter.

5.2 Descriptive statistics

Figures 5.1 and 5.2 respectively show the number and the percentage of the mismatched workers. It can be observed that the number of undereducated workers as well as the rate of undereducation are higher than those recorded under overeducation for most of the period under consideration. As indicated in Figure 5.1, the number of undereducated workers ranges between 1.27 million and 2.08 million while the number of overeducated workers ranges from 0.96 million to 1.84 million. Likewise, the percentage of undereducated workers, as shown in Figure 5.2, ranges from 11.4 percent to 16.2 percent compared to the percentage of overeducated workers which ranges from 6.6 percent to 15.1 percent. Moreover, most workers in South Africa have the required education for their jobs. Between 1995 and 2016, the number of workers who have the required level of education has increased from 6.63 million to 12.54 million as shown in Table A13. Table A13 also indicates that between 64.5 to 78.7 percent of workers are in jobs that adequately match their educational qualifications.

Figure 5.1: Number of mismatched workers

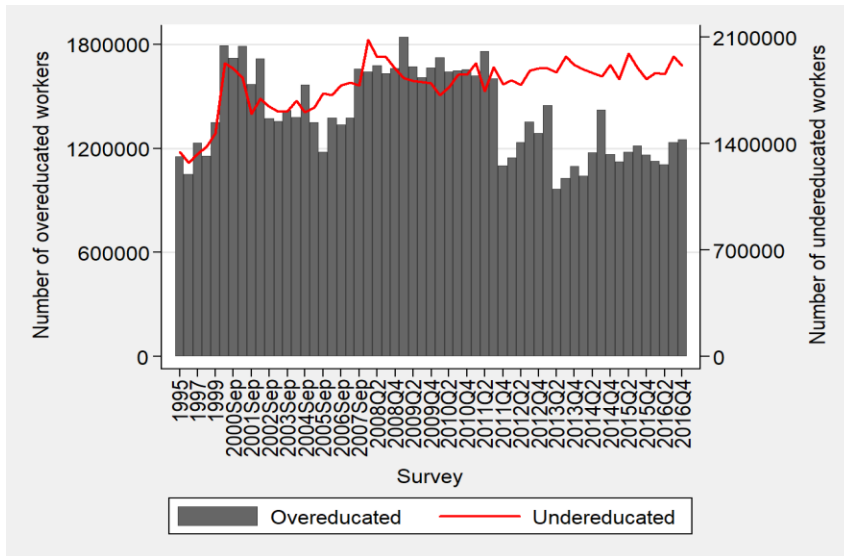


Figure 5.2: Percentage of mismatched workers

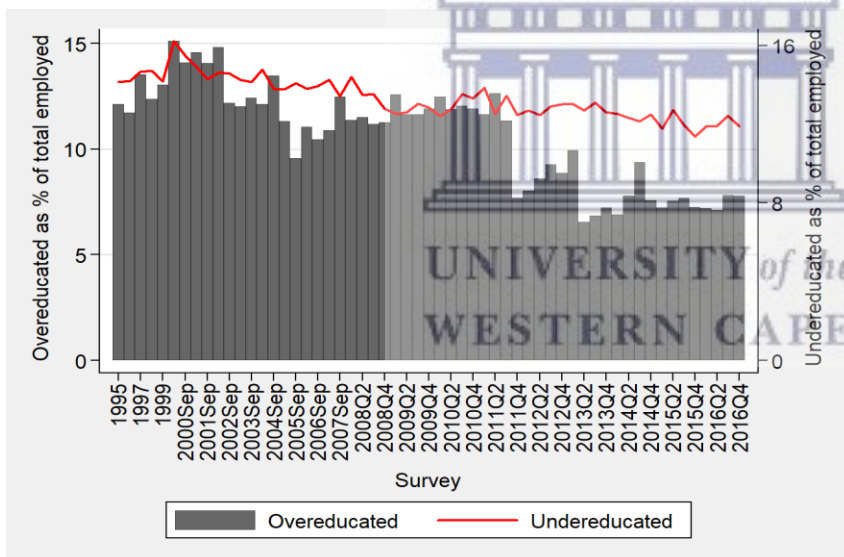


Table 5.1: The share of education mismatch, selected periods

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Race												
African	0.611	0.630	0.637*	0.612*	0.848*	0.866*	0.822*	0.818*	0.620	0.646	0.690	0.746
Coloured	0.093*	0.080*	0.073*	0.063*	0.112*	0.095*	0.102	0.114	0.131	0.128	0.120	0.107
Indian	0.036	0.044	0.040	0.045	0.014*	0.011*	0.025*	0.025	0.041	0.043	0.040	0.033
White	0.260*	0.243*	0.250*	0.281*	0.027*	0.027*	0.051*	0.043*	0.207	0.183	0.150	0.114
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Gender												
Male	0.591	0.601	0.541	0.472*	0.649*	0.612*	0.591	0.629*	0.605	0.577	0.568	0.565
Female	0.409	0.399	0.459	0.528*	0.351*	0.388*	0.409	0.371*	0.395	0.423	0.432	0.435
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Age												
15 to 24 years	0.165*	0.149*	0.094	0.041*	0.061*	0.044*	0.044*	0.048*	0.126	0.128	0.100	0.090
25 to 34 years	0.445*	0.463*	0.339	0.295	0.220*	0.171*	0.177*	0.187*	0.352	0.343	0.351	0.331
35 to 44 years	0.251*	0.238*	0.334	0.342	0.313	0.297	0.250*	0.231*	0.304	0.283	0.304	0.320
45 to 54 years	0.106*	0.106*	0.173	0.213	0.257*	0.303*	0.334*	0.328*	0.159	0.174	0.179	0.188
55 to 65 years	0.034*	0.043*	0.061	0.110*	0.149*	0.185*	0.194*	0.206*	0.059	0.071	0.065	0.071
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>33.46*</i>	<i>33.76*</i>	<i>37.29</i>	<i>39.97*</i>	<i>41.50*</i>	<i>43.90*</i>	<i>44.11*</i>	<i>44.22*</i>	<i>36.20</i>	<i>36.68</i>	<i>37.08</i>	<i>37.75</i>
Occupation												
Managers	0.057	0.132*	0.088	0.163*	0.054	0.040*	0.044*	0.064*	0.054	0.063	0.088	0.083
Professionals	0.000*	0.000	0.096*	0.151*	0.106	0.002*	0.020*	0.044*	0.099	0.007	0.004	0.034
Technicians	0.041*	0.055*	0.176*	0.198*	0.062*	0.051*	0.101	0.057*	0.138	0.135	0.101	0.090
Clerks	0.117	0.031*	0.043*	0.099	0.086	0.104*	0.060*	0.078*	0.084	0.128	0.125	0.121
Service workers	0.063*	0.015*	0.016*	0.046*	0.181	0.094*	0.089*	0.139*	0.176	0.131	0.139	0.171
Skilled agriculture	0.008	0.093*	0.004	0.010	0.103*	0.017	0.087*	0.006	0.079	0.012	0.056	0.006
Trade workers	0.055*	0.039*	0.065*	0.090*	0.171*	0.135	0.161	0.168*	0.286	0.262	0.130	0.146
Operators	0.166*	0.169*	0.036*	0.047*	0.137*	0.119*	0.084*	0.095	0.053	0.109	0.092	0.103
Elementary	0.388*	0.344*	0.394*	0.076*	0.293*	0.272*	0.276*	0.267	0.225	0.174	0.176	0.247
Domestic workers	0.105*	0.122*	0.082	0.121*	0.103*	0.101*	0.088*	0.082*	0.065	0.066	0.067	0.058
Other/Unspecified	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Years of work experience												
1 to 5 years	0.129*	0.124*	0.094*	0.084*	0.003*	0.004*	0.008*	0.005*	0.056	0.063	0.056	0.051
6 to 10 years	0.220*	0.255*	0.168	0.162	0.019*	0.015*	0.033*	0.034*	0.132	0.147	0.144	0.137
11 to 15 years	0.222*	0.219*	0.185	0.151	0.050*	0.036*	0.055*	0.066*	0.170	0.164	0.18	0.172
16 to 20 years	0.170	0.144	0.211*	0.186	0.094*	0.059*	0.077*	0.098*	0.170	0.152	0.176	0.173
21 to 25 years	0.104*	0.112*	0.132	0.143	0.120*	0.099*	0.091*	0.084*	0.150	0.138	0.143	0.154
26 to 30 years	0.076*	0.066*	0.109	0.117	0.143	0.125	0.127	0.111	0.122	0.115	0.113	0.119
Above 30 years	0.079*	0.080*	0.101*	0.156*	0.570*	0.663*	0.609	0.603*	0.200	0.221	0.189	0.193
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>15.39*</i>	<i>15.13*</i>	<i>17.49*</i>	<i>18.84*</i>	<i>32.95*</i>	<i>35.47*</i>	<i>33.47*</i>	<i>33.10*</i>	<i>20.84</i>	<i>20.99</i>	<i>20.27</i>	<i>20.63</i>

* The estimate is significantly different from that of adequately educated workers in the same year at $\alpha = 5\%$.

Table A11 in the appendix presents the incidence of mismatch by gender for four selected periods. It can be deduced that the incidence of mismatch between workers' qualification and the educational requirements of their jobs (both overeducation and undereducation) is higher for males compared to females. Except in the third quarter of 2016 which has relatively lower rates (3.7 percent for males and 4.1 percent for females), the rate of overeducation is approximately seven percent for males but five percent for females. While the incidence of undereducation for males seems to be higher than that of overeducation, the rates for the two forms of mismatch for females are similar. Moreover, while the rate of adequately matched male workers ranges between 39 percent and 44 percent, the rate for their female counterpart ranges from 28 percent to 34 percent.

Table 5.1 presents the share of mismatched workers based on certain demographic and work-related variables in 1995, September 2002, and the third quarter of 2010 and 2016. In relation to the proportion of mismatched workers by gender, males dominate the share of both overeducation and undereducation. Also, approximately 57 to 60 percent of adequately matched workers are males. The average age of undereducated workers ranges between 41 and 44 years while the mean age of overeducated workers is between 33 to 39 years. Thus, the overeducated are relatively younger than undereducated workers. Overeducation can, therefore, be said to be more prevalent at the start of one's career due to the lack of the relevant work-related experience.

Regarding the share of surplus and deficit education by race, Africans dominate both forms of mismatch. However, Africans also constitute the highest proportion of well-matched workers (representing 62 to 75 percent of all adequately educated workers), followed by the White population which represents about 11 to 20 percent of well-matched workers. The Indian population group, on the other hand, make up the lowest proportion both overeducated and undereducated workers.

It is also important to analyse how years of work experience affect surplus and deficit education. Undereducated workers have the highest mean years of experience (between 33 and 35 years) compared to the overeducated workers (between 15 and 19 years). Based on the estimates reported in Table 5.1, except for the 2016 estimates, it appears that the more a worker

accumulates years of work experience, the lesser is the chance of being overeducated. This observation gives credence to the theoretical argument that overeducation is a transient phenomenon that declines as workers gain more work experience and/or acquire on-the-job training. On the other hand, undereducated workers rely on more years of work experience to compensate for their lower level of education. As it is evident in Table 5.1, the share of undereducated workers increases from one percent and below (for workers with not more than five years of experience) to between 57 to 66 percent (for those with more than 30 years of experience). Table A12 supports the findings in Table 5.1 as the correlation coefficient between overeducation and years of experience is negative while there is a positive correlation between undereducation and years of experience. Furthermore, the correlation coefficient between years of education and years of experience is negative which emphasises the trade-off that exist between the two variables.

With respect to the share of mismatch by occupational category, Table 5.1 reports that workers in the elementary occupations constitute the highest proportion of both overeducated and undereducated workers. It can be expected that these workers may have less educational qualifications but rather more work experience. On the other hand, professionals seem to be less prone to mismatch. This is probably because professionals are more likely to obtain high advanced degrees which their jobs require. Moreover, as shown in Table A14, the utilities and mining industries have the lowest share of both overeducated and undereducated workers while workers in the wholesale and retail trade industry as well as those in the community services industry constitute the highest proportion of adequately educated workers.

On the basis of province, Table A14 gives an indication that most undereducated workers, just like their overeducated counterparts, reside in Gauteng and KwaZulu-Natal while the Northern Cape has the lowest (less than five percent) proportion of workers in both categories. Furthermore, the average tenure for overeducated workers ranges from five to nine years while that of undereducated workers is between eight and nine years. It appears that as the tenure of employment increases, the proportion of both overeducated and undereducated workers declines. With regard to overeducation, it seems that as workers' tenure of employment increases, they get more experience and/or training which make them qualify for more suitable positions in the

organisation. The results also give the impression that as undereducated workers stay longer in their organisation, they tend to acquire further education either willingly or as demanded by their organisation.

Figure 5.3 displays the percentage of mismatch based on the workers' level of education. As expected, workers with no years of formal education are all deemed as undereducated for their jobs in both 2010 and 2016. Likewise, 63.3 percent of workers who have only primary education are undereducated with the remaining 36.7 percent being adequately matched in 2016. In contrast, approximately 87 percent of workers who have a university degree are overeducated while the remaining 13 percent are adequately matched based on the 2010 data. In 2016, however, the share of overeducated graduates drops to 67 percent while the proportion of graduates who are adequately educated for their jobs increases to 33 percent. Moreover, workers who have a secondary school education and those with post-secondary school certificate or diploma have the highest percentage of adequately educated workers. In 2016, 94 percent of workers who have completed Matric are adequately matched while only 4.7 percent and 1.3 percent of them are undereducated and overeducated respectively. Similarly, 86.7 percent of workers who possess a post-Matric certificate or diploma are adequately matched while the remaining 13.3 percent are overeducated.

Figure 5.3: Percentage of mismatch by education level, 2010 and 2016

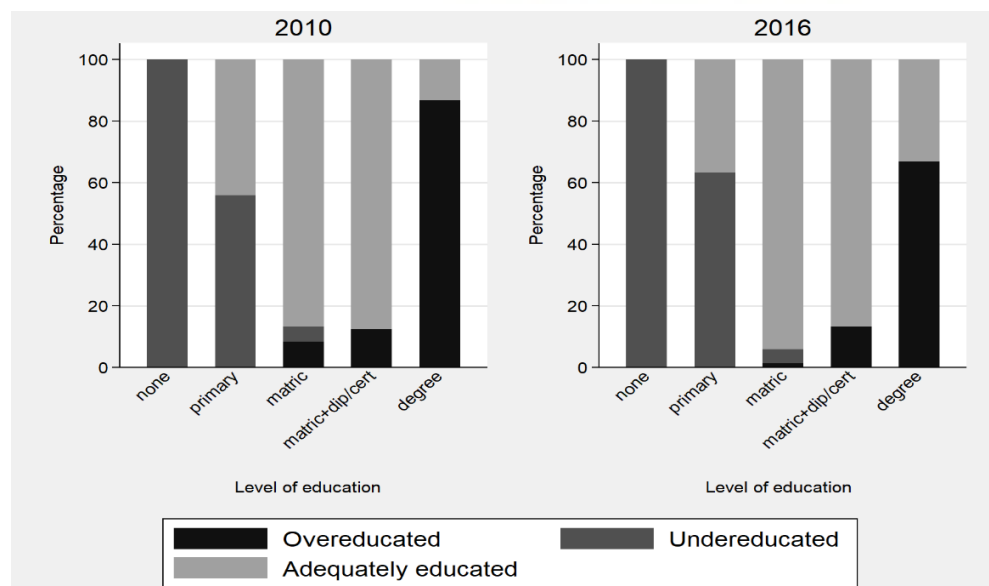


Table 5.2 presents the proportion of well-matched and mismatched workers in each educational attainment category. As expected, overeducated workers have the highest mean years of education (between 12 to 15 years) while undereducated workers, on average, have the lowest years of education (between two to five years). A significant number of undereducated workers either have no formal education or only completed primary education. Moreover, the proportion of overeducated with a bachelor's degree has significantly increased from about 15 percent in 1995 to approximately 72 percent. This, therefore, supports the notion that the increase in overeducation is due to the structural oversupply of skilled workers since there has been a general rise in educational attainment in recent times.

Table 5.2: The share of education mismatch by educational attainment, selected periods

Educational level	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
None	0.000	0.000	0.000	0.000	0.574*	0.483*	0.220*	0.166*	0.000	0.000	0.000	0.000
Primary	0.000*	0.000*	0.000*	0.000*	0.282	0.410*	0.553*	0.586*	0.271	0.239	0.082	0.055
Matric	0.614	0.678	0.442*	0.111*	0.145*	0.107*	0.227*	0.248*	0.637	0.651	0.769	0.802
Matric + Cert. / Dip.	0.238*	0.072*	0.117	0.165*	0.000*	0.000*	0.000*	0.000*	0.092	0.110	0.137	0.108
Degree	0.147*	0.250*	0.441*	0.723*	0.000	0.000	0.000*	0.000*	0.000	0.000	0.011	0.036
Unspecified	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Mean</i>	<i>12.07*</i>	<i>12.63*</i>	<i>13.81*</i>	<i>15.14*</i>	<i>2.55*</i>	<i>2.42*</i>	<i>4.64*</i>	<i>5.12*</i>	<i>9.36</i>	<i>9.68</i>	<i>10.82</i>	<i>11.12</i>

* The estimate is significantly different from that of adequately educated workers in the same year at $\alpha = 5\%$.

Table 5.3 contains the average real hourly and monthly earnings of workers in accordance with their level of education. It can be deduced that education significantly increases earnings. This is because the estimates in the table portray that both the mean hourly wages and monthly real earnings of workers increase as the level of education increases. For instance, in 1995, while workers with no formal education only earned an average of R17.56 per hour, those who have completed Matric received 43.41 per hour and degree holders earned R116.03 per hour on average.

The 2002, 2010 and 2016 estimates show that the mean monthly real earnings of workers with a post-Matric certificate or diploma is more than twice that of workers with Matric only, while degree holders on average earn three times more than their colleagues who have only completed matric. Figure A4 in the Appendix also depicts that there is a positive relationship between

earnings and years of education. This observation supports the human capital theory which suggests that each additional year of schooling is rewarded with a higher return. In other words, the observed variations in earnings can be explained by the amount of investment in human capital.

Table 5.3: Average real remuneration by education level

Educational level	Real hourly wage				Real monthly earnings			
	1995	2002	2010	2016	1995	2002	2010	2016
None	17.56	9.11	16.13	19.25	2 788	1 606	2 866	2 899
Primary	18.20	11.40	19.05	21.49	3 060	2 017	3 406	3 280
Matric	43.41	32.02	34.51	33.74	7 768	5 596	6 147	5 858
Matric + Cert. / Dip.	74.58	66.77	81.20	75.68	12 798	11 940	14 344	12 536
Degree	116.03	100.69	120.31	114.01	21 093	18 444	20 593	19 342
Unspecified	53.60	20.37	35.73	26.28	8 472	3 891	6 420	5 470

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered.

Furthermore, both the average hourly and monthly real earnings of overeducated workers are higher than those of workers who are adequately educated for the period under consideration. As indicated in Table A16, the mean real earnings of overeducated workers range between R35.86 and R106.80 per hour and from R6 845 to R17 463 per month while adequately matched workers on average earn between R26.10 and R44.65 per hour and between R4 880 and R7 713 per month. Undereducated workers, on the other hand, earn less as the mean real earnings of such workers range between R11.95 and R29.59 per hour and between R2 077 and R5 045 per month.

Figures 5.4 and 5.5 show the distributions of real hourly wages for overeducated, undereducated, and adequately educated workers in 1995 and 2016 respectively using kernel density plots. It can be deduced from Figure 5.4 that the real hourly wages of overeducated and adequately matched workers are higher than that of the undereducated. This is because the kernel density plots for overeducated and adequately matched workers are further to the right compared to the plot for the undereducated. The figure also shows that although the overeducated earn relatively higher than their adequately educated counterparts, the wage difference between them is minimal in 1995. Although the overeducated may earn more on average, in relative terms, the result could be different if the overeducated are compared to their colleagues with the same years of

education who are adequately employed. The econometric analysis in section 5.3 will provide some answers in that direction.

Figure 5.4: Kernel density plot of the natural logarithm of real hourly wages (1995)

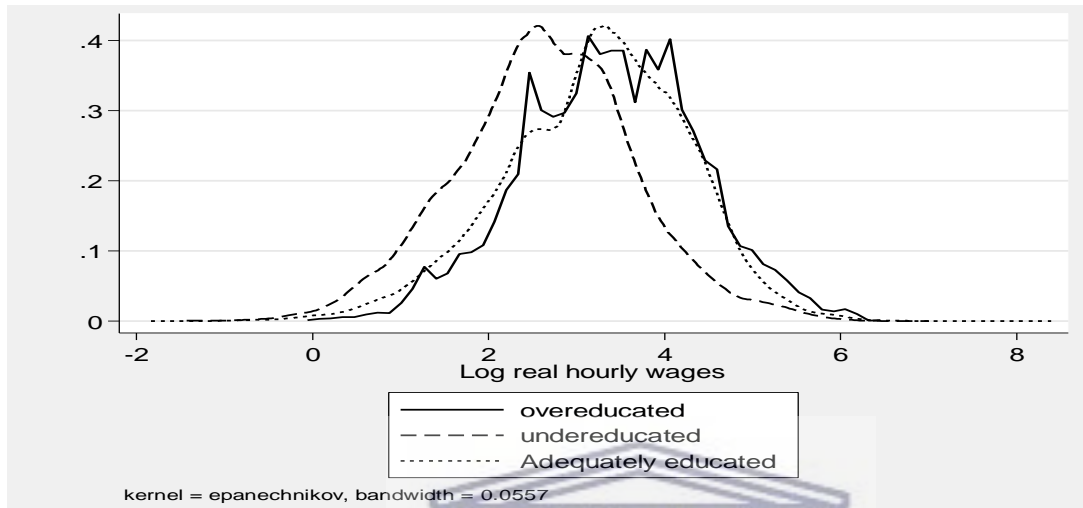
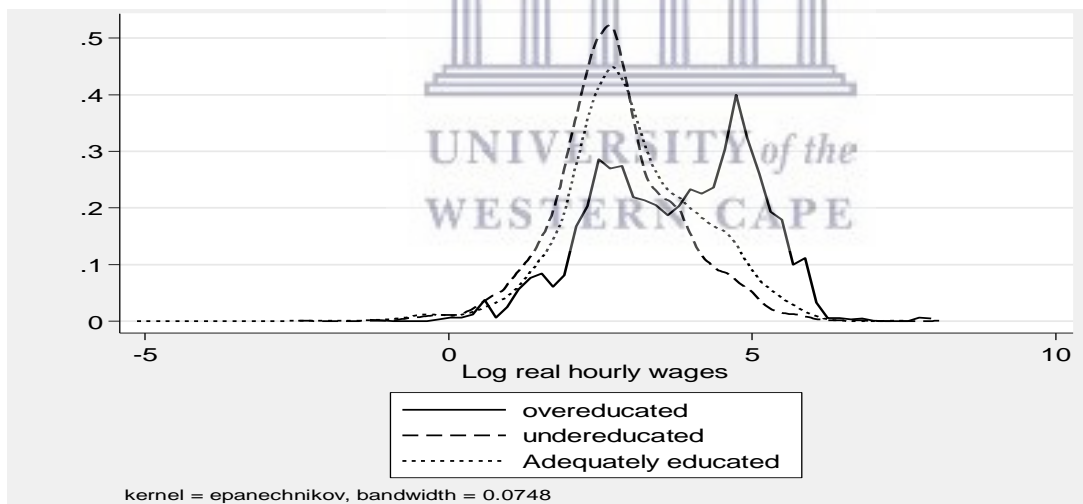


Figure 5.5: Kernel density plot of the natural logarithm of real hourly wages (2016)



On the contrary, the difference in real wages between overeducated and well-matched workers seems more distinct in 2016 as indicated in Figure 5.5. As shown in the figure, the distribution of real hourly wages for overeducated workers is skewed to the left. This suggests that the average real hourly wages of overeducated workers are significantly higher than those of the other two categories. Moreover, although the average real hourly wages are lower for workers with deficit

schooling, the gap between the undereducated and adequately educated workers is smaller in 2016 than in 1995. This means that while the wage gap between overeducated workers and the rest has widened between 1995 and 2016, the gap between undereducated and adequately matched workers has reduced over the same period.

Figure 5.6: Kernel density plot of the natural logarithm of real monthly wages (1995)

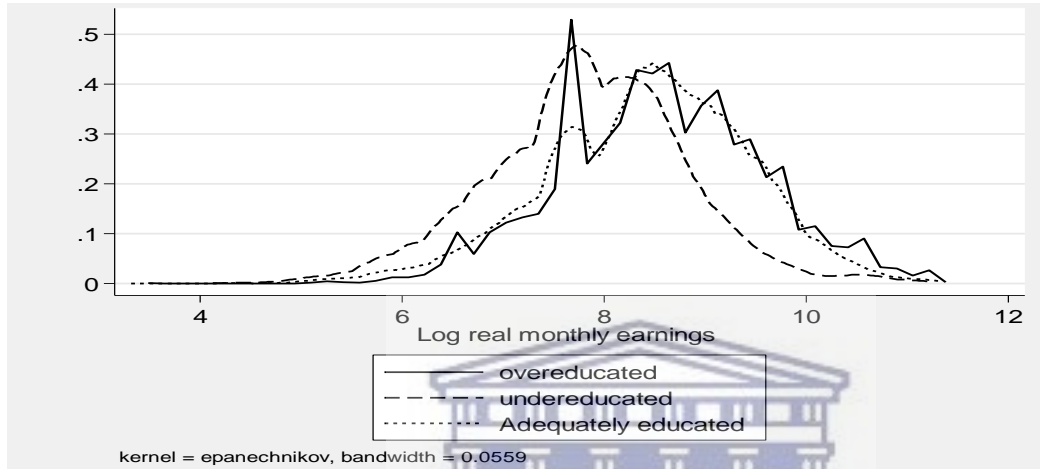
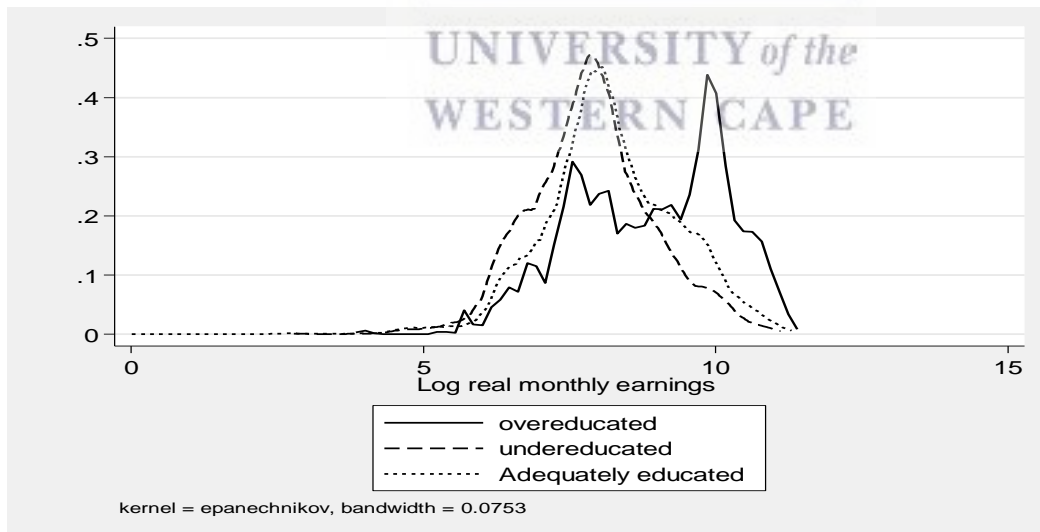


Figure 5.7: Kernel density plot of the natural logarithm of real monthly wages (2016)



The distributions of real monthly earnings for matched and mismatched workers in 1995 and 2016 are shown in Figures 5.6 and 5.7 respectively. The results are similar to what was observed in the case of real hourly wages. As Figure 5.6 depicts, average real monthly earnings in 1995

are significantly higher among overeducated and adequately educated workers relative to undereducated workers. In addition, Figure 5.7 shows that real monthly earnings of overeducated workers in 2016 are significantly higher than that of adequately matched workers, unlike in 1995 where the gap in real earnings between these two groups of workers is not too wide. Overeducated workers may, on average, receive a higher remuneration than their co-workers (holding other characteristics constant) since they are employed in occupations which require lower qualifications than what they possess. Consequently, the returns to their education may be lower relative to what they could have received if they were employed in jobs that match their level of education. Moreover, although undereducated workers are paid lower wages, on average, than their co-workers, they may receive more than workers with the same level of education who are well-matched in their jobs. Therefore, in Section 5.3, the study empirically analyses the earnings of mismatched workers relative to workers with the same level of education who are well-matched in their jobs.

Tables A15 to A17 in the Appendix provide additional information by highlighting certain personal and work-related characteristics pertaining to real hourly wages and real monthly earnings of mismatched and well-matched workers in selected years. The results show that, across all the three categories, the mean wages for males, White, and highly skilled workers are significantly higher compared to female workers, low-skill workers, and workers from the other three racial groups. Among the overeducated, Africans receive the lowest remuneration while Coloured workers, on the other hand, have the lowest mean earnings among the undereducated. It can also be deduced that real wages and earnings increase with the age of the worker. This is because the results indicate that workers younger age brackets earn lower than older workers.

Average earnings of overeducated workers increase as they stay longer in their jobs and as they gain more work-related experience. With regard to industry, the overeducated in the financial industry earn more than their colleagues in other sectors while those in the private households industry receive the lowest mean real earnings. For undereducated workers, those employed in the agriculture and private households sectors receive the lowest average real earnings.

Finally, Table 5.4 below shows that across all the three categories, workers who have attained more years of education are the highest paid within each category, predicted by the human capital theory. For example, while overeducated graduates earn approximately between R100 and R120 per hour in real terms, the overeducated who have only completed Matric earn between R15 and R28. Likewise, the monthly real earnings of undereducated workers who have completed Matric ranges from R7 297 to R8 277 which is significantly more than the R1 604 to R2 899 per month paid to undereducated workers with no formal education.

Table 5.4: Mean real hourly wages and monthly earnings of mismatched and matched workers by educational attainment, selected periods

Educational level	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
	Real hourly wage											
None	N/A	N/A	N/A	N/A	17.56	9.10	16.13	19.25	N/A	N/A	N/A	N/A
Primary	N/A	N/A	N/A	N/A	25.84	14.40	20.69	24.97	16.59	10.30	16.98	15.71
Matric	27.81	17.99	23.58	15.22	47.04	43.08	41.69	47.50	45.82	34.31	35.14	33.35
Matric + Cert. / Dip.	56.69	52.21	59.22	77.58	N/A	N/A	N/A	N/A	82.61	68.45	84.21	75.37
Degree	119.54	100.28	113.58	103.62	N/A	N/A	N/A	N/A	N/A	N/A	137.99	128.18
	Real monthly earnings											
None	N/A	N/A	N/A	N/A	2 787	1 604	2 866	2 899	N/A	N/A	N/A	N/A
Primary	N/A	N/A	N/A	N/A	4 687	2 484	3 651	3 802	2 717	1 844	3 097	2 411
Matric	4 830	3 296	4 136	2 102	8 255	8 190	7 297	8 277	8 233	5 943	6 274	5 796
Matric + Cert. / Dip.	9 957	10 547	10 938	9 414	N/A	N/A	N/A	N/A	14 071	12 102	14 811	13 034
Degree	22 062	19 100	19 207	17 404	N/A	N/A	N/A	N/A	N/A	N/A	26 334	22 357

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered.

5.3 The Impact of overeducation on earnings

This section explores the effects of overeducation on earnings using the traditional Mincer wage model and the ORU model³⁷. Specifically, the ORU model is employed to analyse the returns to overeducation, required education, and undereducation. The results for each of the three models specified in Chapter Three are discussed below.

³⁷ The ORU model was thoroughly explained in Chapter Three.

Tables 5.5 to 5.7 report the results of the estimated wage equations after correcting for possible sample bias using the Heckman two-step procedure with the log of real hourly wage as the dependent variable. Table 5.8 to 5.10, on the other hand, use the log of real monthly earnings as the dependent variable. The first step of the Heckman procedure estimates the probability of being employed conditional on labour force participation. To achieve this, a probit regression on labour force participation is first estimated (see Table A18 for the results). Based on the estimates from the participation probit, the inverse Mills ratio (λ) is derived and included as a regressor in the employment probit regression (see results in Table A19). The coefficients of λ in the employment probit are statistically significant for all four periods. This suggests the existence of sampling bias, thus, the correction using Heckman procedure is justified. The next step is to use the estimates from the employment probit to derive another inverse Mills ratio. The second λ is then included in the earnings regressions to make them conditional on participation and selection into employment.³⁸

First, Table 5.5 presents the results of the estimated Mincer hourly wage functions in the four selected periods. The returns to the variables that pertain to human capital in the traditional Mincer model are similar to the findings in previous studies. The results indicate that the relationship between education and earnings is non-linear and convex. The returns to education are initially negative according to the 1995 and 2010 estimates. However, as workers acquire more years of schooling, the returns become positive. This supports the human capital theory which suggests that which subsequent years of education are rewarded with higher earnings. The other human capital component, years of work experiences, also has a positive effect on wage as the estimates for 1995, 2002 and 2016 predict. However, there are diminishing returns to experience as the results indicate that there is a moment when the positive returns to work experience start to decrease. Similar results were obtained in Table A22 when only African population was considered.

³⁸ The regressions in Tables A18 and A19 fall beyond the scope of this study and hence are not discussed in further detail.

Table 5.5: Mincer wage model with Heckman correction for sample selection bias

Independent variable	Dependent variable: Log real hourly wage							
	1995		2002		2010		2016	
25 to 34 years	0.1017***	(0.0287)	-0.1545***	(0.0388)	-0.1712***	(0.0490)	-0.1474*	(0.0777)
35 to 44 years	0.0770*	(0.0401)	-0.2453***	(0.0560)	-0.2265***	(0.0664)	-0.1951*	(0.1056)
45 to 54 years	0.0569	(0.0477)	-0.3301***	(0.0660)	-0.2754***	(0.0784)	-0.3204**	(0.1261)
55 to 65 years	0.0059	(0.0554)	-0.3783***	(0.0756)	-0.2550***	(0.0856)	-0.2670*	(0.1364)
Female	-0.2612***	(0.0138)	-0.1221***	(0.0170)	-0.1313***	(0.0179)	-0.1060***	(0.0261)
African	-0.5301***	(0.0131)	-0.6408***	(0.0193)	-0.5738***	(0.0201)	-0.1801***	(0.0351)
Coloured	-0.3814***	(0.0165)	-0.4012***	(0.0227)	-0.4701***	(0.0253)	-0.1781***	(0.0487)
Indian	-0.2631***	(0.0226)	-0.2627***	(0.0297)	-0.1840***	(0.0338)	-0.0582	(0.0636)
Eastern Cape	-0.0474***	(0.0184)	-0.3009***	(0.0234)	-0.1291***	(0.0257)	-0.3349***	(0.0427)
Northern Cape	-0.1382***	(0.0271)	-0.2058***	(0.0353)	-0.1026***	(0.0397)	-0.2161***	(0.0747)
Free State	-0.3881***	(0.0184)	-0.4608***	(0.0251)	-0.2200***	(0.0297)	-0.3656***	(0.0518)
KwaZulu-Natal	0.0571***	(0.0166)	-0.1375***	(0.0213)	-0.0996***	(0.0240)	-0.3829***	(0.0426)
North West	-0.0122	(0.0188)	-0.1613***	(0.0260)	0.0082	(0.0304)	-0.1007*	(0.0563)
Gauteng	0.1620***	(0.0144)	0.0085	(0.0195)	0.0511**	(0.0210)	-0.1207***	(0.0379)
Mpumalanga	0.0125	(0.0206)	-0.1467***	(0.0260)	0.0732**	(0.0289)	-0.1991***	(0.0477)
Limpopo	0.1877***	(0.0232)	-0.2653***	(0.0278)	-0.1276***	(0.0311)	-0.3181***	(0.0503)
Mining	0.5405***	(0.0229)	0.8447***	(0.0318)	0.6208***	(0.0453)	0.5122***	(0.0835)
Manufacturing	0.5349***	(0.0178)	0.6268***	(0.0250)	0.2923***	(0.0326)	0.2267***	(0.0576)
Water & electricity	0.6688***	(0.0422)	0.7160***	(0.0594)	0.2417***	(0.0676)	0.5057***	(0.1094)
Wholesale & retail	0.4440***	(0.0231)	0.5794***	(0.0310)	0.2663***	(0.0358)	0.1171**	(0.0592)
Construction	0.4315***	(0.0176)	0.4065***	(0.0244)	0.1809***	(0.0317)	0.1192**	(0.0555)
Communication	0.5934***	(0.0225)	0.6039***	(0.0310)	0.2564***	(0.0375)	0.2061***	(0.0644)
Finance	0.5594***	(0.0222)	0.6601***	(0.0278)	0.3029***	(0.0329)	0.1373**	(0.0564)
Community services	0.4229***	(0.0303)	0.5175***	(0.0290)	0.2903***	(0.0351)	0.1221**	(0.0573)
Private households	0.0650*	(0.0338)	0.2092***	(0.0564)	0.1313***	(0.0459)	0.0280	(0.0769)
Managers	0.1569***	(0.0297)	0.2292***	(0.0347)	0.0434	(0.0340)	-0.0471	(0.0573)
Technicians	0.0836***	(0.0247)	0.0156	(0.0315)	-0.2012***	(0.0293)	-0.6176***	(0.0520)
Clerks	-0.2135***	(0.0263)	-0.1876**	(0.0332)	-0.3675***	(0.0298)	-0.8242***	(0.0530)
Service workers	-0.3460***	(0.0272)	-0.5896***	(0.0341)	-0.7303***	(0.0304)	-1.1423***	(0.0534)
Skilled agriculture	0.0259	(0.0467)	-0.2950***	(0.0492)	-0.5413***	(0.1008)	-1.1335***	(0.2100)
Trade workers	-0.2535***	(0.0285)	-0.3637***	(0.0362)	-0.5189***	(0.0336)	-0.9528***	(0.0597)
Operators	-0.3472***	(0.0291)	-0.4490***	(0.0371)	-0.6632***	(0.0341)	-1.2262***	(0.0614)
Elementary workers	-0.4762***	(0.0284)	-0.6223***	(0.0351)	-0.7547***	(0.0314)	-1.3046***	(0.0553)
Domestic workers	-1.0544***	(0.0503)	-0.7213***	(0.0676)	-0.7452***	(0.0530)	-1.2250***	(0.0875)
Employees	-0.3489***	(0.0239)	-0.1069***	(0.0209)	N/A ⁺		N/A ⁺	
Public	0.2121***	(0.0275)	0.4098***	(0.0226)	0.2921***	(0.0235)	0.1285***	(0.0328)
Urban	0.1480***	(0.0107)	0.1721***	(0.0137)	0.1613***	(0.0191)	0.1792***	(0.0341)
Informal	-0.1493***	(0.0241)	-0.4785***	(0.0213)	-0.3332***	(0.0233)	-0.2349***	(0.0342)
Union member	0.1487***	(0.0093)	0.2752***	(0.0142)	0.2458***	(0.0148)	0.2400***	(0.0238)
Education	-0.0155***	(0.0043)	0.0111*	(0.0060)	-0.0127*	(0.0076)	-0.0076	(0.0129)
Education squared	0.0067***	(0.0003)	0.0043***	(0.0004)	0.0043***	(0.0005)	0.0032***	(0.0007)
Experience	0.0330***	(0.0022)	0.0257***	(0.0029)	0.0036	(0.0035)	0.0130**	(0.0057)
Experience squared	-0.0004***	(0.0000)	-0.0001***	(0.0000)	0.0001	(0.0001)	0.0000	(0.0001)
Lambda	0.0401	(0.0293)	-0.2608***	(0.0449)	-0.3222***	(0.0519)	-0.1987**	(0.0818)
Constant	2.6565***	(0.0607)	2.7056***	(0.0815)	3.6903***	(0.1077)	3.8103***	(0.1871)
Observations	29 714		21 998		16 654		11 527	
F Stat.	1 214.64		896.21		437.60		133.46	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.6430		0.6424		0.5311		0.3332	
Adjusted R-squared	0.6425		0.6417		0.5299		0.3307	
Root MSE	0.6403		0.7326		0.7115		0.9446	

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.10 + omitted because of perfect collinearity
Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; rural; formal sector; not a trade union member

With respect to the control variables, workers' age seems to influence their earnings prospect. Workers who are between the ages of 25 and 65 years earn significantly less than those who are less than 25 years. As expected, female workers tend to earn between 11 to 26 percent less relative to male workers across all four periods. On racial grounds, African, Coloured and Indian workers all earn significantly less than their White counterparts. Africans, for instance, earn between 18 to 64 percent less than their White counterparts.

As far as the province of residence is concerned, workers who reside in the Eastern Cape, Northern Cape, Free State and North West earn less hourly wages than those in the Western Cape. The results for the other provinces are mixed as the estimated coefficients are negative for some periods and positive for others. Moreover, workers who reside in urban areas and those who work in the public sector receive higher remuneration per hour in comparison with their colleagues in the rural area and private sector respectively. For instance, compared to those who work in the rural areas, workers in urban areas earn between 15 to 18 percent higher.

Workers in the mining, manufacturing, water and electricity, wholesale and retail, construction, communication, finance, community services, and private households industries earn significantly higher wages per hour than those employed in the agriculture industry. The occupational dummies show that clerks, service workers, agricultural workers, trade workers, operators, elementary and domestic workers all earn significantly less than professionals. Managers, on the other hand, earn more than professionals as the 1995 and 2002 estimates portray. Furthermore, being employed in the informal sector relative to the formal sector is associated with a negative impact on wage. Likewise, employees earn lower wages than their self-employed counterparts based on the 1995 and 2002 estimates. Union membership has a positive effect on earnings. The union wage premium is between 15 to 28 percent across all four periods.

Finally, the lambda coefficient is negative and statistically significant for all periods except 1995. Therefore, there was a sample selection bias and the use of the Heckman sample correction procedure is justified. In other words, the omission of a control for the likelihood of being employed in the wage function would imply a bias in the results.

The results obtained from the Verdugo and Verdugo (V&V) specification are presented in Table 5.6. The results indicate that overeducated workers suffer a wage penalty relative to adequately matched workers with the same level of education³⁹, which is in line with the findings in previous literature. A similar result was obtained in Table A23 when only the African sample was analysed. These findings depict that although the returns to additional years of schooling may be positive, the earnings of overeducated workers are statistically significantly lower than that of adequately educated workers as the coefficients for 1995, 2002 and 2010 depict. In fact, overeducated workers earn approximately 6 to 8 percent less than well-matched workers.

Likewise, the 2010⁴⁰ estimates show that undereducated workers also earn about seven percent less than workers who have the required level of education for their jobs. Again, the same observation was made in Table A13 which solely focuses on the African population. Therefore, undereducated workers are not rewarded more than their adequately educated colleagues. This is contrary to the findings in previous studies which suggest that the undereducated receive a wage premium. However, by omitting the additional explanatory variables and only including the human capital variables, the results in Table A10 show that the undereducated benefit from a wage premium for working in a higher occupation compared to those with the same qualification who are well-matched in their jobs.

Just like in the case of the Mincer wage function, education is found to have an increasing return while there are diminishing returns to experience. Although the returns to education are initially negative, the returns become positive as the years of education doubles. The positive effect of work experience, however, fades away as workers accumulate more years of experience. For example, the 1995 and 2002 estimates show that each additional year of experience generates a return of earnings of about three percent, but this positive effect diminishes as experience doubles.

³⁹ The results in Table A20 in the Appendix which only include the human capital variables also confirms that the overeducated face an opportunity cost from not being employed in an occupation that match their level of education

⁴⁰ The coefficients of the other three periods are not statistically significant.

Table 5.6: Verdugo & Verdugo wage model with Heckman correction for sample selection bias

Independent variable	Dependent variable: Log real hourly wage							
	1995		2002		2010		2016	
25 to 34 years	0.1032***	(0.0287)	-0.1522***	(0.0388)	-0.1592***	(0.0491)	-0.1476*	(0.0780)
35 to 44 years	0.0790**	(0.0401)	-0.2413***	(0.0560)	-0.2106***	(0.0665)	-0.1954*	(0.1059)
45 to 54 years	0.0588	(0.0477)	-0.3260***	(0.0660)	-0.2582***	(0.0785)	-0.3208**	(0.1264)
55 to 65 years	0.0071	(0.0554)	-0.3760***	(0.0757)	-0.2423***	(0.0857)	-0.2674*	(0.1366)
Female	-0.2613***	(0.0138)	-0.1240***	(0.0170)	-0.1362***	(0.0179)	-0.1059***	(0.0262)
African	-0.5257***	(0.0132)	-0.6379***	(0.0193)	-0.5748***	(0.0201)	-0.1801***	(0.0351)
Coloured	-0.3786***	(0.0165)	-0.3997***	(0.0227)	-0.4694***	(0.0253)	-0.1781***	(0.0487)
Indian	-0.2628***	(0.0226)	-0.2617***	(0.0297)	-0.1836***	(0.0338)	-0.0580	(0.0636)
Eastern Cape	-0.0496***	(0.0184)	-0.3021***	(0.0234)	-0.1294***	(0.0257)	-0.3350***	(0.0427)
Northern Cape	-0.1400***	(0.0271)	-0.2073***	(0.0353)	-0.1040***	(0.0397)	-0.2160***	(0.0747)
Free State	-0.3893***	(0.0184)	-0.4616***	(0.0251)	-0.2193***	(0.0297)	-0.3656***	(0.0519)
KwaZulu-Natal	0.0559***	(0.0166)	-0.1374***	(0.0212)	-0.1003***	(0.0240)	-0.3829***	(0.0426)
North West	-0.0144	(0.0188)	-0.1639***	(0.0260)	0.0070	(0.0303)	-0.1007*	(0.0564)
Gauteng	0.1605***	(0.0144)	0.0079	(0.0195)	0.0519**	(0.0210)	-0.1207***	(0.0379)
Mpumalanga	0.0112	(0.0206)	-0.1471***	(0.0260)	0.0745**	(0.0289)	-0.1991***	(0.0477)
Limpopo	0.1863***	(0.0232)	-0.2672***	(0.0278)	-0.1283***	(0.0311)	-0.3182***	(0.0503)
Mining	0.5444***	(0.0229)	0.8473***	(0.0318)	0.6308***	(0.0453)	0.5125***	(0.0836)
Manufacturing	0.5383***	(0.0179)	0.6306***	(0.0250)	0.2994***	(0.0326)	0.2270***	(0.0576)
Water & electricity	0.6745***	(0.0422)	0.7200***	(0.0594)	0.2480***	(0.0676)	0.5059***	(0.1094)
Wholesale & retail	0.4487***	(0.0231)	0.5838***	(0.0310)	0.2731***	(0.0358)	0.1173**	(0.0592)
Construction	0.4343***	(0.0177)	0.4087***	(0.0244)	0.1890***	(0.0318)	0.1196**	(0.0556)
Communication	0.5978***	(0.0225)	0.6061***	(0.0310)	0.2631***	(0.0376)	0.2065***	(0.0645)
Finance	0.5632***	(0.0222)	0.6607***	(0.0278)	0.3076***	(0.0330)	0.1375**	(0.0564)
Community services	0.4274***	(0.0303)	0.5202***	(0.0290)	0.2965***	(0.0351)	0.1224**	(0.0574)
Private households	0.0660*	(0.0338)	0.2038***	(0.0564)	0.1313***	(0.0459)	0.0278	(0.0769)
Managers	0.1949***	(0.0312)	0.2771***	(0.0373)	0.0395	(0.0342)	-0.0491	(0.0590)
Technicians	0.1109***	(0.0256)	0.0562*	(0.0336)	-0.1929***	(0.0296)	-0.6199***	(0.0547)
Clerks	-0.1730***	(0.0282)	-0.1439***	(0.0355)	-0.3612***	(0.0300)	-0.8265***	(0.0558)
Service workers	-0.2999***	(0.0296)	-0.5380***	(0.0373)	-0.7292***	(0.0313)	-1.1452***	(0.0573)
Skilled agriculture	0.0750	(0.0482)	-0.2075***	(0.0559)	-0.5355***	(0.1013)	-1.1374***	(0.2117)
Trade workers	-0.2040***	(0.0312)	-0.3031***	(0.0404)	-0.5143***	(0.0355)	-0.9562***	(0.0646)
Operators	-0.2854***	(0.0331)	-0.3709***	(0.0437)	-0.6599***	(0.0358)	-1.2296***	(0.0661)
Elementary workers	-0.4043***	(0.0343)	-0.5383***	(0.0432)	-0.7361***	(0.0357)	-1.3087***	(0.0621)
Domestic workers	-0.9804***	(0.0541)	-0.6250***	(0.0733)	-0.7308***	(0.0559)	-1.2296***	(0.0936)
Employees	-0.3489***	(0.0239)	-0.1083**	(0.0209)	N/A ⁺		N/A ⁺	
Public	0.2091***	(0.0275)	0.4049***	(0.0227)	0.2892***	(0.0235)	0.1284***	(0.0329)
Urban	0.1482***	(0.0107)	0.1713***	(0.0137)	0.1636***	(0.0191)	0.1791***	(0.0341)
Informal	-0.1457***	(0.0241)	-0.4766***	(0.0213)	-0.3325***	(0.0233)	-0.2349***	(0.0342)
Union member	0.1476***	(0.0093)	0.2745***	(0.0142)	0.2462***	(0.0148)	0.2400***	(0.0238)
Overeducation	-0.0634***	(0.0159)	-0.0785***	(0.0223)	-0.0662***	(0.0247)	0.0040	(0.0469)
Undereducation	0.0106	(0.0188)	0.0162	(0.0258)	-0.0654**	(0.0272)	-0.0062	(0.0441)
Education	-0.0175***	(0.0053)	0.0090	(0.0073)	-0.0303***	(0.0089)	-0.0081	(0.0154)
Education squared	0.0072***	(0.0003)	0.0048***	(0.0005)	0.0053***	(0.0005)	0.0032***	(0.0009)
Experience	0.0330***	(0.0022)	0.0255***	(0.0029)	0.0036	(0.0035)	0.0130**	(0.0057)
Experience squared	-0.0004***	(0.0000)	-0.0001***	(0.0000)	0.0001	(0.0001)	0.0000	(0.0001)
Lambda	0.0414	(0.0293)	-0.2577***	(0.0450)	-0.3057***	(0.0520)	-0.1990**	(0.0822)
Constant	2.5757***	(0.0681)	2.6091***	(0.0931)	3.7338***	(0.1145)	3.8213***	(0.2008)
Observations	29 714		21 998		16 654		11 527	
F Stat.	1162.73		857.92		418.90		127.51	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.6432		0.6426		0.5316		0.3332	
Adj. R-squared	0.6427		0.6418		0.5304		0.3306	
Root MSE	0.6402		0.7324		0.7112		0.9447	

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.10 + omitted because of perfect collinearity
Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; rural; formal sector; not a trade union member

With regard to the control variables, the results are similar to the ones found under the Mincer model. Except for 1995, 15 to 24 year olds earn significantly more than those who are above 25 years. Female workers, African, Coloureds and Indians earn less than male and White workers respectively while workers in Western Cape earn more than those in Eastern Cape, Northern Cape, Free State, and North West. Relative to agriculture, workers in all the other industries earn significantly higher wages. Also, workers in semi-skilled and low-skilled occupations earn less than professionals. While employees and informal sector workers respectively earn less than the self-employed and formal sector workers, workers in the public sector and those who reside in urban areas earn more than their counterparts in the private sector and rural areas respectively. Finally, the lambda coefficients for 2002, 2010 and 2016 are negatively and statistically significant which validate the use of the Heckman correction for sample bias.

The results from the Duncan and Hoffman (D&H)⁴¹ specification are contained in Table 5.7. The results indicate that the returns to required education and overeducation are both positive and statistically significant in all four surveys. However, the returns to overeducation are lower than that of required education⁴². While adequately matched workers receive a rate of return of about 18 to 23 percent, the rate of returns for overeducated workers ranges between five and 10 percent. On the other hand, there are negative returns to deficit education⁴³. Thus, each year of undereducation decreases hourly wage by approximately three to six percent. This is an indication that undereducated workers earn less than their co-workers who are adequately educated. However, undereducated workers are better off than they would be if they were employed in a lower level occupation which matches their qualification. For example, on the basis of the 2010 estimates, a worker whose level of education is one year less than the required level in his/her occupation earns 13 percent higher than he/she would if employed in a correctly matched occupation (18 percent higher wages for the additional year of required education less five percent reduction in wages for being undereducated). The findings are similar to previous studies (Duncan and Hoffman, 1989; Sicherman 1991; Cohn and Khan, 1995).

⁴¹ In Table A23, only the African sample was analysed, and the results are similar to the one based on the whole sample.

⁴² These results are similar to the one obtained in Table A20 in the Appendix where only the human capital variables are included as explanatory variables.

⁴³ Once again, this result is identical to the one contained in Table A20 when only the relevant human capital variables were considered.

Table 5.7: Duncan & Hoffman wage model with Heckman correction for sample selection

bias

Independent variable	Dependent variable: Log real hourly wage							
	1995		2002		2010		2016	
25 to 34 years	-0.0229	(0.0281)	-0.2569***	(0.0375)	-0.3038***	(0.0479)	-0.1900**	(0.0762)
35 to 44 years	-0.0786**	(0.0395)	-0.3822***	(0.0544)	-0.3842***	(0.0653)	-0.2443**	(0.1041)
45 to 54 years	-0.1080**	(0.0472)	-0.4744***	(0.0645)	-0.4581***	(0.0772)	-0.3781***	(0.1244)
55 to 65 years	-0.1249**	(0.0553)	-0.5015***	(0.0748)	-0.4233***	(0.0848)	-0.3200**	(0.1351)
Female	-0.1903***	(0.0134)	-0.0675***	(0.0160)	-0.0844***	(0.0175)	-0.0912***	(0.0255)
African	-0.5365***	(0.0132)	-0.6210***	(0.0193)	-0.5596***	(0.0202)	-0.1782***	(0.0351)
Coloured	-0.4342***	(0.0164)	-0.4175***	(0.0227)	-0.4873***	(0.0253)	-0.1813***	(0.0487)
Indian	-0.2906***	(0.0227)	-0.2595***	(0.0297)	-0.1969***	(0.0339)	-0.0570	(0.0636)
Eastern Cape	0.0101	(0.0182)	-0.2767***	(0.0233)	-0.1200**	(0.0258)	-0.3294***	(0.0427)
Northern Cape	-0.0980**	(0.0272)	-0.1833***	(0.0353)	-0.0923**	(0.0398)	-0.2082***	(0.0747)
Free State	-0.3931***	(0.0185)	-0.4550***	(0.0251)	-0.2181***	(0.0298)	-0.3555***	(0.0517)
KwaZulu-Natal	0.0917***	(0.0166)	-0.1228***	(0.0212)	-0.0927***	(0.0241)	-0.3775***	(0.0425)
North West	0.0071	(0.0189)	-0.1376***	(0.0259)	0.0192	(0.0304)	-0.0886	(0.0562)
Gauteng	0.1625***	(0.0145)	0.0185	(0.0195)	0.0532**	(0.0211)	-0.1161***	(0.0378)
Mpumalanga	0.0474**	(0.0206)	-0.1335***	(0.0260)	0.0712**	(0.0290)	-0.1992***	(0.0477)
Limpopo	0.2647***	(0.0230)	-0.2229***	(0.0275)	-0.1181***	(0.0312)	-0.3171***	(0.0503)
Mining	0.5055***	(0.0230)	0.8239***	(0.0318)	0.5961***	(0.0453)	0.5020***	(0.0836)
Manufacturing	0.5160***	(0.0180)	0.6146***	(0.0250)	0.2740***	(0.0326)	0.2155***	(0.0576)
Water & electricity	0.6445***	(0.0425)	0.7026***	(0.0595)	0.2303***	(0.0678)	0.4991***	(0.1094)
Wholesale & retail	0.4218***	(0.0233)	0.5678***	(0.0310)	0.2454***	(0.0358)	0.1091*	(0.0592)
Construction	0.4035***	(0.0178)	0.3934***	(0.0244)	0.1606***	(0.0317)	0.1071*	(0.0555)
Communication	0.5617***	(0.0226)	0.5872***	(0.0311)	0.2380***	(0.0376)	0.1952***	(0.0644)
Finance	0.5458***	(0.0224)	0.6537***	(0.0279)	0.2858***	(0.0330)	0.1304**	(0.0564)
Community services	0.3960***	(0.0305)	0.5051***	(0.0291)	0.2823***	(0.0352)	0.1146**	(0.0574)
Private households	0.0496	(0.0340)	0.2121***	(0.0566)	0.1238***	(0.0460)	0.0300	(0.0770)
Managers	0.4436***	(0.0267)	0.4134***	(0.0327)	0.1842***	(0.0323)	0.3714***	(0.0535)
Technicians	0.2447***	(0.0218)	0.1869***	(0.0299)	-0.1062***	(0.0270)	-0.1903***	(0.0462)
Clerks	0.0298	(0.0235)	0.0145	(0.0320)	-0.1870***	(0.0270)	-0.3111***	(0.0466)
Service workers	0.0874***	(0.0273)	-0.2514***	(0.0387)	-0.3818***	(0.0304)	-0.4214***	(0.0513)
Skilled agriculture	0.3340***	(0.0431)	0.3950***	(0.0443)	-0.0312	(0.1025)	-0.2380	(0.2108)
Trade workers	0.3004***	(0.0307)	0.1236**	(0.0484)	-0.0152	(0.0388)	-0.0519	(0.0636)
Operators	0.3488***	(0.0348)	0.0844*	(0.0510)	-0.1935***	(0.0379)	-0.3631***	(0.0636)
Elementary workers	0.4799***	(0.0398)	0.0214	(0.0552)	-0.1195***	(0.0385)	-0.2251***	(0.0616)
Domestic workers	N/A ⁺		N/A ⁺		N/A ⁺		N/A ⁺	
Employees	-0.3539***	(0.0240)	-0.1084**	(0.0210)	N/A ⁺		N/A ⁺	
Public	0.2270***	(0.0277)	0.4253***	(0.0227)	0.3036***	(0.0236)	0.1353***	(0.0328)
Urban	0.1515***	(0.0108)	0.1752***	(0.0137)	0.1253***	(0.0189)	0.1638***	(0.0336)
Informal	-0.1777***	(0.0242)	-0.4844***	(0.0213)	-0.3381***	(0.0233)	-0.2366***	(0.0342)
Union member	0.1498***	(0.0094)	0.2767***	(0.0142)	0.2485***	(0.0149)	0.2401***	(0.0238)
Overeducation	0.0996***	(0.0036)	0.0822***	(0.0048)	0.0531***	(0.0067)	0.0707***	(0.0110)
Undereducation	-0.0491***	(0.0027)	-0.0568***	(0.0036)	-0.0480***	(0.0047)	-0.0274***	(0.0074)
Required education	0.2167***	(0.0054)	0.1685***	(0.0078)	0.1814***	(0.0095)	0.2341***	(0.0135)
Experience	0.0265***	(0.0022)	0.0207***	(0.0029)	-0.0029	(0.0035)	0.0099*	(0.0056)
Experience squared	-0.0002***	(0.0000)	-0.0000	(0.0000)	0.0003***	(0.0001)	0.0001	(0.0001)
Lambda	-0.1667***	(0.0274)	-0.4521***	(0.0407)	-0.5351***	(0.0492)	-0.2683***	(0.0777)
Constant	0.9343***	(0.0769)	1.4969***	(0.1256)	2.1685***	(0.1595)	0.9571***	(0.2630)
Observations	29 714		21 998		16 654		11 527	
F Stat.	1191.91		890.57		433.16		133.21	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.6387		0.6409		0.5286		0.3328	
Adj. R-squared	0.6381		0.6402		0.5274		0.3303	
Root MSE	0.6442		0.7340		0.7134		0.9449	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

+ Omitted because of perfect collinearity

Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Given that the coefficients of overeducation, undereducation and required education are not equal, it can be said that the findings support the assignment model. This means that in the South African labour market, wages are influenced by a combination of job characteristics and workers' characteristics. Furthermore, the coefficients of experience are significantly positive except for 2010 while the experience squared⁴⁴ variable is negative for 1995. This, therefore, supports the findings in the previous two models that there are diminishing returns to years of experience.

Similar to the findings in the V&V model, females earn about seven to 19 percent less wages per hour than males. All the other control variables have the same effects as were recorded in the two previous models. Young workers between the ages of 15 to 24 (compared to those who are 25 years and older) as well as workers who live in the Western Cape (compared to those in the Eastern Cape, Northern Cape, Free State, and North West) earn significantly more. Female workers, African, Coloureds and Indians earn less than male and White workers respectively while workers in industries other than agriculture earn significantly higher wages. Also, skilled workers mostly receive higher remunerations than semi-skilled and low-skilled workers. Moreover, living in an urban area, working in the public sector or the formal sector, and being self-employed are associated with relatively higher earnings. It is found that the lambda coefficients are statistically significant for all four periods which make the adoption of the Heckman specification plausible.

Tables 5.8 to 5.10 present the regression results of the three earnings functions, this time using the log of real monthly earnings as the dependent variable. The explanatory variables are the same as the ones in the previous wage regression except that there is an addition of a new explanatory variable, namely weekly work hours. It must be emphasised that the results are very similar to the ones obtained earlier, thus the discussion will only focus on the variables which relate to human capital.

⁴⁴ The coefficient of this explanatory variable was positive and statistically significantly positive in 2010.

Table 5.8: Mincer earnings model with Heckman correction for sample selection bias

Independent variable	Dependent variable: Log real monthly earnings							
	1995		2002		2010		2016	
25 to 34 years	0.1138***	(0.0265)	-0.1415***	(0.0357)	-0.2059***	(0.0478)	-0.2234***	(0.0768)
35 to 44 years	0.0802**	(0.0369)	-0.2502***	(0.0514)	-0.2843***	(0.0648)	-0.3145***	(0.1044)
45 to 54 years	0.0493	(0.0439)	-0.3281***	(0.0606)	-0.3461***	(0.0765)	-0.4341***	(0.1246)
55 to 65 years	-0.0154	(0.0510)	-0.3470***	(0.0695)	-0.3213***	(0.0835)	-0.3002**	(0.1347)
Female	-0.3178***	(0.0127)	-0.1723***	(0.0156)	-0.1636***	(0.0174)	-0.1292***	(0.0258)
African	-0.5817***	(0.0121)	-0.6459***	(0.0177)	-0.5562***	(0.0196)	-0.1377***	(0.0347)
Coloured	-0.4175***	(0.0152)	-0.4396***	(0.0209)	-0.4618***	(0.0247)	-0.1661***	(0.0481)
Indian	-0.2701***	(0.0208)	-0.2919***	(0.0272)	-0.1943***	(0.0330)	-0.0349	(0.0628)
Eastern Cape	-0.0954***	(0.0169)	-0.3141***	(0.0215)	-0.1235***	(0.0251)	-0.3620***	(0.0422)
Northern Cape	-0.1719***	(0.0250)	-0.1919***	(0.0324)	-0.1073***	(0.0387)	-0.2472***	(0.0738)
Free State	-0.3143***	(0.0170)	-0.4206***	(0.0230)	-0.2134***	(0.0290)	-0.4016***	(0.0512)
KwaZulu-Natal	0.0646***	(0.0152)	-0.0945***	(0.0195)	-0.0823***	(0.0235)	-0.3707***	(0.0420)
North West	-0.0150	(0.0173)	-0.1482***	(0.0239)	0.0329	(0.0296)	-0.1107**	(0.0556)
Gauteng	0.1691***	(0.0133)	0.0253	(0.0179)	0.0803***	(0.0205)	-0.1114***	(0.0374)
Mpumalanga	0.0567***	(0.0190)	-0.1060***	(0.0239)	0.1092***	(0.0282)	-0.2147***	(0.0471)
Limpopo	0.1582***	(0.0214)	-0.2062***	(0.0255)	-0.0734**	(0.0304)	-0.3165***	(0.0497)
Mining	0.5126***	(0.0211)	0.7960***	(0.0292)	0.5667***	(0.0442)	0.4645***	(0.0825)
Manufacturing	0.4682***	(0.0164)	0.5532***	(0.0230)	0.2175***	(0.0318)	0.1566***	(0.0570)
Water & electricity	0.6155***	(0.0389)	0.6367***	(0.0545)	0.1645**	(0.0659)	0.4143***	(0.1081)
Wholesale & retail	0.3631***	(0.0213)	0.5405***	(0.0284)	0.1561***	(0.0350)	0.0313	(0.0586)
Construction	0.3494***	(0.0163)	0.3702***	(0.0224)	0.1369***	(0.0310)	0.0720	(0.0548)
Communication	0.5511***	(0.0207)	0.6044***	(0.0285)	0.2516***	(0.0366)	0.1812***	(0.0636)
Finance	0.4889***	(0.0205)	0.5867***	(0.0256)	0.2588***	(0.0321)	0.0865	(0.0557)
Community services	0.3087***	(0.0279)	0.4101***	(0.0267)	0.2101***	(0.0342)	0.0106	(0.0568)
Private households	-0.0894***	(0.0312)	0.0393	(0.0519)	-0.2202***	(0.0453)	-0.2845***	(0.0767)
Managers	0.2068***	(0.0274)	0.2752***	(0.0319)	0.0696**	(0.0332)	-0.0323	(0.0566)
Technicians	0.0370	(0.0228)	-0.0230	(0.0290)	-0.2173***	(0.0286)	-0.6178***	(0.0514)
Clerks	-0.2419***	(0.0242)	-0.2223***	(0.0305)	-0.3509***	(0.0291)	-0.8110***	(0.0523)
Service workers	-0.3426***	(0.0250)	-0.5246***	(0.0314)	-0.6479***	(0.0298)	-1.0724***	(0.0530)
Skilled agriculture	0.0024	(0.0430)	-0.3767***	(0.0452)	-0.5229***	(0.0983)	-1.1285***	(0.2074)
Trade workers	-0.2752***	(0.0263)	-0.3990***	(0.0332)	-0.4888***	(0.0328)	-0.9546***	(0.0590)
Operators	-0.3628***	(0.0268)	-0.4274***	(0.0340)	-0.6069***	(0.0333)	-1.2073***	(0.0606)
Elementary workers	-0.5072***	(0.0262)	-0.6284***	(0.0323)	-0.7638***	(0.0306)	-1.3600***	(0.0547)
Domestic workers	-1.0593***	(0.0463)	-0.7633***	(0.0621)	-0.6858***	(0.0517)	-1.1669***	(0.0864)
Employees	-0.3683***	(0.0220)	-0.0368*	(0.0192)	N/A ⁺		N/A ⁺	
Public	0.2365***	(0.0253)	0.3970***	(0.0208)	0.2347***	(0.0230)	0.0555*	(0.0326)
Urban	0.1307***	(0.0099)	0.1755***	(0.0126)	0.1545***	(0.0186)	0.1619***	(0.0337)
Informal	-0.2375***	(0.0222)	-0.5553***	(0.0195)	-0.3212***	(0.0228)	-0.2584***	(0.0337)
Union member	0.1704***	(0.0086)	0.2830***	(0.0130)	0.2792***	(0.0145)	0.3032***	(0.0236)
Education	-0.0096**	(0.0040)	0.0143***	(0.0055)	-0.0146*	(0.0075)	-0.0049	(0.0128)
Education squared	0.0062***	(0.0003)	0.0039***	(0.0004)	0.0043***	(0.0004)	0.0028***	(0.0007)
Experience	0.0340***	(0.0020)	0.0285***	(0.0027)	0.0068**	(0.0034)	0.0180***	(0.0056)
Experience squared	-0.0004***	(0.0000)	-0.0002***	(0.0000)	0.0000	(0.0001)	-0.0001	(0.0001)
Work hours	0.0010***	(0.0001)	0.0011***	(0.0001)	0.0015***	(0.0001)	0.0021***	(0.0002)
Lambda	0.0442	(0.0270)	-0.2802***	(0.0412)	-0.3621***	(0.0506)	-0.3026***	(0.0808)
Constant	7.8134***	(0.0581)	7.7603***	(0.0766)	8.7091***	(0.1081)	8.8077***	(0.1898)
Observations	29 714		21 995		16 654		11 527	
F Stat	1416.63		1078.49		481.34		156.43	
Prob > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.6824		0.6886		0.5605		0.3748	
Adj R-squared	0.6819		0.6879		0.5593		0.3724	
Root MSE	0.5896		0.6725		0.6939		0.9328	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Note: For 1995, total hours worked was used as a proxy for the usual work hours

Table 5.9: Verdugo & Verdugo earnings model with Heckman correction for sample selection bias

Independent variable	Dependent variable: Log real monthly earnings							
	1995		2002		2010		2016	
25 to 34 years	0.1157***	(0.0264)	-0.1396***	(0.0357)	-0.1939***	(0.0479)	-0.2236***	(0.0771)
35 to 44 years	0.0828**	(0.0369)	-0.2468***	(0.0515)	-0.2687***	(0.0649)	-0.3147***	(0.1047)
45 to 54 years	0.0519	(0.0439)	-0.3247***	(0.0606)	-0.3296***	(0.0766)	-0.4342***	(0.1249)
55 to 65 years	-0.0139	(0.0510)	-0.3451***	(0.0695)	-0.3094***	(0.0836)	-0.3003**	(0.1349)
Female	-0.3178***	(0.0127)	-0.1738***	(0.0156)	-0.1684***	(0.0175)	-0.1291***	(0.0259)
African	-0.5760***	(0.0121)	-0.6436***	(0.0177)	-0.5571***	(0.0196)	-0.1377***	(0.0348)
Coloured	-0.4138***	(0.0152)	-0.4383***	(0.0209)	-0.4613***	(0.0247)	-0.1660***	(0.0481)
Indian	-0.2697***	(0.0208)	-0.2910***	(0.0272)	-0.1940***	(0.0330)	-0.0350	(0.0628)
Eastern Cape	-0.0983***	(0.0169)	-0.3152***	(0.0215)	-0.1238***	(0.0251)	-0.3618***	(0.0422)
Northern Cape	-0.1741***	(0.0250)	-0.1931***	(0.0324)	-0.1089***	(0.0387)	-0.2473***	(0.0738)
Free State	-0.3159***	(0.0170)	-0.4213***	(0.0230)	-0.2129***	(0.0290)	-0.4015***	(0.0513)
KwaZulu-Natal	0.0632***	(0.0152)	-0.0945***	(0.0195)	-0.0829***	(0.0234)	-0.3705***	(0.0421)
North West	-0.0176	(0.0173)	-0.1504***	(0.0239)	0.0318	(0.0296)	-0.1105**	(0.0557)
Gauteng	0.1672***	(0.0133)	0.0248	(0.0179)	0.0810***	(0.0205)	-0.1114***	(0.0374)
Mpumalanga	0.0552***	(0.0190)	-0.1063***	(0.0239)	0.1104***	(0.0282)	-0.2146***	(0.0471)
Limpopo	0.1566***	(0.0213)	-0.2079***	(0.0255)	-0.0742**	(0.0304)	-0.3163***	(0.0497)
Mining	0.5180***	(0.0211)	0.7982***	(0.0292)	0.5760***	(0.0442)	0.4642***	(0.0825)
Manufacturing	0.4728***	(0.0165)	0.5564***	(0.0230)	0.2242***	(0.0319)	0.1563***	(0.0570)
Water & electricity	0.6231***	(0.0389)	0.6401***	(0.0545)	0.1699***	(0.0659)	0.4140***	(0.1081)
Wholesale & retail	0.3693***	(0.0213)	0.5442***	(0.0285)	0.1623***	(0.0350)	0.0310	(0.0586)
Construction	0.3534***	(0.0163)	0.3720***	(0.0224)	0.1443***	(0.0310)	0.0716	(0.0549)
Communication	0.5572***	(0.0208)	0.6062***	(0.0285)	0.2579***	(0.0367)	0.1809***	(0.0637)
Finance	0.4939***	(0.0205)	0.5873***	(0.0256)	0.2629***	(0.0321)	0.0864	(0.0557)
Community services	0.3148***	(0.0279)	0.4124***	(0.0267)	0.2157***	(0.0342)	0.0102	(0.0568)
Private households	-0.0879***	(0.0312)	0.0351	(0.0519)	-0.2204***	(0.0453)	-0.2843***	(0.0767)
Managers	0.2548***	(0.0287)	0.3146***	(0.0343)	0.0641*	(0.0333)	-0.0297	(0.0583)
Technicians	0.0717***	(0.0236)	0.0104	(0.0309)	-0.2111***	(0.0288)	-0.6150***	(0.0540)
Clerks	-0.1905***	(0.0260)	-0.1864***	(0.0326)	-0.3465***	(0.0293)	-0.8082***	(0.0551)
Service workers	-0.2850***	(0.0272)	-0.4823***	(0.0343)	-0.6506***	(0.0306)	-1.0687***	(0.0568)
Skilled agriculture	0.0641	(0.0444)	-0.3045***	(0.0513)	-0.5227***	(0.0988)	-1.1232***	(0.2090)
Trade workers	-0.2136***	(0.0287)	-0.3491***	(0.0371)	-0.4903***	(0.0346)	-0.9504***	(0.0638)
Operators	-0.2861***	(0.0305)	-0.3631***	(0.0401)	-0.6095***	(0.0350)	-1.2030***	(0.0653)
Elementary workers	-0.4189***	(0.0316)	-0.5592***	(0.0397)	-0.7546***	(0.0348)	-1.3546***	(0.0613)
Domestic workers	-0.9686***	(0.0498)	-0.6841***	(0.0673)	-0.6811***	(0.0545)	-1.1608***	(0.0924)
Employees	-0.3686***	(0.0220)	-0.0379**	(0.0192)	N/A+		N/A+	
Public	0.2327***	(0.0253)	0.3931***	(0.0208)	0.2319***	(0.0230)	0.0557*	(0.0326)
Urban	0.1310***	(0.0099)	0.1749***	(0.0126)	0.1568***	(0.0186)	0.1620***	(0.0337)
Informal	-0.2328***	(0.0222)	-0.5537***	(0.0195)	-0.3207***	(0.0228)	-0.2585***	(0.0338)
Union member	0.1691***	(0.0086)	0.2824***	(0.0130)	0.2797***	(0.0145)	0.3031***	(0.0236)
Overeducation	-0.0797***	(0.0147)	-0.0644***	(0.0205)	-0.0543**	(0.0241)	-0.0031	(0.0463)
Undereducation	0.0060	(0.0173)	0.0141	(0.0237)	-0.0752***	(0.0265)	0.0107	(0.0435)
Education	-0.0133***	(0.0049)	0.0127*	(0.0067)	-0.0325***	(0.0087)	-0.0036	(0.0152)
Education squared	0.0069***	(0.0003)	0.0044***	(0.0004)	0.0052***	(0.0005)	0.0028***	(0.0009)
Experience	0.0339***	(0.0020)	0.0283***	(0.0027)	0.0067*	(0.0034)	0.0180***	(0.0056)
Experience squared	-0.0004***	(0.0000)	-0.0002***	(0.0000)	0.0000	(0.0001)	-0.0001	(0.0001)
Work hours	0.0010***	(0.0001)	0.0011***	(0.0001)	0.0015***	(0.0001)	0.0021***	(0.0002)
Lambda	0.0458*	(0.0270)	-0.2775***	(0.0413)	-0.3462***	(0.0507)	-0.3027***	(0.0813)
Constant	7.7211***	(0.0647)	7.6787***	(0.0870)	8.7719***	(0.1148)	8.7905***	(0.2029)
Observations	29 714		21 995		16 654		11 527	
F Stat	1358.31		1033.19		461.21		149.61	
Prob > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.6827		0.6887		0.5609		0.3748	
Adj R-squared	0.6822		0.6881		0.5597		0.3723	
Root MSE	0.5893		0.6724		0.6936		0.9329	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Note: For 1995, total hours worked was used as a proxy for the usual work hours

Table 5.10: Duncan & Hoffman earnings model with Heckman correction for sample selection bias

Independent variable	Dependent variable: Log real monthly earnings							
	1995		2002		2010		2016	
25 to 34 years	-0.0077	(0.0259)	-0.2318***	(0.0344)	-0.3338***	(0.0467)	-0.2536***	(0.0753)
35 to 44 years	-0.0715**	(0.0364)	-0.3708***	(0.0499)	-0.4366***	(0.0637)	-0.3499***	(0.1029)
45 to 54 years	-0.1116**	(0.0435)	-0.4551***	(0.0592)	-0.5223***	(0.0754)	-0.4751***	(0.1229)
55 to 65 years	-0.1442***	(0.0510)	-0.4552***	(0.0687)	-0.4835***	(0.0828)	-0.3379**	(0.1333)
Female	-0.2486***	(0.0124)	-0.1240***	(0.0148)	-0.1183***	(0.0171)	-0.1188***	(0.0253)
African	-0.5859***	(0.0122)	-0.6290***	(0.0177)	-0.5428***	(0.0197)	-0.1369***	(0.0347)
Coloured	-0.4678***	(0.0151)	-0.4544***	(0.0209)	-0.4785***	(0.0247)	-0.1687***	(0.0481)
Indian	-0.2968***	(0.0209)	-0.2892***	(0.0273)	-0.2068***	(0.0331)	-0.0350	(0.0628)
Eastern Cape	-0.0399**	(0.0168)	-0.2924***	(0.0214)	-0.1148***	(0.0251)	-0.3578***	(0.0421)
Northern Cape	-0.1331***	(0.0251)	-0.1717***	(0.0324)	-0.0973**	(0.0388)	-0.2420***	(0.0737)
Free State	-0.3197***	(0.0171)	-0.4149***	(0.0231)	-0.2116***	(0.0291)	-0.3940***	(0.0511)
KwaZulu-Natal	0.0988***	(0.0153)	-0.0814***	(0.0195)	-0.0757***	(0.0235)	-0.3667***	(0.0420)
North West	0.0040	(0.0174)	-0.1270***	(0.0238)	0.0436	(0.0297)	-0.1017*	(0.0555)
Gauteng	0.1694***	(0.0134)	0.0344*	(0.0179)	0.0822***	(0.0206)	-0.1085***	(0.0374)
Mpumalanga	0.0912***	(0.0190)	-0.0940***	(0.0239)	0.1072***	(0.0283)	-0.2150***	(0.0471)
Limpopo	0.2341***	(0.0212)	-0.1684***	(0.0253)	-0.0641**	(0.0305)	-0.3146***	(0.0497)
Mining	0.4816***	(0.0212)	0.7768***	(0.0292)	0.5417***	(0.0442)	0.4545***	(0.0825)
Manufacturing	0.4525***	(0.0166)	0.5414***	(0.0230)	0.1989***	(0.0319)	0.1460**	(0.0569)
Water & electricity	0.5957***	(0.0392)	0.6234***	(0.0546)	0.1527**	(0.0661)	0.4074***	(0.1081)
Wholesale & retail	0.3436***	(0.0215)	0.5296***	(0.0285)	0.1354***	(0.0350)	0.0239	(0.0585)
Construction	0.3252***	(0.0164)	0.3580***	(0.0224)	0.1166***	(0.0310)	0.0610	(0.0548)
Communication	0.5233***	(0.0209)	0.5888***	(0.0285)	0.2332***	(0.0367)	0.1716***	(0.0636)
Finance	0.4775***	(0.0206)	0.5808***	(0.0256)	0.2417***	(0.0322)	0.0804	(0.0557)
Community services	0.2861***	(0.0281)	0.3979***	(0.0267)	0.2015***	(0.0343)	0.0030	(0.0568)
Private households	-0.1028***	(0.0314)	0.0422	(0.0520)	-0.2274***	(0.0455)	-0.2832***	(0.0767)
Managers	0.5063***	(0.0246)	0.4773***	(0.0300)	0.1995***	(0.0315)	0.3665***	(0.0528)
Technicians	0.2067***	(0.0200)	0.1680***	(0.0274)	-0.1309***	(0.0263)	-0.2074***	(0.0456)
Clerks	0.0131	(0.0217)	0.0022	(0.0294)	-0.1859***	(0.0263)	-0.3179***	(0.0460)
Service workers	0.1048***	(0.0252)	-0.1579***	(0.0356)	-0.3285***	(0.0298)	-0.3823***	(0.0507)
Skilled agriculture	0.3323***	(0.0397)	0.3544***	(0.0407)	-0.0550	(0.0999)	-0.2747	(0.2081)
Trade workers	0.2927***	(0.0283)	0.1223***	(0.0444)	-0.0262	(0.0378)	-0.0951	(0.0629)
Operators	0.3460***	(0.0321)	0.1421***	(0.0468)	-0.1758***	(0.0370)	-0.3830***	(0.0628)
Elementary workers	0.4577***	(0.0366)	0.0547	(0.0507)	-0.1797***	(0.0376)	-0.3314***	(0.0610)
Domestic workers	N/A ⁺		N/A ⁺		N/A ⁺		N/A ⁺	
Employees	-0.3743***	(0.0222)	-0.0372*	(0.0193)	N/A ⁺		N/A ⁺	
Public	0.2496***	(0.0255)	0.4114***	(0.0208)	0.2461***	(0.0230)	0.0610*	(0.0326)
Urban	0.1343***	(0.0099)	0.1782***	(0.0126)	0.1198***	(0.0184)	0.1516***	(0.0332)
Informal	-0.2634***	(0.0223)	-0.5609***	(0.0196)	-0.3260***	(0.0228)	-0.2602***	(0.0338)
Union member	0.1713***	(0.0086)	0.2842***	(0.0130)	0.2818***	(0.0145)	0.3031***	(0.0236)
Overeducation	0.0930***	(0.0033)	0.0813***	(0.0044)	0.0532***	(0.0065)	0.0692***	(0.0108)
Undereducation	-0.0528***	(0.0025)	-0.0552***	(0.0033)	-0.0448***	(0.0046)	-0.0239***	(0.0073)
Required education	0.2131***	(0.0050)	0.1706***	(0.0072)	0.1705***	(0.0093)	0.2221***	(0.0133)
Experience	0.0274***	(0.0020)	0.0242***	(0.0027)	0.0005	(0.0034)	0.0160***	(0.0055)
Experience squared	-0.0003***	(0.0000)	-0.0001***	(0.0000)	0.0002***	(0.0001)	-0.0001	(0.0001)
Work hours	0.0010***	(0.0001)	0.0011***	(0.0001)	0.0015***	(0.0001)	0.0021***	(0.0002)
Lambda	-0.1582***	(0.0252)	-0.4486***	(0.0373)	-0.5671***	(0.0480)	-0.3509***	(0.0768)
Constant	6.1252***	(0.0726)	6.4682***	(0.1164)	7.2936***	(0.1583)	6.0636***	(0.2645)
F Stat		29 714		21 995		16 654		11 527
Prob > F		1389.15		1072.47		476.55		156.35
R-squared		0.0000		0.0000		0.0000		0.0000
Adj R-squared		0.6781		0.6874		0.5580		0.3747
Root MSE		0.6777		0.6867		0.5568		0.3723
F Stat		0.5935		0.6738		0.6958		0.9329

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: 15-24 years; male; white; Western Cape; agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Note: For 1995, total hours worked was used as a proxy for the usual work hours

Referring to the results for the Mincer model in Table 5.8, the relationship between education and earnings remains non-linear and convex, an indication that the returns to education increase with each additional year of completed schooling. Likewise, the returns to years of work experience are found to be positive, but the positive returns diminish over time. The weekly hours of work variable is positive and statistically significant, suggesting that an increase in the number of working hours per week significantly increases workers' earnings. Moreover, the use of the Heckman sample selection procedure is justified by the fact that lambda is significantly negative.

Table 5.9 presents the results of the V&V model. Like earlier findings, the earnings of adequately matched workers are found to be higher in relation to what overeducated workers earn. The results for 1995, 2002 and 2010 indicate that overeducated workers earn between five to eight percent lower than adequately educated workers with similar qualification. Undereducated workers, on the other hand, earn approximately eight percent lower than their adequately educated colleagues. However, when all other explanatory variables are omitted except for the human capital variables such as was the case in Table A21, the undereducated seems to benefit from a wage premium. Once again, there is a non-linear convex relation between education and earnings while the relationship between weekly work hours and earnings is positive, just like in the Mincer model.

Similar to the findings in Table 5.7, the results in Table 5.10 using the D&H model show that there are positive returns to overeducation and adequate education. However, the returns to adequate education are about nine to fifteen percent higher than the returns to overeducation. On the contrary, the returns to undereducation are negative and statistically significant. These results mimic Sattinger's assignment theory, indicating that labour market earnings in South Africa are neither solely dependent on the characteristics of the job nor the characteristics of workers, but a combination of both.

5.4 Conclusion

This chapter mainly examines the wage effects of educational mismatch in the South African labour market using three different wage models, namely, the Mincer model, the ORU model by Duncan and Hoffman, as well as the Verdugo and Verdugo model. Sample selection bias is controlled for in all three model specifications using the Heckman two-step procedure.

When analysing the characteristics of mismatched workers, it was found that males, Africans, elementary workers, and workers residing in Gauteng and KwaZulu-Natal dominate the share of overeducated and undereducated workers. Moreover, the proportion of overeducated workers is negatively related to years of work experience, which seems to suggest that overeducation may exist at the start of a worker's career but fades away as the worker gains the relevant work experience. Conversely, the likelihood of workers being undereducated increases in line with the years of experience because undereducated workers try to make up for the lower level of education with more work experience.

The empirical findings indicate that skilled workers, young workers between the ages of 15 to 24 years, those who live in the Western Cape relative to those in the Eastern Cape, Northern Cape, Free State, and North West, and workers in industries other than agriculture earn significantly more. Moreover, living in an urban area, working in the public sector or the formal sector, and being self-employed are associated with relatively higher earnings. On the contrary, female workers, African, Coloureds and Indians earn less than male and White workers respectively. Furthermore, while there appears to be increasing returns to education, the effect of experience although initially positive, diminishes over time.

In general, overeducated workers receive substantively lower wages than what they would earn if they were employed in a job which adequately matches their education. The results point to the conclusion that although the rate of return to overeducation is positive, it is lower than the rate of return to adequate schooling. Conversely, the rate of return to undereducation is negative, but compared to being well-matched, the undereducated benefit from a wage premium. It therefore seems that the earnings of workers in South African can be explained by the assignment theory.

CHAPTER SIX: A PANEL DATA ANALYSIS OF OVEREDUCATION AND INCOME-RELATED UNDEREMPLOYMENT

6.1 Introduction

The aim of this chapter is to investigate whether underemployment is a short-term or a long-term phenomenon. Specifically, the chapter examines the duration of overeducation and the two types of income-related underemployment in South Africa using NIDS panel data to track individuals across different time periods. A limited number of international studies have been undertaken to evaluate the permanent or transitory nature of individuals' overeducation spell. Some argue that overeducation is temporary, acting as a stepping stone to better employment prospects by accelerating the transition to an adequate job. Others are also of the view that overeducation may be long-lasting due to the scarring effect it has on workers' chances of moving into adequate employment in the long run. Section 6.2 analyses the number and percentage of underemployed workers, the permanency of overeducation and income-related underemployment as well as the transitory or chronic of these two types of underemployment based on various demographic and work-related characteristics. Numerous pooled-data probit and panel data probit regressions are conducted in Section 6.3, whereas section 6.4 concludes this chapter.

6.2 Descriptive statistics

The number of employed and underemployed individuals in each of the four waves of NIDS as well as the number of those employed in two consecutive waves is discussed in sub-section 6.2.1. Sub-section 6.2.2 looks at the chronic or transient nature of underemployment.

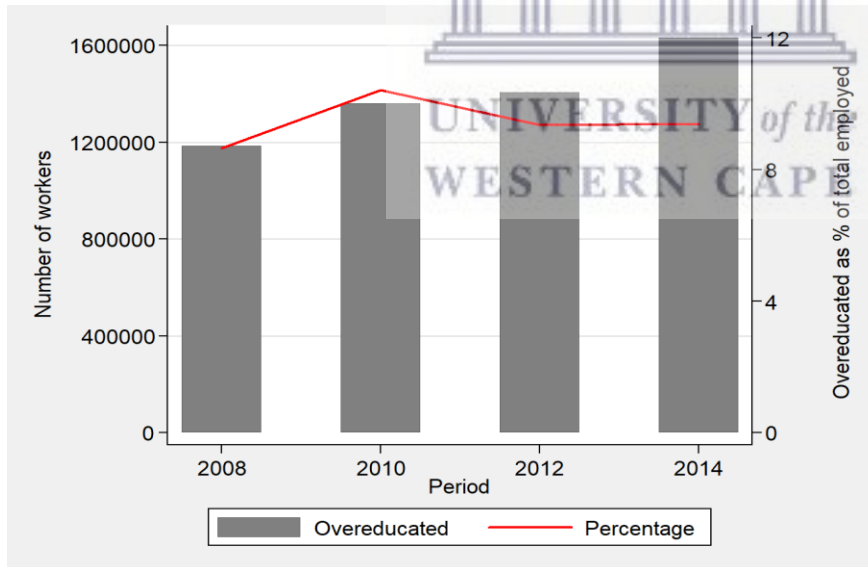
6.2.1 Number of employed and underemployed workers

As shown in Table A25, the total number of employed workers increases from 13.71 to 17.37 million between the first and fourth waves. Table A26 also highlights the number of workers who are employed in two consecutive waves. The results reveal that about 8.59 million individuals are employed in both waves 1 and 2, whereas the number of workers who are

consecutively employed in waves 2 and 3 as well as waves 3 and 4 are about 9.62 million and 9.86 million respectively. Moreover, 4.29 million workers are employed in all four waves.

Next, the number as well as the percentage of overeducated workers across all four waves are presented in Figure 6.1. It shows that the number of overeducated workers ranges from 1.18 million in wave 1 to 1.63 million in wave 4. The overeducated constitute about 8.6 to 10.4 percent of the total number of employed workers. The number and percentage of overeducated workers recorded in the QLFS are more than the ones captured in NIDS in 2008 and 2010 as shown in Table A27. For example, in 2008, while the number and the percentage of overeducated workers are 1.66 million and 11.25 percent respectively in the QLFS, the NIDS data report 1.18 million overeducated workers, representing 8.64 percent. However, in 2012 and 2014, NIDS records a higher number and percentage of overeducated workers than the QLFS. For instance, the percentage of overeducated workers in 2014 is 9.38 in NIDS and 7.58 in the QLFS.

Figure 6.1: Number and percentage of overeducated workers



Figures 6.2 and 6.3 present the number and percentage of income-related underemployed workers based on the two definitions discussed in Chapter Two. First, Figure 6.2 shows that workers who earn less than 125% of the poverty threshold represent between 11.8 to 15.0 percent of the total employed. In absolute terms, such workers are between 1.77 million and 2.37

million. These numbers are higher than what was captured in the QLFS as can be seen in Table A27. For instance, in 2014, the number of overeducated workers in NIDS is 0.93 million more than the number that is captured in the QLFS. In Figure 6.3, the number of income-related underemployed workers ranges from 2.30 million and 2.67 million, which represent between 13.9 and 17.8 percent of the total number of employed workers.

Figure 6.2: Number and percentage of income-related underemployed workers (Earnings less than 125% of poverty threshold)

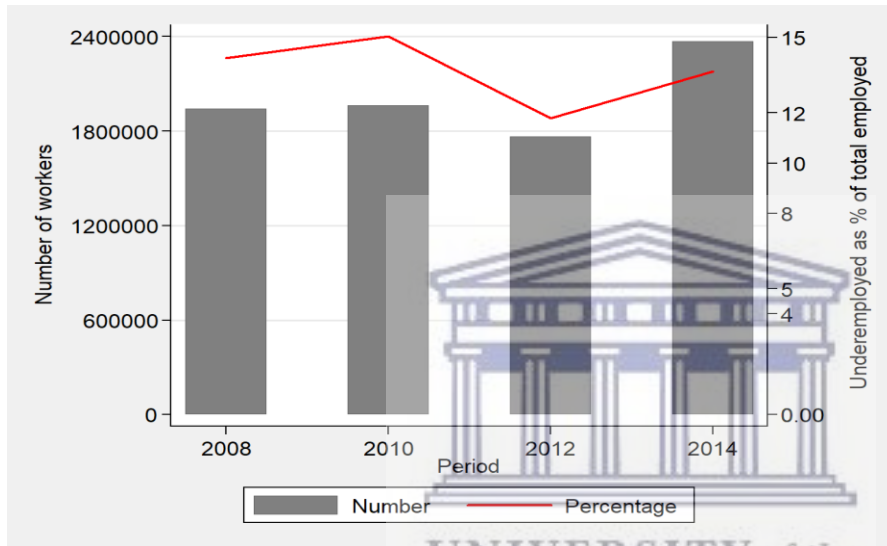
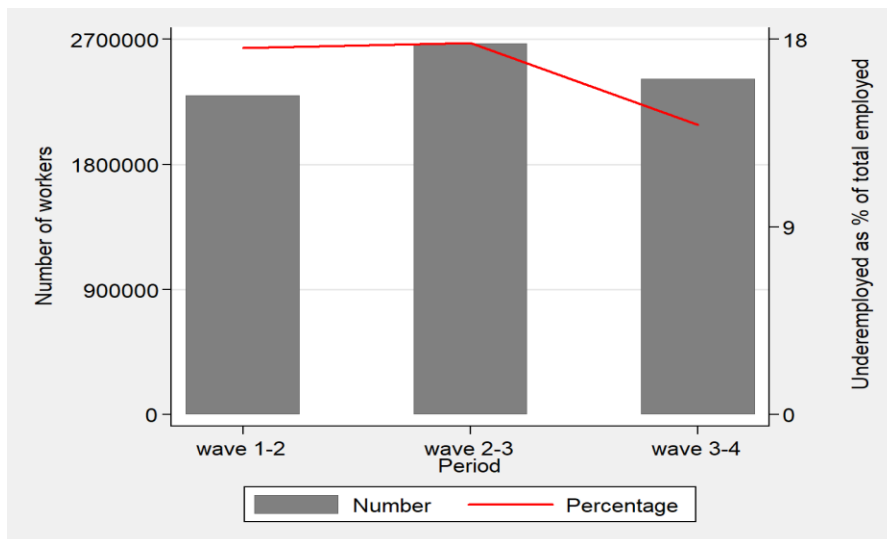


Figure 6.3: Number and percentage of income-related underemployed workers (Earnings less than 20% of previous income)



Both the number and percentage of workers defined as income-related underemployed, because they earn than 20% less than their income in the previous, are higher than those defined as underemployed based on the poverty threshold. It must be emphasised that some of these workers may be high-income individuals and therefore may not be captured as income-related underemployed based on the poverty threshold.

Tables A28 and A29 detail the relationship between per capita income decile and income-related underemployment, based on the poverty threshold and previous earnings respectively, in quintiles. Table A28 depicts that a greater proportion of workers who earn less than 125 percent of the poverty threshold are in the lower half of the income distribution. For example, about 72 percent and 76 percent of individuals defined as income-related underemployed, based on the poverty threshold approach, in 2008 and 2014 respectively are found at the bottom half of the income distribution. On the other hand, Table A29 shows that most individuals who are defined as income-related underemployed, using the previous earnings approach, are in the richest 50 percent of the income distribution. As Table A29 reveals, over 55 percent of income-related underemployed workers, based on the previous earnings approach, are in the top half of the income distribution. It can, therefore, be said that the two approaches may have captured different groups of income-based underemployed workers.

As portrayed in Tables A30 and A31, being in the bottom-end of the income distribution increases the probability of falling into income-related underemployment. As expected, Table A30 shows that between 69 to 87 percent of those in the poorest decile are classified as income-related underemployed based on the poverty threshold method across all four waves. The percentage of income-related underemployed individuals decreases significantly as we move towards the higher-end of the income distribution, with only 0.2 to two percent of those in the top 10 percent being classified as income-related underemployed. Table A31 presents a similar picture, although the percentage of income-related underemployed individuals in the top half of the income distribution is relatively higher under the previous income method. For instance, between 15 to 26 percent of those in the richest 10 percent are underemployed according to the previous income method across all three periods.

Furthermore, less than 25 percent of workers who are defined as underemployed based on the previous income approach are also classified as underemployed according to the poverty threshold approach as shown in Table A32. The table also reveals that over 75 percent of individuals who are classified as underemployed based on the previous earnings approach are not underemployed according to the poverty threshold approach. Alternatively, about four percent of workers who are underemployed based on the poverty threshold approach are not underemployed based on the previous income approach. These results once again imply that the two approaches may have captured different groups of income-related underemployed workers.

6.2.2 The permanent or transitory nature of underemployment

Tables 6.1 and 6.2 display the persistence of the two types of income-related underemployment. It can be deduced that income-related underemployment is short-lived for most workers. For those defined as income-related underemployed based on the poverty threshold approach, approximately 58 to 64 percent move out of the phenomenon two years later. Moreover, only 32 to 34 percent of workers stay in income-related underemployment for a period of four to six years.

Table 6.1: Proportion of income-related underemployed workers in a given period who remain underemployed in subsequent periods (Earnings < 125% of poverty threshold)

Income-related underemployment (<i>t</i>)	Income-related underemployment (<i>t+1</i>)		
	2010	2012	2014
2008	42.37	32.05	33.73
2010		36.40	33.16
2012			37.94

Likewise, as Table 6.2 depicts, between 83 to 88 percent of workers who become income-related underemployed in a given year, because they earn 20 percent less than their previous income, escape the underemployment phenomenon after two years and about 81 percent after four years. It can, therefore, be deduced that income-related underemployment based on the previous earnings approach is less persistent than the other type which is based on the poverty threshold approach.

Table 6.2: Proportion of income-related underemployed workers in a given period who remain underemployed in subsequent periods (Earnings < 20% of previous income)

Income-related underemployment (<i>t</i>)	Income-related underemployment (<i>t+1</i>)	
	2012	2014
2010	11.58	18.60
2012		16.04

Table 6.3 shows the persistence of overeducation between 2008 and 2014. The results indicate that between 55 to 64 percent of workers who become overeducated in a given year remain in the overeducation phenomenon two years later. For example, about 55 percent of overeducated workers in 2010 could not escape overeducation in 2012 while 64 percent of those who were overeducated in 2012 remained overeducated in 2014. Furthermore, between 41 to 54 percent of workers have an overeducation spell that spans across four years, whereas about 42 percent of workers remain overeducated for six years. This means that close to 60 percent of workers find adequately matched jobs six years after being overeducated. Nevertheless, the results seem to suggest that overeducation is a long-term phenomenon for a considerable number of workers. For these workers, initial overeducation may not serve as a stepping stone to finding better jobs as the career mobility theory portrays.

Table 6.3: Proportion of overeducated workers in a given period who remain overeducated in subsequent periods

Overeducation (<i>t</i>)	Overeducation (<i>t+1</i>)		
	2010	2012	2014
2008	54.60	40.69	41.63
2010		54.98	53.90
2012			63.68

Table 6.4 provides additional information by showing the relationship between the transition into and out of overeducation between 2008 and 2014 and occupational changes across the same period. The results depict that most workers who were overeducated in 2008 but became well-matched in 2014 changed occupations across the two periods, mostly from low skilled

occupation into high skilled occupation. For instance, while the proportion of elementary workers declined from 2008 to 2014 for workers who escaped overeducation, the proportion of managers, professionals and technicians increased. This means that some workers change occupations to move out of overeducation.

The converse is also true for individuals who move from well-matched to overeducated. Most workers who transition from well-matched into overeducation also move from high skilled and semi-skilled jobs into low skilled jobs. Regarding workers who either remained overeducated or well-matched throughout the two periods, there were very little movements across occupations as Table 6.4 shows that the occupational composition of such workers was relatively similar between 2008 and 2014.

Table 6.4: Relationship between overeducation status and changes in the composition of occupation between 2008 and 2014

	Overeducated in 2008 but matched in 2014		Overeducated in both 2008 and 2014		Well-matched in 2008 but overeducated in 2014		Well-matched in both 2008 and 2014	
	2008	2014	2008	2014	2008	2014	2008	2014
Managers	1.64	5.93	15.55	14.81	9.33	16.15	5.97	7.2
Professionals	1.21	7.17	48.79	40.36	37.93	29.79	9.27	11.29
Technicians	0.29	13.06	3.94	4.12	4.17	3.91	5.16	5.27
Clerks	1.26	5.99	3.51	6.46	12.02	0.38	11.93	8.97
Service workers	0.20	17.98	3.53	10.51	18.09	4.34	18.1	19.22
Skilled agriculture	11.91	1.36	2.07	1.25	0	0	2.23	0.52
Trade	18.63	15.29	6.81	5.95	12.03	21.1	18.33	13.54
Operators	7.51	11.61	4.93	4.33	3.8	9.84	10.08	13.83
Elementary occupation	57.36	21.60	10.86	12.21	2.63	14.48	18.92	20.16

Table 6.5: Changes in detailed labour status across two waves

Status in 2008	Status in 2010						
	Inactive	Unemployed	Undereducated	Matched	Overeducated	Undefined	Unclassified
Inactive	70.57	15.29	1.97	7.23	1.09	2.49	1.36
Unemployed	41.12	27.48	3.19	20.82	2.14	3.97	1.29
Undereducated	22.30	10.73	42.22	18.02	0.04	5.51	1.19
Matched	13.90	8.99	2.85	61.70	4.98	6.68	0.90
Overeducated	9.96	9.64	0.12	27.55	43.72	8.69	0.33
Undefined	46.94	12.21	5.29	20.50	5.51	8.91	0.65
Unclassified	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Status in 2010	Status in 2012						
	Inactive	Unemployed	Undereducated	Matched	Overeducated	Undefined	Unclassified
Inactive	67.26	15.55	2.99	11.15	0.73	2.03	0.29
Unemployed	38.66	26.30	4.61	25.52	1.85	2.77	0.28
Undereducated	21.16	9.88	57.55	8.53	0.10	2.78	0.00
Matched	12.42	8.87	3.85	70.87	3.01	0.86	0.12
Overeducated	11.62	3.83	0.17	36.87	46.44	1.00	0.08
Undefined	21.90	11.58	7.81	43.79	11.43	2.98	0.52
Unclassified	55.99	19.14	5.14	15.55	2.10	2.09	0.00

Status in 2012	Status in 2014						
	Inactive	Unemployed	Undereducated	Matched	Overeducated	Undefined	Unclassified
Inactive	66.46	12.01	3.90	14.65	0.96	2.02	0.00
Unemployed	30.29	25.09	4.63	34.81	2.87	2.30	0.00
Undereducated	22.97	7.37	53.17	14.88	0.10	1.50	0.00
Matched	11.19	7.20	5.13	71.29	3.71	1.48	0.00
Overeducated	8.29	1.81	0.06	31.22	57.25	1.37	0.00
Undefined	38.99	10.15	8.73	26.35	3.94	11.84	0.00
Unclassified	50.53	8.47	13.25	20.33	6.54	0.89	0.00

Status in 2008	Status in 2014						
	Inactive	Unemployed	Undereducated	Matched	Overeducated	Undefined	Unclassified
Inactive	51.33	14.98	3.63	25.05	2.59	2.42	0.00
Unemployed	32.01	18.31	6.79	38.58	2.48	1.83	0.00
Undereducated	30.06	5.24	44.81	18.59	0.13	1.17	0.00
Matched	17.64	6.42	7.77	60.50	5.70	1.97	0.00
Overeducated	9.80	6.82	0.55	46.72	34.71	1.39	0.00
Undefined	41.70	8.41	8.19	33.92	5.85	1.92	0.00
Unclassified	51.33	14.98	3.63	25.05	2.59	2.42	0.00

Table 6.5 compares the individual changes in labour market status across different periods. A greater proportion of undereducated workers in one period remain undereducated in subsequent periods. For example, about 57.5 percent of individuals who were undereducated in 2010 remained undereducated in 2012 and only 8.5 percent moved into well-match jobs. Likewise, approximately 45 percent of undereducated workers in 2008 were also undereducated in 2014, whereas 18.6 percent found well-matched jobs. This seems to suggest that workers do not move out of undereducation quickly probably due to the wage premium associated with undereducation.

There seems to be a relatively quick dissolution of overeducation than undereducation. Again, the desire to move out of overeducation can be linked to the wage penalty associated with this phenomenon. The results in Table 6.5 reveal that approximately 28 to 31 percent of workers who are overeducated in a given period find well-matched two years after, about 36 to 45 percent become adequately employed after four years, and close to 47 percent escape overeducation after six years.

Furthermore, most workers who are well-matched in a given period remain adequately employed in subsequent periods, and very few of them ever become mismatched. For instance, approximately 71 percent of individuals who were well-matched in 2012 were also found in jobs which adequately match their skills in 2014. Only 3.7 percent and 5.1 percent of such workers became overeducated and undereducated respectively in 2014. This signifies that initially finding a job that matches one's level of education is important to remaining adequately employed throughout the career path.

It must be emphasised that very few workers transition from overeducation to undereducation and vice versa. As the results depict, less than one percent of workers who are undereducated in one period become overeducated in a subsequent period. At the same time the likelihood of an overeducated worker becoming undereducated is less than one percent. Moreover, out of the individuals who transition from unemployment into employment, a significant number of them move into well-matched jobs and only a few of them move into jobs in which they are either

overeducated or undereducated. This gives an impression that most individuals will look for and prefer to find well-matched jobs than to be overeducated or undereducated.

Next, Table 6.6 shows the prevalence of overeducation and income-related underemployment for workers employed in all four waves of NIDS. The results portray that overeducation is transitory for about 16 percent of workers and long-lasting for approximately six percent of workers who are employed in all four waves. The remaining 80 percent never experienced overeducation at all. The observed short duration of overeducation is consistent with the job matching theory, which suggests that overeducation is temporary and mostly occur at the beginning of individual careers.

Income-related underemployment based on the previous earnings approach is transitory for about 66 percent of workers, and only 0.35 percent experience chronic underemployment while approximately 33 percent never experienced this type of income-related underemployment. On the other hand, on the basis of the poverty threshold approach, income-related underemployment is chronic for about two percent of workers and transitory for 15 percent of workers, whereas approximately 82 percent of workers never had to deal with this phenomenon.

Table 6.6: The chronic or transitory nature of underemployment for individuals employed in all four waves

	Overeducation	Income-related underemployment	
		Earnings < 20% of previous income	Earnings < 125% of poverty threshold
Never	77.99	33.43	82.82
Transitory	15.58	66.22	15.20
Chronic	6.43	0.35	1.98

The respective likelihoods of underemployment being transitory and chronic can differ depending on certain individual as well as work-related characteristics. Tables 6.7 and A33 show the transient or permanent nature of overeducation and the two types of income-related underemployment based on certain demographic factors (age, gender, race, education level, occupation, etc.) amongst workers who were employed in all four waves. With regard to gender,

women are more prone to chronic overeducation than men while about 68 percent of workers who suffer from transitory overeducation are men. Males also dominate the share of both transitory and chronic income-related underemployment based on the previous income approach, whereas females constitute about 77 percent who are defined as chronically income-related underemployed according to the poverty threshold definition.

Workers between the ages of 35 and 54 make up the highest proportion of both transitory and chronic overeducated workers and income-related undereducated workers based on the poverty threshold definition. For those classified as income-related underemployed according to the previous income approach, the majority who suffer from chronic underemployment are between 45 and 54 years old. Workers who suffer from chronic income-related underemployment based on the previous earnings approach have the highest average age while transitory overeducated workers have the lowest mean age. Furthermore, young workers between the ages of 15 and 24 are the least likely to be temporarily or chronically overeducated and income-related underemployed.

With respect to race, Africans account for the highest share of both transitory and chronic overeducation and income-related underemployment based on the poverty threshold approach. Coloureds, on the other hand, have the highest percentage of chronically income-related underemployed workers based on the previous earnings approach. It is also not surprising that a significant proportion of chronically overeducated workers are Whites (almost 41 percent) because they are more educated. Moreover, workers who reside in the Gauteng province as well as those who live in urban areas are more susceptible to both chronic and transitory overeducation and the two types of income-related underemployment.

Workers who are affected by chronic overeducation have the highest mean years of education while those classified as chronically income-related underemployed have the lowest average years of education. Among the chronically overeducated workers, about 80 percent are degree holders, whereas over 65 percent of transitory overeducated workers are matriculants and those with post-matric certificates. Conversely, workers with incomplete secondary education have the

higher share of both transitory and chronic income-related underemployment while degree holders are the least affected by any form of income-related underemployment.

The majority of workers who are prone to both transitory and chronic overeducation are employees. Likewise, a higher proportion of employees are affected by both transitory and chronic income-related underemployment based on the previous earnings approach. Regarding transitory income-related underemployment based on the poverty threshold approach, the self-employed represent the highest share. Moreover, on the basis of the sector of employment, more than 80 percent of transitory overeducated workers can be found in the formal sector. Similarly, over 92 percent of workers who suffer from chronic overeducation are in the formal sector. On the contrary, the informal sector has the highest proportion of workers who are defined as chronically income-related underemployed based on the poverty threshold approach.

As far as the industry of employment is concerned, the community, social and personal services industry accounts for the highest share of workers who are affected by both chronic and transitory overeducation. For workers who are income-related underemployed according to the previous income approach, the highest proportion of them who suffer from the transitory type can be found in the community, social and personal services industry, whereas those who are affected by the chronic type operate in the transport, storage and communication industry. The two industries with the highest share of chronic and transitory income-related underemployment based on the poverty threshold approach are respectively the private households industry and the community, social and personal services industry.

A significant proportion of workers who fall under transitory overeducation are those who are engaged in elementary occupations, trade workers, and plant and machinery operators, whereas about 40 percent of chronically overeducated workers are managers. Moreover, service workers constitute the highest proportion of workers who are classified as chronically income-related underemployed based on the previous earnings approach. Workers involved in elementary occupations and service workers respectively make up the highest percentage of transitory and chronic income-related underemployed workers according to the poverty threshold approach.

Table 6.7: Transitory or chronic nature of underemployment

	Overeducation			Income-related underemployment					
	Never	Transitory	Chronic	Earnings < 20% of previous income			Earnings < 125% of poverty threshold		
				Never	Transitory	Chronic	Never	Transitory	Chronic
Gender									
Male	61.20	68.31	47.91	60.79	61.76	60.26	64.12	51.88	22.58
Female	38.80	31.69	52.09	39.21	38.24	39.74	35.88	48.12	77.42
Race									
African	75.81	74.54	43.06	78.44	71.07	46.84	71.01	83.82	95.73
Coloured	10.80	7.16	5.81	7.86	11.01	53.16	9.44	14.49	4.27
Indian	3.62	1.52	10.28	1.99	4.73	0.00	4.49	0.51	0.00
White	9.77	16.77	40.85	11.71	13.19	0.00	15.06	1.17	0.00
Age									
15 to 24	0.54	0.67	0.00	1.00	0.00	0.00	0.37	0.19	0.00
25 to 34	14.92	23.57	5.37	20.66	12.94	0.00	15.04	18.13	13.34
35 to 44	37.17	42.03	45.13	35.62	40.76	3.65	39.00	37.55	45.68
45 to 54	31.46	24.24	32.07	30.25	30.88	56.61	29.78	36.23	29.64
55 and above	15.91	9.49	17.43	12.47	15.43	39.74	15.81	7.89	11.33
<i>Mean</i>	<i>44.37</i>	<i>41.68</i>	<i>46.62</i>	<i>43.02</i>	<i>44.61</i>	<i>51.55</i>	<i>44.33</i>	<i>42.92</i>	<i>43.53</i>
Province									
Western Cape	13.19	10.01	13.83	9.10	14.49	39.74	11.91	18.06	8.37
Eastern Cape	8.06	5.58	5.56	4.83	8.93	7.10	7.17	8.44	16.67
Northern Cape	2.76	3.17	3.97	3.58	2.64	3.65	2.81	3.85	2.01
Free State	5.65	7.00	6.53	8.79	4.53	0.00	5.57	7.20	11.80
KwaZulu-Natal	11.73	9.13	19.03	13.09	10.58	0.00	10.91	12.03	26.27
North West	4.37	7.91	1.49	7.90	3.31	0.00	5.16	2.94	5.69
Gauteng	37.06	28.69	29.44	33.15	36.92	49.51	37.84	26.08	20.33
Mpumalanga	8.01	11.18	6.20	8.06	8.68	0.00	8.47	9.40	0.00
Limpopo	5.88	6.82	5.04	6.64	5.71	0.00	5.74	7.13	8.47
Movers	3.29	10.52	8.91	4.86	4.20	0.00	4.42	4.87	0.38
Area type									
Traditional	15.23	20.78	6.38	14.24	15.73	0.00	13.32	23.77	26.79
Urban	75.86	76.32	89.44	76.84	77.08	100.00	78.84	69.07	65.02
Farms	8.89	2.90	4.18	8.92	7.19	0.00	7.84	7.16	8.19
Education									
None	4.38	0.00	0.00	4.15	3.15	0.00	3.01	5.05	10.71
Incomplete primary	11.61	0.00	0.00	9.66	8.61	39.74	7.48	13.74	39.55
Incomplete secondary	47.48	12.30	2.00	34.60	40.68	56.61	35.43	56.38	40.05
Matric	14.95	30.72	0.45	15.67	17.27	0.00	17.42	13.55	9.68
Matric + certificate	19.86	37.15	17.38	25.87	20.99	3.65	25.35	10.29	0.00
Degree	1.68	18.95	80.17	10.05	9.04	0.00	11.10	1.00	0.00
Other/unspecified	0.04	0.88	0.00	0.00	0.26	0.00	0.21	0.00	0.00
<i>Mean</i>	<i>9.72</i>	<i>12.88</i>	<i>15.40</i>	<i>10.55</i>	<i>10.59</i>	<i>8.59</i>	<i>10.93</i>	<i>9.13</i>	<i>6.58</i>

It must be emphasised that the discussion on the transitory or chronic nature of underemployment is based on a balanced panel data which has much fewer observations (1 564 people, or 4.29 million in weighted terms). Therefore, the next section will adopt an unbalanced panel (pooled) data in the long format for the econometric analysis.

6.3 Econometric analysis

The marginal effects from pooled probit and random effects probit model estimation regarding the likelihood of being income-related underemployed are given in Tables 6.8 and 6.9, whereas Table 6.10 contains the likelihood of overeducation.

Table 6.8 presents the average marginal effects estimates of the determinants of income-related underemployment based on the poverty threshold method. The random effects probit is the preferred model because the null hypothesis that rho is equal to zero is rejected since the estimated rho is 0.309 and is statistically significant. The estimated rho reveals that unobservable individual heterogeneity accounts for roughly one third of the total error variance. Although the random effects probit is the preferred model, it must be emphasised that the estimated average marginal effects from the pooled probit are similar in both sign and magnitude to the random effects probit.

Just like it was in the case of the regressions based on the QLFS in Table 4.8, the relationship between age and income-related underemployment likelihood is non-linear and convex. On the contrary, the results point in the direction of a non-linear concave relationship between experience and income-related underemployment. With regards to the QLFS, the relationship between the two variables was found to be positive and linear. Moreover, the sign of the coefficients of most of the other explanatory variables is similar to the results obtained in Table 4.8. The reported marginal effects show that women, Africans and Coloureds are more likely to be income-related underemployed than men and Whites respectively. Likewise, the probability of falling into income-related underemployment is higher for workers who reside in the Eastern Cape, Free State, KwaZulu-Natal and Limpopo, relative to those who reside in the Western Cape.

Table 6.8: The likelihood of being income-related underemployed (earn 125% < poverty threshold), NIDS 2008-2015

Independent variable	Average marginal effects			
	Pooled Probit		Random Effects Probit	
Age	-0.0388***	(0.0025)	-0.0405***	(0.0027)
Age squared	0.0002***	(0.0000)	0.0003***	(0.0000)
Female	0.0872***	(0.0043)	0.0877***	(0.0046)
African	0.0932***	(0.0120)	0.1053***	(0.0151)
Coloured	0.1166***	(0.0173)	0.1095***	(0.0155)
Indian	-0.0110	(0.0272)	-0.0086	(0.0297)
Experience	0.0238***	(0.0014)	0.0245***	(0.0015)
Experience squared	-0.0001***	(0.0000)	-0.0001***	(0.0000)
Eastern Cape	0.0765***	(0.0105)	0.0711***	(0.0094)
Northern Cape	0.0030	(0.0086)	0.0049	(0.0092)
Free State	0.0632***	(0.0119)	0.0569***	(0.0110)
KwaZulu-Natal	0.0360***	(0.0087)	0.0359***	(0.0088)
North West	-0.0011	(0.0110)	0.0001	(0.0119)
Gauteng	-0.0078	(0.0087)	-0.0075	(0.0095)
Mpumalanga	-0.0077	(0.0100)	-0.0067	(0.0110)
Limpopo	0.0645***	(0.0118)	0.0598***	(0.0108)
Mining	-0.0431**	(0.0177)	-0.0511**	(0.0215)
Manufacturing	0.0004	(0.0098)	-0.0015	(0.0100)
Utility	-0.0207	(0.0223)	-0.0241	(0.0243)
Construction	0.0182*	(0.0101)	0.0153	(0.0099)
Wholesale & retail	0.0061	(0.0086)	0.0052	(0.0087)
Transport	0.0080	(0.0127)	0.0057	(0.0127)
Finance	-0.0393***	(0.0119)	-0.0435***	(0.0140)
Community, personal & social serv.	0.0336***	(0.0084)	0.0323***	(0.0082)
Private households	0.0366***	(0.0088)	0.0368***	(0.0082)
Industry: other	0.0757***	(0.0097)	0.0664***	(0.0081)
Casual	0.2223***	(0.0094)	0.1693***	(0.0058)
Self-employed	0.1788***	(0.0082)	0.1491***	(0.0059)
Informal	0.1186***	(0.0053)	0.1074***	(0.0051)
Observations	27 298		27 298	
LR Chi-square	7595.25			
Prob. > Chi-squared	0.0000		0.0000	
Pseudo R squared	0.2929			
Observed prob.	0.1824			
Predicted prob. (at \bar{X})	0.1091			
Log likelihood	-9169.05		-9061.73	
Wald chi squared (29)			2747.76	
/Insig2u			-0.8043	(0.0994)
Sigma_u			0.6689	(0.0332)
Rho			0.3091	(0.0212)
Number of unique persons			14 968	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; employee; formal sector

LR test of rho = 0: chibar squared (01) = 214.65 Prob >= chibar squared = 0.000

The industry variables show that there is a significantly lower probability of workers in the mining and finance industries, compared to those in skilled agriculture, to be income-related underemployed. On the contrary, working in the private households industry as well as those in the community, personal and social services industry other than in skilled agriculture is associated with a significantly higher probability of experiencing income-related underemployment. Furthermore, casual workers and the self-employed are respectively about 17 and 15 percent more likely to be income-related underemployed compared to employees. A priori, it is expected that income-related underemployment will be more prevalent in the informal sector as the labour market segmentation theory predicts. The results confirm that the probability of being income-related underemployed increases by about 11 percent for informal sector workers relative to those in the formal sector.

Table 6.9 presents the results of the determinants of income-related underemployment based on the previous income approach. It is evident from the table that the sign and the magnitude of the average marginal effects estimates are similar across the pooled probit model and the random effects probit model. The results portray that the relationship between income-related underemployment and age is the same as the one observed in the previous model. However, unlike in the previous model, women are found to be about 3 percent less likely than men to be income-related underemployed.

Likewise, working in the Northern Cape, Free State, KwaZulu-Natal and North West is linked with a lower probability of income-related underemployment compared to working in the Western Cape. Regarding the industry of employment, the probability of becoming income-related underemployment is higher for individuals who work in the manufacturing; construction; wholesale and retail; private households; and community, personal and social services industries. Moreover, similar to the findings in Table 6.8, employees and formal sector workers are relatively less likely to become income-related underemployed.

Table 6.9: The likelihood of being income-related underemployed (earn 20% < previous income), NIDS 2008-2015

Independent variable	Average marginal effects			
	Pooled Probit		Random Effects Probit	
Age	0.0186***	(0.0067)	0.0186***	(0.0067)
Age squared	-0.0002**	(0.0001)	-0.0002**	(0.0001)
Female	-0.0307***	(0.0092)	-0.0308***	(0.0092)
African	-0.0169	(0.0198)	-0.0168	(0.0196)
Coloured	-0.0062	(0.0208)	-0.0062	(0.0210)
Indian	0.0410	(0.0402)	0.0395	(0.0374)
Experience	-0.0060	(0.0038)	-0.0060	(0.0038)
Experience squared	0.0001	(0.0001)	0.0001	(0.0001)
Eastern Cape	0.0083	(0.0191)	0.0082	(0.0188)
Northern Cape	-0.0330**	(0.0165)	-0.0340*	(0.0175)
Free State	-0.0510***	(0.0196)	-0.0537**	(0.0218)
KwaZulu-Natal	-0.0456***	(0.0161)	-0.0470***	(0.0171)
North West	-0.0470**	(0.0206)	-0.0493**	(0.0228)
Gauteng	-0.0108	(0.0168)	-0.0109	(0.0171)
Mpumalanga	-0.0087	(0.0197)	-0.0088	(0.0200)
Limpopo	-0.0298	(0.0207)	-0.0307	(0.0220)
Mining	0.0063	(0.0285)	0.0062	(0.0282)
Manufacturing	0.0605***	(0.0213)	0.0579***	(0.0196)
Utility	0.0490	(0.0439)	0.0469	(0.0403)
Construction	0.0391*	(0.0236)	0.0378*	(0.0222)
Wholesale & retail	0.0389**	(0.0190)	0.0379**	(0.0181)
Transport	0.0228	(0.0253)	0.0223	(0.0243)
Finance	0.0232	(0.0235)	0.0228	(0.0226)
Community, personal & social serv.	0.0372**	(0.0178)	0.0367**	(0.0173)
Private households	0.0441**	(0.0213)	0.0426**	(0.0200)
Industry: other	0.0989***	(0.0251)	0.0914***	(0.0217)
Casual	0.2171***	(0.0235)	0.1891***	(0.0187)
Self-employed	0.1928***	(0.0187)	0.1699***	(0.0150)
Informal	0.0466***	(0.0114)	0.0457***	(0.0110)
Observations	10 281		10 281	
LR Chi-square	487.91			
Prob. > Chi-square	0.0000		0.0000	
Pseudo R squared	0.0416			
Observed prob.	0.2574			
Predicted prob. (at \bar{X})	0.2501			
Log likelihood	-5619.15		-5619.15	
Wald chi squared (29)			482.25	
/Insig2u			-13.98	(7.7751)
Sigma_u			0.0009	(0.0034)
Rho			8.47E-07	(0.0000)
Number of unique persons			6 018	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; employee; formal sector

LR test of rho = 0: chibar squared (01) = 8.2e-04 Prob >= chibar squared = 0.489

Table 6.10: The likelihood of being overeducated, NIDS 2008-2015

Independent variable	Average marginal effects			
	Pooled Probit		Random Effects Probit	
Age	0.0608***	(0.0032)	0.0503***	(0.0032)
Age squared	-0.0001*	(0.0000)	-0.0000	(0.0000)
Female	-0.0140***	(0.0025)	-0.0123***	(0.0024)
African	0.0210***	(0.0042)	0.0201***	(0.0045)
Coloured	0.0234***	(0.0064)	0.0195***	(0.0051)
Indian	0.0136	(0.0109)	0.0095	(0.0090)
Experience	-0.0579***	(0.0019)	-0.0491***	(0.0021)
Experience squared	0.0001	(0.0000)	0.0000	(0.0000)
Eastern Cape	-0.0100*	(0.0053)	-0.0095*	(0.0055)
Northern Cape	0.0077	(0.0056)	0.0051	(0.0048)
Free State	0.0003	(0.0061)	-0.0007	(0.0057)
KwaZulu-Natal	-0.0050	(0.0046)	-0.0048	(0.0045)
North West	-0.0026	(0.0061)	-0.0028	(0.0059)
Gauteng	-0.0048	(0.0045)	-0.0051	(0.0044)
Mpumalanga	0.0156**	(0.0061)	0.0125**	(0.0050)
Limpopo	-0.0005	(0.0059)	-0.0014	(0.0056)
Mining	-0.0302***	(0.0048)	-0.0298***	(0.0067)
Manufacturing	-0.0352***	(0.0039)	-0.0353***	(0.0052)
Utility	-0.0427***	(0.0052)	-0.0531***	(0.0104)
Construction	-0.0418***	(0.0037)	-0.0464***	(0.0060)
Wholesale & retail	-0.0608***	(0.0036)	-0.0630***	(0.0052)
Transport	-0.0440***	(0.0036)	-0.0477***	(0.0063)
Finance	-0.0628***	(0.0026)	-0.0812***	(0.0063)
Community, personal & social serv.	-0.0864***	(0.0038)	-0.0908***	(0.0055)
Private households	-0.0277***	(0.0047)	-0.0283***	(0.0058)
Industry: other	-0.0549***	(0.0034)	-0.0604***	(0.0053)
Casual	0.0083	(0.0055)	0.0087**	(0.0044)
Self-employed	-0.0011	(0.0042)	0.0008	(0.0037)
Informal	0.0214***	(0.0033)	0.0167***	(0.0027)
Observations	28 736		28 736	
LR Chi-square	6677.94			
Prob. > Chi-squared	0.0000		0.0000	
Pseudo R squared	0.4605			
Observed prob.	0.0695			
Predicted prob. (at \bar{X})	0.0004			
Log likelihood	-3911.98		-3835.72	
Wald chi squared (29)			1243.15	
/Insig2u			-0.6033	(0.1283)
Sigma_u			0.7396	(0.0474)
Rho			0.3536	(0.0293)
Number of unique persons			15 911	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; employee; formal sector

LR test of rho=0: chibar squared (01) = 152.53 Prob >= chibar squared = 0.000

Table 6.10 shows the likelihood of overeducation based on certain explanatory variables. For most of these variables, the sign as well as the magnitude of the estimated average marginal effects are similar across the pooled probit and random effects probit models. However, only the results from the random effects model are analysed. This is because the null hypothesis ($\rho = 0$) is rejected since the estimated ρ is 0.354. It implies that about 35 percent of the total error variance is accounted for by unobservable individual heterogeneity.

The results in Table 6.10 depict that the relationship between age and overeducation is linear and positive, whereas in Table 4.7, the relationship was found to be non-linear. Experience, on the other hand, is inversely related to overeducation which could imply that overeducation may be more common for career starters than workers with more work-related experience as the career mobility theory suggests. However, while the relationship between experience and overeducation is linear in NIDS, it was found to be non-linear in the QLFS.

The results also show that females are about one percent less likely than their male counterparts to be overeducated while Africans and Coloureds, relative to Whites, face a higher chance of falling into overeducation. These findings are consistent with the results pertaining to the QLFS in Table 4.7. Moreover, compared to the Western Cape, the probability of experiencing overeducation is lower for workers who reside in the Eastern Cape, but higher for those in Mpumalanga. On the basis of industry, working in any other industry, relative to the skilled agriculture industry, decreases the probability of being overeducated. Except for the private households industry, a similar finding was derived in Table 4.7. Finally, as expected, the probability of becoming overeducated is higher for informal sector workers as well as casual workers.

Table 6.11: Adequately educated in period t , determinants of becoming overeducated in period $t+1$ – multinomial logit⁴⁵

Independent variable	Relative risk ratio	
Age	2.2368***	(0.4124)
Age squared	1.0008	(0.0023)
Female	0.6859***	(0.0893)
African	1.0471	(0.2431)
Coloured	0.5815*	(0.1687)
Indian	0.9911	(0.4684)
Experience	0.4248***	(0.0459)
Experience squared	0.9997	(0.0024)
Eastern Cape	0.9438	(0.2878)
Northern Cape	1.6342*	(0.4497)
Free State	1.2222	(0.3744)
KwaZulu-Natal	0.9094	(0.2403)
North West	1.5657	(0.4775)
Gauteng	0.9011	(0.2324)
Mpumalanga	1.1593	(0.3292)
Limpopo	1.5934	(0.4727)
Skilled agriculture	1.8278	(0.7167)
Mining	2.3388**	(0.7822)
Manufacturing	1.7168*	(0.5138)
Utility	1.4609	(0.9356)
Construction	1.4088	(0.5642)
Wholesale & retail	1.2109	(0.3201)
Transport	2.0874**	(0.7004)
Community, personal & social services	0.7842	(0.1918)
Private households	1.7056	(0.6692)
Industry: other	1.5474	(0.4845)
Casual	1.1533	(0.4091)
Self-employed	1.5886*	(0.4158)
Informal	0.7407*	(0.1274)
Constant	0.0000***	(0.0000)
Observations	9 513	
LR Chi-square (112)	2407.33	
Prob > Chi-square	0.0000	
Pseudo R Squared	0.1279	

Standard errors in parentheses Base category: adequately educated

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; finance; employee; formal sector

⁴⁵ Although the model includes five outcome categories with adequately educated as the reference category, only the results for the overeducation category are shown here. The full results are presented in Table A34 in the Appendix.

Table 6.11 shows the likelihood of previously well-matched workers becoming overeducated in the next period based on certain individual and work-related characteristics. Table 6.11 reports the ratio of relative risk for a unit change in the explanatory variable, which is the relative risk of becoming overeducated in period $(t+1)$ relative to being well-matched. The results reveal that age increases the relative probability of being overeducated period $(t+1)$ relative to being well-matched. Also, the relative risk of adequately educated workers becoming overeducated rather than remaining well-matched in the subsequent period is about 69 percent lower for female workers relative to their male counterparts.

Moreover, experience significantly decreases the odds of moving from well-matched in a given period into overeducation in the subsequent period. This can be explained by the fact that according to the career mobility theory, individuals may consider being initially overeducated in their jobs if there is the possibility of promotion, which will eventually move them out of overeducation. Therefore, as a worker acquires more years of work experience, the incidence of overeducation may decline. The results also show that the relative risk regarding the transition into overeducation is higher for workers who reside in the Northern Cape (relative to the Western Cape) and for those working in the mining, manufacturing and transport industries (compared to the finance industry). Furthermore, while the self-employed are at odds of becoming overeducated in a subsequent period, informal sector workers face a lower relative risk of moving into overeducation.

Finally, Table 6.12 contains results that show factor which influence the transition out of overeducation into adequate education between two consecutive periods. The results portray that age decreases the relative odds of becoming well-matched in period $(t+1)$ while experience increases the odds of moving out of overeducation. Again, this is plausible because the career mobility theory suggests that overeducated workers are more likely to move to a higher-level occupation over time by using their initial position as a stepping stone to find adequate jobs. The results also suggest that the relative odds for the transition from overeducation into adequate education is higher for workers who work in the transport industry relative to those in the finance industry.

Table 6.12: Overeducated in period t , determinants of becoming adequately educated in period in $t+1$ – multinomial logit⁴⁶

Independent variable	Relative risk ratio	
Age	0.5428***	(0.1284)
Age squared	0.9986	(0.0030)
Female	1.0393	(0.1949)
African	1.1616	(0.4031)
Coloured	1.8885	(0.7456)
Indian	0.8506	(0.5473)
Experience	1.8068***	(0.2457)
Experience squared	1.0029	(0.0031)
Eastern Cape	0.8554	(0.4186)
Northern Cape	0.7569	(0.2878)
Free State	1.4774	(0.6554)
KwaZulu-Natal	1.2055	(0.4585)
North West	1.5923	(0.7389)
Gauteng	1.4209	(0.5078)
Mpumalanga	1.2213	(0.4753)
Limpopo	1.3644	(0.6209)
Mining	0.9980	(0.5305)
Manufacturing	1.1054	(0.6051)
Utility	0.7402	(0.3584)
Construction	0.3641	(0.3023)
Wholesale & retail	1.2810	(0.8114)
Transport	2.2935*	(1.0897)
Finance	1.5213	(0.8330)
Community, personal & social services	0.8960	(0.4060)
Private households	1.4458	(0.8084)
Industry: other	0.6397	(0.3360)
Casual	1.3649	(0.6678)
Self-employed	1.0305	(0.3453)
Informal	0.8434	(0.1989)
Constant	274,235***	(988,008)
Observations	1 022	
LR chi2(112)	560.83	
Prob > chi2	0.0000	
Pseudo R2	0.2293	

Standard errors in parentheses

Base category: overeducated

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Reference groups: male; white; Western Cape; skilled agriculture; employee; formal sector

⁴⁶ While the model includes the five outcome categories specified in Chapter Three (overeducated being the reference category), only the results for the adequate education category are shown here. The full results table can be found in Table A35 in the Appendix.

6.4 Conclusion

This chapter examines the dynamics of income-related underemployment and overeducation using NIDS panel data. It is observed that income-related underemployment is short-lived, and it mostly affects individuals in the bottom-end of the income distribution. Moreover, while a greater proportion of workers who are categorised as income-related underemployed based on the poverty threshold method can be found in the lower half of the income distribution, the majority of those who are defined as underemployed based on the previous income approach are in the top five income deciles.

With regard to overeducation, close to 60 percent of affected workers find adequately matched jobs six years later, and most workers who move out of the overeducation spell change occupation from low skilled to high skilled jobs. By analysing the changes in labour market status across two waves, it seems that there is a relatively quick dissolution of overeducation than undereducation. It is because the proportion of overeducated workers who subsequently escape overeducation is higher than the percentage of undereducated workers who move out of undereducation. It was also found that only a smaller percentage of workers are affected by chronic overeducation or income-related underemployment.

The chapter also uses random effects probit models to assess the likelihood of the two types of income-related underemployment and overeducation based on certain determinants. The results indicate that the probability of experiencing income-related underemployment (based on the poverty threshold method) is higher for females; Africans; Coloureds; workers who reside in the Eastern Cape, Free State, KwaZulu-Natal and Limpopo; workers employed in the private households and community, personal and social services industries; casual workers; the self-employed; and informal sector workers. On the other hand, the likelihood of being income-related underemployed (according to the previous income approach) is lower for females, employees, formal sector workers, and workers in the Northern Cape, Free State, KwaZulu-Natal and North West. Regarding the determinants of overeducation, the results show that female workers and workers in any industry other than the skilled agriculture industry are less likely to

be overeducated, but the probability of becoming overeducated is higher for Africans, Coloureds, informal sector workers, and casual workers.

Moreover, the chapter adopts multinomial logit models to examine the transitions between overeducation and adequate education. It was found that age increases the relative risks of moving from adequate education in one period to overeducation in another period, but experience significantly lowers the odds of moving from well-matched to overeducated. However, the opposite was observed regarding the transition from being overeducated to becoming well-matched in a subsequent period.



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CHAPTER SEVEN: CONCLUSION

7.1 Introduction

This chapter presents the conclusions that can be drawn from the main findings of the study as well as the policy implications and recommendations pertaining to the study. The chapter commences with a general overview of the study in Section 7.2. This is then followed by section 7.3 which reviews the key findings arising from the three empirical chapters. The policy implications of the findings are then discussed in Section 7.4, while section 7.5 concludes the chapter with some suggestions for future research.

7.2 Overview of the study

The main aim of this study was to examine the prevalence, extent, determinants, and effects of the three types of underemployment in South Africa. More precisely, the study was designed to assess the trends in underemployment as well as the characteristics of the underemployed in South Africa, to analyse the wage effects of educational mismatch, more specifically overeducation, and to examine whether underemployment is a short-lived or long-lasting phenomenon. Underemployment constitutes a key aspect of the analysis of the quality of work framework since it identifies workers who are inadequately employed in terms of hours of work, income earned and the matching of jobs to educational attainments. The issue that most individuals face in the labour market is not that of a lack of employment possibilities but rather the absence of adequate employment opportunities. This means that to be able to completely capture the full extent of inefficiencies in the labour market, both unemployment and underemployment should be considered. Investigating underemployment provides a platform to analyse the ability or inability of the economy to provide adequate and decent employment opportunities to all persons who are willing and available to work. Decent jobs include those that offer decent work hours, adequate earnings and effective utilisation of acquired qualification.

The next section presents a summary of the main conclusions pertaining to the three research objectives of the study.

7.3 Review of key findings

The study uses the OHS, LFS and QLFS data from 1995 to 2016 to examine of the nature, extent, incidence, and likelihood of underemployment in South Africa in line with the first objective of the study. The findings revealed that Africans, females, individuals aged between 25 and 44 years at the time of the survey, and those living in urban areas constitute a greater proportion of underemployed workers. Moreover, the majority of time-related and income-based underemployed workers are involved in elementary jobs and domestic work while the overeducated were mostly managers and workers in elementary occupations. Also, the prevalence of overeducation and income-based underemployment was found to be higher than the incidence of time-related underemployment. Overall, overeducated workers were presented with better working conditions than the individuals who were affected by time-related and income-based underemployment.

The results from the various probit models reveal that the likelihood of experiencing underemployment is higher for females⁴⁷, Africans, informal sector employees, workers in the private households industry, and the self-employed. It was also discovered that experience significantly decreases the likelihood of being underemployed in at least one of the types of underemployment by 1 to 4 percent, albeit a diminishing effect. The observation that workers in the informal sector are between 10 to 14 percent more likely to experience underemployment is consistent with the labour market segmentation theory's proposition that the secondary sector is characterised by bad jobs with inadequate working conditions.

Workers involved in low-skill jobs account for the highest proportion of both time-related and income-based underemployed workers. This is because such jobs may be temporary in nature and offer lower remuneration. On the other hand, managers and technicians have the highest share of overeducated workers while for most of the periods, workers involved in skilled agriculture and professionals account for the lowest proportion of underemployment across all the three approaches. The vast majority of underemployed workers work in the private sector across all the three definitions (between 68 and 99 percent). This suggests that the private sector

⁴⁷ Except in the case of overeducation.

employs highly educated workers and offers a lot of part-time employment relative to the public sector. As expected, the time-related underemployed have the lowest mean usual weekly work hours. Furthermore, several overeducated and income-related workers indicated that they are not willing to work longer hours. The above observation gives credence to the fact that the overeducated and income-related underemployed workers are full-time employees.

Moreover, workers with primary and secondary education constitute the highest proportion of the time-related and income-related underemployed across all the observed periods while workers with a degree and secondary school certificate are the most overeducated. The proportion of overeducated degree holders has increased from approximately 15 percent in 1995 to 71 percent in 2016. This upsurge in educational attainment and the inability of the economy to create the employment opportunities commensurate to the increased supply of graduate has led to the overeducation phenomenon. Whereas, most overeducated workers can be found in bigger establishments made up of 50 or more workers, time-related and income-related underemployed workers mostly work for smaller firms. This is consistent with the findings of Cam (2014) that workers in small-sized firms are susceptible to be time-related underemployed. The results seem to suggest that bigger firms attract highly skilled individuals to fill up positions that require a relatively lower qualification while smaller establishments usually employ workers on part-time basis.

In addressing the second research objective, the study compared the earnings profile of matched and mismatched workers, using labour force survey data from 1995 to 2016, to ascertain the differences in earnings. An analysis of the characteristics of mismatched workers revealed that a greater share of overeducated and undereducated workers were males, Africans, and workers in elementary occupations. Moreover, the proportion of overeducated workers was found to be negatively related to years of work experience, which seems to suggest that overeducation may exist at the start of a worker's career but fades away as the worker gains the relevant work experience. On the contrary, the likelihood of workers being undereducated increases in line with the years of experience because undereducated workers try to make up for the lower level of education with more work experience.

Using three variants of the earnings function, the empirical findings indicated that skilled workers, young workers between 15 to 24 years, workers who live in the Western Cape, and workers in industries other than agriculture earn significantly more. Likewise, living in an urban area, working in the public sector or the formal sector, and being self-employed are associated with relatively higher earnings. Furthermore, there appears to be increasing returns to education, but the effect of experience although initially positive, diminishes over time.

In general, although the returns to overeducation were found to be positive, overeducated workers receive substantively lower wages than what they would earn if they were employed in a job which adequately matches their education. Conversely, the rate of return to undereducation was found to be negative. However, as the results from the Duncan and Hoffman model show, undereducated workers may receive a wage premium relative to being well-matched. By only including the human capital variables, the results from the Verdugo and Verdugo model also confirms the wage premium associated with undereducation. It therefore seems that the earnings of workers in South African can be explained by the assignment theory.

Finally, the study uses the first four waves of NIDS panel data to examine the dynamics of income-related underemployment and overeducation in relation to the third research objective. It was observed that income-related underemployment is short-lived, and mostly affect individuals in the bottom-end of the income distribution. With regard to overeducation, close to 60 percent of affected workers find adequately matched jobs six years later, and most workers who move out of the overeducation spell change occupation from low skilled to high skilled jobs. Moreover, only a smaller percentage of workers are affected by chronic overeducation or income-related underemployment. This points to the fact that overeducation is temporary as predicted by the career mobility and matching theories.

The results from the random effects probit model show that the probability of experiencing overeducation or income-related underemployment is higher for workers from the African and Coloured population groups, casual workers, and informal sector workers. Moreover, the estimated results from the multinomial logit model reveal that while age decreases the odds of moving from overeducation to adequate education, work experience allows workers to move out

of overeducation into adequately matching jobs. This is plausible because the career mobility theory suggests that workers use overeducation as a stepping stone to move to well-matched jobs.

7.4 Policy implications

This section discusses the policy implications relating to the findings of this study. Given the high rate of unemployment in South Africa, it may seem that underemployment should not be a major concern since having some form of employment appears to be better than being unemployed. However, some studies (for example, Feldman 1996; Lee 2005; Wilkins 2007) have found that the underemployed encounter adverse outcomes just like the unemployed. Moreover, since underemployment represents a form of inadequate employment and does not fulfil the definition of decent work, labour market policy initiatives should not only aim at facilitating access to employment. Such policy initiatives should also ensure that the created jobs are adequate in terms of providing adequate earnings, decent hours, stability and security of work, and matching the educational credentials of the workforce.

The existence of time-related underemployment is an indication that a significant portion of the workforce is not able to be fully productive, and the underutilised labour hours represent a waste of human capital. Wiebe (1996) suggests that the government can harness the excess capacity and stimulate higher levels of productivity from the workforce through public work programs. Moreover, in dealing with time-related underemployment, the state can give a partial form of unemployment insurance benefits to involuntary part-time workers as suggested by Kyyrä (2010) as well as Godøy and Røed (2014). This can provide a much-needed relief to time-related underemployed workers. Furthermore, Kyyrä (2010) claims that subsidising part-time employment via the unemployment compensation system can enhance efficiency in the labour market if such jobs eventually facilitate the transition to full-time employment. The rationale behind this policy is to encourage individuals to be active in the labour market, even if it means doing part-time work, rather than waiting to be fully employed. The active participation in the labour market can help maintain and upgrade professional skills and enhance networking which can provide contacts with potential employers.

Concerning overeducation, the empirical findings reveal that although an extra year of overeducation still offers a positive return; the return is, however, small relative to what could have been earned if the worker was adequately matched. Apart from the wage penalty, the full effect of overeducation could be more severe if the additional year of overeducation is at the expense of a year of work experience and does not take in account both the private direct costs of education and the public costs of providing education (Dockery and Miller, 2012). It, therefore, seems from a policy perspective that it is important to ensure a better alignment between individuals' educational attainment and occupational requirements to minimise both the private and public cost of overeducation. This can be achieved by promoting a stronger partnership between schools and industries or employers to create effective post-secondary education programmes that more directly fill the workforce development gaps and employment needs.

Moreover, the provision of proper counselling in the educational sector as well as the provision of adequate guidance for students when deciding on educational programmes at the university will offer more information on the labour market prospects of the different fields of study (Acosta-Ballesteros, Osorno-del Rosal, and Rodríguez-Rodríguez, 2018). Also, since experience has a positive impact in reducing overeducation, the promotion of apprenticeships for students and young career aspirants to obtain work-based training can ensure better matching between attained and required credentials. Bartlett (2013) also suggests that since the incidence of overeducation is high among youth and more educated workers, it will be useful to provide subsidies which will encourage employers to hire young skilled individuals. Such subsidies can be used for training and retraining purposes.

For income-based underemployment, the results from the empirical analysis in general confirm that most affected workers are at the bottom-end of the income distribution as expected. Therefore, individuals categorised as income-related underemployed, especially based on the poverty threshold method constitute the working poor who live in poverty conditions. This implies that income-related underemployment worsens the already high levels of inequality and poverty in South Africa. Thus, a policy that ensures decent wages for workers, such as the proposed National Minimum Wage Bill, could be a step in the right direction to help mitigate the effects of income-related underemployment. It must be noted that income-related

underemployment according to the previous income approach (those who earn 20 percent less than their previous income) is relatively less concerning since most of the workers who fall under this category were found to be in the top half of the income deciles.

Finally, the findings point to the fact that all three forms of underemployment are more prevalent in the informal sector. This reveals the inadequate working conditions in the informal sector, also referred to as secondary or the low-wage sector. Davies and Thurlow (2009) posit that the provision of an unconditional cash transfer can help to close the income gap between households in the informal sector and those in the formal sector.

7.5 Conclusion

This chapter provided a general conclusion for the study by giving an overview of the study and reviewing the key research findings and their policy implications. Overall, gender, race, age, experience, education, sector of employment, dwelling type, occupation and industry were found to be some of the key determinants of underemployment. Moreover, there seems to be a wage penalty associated with overeducation, although overeducation, together with income-related underemployment, is more transitory than chronic.

Even though this study has extensively explored the underemployment phenomenon in South Africa, there is still more scope for future research. One of the areas that can be the focus of future research is the analysis of horizontal mismatch. However, such a study may require a primary survey because the sample size for the available labour force survey data is extremely small for robust empirical analysis. This is because only graduates with post-matric qualification were required to answer the field of study question.

Another possible topic that can be explored is an examination of the consequences or adverse outcomes associated with underemployment, such as the effects on job satisfaction, life satisfaction, psychological well-being, and job attitude. This will involve the use of the self-assessment method. The prospective researcher may, therefore, have to collect primary data.

REFERENCES

- Abbring, J.H. & Van den Berg, G.J. (2003). The nonparametric identification of treatment effects in duration models. *Econometrica*. 71(5): 1491-1517.
- Acemoglu, D. 2001. Good Jobs versus Bad Jobs. *Journal of Labor Economics*. 19(1): 1-21.
- Acosta-Ballesteros, J., Osorno-del Rosal, M.P. & Rodríguez-Rodríguez, O.M. (2018). Overeducation of young workers in Spain: how much does the first job matter? *Social Indicators Research*. 138(1):109-139.
- Altman, M. (2003). *Jobless or job creating growth? Some preliminary thoughts*. Proceedings of the 2003 TIPS (Trade & Industrial Policy Strategies) / DPRU (Development Policy Research Unit) Annual Forum, 8-10 September, Johannesburg.
- Altman, M. (2007). *Youth labour market challenges in South Africa*. Cape Town: HSRC (Human Sciences Research Council) Press.
- Altman, M. & Potgieter-Gqubule, F. (2009). *The state of youth: labour market status and policy challenges*. Cape Town: HSRC (Human Sciences Research Council) Press.
- Arulampalam, W. (1999). Practitioners' corner: a note on estimated coefficients in random effects probit models. *Oxford Bulletin of Economics and Statistics*. 61(4): 597-602.
- Baert, S., Cockx, B. & Verhaest, D. (2013). Overeducation at the start of the career: stepping stone or trap? *Labour Economics*. 25(C): 123-140.
- Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z. & Woolard, I. (2008). Why has unemployment risen in the new South Africa? *Economics of Transition*. 16(4): 715-740.
- Barker, F.S. (2007). *The South African labour market: theory & practice*. 5th edition. Pretoria: Van Schaik Publishers.
- Bartlett, W. (2013). *Skill mismatch, education systems, and labour markets in EU neighbourhood policy countries*. Search Working Papers WP5/20. Brussels: European Commission.
- Battu, H., Belfield, C. & Sloane, P. (1999). Overeducation among graduates: a cohort view. *Education Economics*. 7(1): 21-38.
- Bauer, T. K. (2002). Educational mismatch and wages: a panel analysis. *Economics of Education Review*. 21(3): 221-229.

- Bazillier, R., Boboc, C. & Calavrezo, O. (2016). Measuring employment vulnerability in Europe. *International Labour Review*. 155(2): 265-280.
- Becker, G.S. (1964). *Human capital: a theoretical and empirical analysis, with special reference to education*. Chicago: University of Chicago Press.
- Bedir, N. (2014). *The impact of overeducation and undereducation on earnings: Egypt in a post-revolutionary era*. School of Economics and Management. Lund: Lund University.
- Berger, M. & Coomes, P. (2003). *Measuring underemployment at the county level*. UK Center for Poverty Research Discussion Paper Series: 2003-08. Lexington: UK Center for Poverty Research.
- Bernburg, J.G. (2010). Relative deprivation theory does not imply a contextual effect of country-level inequality on poor health. A commentary on Jen, Jones, and Johnston (68:4, 2009). *Social Science & Medicine*. 70(4): 493-495.
- Beukes, R., Fransman, T., Murozvi, S. & Yu, D. (2016). *Underemployment in South Africa*. ERSA Working Paper Number 575. Claremont: Economic Research Southern Africa.
- Beukes, R., Fransman, T., Murozvi, S. & Yu, D. (2017). Underemployment in South Africa. *Development Southern Africa*. 34(1): 33-55.
- Bhatti, S. H. (2012). *Estimation of the Mincerian wage model addressing its specification and different econometric issues*. Dijon Cedex: Université de Bourgogne.
- Bhorat, H. (2009). *Unemployment in South Africa: Descriptors and determinants*. Proceedings of the IZA (Institute for the Study of Labour) / World Bank Conference on Employment and Development, Bonn, Germany.
- Bland, J. R. & Cook, A. C. (2018). Random effects probit and logit: understanding predictions and marginal effects. *Applied Economics Letters*. [Online]. Available: <https://www.tandfonline.com/doi/abs/10.1080/13504851.2018.1441498> [Accessed 1 July 2018].
- Bolduc, D. (1999). A practical technique to estimate multinomial probit models in transportation. *Transportation Research Part B*. 33(1): 63-79.
- Bonnal, M., Lira, C. & Addy, S.N. (2009). Underemployment and local employment dynamics: New evidence. *The Review of Regional Studies*. 39(3): 317-335.

- Borghans, L. & De Grip, A. (2000). The debate in economics about skill underutilization. Borghans, L. & de Grip, A. (Eds). *The overeducated worker? The economics of skill utilization*. Cheltenham: Edward Elgar: 3-23.
- Bosanquet, N. & Doeringer, P.B. (1973). Is there a dual labour market in Great Britain? *Economic Journal*. 83(330): 421-435.
- Brown, G. & Pintaldi, F. (2006). A multidimensional approach in the measurement of underemployment. *Statistical Journal of the United Nations Economic Commission for Europe*. 23(1): 43-56.
- Brynin, M. & Longhi, S. (2009). Overqualification: major or minor mismatch? *Economics of Education Review*. 28(1): 114-121.
- Büchel, F. & Mertens, A. (2000). *Overeducation, undereducation, and the theory of career mobility*. IZA Discussion Paper Number 195. Bonn: Institute for the Study of Labor.
- Büchel, F. & Van Ham, M. (2003). Overeducation, regional labor markets, and spatial flexibility. *Journal of Urban Economics*. 53(3):482-493.
- Burger, R.P. & Yu, D. (2006). Wage trends in post-apartheid South Africa: constructing an earnings series for South Africa from household survey data. *Labour Market Frontiers*. Number 8. Pretoria: South African Reserve Bank: 1-8.
- Cahuc, P & Carcillo, S. (2011). *Is short-time work a good method to keep unemployment down?* Discussion Paper No. 5430. Bonn: The Institute for the Study of Labor (IZA).
- Cam, S. (2014). *The underemployed: evidence from the UK labour force survey*. Cardiff School of Social Sciences. Working Paper Number 152. Cardiff: Cardiff University.
- Caroleo, F.E. & Pastore, F. (2013). *Overeducation at a glance: Determinants and wage effects of the educational mismatch, looking at the AlmaLaurea data*. IZA Discussion Papers Number 7788. Bonn: Institute for the Study of Labour.
- Caroleo, F.E. & Pastore, F. (2018). Overeducation at a glance. Determinants and wage effects of the educational mismatch based on AlmaLaurea data. *Social Indicator Research*. 137(3): 999-1032.
- Carroll, D. & Tani, M. (2013). Overeducation of recent graduate higher education graduates: new Australian panel evidence. *Economics of Education Review*. 32: 207-218.
- Chevalier, A. (2000). *Graduate overeducation in the UK*. Centre for the Economics of Education Discussion Paper. London: Centre for the Economics of Education.

- Chinhema, M., Brophy, T., Brown, M., Leibbrandt, M., Mlatsheni, C. & Woolard, I. (Eds). (2016). *National Income Dynamics Study Panel User Manual*. Cape Town: Southern Africa Labour and Development Research Unit.
- Clark, B., Joubert, C. & Maurel, A. (2017). The career prospects of overeducated Americans. *IZA Journal of Labour Economics*. 6(3):1-29.
- Clogg, C.C., Sullivan, T.A. & Mutchler, J.E. (1986). Measuring underemployment and inequality in the work force. *Social Indicators research*. 18(4): 375-393.
- Cohn, E. & Ng, C.Y. (2000). Incidence and wage effects of under-schooling and over-schooling in Hong Kong. *Economics of Education Review*. 19(2): 159-168.
- Cohn, E. & Khan, S. (1995). The wage effects of overschooling revisited. *Labour Economics*. 2(1): 67-76.
- Cutillo, A. & DiPietro, G. (2006). The effects of overeducation on wages in Italy: a bivariate selectivity approach. *International Journal of Manpower*. 27(2): 143-168.
- Daly, M., Büchel, F. & Duncan, G. (2000). Premiums and penalties for surplus and deficit education: evidence from the United States and Germany. *Economics of Education Review*. 19(2): 169-178.
- Davidson, R. & Mackinnon, J.G. (2004). *Econometric theory and models*. New York: Oxford University Press.
- Davies, R. & Thurlow, J. (2009). *Formal-informal economy linkages and unemployment in South Africa*. Cape Town: HSRC (Human Sciences Research Council) Press.
- Deakin, S. (2013). *Addressing labour market segmentation: the role of labour law*. Governance and Tripartism Department Working Paper Number 52. Geneva: International Labour Organisation.
- Dekker, R., De Grip, A. & Heijke, H. (2002). The effects of training and overeducation on career mobility in a segmented labour market. *International Journal of Manpower*. 23(2):106-125.
- Devereux, P.J. (2002). Occupational upgrading and the business cycle. *Labour*. 16(3): 423-452.
- Devey, R., Skinner, C. & Valodia, I. (2006). Definitions, data and the informal economy in South Africa: a critical analysis. In Padayachee, V (ed.): *The development decade? Economic and social change in South Africa, 1994 – 2004*. Cape Town: Human Sciences Research Council Press: 302- 323.

- Dickens, W.T. & Lang, K. (1988). The re-emergence of segmented labor market theory. *American Economic Review*. 78(2): 129-134.
- Dockery, A.M. & Miller, S. (2012). *Overeducation, undereducation and credentialism in the Australian labour market*. NCVER Monograph Series. Adelaide: National Centre for Vocational Educational Research.
- Dolton, P. & Silles, M. (2008). The effects of over-education on earnings in the graduate labour market. *Economics of Education Review*. 27 (2): 125-139.
- Dolton, P. & Vignoles, A. (2000). The incidence and effects of overeducation in the U.K. graduate labour market. *Economics of Education Review*. 19(2): 179-198.
- Duncan, G. & Hoffman, S.D. (1981). The incidence and wage effects of overeducation. *Economics of Education Review*. 1(1): 75-86.
- Ek, S. & Holmlund, B. (2011). *Part-time unemployment and optimal unemployment insurance*. Discussion Paper No. 5540. Bonn: The Institute for the Study of Labor (IZA).
- Essop, H. & Yu, D. (2008). *Alternative definitions of informal sector employment in South Africa*. Stellenbosch economic working papers: 21/08. Stellenbosch: Stellenbosch University.
- Feldman, D.C. (1996). The nature, antecedents and consequences of underemployment. *Journal of Management*. 22(3): 385-407.
- Feldman, D.C., Leana, C.R. & Bolino, M.C. (2002). Underemployment and relative deprivation among re-employed executives. *Journal of Occupational and Organizational Psychology*. 75(4): 453-471.
- Feldman, D.C., Leana, C.R. & Turnley, W.H. (1997). A relative deprivation approach to understanding underemployment. In Cooper, C.L. & Rousseau, D.M. (Eds), *Trends in organizational behaviour*. New York: Wiley: 43-60.
- Findeis, J.L., Shields, M. & Shrestha, S. (2009). *Studies on unemployment and underemployment in rural Pennsylvania: Determining policy options for reducing unemployment and underemployment in rural Pennsylvania*. Harrisburg: The Center for Rural Pennsylvania.
- Fourie, F. (2011). *The South African unemployment debate: three worlds, three discourses?* SALDRU Working Paper Number 63. Cape Town: Southern African Labour and Development Research Unit.

- Frank, R. (1978). Why women earn less: the theory and estimation of differential overqualification. *American Economic Review*. 68(3): 360-373.
- Frei, C. & Sousa-Posa, A. (2012). Overqualification: permanent or transitory? *Applied Economics*. 44(14): 1837-1847.
- Frenette, M. (2004). The overqualified Canadian graduate: the role of the academic programme in the incidence, persistence and economic returns to overeducation. *Economics of Education Review*. 23: 29 - 45.
- Gibbons, R.D. & Bock, R.D. (1987). Trend in correlated proportions. *Psychometrika*. 52: 113-124.
- Gibbons, R. D. & Hedeker, D. (1994). Application of random-effects probit regression models. *Journal of Consulting and Clinical Psychology*. 62(2): 285-296.
- Gill, A.M. & Solberg, E.J. (1992). Surplus schooling and earnings: a critique. *The Journal of Human Resources*. 27(4): 683-689.
- Glyde, G.P. (1977). Under-employment: definition and causes. *Journal of Economic Issues*. 11(2): 245-261.
- Godøy, A & Røed, K. (2014). *Unemployment insurance and underemployment*. Discussion Paper No. 7913. Bonn: Institute for the Study of Labor (IZA).
- Golub, S. & Hayat, F. (2015). Employment, Unemployment and Underemployment in Africa. In Monga, C. & Lin, J. (Eds), *The Oxford Handbook of Africa and Economics: Volume 1: Context and Concepts*. Oxford: Oxford University Press: 136-153.
- Greenwood, A.M. (1999). *International definitions and prospects of underemployment statistics*. Paper prepared for the Seminario sobre Subempleo: Departamento Administrativo Nacional de Estadísticas (DANE) and the Universidad Javeriana, Bogotá, 8-12 November.
- Groot, W. (1996). The incidence and returns to overeducation in the UK. *Applied Economics*. 28(10): 1345-1350.
- Guironnet, J. (2008). *The impact of surplus schooling on earnings: some additional findings*. Working Paper 4. Restinclières: Association Francaise de Cliometrie.
- Haddad, G.K. & Habibi, N. (2017). Vertical skill mismatch and wage consequences in low-skilled jobs: evidence from Iran. *International Labour Review*. 156(1): 45-72.
- Hartog, J. (2000). Over-education and earnings: where are we, where should we go? *Economics of Education Review*. 19(2): 131-147.

- Harrison, B. (1971). Human capital, black poverty and 'radical economics'. *Industrial Relations*. 10(3): 277-278.
- Hasan, A., Zhiyu, W. & Mahani, A. S. (2016). Fast Estimation of Multinomial Logit Models: R Package mnlogit. *Journal of Statistical Software*. 75(3): 1-24.
- Hausman, J. & McFadden, D. (1984). Specification tests for the multinomial logit model. *Econometrica*. 52(5): 1219-1240.
- Heckman, J.J., Lochner, L.J. & Todd, P.E. (2005). *Earnings functions, rates of return, and treatment effects: the mincer equation and beyond*. NBER Working Paper Series No. 11544. Cambridge: National Bureau of Economic Research.
- Heckman, J. J. 1979. Sample selection bias as a specification Error. *Econometrica*. 47(1): 153 – 161.
- Heintz, J. & Posel, D. (2008). Revisiting informal employment and segmentation in the South African labour market. *South African Journal of Economics*. 76(1): 26-44.
- Humburg, M., De Grip, A. & Van der Velden, R. (2017). Which skills protect graduates against a slack labour market? *International Labour Review*. 156(1): 25-43.
- Hussmanns, R. (2007). *Measurement of employment, unemployment and underemployment – current international standards and issues in their application*. Geneva: International Labour Organisation.
- International Labour Organization. (1998). *Resolution concerning the measurement of underemployment and inadequate employment situations*. Geneva: International Labour Organisation.
- International Labour Organisation. (2010). *Global employment trends*. Geneva: International Labour Organisation.
- International Labour Organisation. (2012). *Decent work indicators: concepts and definitions*. Geneva: International Labour Organisation.
- Jensen, L. & Slack, T. (2003). Underemployment in America: measurement and evidence. *American Journal of Community Psychology*. 32(1-2): 21-31.
- Johnson, W. (1978). A theory of job shopping. *Quarterly Journal of Economics*. 92(2): 261-277.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of Political Economy*. 87(3): 972-990.

- Julian, J.J., Hall, C. & Yerger, D. (2010). Rural Pennsylvania underemployment and its determinants. *Journal of Business and Economics Research*. 8(3): 17-24.
- Kazan, M. (2012). *Underemployment: implications for organizations*. Redmond: Economic Research Institute.
- Kiersztyn A. (2013). Stuck in a mismatch? The persistence of overeducation during twenty years of the post-communist transition in Poland. *Economics of Education Review*. 32(1): 78-91.
- Kiker, B.F., Santos, M.C. & De Oliveira, M. (1997). Overeducation and undereducation: Evidence for Portugal. *Economics of Education Review*. 16(2): 111-125.
- Kingdon, G.G. & Knight, J. (2004). Unemployment in South Africa: the nature of the beast. *World Development*. 32(3): 391-408.
- Kingdon, G.G. & Knight, J. (2007). Unemployment in South Africa, 1995-2003: Causes, problems and policies. *Journal of African Economies*. 16(5): 813-848.
- Korpi, T. & Tåhlin, M. (2009). Educational mismatch, wages, and wage growth: overeducation in Sweden, 1974-2000. *Labour Economics*. 16(2): 183-193.
- Kyyrä, T. (2010). Partial unemployment insurance benefits and the transition rate to regular work. *European Economic Review*. 54(7): 911-930.
- Lass, I. & Wooden, M. (2017). *The structure of the wage gap for temporary workers: evidence from Australia panel data*. IZA Discussion Paper No. 10670. Bonn: Institute of Labour Economics.
- Lauver, K.J. & Kristof-Brown, A. (2001). Distinguishing between employees' perceptions of person-job and person-organization fit. *Journal of Vocational Behaviour*. 59(3): 454-470.
- Lee, C.H. 2005. A study of underemployment among self-initiated expatriates. *Journal of World Business*. 40(2): 172-187.
- Leuven, E. & Oosterbeek, H. (2011). *Overeducation and mismatch in the labor market*. IZA Discussion Papers No. 5523. Bonn: Institute for the Study of Labor (IZA).
- Livingstone, D.W. (1990). Lifelong learning and underemployment in the knowledge society: a North American perspective. *Comparative Education*. 35(2): 163-186.
- Luce, R. D. (1959). *Individual choice behaviour*. New York: Wiley.
- Mathebula, I. (2013). *The determinants of time-related underemployment in South Africa*. Pretoria: Statistics South Africa.

- McFadden, D. (1973). Conditional logit analysis of qualitative choice behaviour. In Zarembka, P. (Ed), *Frontiers in econometrics*. New York: Academic Press.
- McFadden, D. (1977). *Modelling the choice of residential location*. Cowles Foundation for Research in Economics Discussion Paper No. 477. Connecticut: Yale University.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economic Surveys*. 20(3): 387-418.
- McKee-Ryan, F.M. & Harvey, J. (2011). "I have a job, but..." A review of underemployment. *Journal of Management*. 37(4): 962-996.
- McKee-Ryan, F., Virick, M., Prussia, G.E., Harvey, J. & Lilly, J.D. (2009). Life after the layoff: getting a job worth keeping. *Journal of Organizational Behaviour*. 30(4): 561-580.
- McNabb, R. & Psacharopoulos, G. (1981). Further evidence of the relevance of the dual labor market hypothesis for the U.K. *The Journal of Human Resources*. 16(3): 442-448.
- Meroni, E.C. & Vera-Toscano, E. (2017). The persistence of overeducation among recent graduates. *Labour Economics*. 48: 120-143.
- Mincer, J. (1974). *Schooling, experience and earnings*. New York: Columbia University Press.
- Moleke, P. (2005). *Finding work: employment experiences of South African graduates*. Cape Town: HSRC (Human Sciences Research Council) Press.
- Montt, G. (2017). Field-of-study mismatch and overqualification: labour market correlates and their wage penalty. *IZA Journal of Labour Economics*. 6(2):1-20.
- Morgado, A., Sequeira, T.N., Santos, M., Ferreira-Lopes, A. & Reis, A.B. (2016). Measuring labour mismatch in Europe. *Social Indicators Research*. 129(1): 161-179.
- Mosca, I. & Wright, R.E. (2011). *Is graduate under-employment persistent? Evidence from the United Kingdom*. Discussion Paper Series 6177. Bonn: Institute for the study of Labor.
- Muller, C. (2003). *Measuring South Africa's informal sector: An analysis of national household surveys*. DPRU working paper 03/71. Cape Town: Development Policy Research Unit, University of Cape Town.
- Muller, C. (2009). *An analysis of the extent, nature and consequences of female part-time employment in post-apartheid South Africa*. Unpublished Doctorate dissertation. Durban: University of KwaZulu-Natal.

- Muysken, J. & Ter Weel, B. (1999). *Overeducation, job competition and unemployment*. Maastricht Economic Research Institute on Innovation and Technology (MERIT). Maastricht: Maastricht University.
- Nerlove, M. & Press, J. (1973). *Univariate and multivariate log-linear and logistic models*. RAND Report: R-1306-EDA/NIH.
- Nieto, S. & Ramos, R. (2017). Overeducation, skills and wage penalty: evidence for Spain using PIAAC data. *Social Indicators Research*. 134(1): 219-236.
- Niyimbanira, F. (2016). Characterisation of time-related underemployment in a South African municipality: a case of Bushbuckridge, Mpumalanga province. *International Journal of Social Sciences and Humanity Studies*. 18(1): 116-132.
- Nord, S. (1989). The relationships among labor-force participation, service-sector employment, and underemployment. *Journal of Regional Science*. 29(3): 407-421.
- Nunley, J.M., Pugh, A., Romero, N. & Seals, R.A. (2014). *Unemployment, underemployment, and employment opportunities: results from a correspondence audit of the labour market for college graduates*. Department of Economics Working Paper Series No. 2014-04. Auburn: Auburn University.
- Olaniyan, D.A. & Okemakinde, T. (2008). Human capital theory: implications for educational development. *Pakistan Journal of Social Sciences*. 5(5): 479-483.
- Organization for Economic Cooperation and Development (OECD). (2014). *Preventing unemployment and underemployment from becoming structural*. Report prepared for the G20 Labour and Employment Ministerial Meeting. Melbourne. 10-11 September 2014.
- Pecoraro, M. (2013). *Is there still a wage penalty for being overeducated but well-matched in skills? A panel data analysis of a Swiss graduate cohort*. Noisy-le-Grand: Institut de Recherches Economiques et Sociales, Université Catholique de Louvain.
- Polachek, S. (1981). Occupational self-selection: a human capital approach to sex differences in occupational structure. *The Review of Economics and Statistics*. 63(1): 60-69.
- Reynolds, L. (2012). The incidence and persistence of youth underemployment: the Canadian context. *Public Policy and Governance Review*. 4(1): 5-18.
- Robst, J. (1995). College quality and overeducation. *Economics of Education Review*. 14(3): 221-228.

- Rubb, S. (2003). Overeducation: a short or long run phenomenon for individuals? *Economics of Education Review*. 22(4): 389-394.
- Ruiz-Quintanilla, S.A. & Claes, R. (1994). *Determinants of underemployment during the early career: a longitudinal multi-country study*. Center for Advanced Human Resource Studies Working Paper 94-06. Ithaca: Cornell University.
- Rumberger, R. (1987). The impact of surplus schooling on productivity and earnings. *Journal of Human Resources*. 22(1): 24-50.
- Sattinger, M. (1993). Assignment models of the distribution of earnings. *Journal of Economic Literature*. 31(2): 831-880.
- Sauders, B. (2015). *Overeducated and over here: skilled EU migrants in Britain*. London: Transnational Press.
- Statistics South Africa. (2008). *South African standard classification of occupations*. Pretoria: Statistics South Africa.
- Schoeman, C.H., Botha, I. & Blaauw, P.F. (2010). Labour conflict and the persistence of macro underemployment in South Africa. *South African Journal of Economic and Management Sciences*. 13(3): 272-292.
- Schucher, G. (2017). The fear of failure: youth employment problems in China. *International Labour Review*. 156(1): 73-98.
- Seagraves, P. (2012). *A multi-factor probit analysis of non-performing commercial mortgage-backed security loans*. Atlanta: Georgia State University.
- Sekiguchi, T. (2004). Person-organisation fit and person-job fit in employee selection: a review of the literature. *Okasa Keidai Ronshu*. 54(6): 179-196.
- Sicherman, N. & Galor, O. (1990). A theory of career mobility. *Journal of Political Economy*. 98(1): 169-192.
- Sicherman, N. (1991). Overeducation in the labor market. *Journal of Labor Economics*. 9(2): 101-122.
- Singha, R. & Greenhaus, J.H. (2004). The relation between career decision-making strategies and person-job fit: a study of job changers. *Journal of Vocational Behaviour*. 64(1): 198-221.
- Slack, T. & Jensen, L. (2002). Race, ethnicity and underemployment in nonmetropolitan America: A 30-year profile. *Rural Sociology*. 67(2): 208-233.

- Sloane, P. J. (2003). Much ado about nothing? What does the over-education literature really tell us? In Buchel, F., De Grip, A & Mertens, A. (Eds), *Overeducation in Europe: current issues in theory and policy*. Cheltenham: Edward Elgar: 11-45.
- Sloane, P. (2014). *Overeducation, skill mismatches, and labor market outcomes for college graduates*. IZA World of Labor. Bonn: Institute of Labor Economics (IZA).
- Smith, H.J. & Pettigrew, T.F. (2015). Advances in relative deprivation theory and research. *Social Justice Research*. 28(1):1-6.
- Smith, H., Pettigrew, T.F., Pippin, G. & Bialosiewicz, S. (2012). Relative deprivation: a theoretical and meta-analytic critique. *Personality and Social Psychology Review*. 16(3): 203-232.
- So, Y. & Kuhfeld, W.F. (1995). *Multinomial logit models*. In Proceedings of the SUGI 20 conference. Florida, USA.
- Sparreboom, T. & De Gier, M.P.F. (2008). *Assessing vulnerable employment: the role of status and sector indicators in Pakistan, Namibia and Brazil*. Employment Working Paper No. 13. Geneva: International Labour Organisation.
- Spence, M. (1973). Job market signalling. *Quarterly Journal of economics*. 87(3): 355-374.
- Tam, H. (2010). Characteristics of the underemployed and the overemployed in the UK. *Economic and Labour Market Review*. 4(7): 8-20.
- Teulings, C.N. (1995). The wage distribution in a model of the assignment of skills to jobs. *Journal of Political Economy*. 103(2): 280-315.
- Thurow, L. C. (1972). Education and economic equality. *The Public Interest*. 28(2): 66-81.
- Thurow, L.C. (1975). *Generating inequality: mechanisms of distribution in the U.S. economy*. New York: Basic Books Inc.
- Tsai, Y. (2010). Returns to overeducation: a longitudinal analysis of the U.S. labor market. *Economics of Education Review*. 29(4): 606-617.
- Vahey, S. (2000). The great Canadian training robbery: evidence on the returns to educational mismatch. *Economics of Education Review*. 19(2): 219-227.
- Van den Berg, G. J. (2005). *Competing risks models*. Working Paper 2005:25. Uppsala: The Institute for Labour Market Policy Evaluation (IFAU).
- Verdugo, R. & Verdugo, N. (1989). The impact of surplus schooling on earnings. *Journal of Human Resources*. 24(4): 629-643.

- Verdugo, R. & Verdugo, N. (1992). Surplus schooling and earnings: reply to Cohn and to Gill and Sollberg. *Journal of Human Resources*. 27(4): 690-695.
- Verhaest, D., Sellami, S. & Van der Velden, R. (2017). Differences in horizontal and vertical mismatches across countries and fields of study. *International Labour Review*. 156(1): 1-23.
- Wachter, M.L. (1974). Primary and secondary labor markets: a critique of the dual approach. *Brookings Papers on Economic Activity*. 5(3): 637-693.
- Walling, A & Gareth Clancy, G. (2010). Underemployment in the UK labour market. *Economic and Labour Market Review*. 4(2): 16-24.
- Weiss, A. (1995). Human capital vs. Signalling explanations of wages. *Journal of Economic Perspectives*. 9(4): 133-154.
- Wiebe, F. (1996). *Income insecurity and underemployment in the Indonesian informal Sector*. Paper presented at the Ministry of Manpower–World Bank workshop on Indonesian workers in the 21st century: Workshop for Economic Reforms and Labor Market Restructuring for Indonesia, Jakarta, 2 - 4 April.
- Wilkins, R. (2004). *The extent and consequences of underemployment in Australia*. Melbourne Institute Applied Economic and Social Research Working Paper. Melbourne: The University of Melbourne.
- Wilkins, R. (2006). Personal and job characteristics associated with underemployment. *Australian Journal of Labour Economics*. 9(4): 371-393.
- Wilkins, R. (2007). The consequences of underemployment for the underemployed. *Journal of Industrial Relations*. 49(2): 247-275.
- Wilkins, R. & Wooden, M. (2011). Economic approaches to studying underemployment. In Feldman, D.C. & Maynard, D.C. (Eds), *Underemployment: psychological, economic, and social challenges*. New York: Springer: 13-34.
- Williams, R. (2017). *Multinomial logit models – overview*. Indiana: University of Notre Dame.
- Yu, D. (2009). *The comparability of Labour Force Survey (LFS) and Quarterly Labour Force Survey (QLFS)*. Stellenbosch Economic Working Papers: 08/09. Stellenbosch: Stellenbosch University.

Yu, D. (2010). *Defining and measuring informal employment in South Africa: A review of recent approaches*. Stellenbosch Economic Working Papers: 09/10. Stellenbosch: Stellenbosch University.

Yu, D. (2013). Revisiting unemployment levels and trends in South Africa since the transition. *Development Southern Africa*. 30(6): 701-723.



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APPENDIX

Table A1: Categorisation of underemployed workers

Period	Overeducation only	Time-related only	Income-based only	Any two approaches	All three approaches	Underemployed (Total)	Underemployment rate (%)
1995	1 048 622	377 657	523 804	156 208	5 708	2 111 999	22.23
1996	981 214	229 001	495 601	106 695	4 870	1 817 381	20.27
1997	1 141 942	239 146	614 326	122 712	8 706	2 126 832	23.39
1998	1 065 044	240 938	761 197	178 426	6 387	2 251 992	24.03
1999	1 190 902	388 590	867 853	303 429	20 076	2 770 850	26.76
2000a	1 389 976	214 655	2 163 376	639 415	58 875	4 466 297	37.61
2000b	1 371 282	206 925	1 839 771	576 808	54 966	4 049 752	33.13
2001a	1 419 503	151 317	2 143 198	536 439	31 675	4 282 132	34.93
2001b	1 340 292	178 118	1 504 937	361 173	24 548	3 409 068	30.53
2002a	1 397 837	171 554	1 834 563	541 073	41 291	3 986 318	34.35
2002b	1 119 995	131 542	1 733 036	414 517	39 710	3 438 800	30.48
2003a	1 089 689	159 553	1 567 214	416 878	47 240	3 280 574	29.04
2003b	1 216 849	160 095	1 340 294	381 533	19 366	3 118 137	27.32
2004a	1 189 566	132 253	1 279 444	328 291	24 531	2 954 085	25.96
2004b	1 379 888	187 194	1 122 878	344 073	20 864	3 054 897	26.27
2005a	1 121 676	183 146	1 294 342	363 767	35 603	2 998 534	25.21
2005b	1 004 328	172 500	1 419 721	336 261	23 777	2 956 587	24.06
2006a	1 145 695	172 464	1 467 821	391 225	28 268	3 205 473	25.77
2006b	1 200 218	196 040	1 254 263	312 327	16 527	2 979 375	23.30
2007a	1 236 707	175 079	1 164 791	240 404	17 768	2 834 749	22.44
2007b	1 512 814	182 203	1 204 145	257 624	13 025	3 169 811	23.85
2008Q1	1 571 056	606 376	N/A	71 124	N/A	2 248 556	15.56
2008Q2	1 609 508	563 021	N/A	70 566	N/A	2 243 095	15.36
2008Q3	1 543 005	566 160	N/A	88 183	N/A	2 197 348	15.09
2008Q4	1 581 939	560 965	N/A	81 374	N/A	2 224 278	15.04
2009Q1	1 740 808	546 947	N/A	100 942	N/A	2 388 697	16.33
2009Q2	1 570 202	584 832	N/A	101 285	N/A	2 256 319	15.70
2009Q3	1 510 468	606 640	N/A	98 672	N/A	2 215 780	16.01
2009Q4	1 589 426	561 083	N/A	75 831	N/A	2 226 340	15.92
2010Q1	1 600 197	385 739	687 609	289 612	11 932	2 975 089	21.53
2010Q2	1 524 302	377 530	710 444	255 692	9 406	2 877 374	20.80
2010Q3	1 526 452	331 039	715 981	277 790	10 325	2 861 587	20.94
2010Q4	1 545 337	327 039	699 598	235 213	14 504	2 821 691	20.28
2011Q1	1 525 185	342 740	701 681	235 511	7 163	2 812 280	20.21
2011Q2	1 640 069	349 661	654 203	238 762	11 610	2 894 305	20.77
2011Q3	1 516 590	347 023	665 549	206 551	8 342	2 744 055	19.42
2011Q4	1 052 451	356 495	672 017	202 824	5 677	2 289 464	15.95
2012Q1	1 096 602	369 583	661 685	219 061	5 153	2 352 084	16.45
2012Q2	1 149 229	362 592	754 318	240 433	4 051	2 510 623	17.50
2012Q3	1 278 431	366 814	884 488	264 402	4 869	2 799 004	19.19
2012Q4	1 200 918	386 676	883 823	268 003	6 599	2 746 019	18.88
2013Q1	1 349 576	358 726	1 011 134	267 676	7 036	2 994 148	20.55
2013Q2	896 823	362 485	1 092 262	267 372	7 807	2 626 749	17.86
2013Q3	957 391	412 895	1 211 663	276 010	8 263	2 866 222	19.03
2013Q4	997 502	395 310	1 173 528	288 947	5 775	2 861 062	18.83
2014Q1	955 636	370 598	1 135 478	265 798	3 414	2 730 924	18.12
2014Q2	1 081 444	373 756	1 191 078	293 459	5 697	2 945 434	19.49
2014Q3	1 307 786	411 498	1 186 291	295 006	6 151	3 206 732	21.17
2014Q4	1 047 468	387 714	1 161 365	311 319	8 595	2 916 461	19.00
2015Q1	1 012 024	415 163	1 143 943	330 531	1 471	2 903 132	18.74
2015Q2	1 078 728	425 262	1 062 478	334 412	12 846	2 913 726	18.59
2015Q3	1 089 261	445 883	1 220 723	369 371	6 294	3 131 532	19.74
2015Q4	1 051 074	425 282	1 193 027	331 688	9 542	3 010 613	18.76
2016Q1	1 039 877	381 044	1 068 866	316 538	7 107	2 813 432	17.93
2016Q2	1 015 856	487 138	964 734	307 936	9 717	2 785 381	17.88
2016Q3	1 149 020	458 046	969 523	323 633	11 007	2 911 229	18.35
2016Q4	1 156 713	434 311	951 249	328 421	9 843	2 880 537	17.90

Table A2: Demographic characteristics of the underemployed, selected years

Variable	Overeducation				Time-related				Income-related				Fully employed				Unemployed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Marital status																				
Married or living together	0.550*	0.504*	0.575	0.611*	0.614*	0.458*	0.391	0.378*	0.577*	0.475*	0.430*	0.433*	0.653	0.627	0.545	0.519	0.290*	0.294*	0.278*	0.277*
Unmarried/widowed/divorced	0.450*	0.496*	0.425	0.389*	0.386*	0.542*	0.609*	0.622*	0.423*	0.525*	0.570*	0.567*	0.347	0.373	0.455	0.481	0.710*	0.706*	0.722*	0.723*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Headship status																				
Household head	0.468*	0.558*	0.554	0.566	0.397*	0.496*	0.504*	0.488*	0.336*	0.496*	0.491*	0.529	0.579	0.614	0.571	0.560	0.150*	0.224*	0.257*	0.280*
Not household head	0.532*	0.442*	0.446	0.434	0.603*	0.504*	0.496*	0.512*	0.664*	0.504*	0.509*	0.471	0.421	0.386	0.429	0.440	0.850*	0.776*	0.743*	0.720*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Area type																				
Urban	0.771*	0.730	0.851*	0.908*	0.620*	0.549*	0.702*	0.694*	0.268*	0.332*	0.532*	0.611*	0.680	0.747	0.795	0.829	0.635*	0.659*	0.756*	0.768*
Rural	0.229*	0.270	0.149*	0.092*	0.380*	0.451*	0.298*	0.306*	0.732*	0.668*	0.468*	0.389*	0.320	0.253	0.205	0.171	0.365*	0.341*	0.244*	0.232*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Province																				
Western Cape	0.155	0.153	0.150	0.149	0.125*	0.105*	0.103*	0.111*	0.063*	0.033*	0.059*	0.038*	0.149	0.162	0.151	0.159	0.107*	0.078*	0.127*	0.106*
Eastern Cape	0.069*	0.087	0.075	0.071	0.160*	0.235*	0.163*	0.132*	0.175*	0.223*	0.152*	0.156*	0.092	0.086	0.090	0.085	0.145*	0.122*	0.095	0.099
Northern Cape	0.015*	0.019	0.015	0.010	0.028*	0.011*	0.015	0.021	0.042*	0.024	0.020	0.022	0.022	0.022	0.021	0.019	0.027	0.017	0.021	0.024
Free State	0.056*	0.053	0.052	0.029	0.072	0.059	0.094*	0.070	0.265*	0.112*	0.084*	0.082*	0.068	0.064	0.053	0.044	0.052*	0.067	0.066	0.070*
KwaZulu-Natal	0.208*	0.207*	0.156	0.133	0.198	0.155	0.150	0.177	0.122*	0.219*	0.199*	0.205*	0.180	0.176	0.167	0.158	0.221*	0.230*	0.129*	0.138
North West	0.059*	0.060*	0.059	0.038*	0.096	0.094	0.039*	0.045	0.112*	0.060	0.059	0.052	0.079	0.076	0.060	0.062	0.077	0.077	0.060	0.060
Gauteng	0.341*	0.302	0.372*	0.444*	0.190*	0.170*	0.238*	0.215*	0.074*	0.238*	0.132*	0.230*	0.288	0.291	0.323	0.315	0.243*	0.259*	0.369*	0.355*
Mpumalanga	0.054	0.068	0.062	0.051*	0.046*	0.094*	0.095*	0.087	0.075	0.095*	0.100*	0.076	0.062	0.062	0.068	0.071	0.057	0.064	0.087*	0.090*
Limpopo	0.044*	0.051	0.060	0.075	0.085*	0.078	0.106	0.143*	0.071	0.114*	0.153*	0.112*	0.061	0.062	0.066	0.086	0.072*	0.086*	0.046*	0.058*
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

Table A3: Work characteristics of the underemployed, selected years

Variable	Overeducation				Time-related				Income-related				Fully employed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Formal/informal sector																
Informal	0.276*	0.141*	0.131*	0.073*	0.399	0.388*	0.328*	0.338*	0.087*	0.332*	0.366*	0.246*	0.430	0.114	0.151	0.162
Formal	0.139*	0.615*	0.757	0.798*	0.058*	0.237*	0.273*	0.306*	0.000*	0.114*	0.302*	0.523*	0.201	0.777	0.733	0.714
Subsistence agriculture	0.005*	0.049*	0.001	0.001*	0.020	0.165*	0.005	0.010	0.011	0.215*	0.026*	0.023*	0.022	0.009	0.006	0.007
Commercial agriculture	0.039	0.072	0.025*	0.013*	0.004*	0.006*	0.015*	0.026*	0.001*	0.124*	0.031	0.041	0.044	0.064	0.044	0.055
Domestic workers	0.541*	0.123*	0.086	0.114*	0.518*	0.204*	0.379*	0.320*	0.901*	0.215*	0.274*	0.167*	0.303	0.036	0.066	0.062
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Usual weekly work hours⁴⁸																
1 to 10 hours	0.016	0.029*	0.009	0.013	0.168*	0.271*	0.195*	0.157*	0.034*	0.102*	0.071*	0.073*	0.005	0.006	0.005	0.006
11 to 20 hours	0.024*	0.034*	0.020	0.030	0.197*	0.305*	0.338*	0.428*	0.061*	0.090*	0.172*	0.213*	0.006	0.009	0.014	0.015
21 to 30 hours	0.040*	0.048*	0.050*	0.052	0.562*	0.389*	0.414*	0.369*	0.074*	0.122*	0.149*	0.092*	0.012	0.030	0.030	0.033
31 to 39 hours	0.142	0.041	0.104*	0.081*	0.073*	0.035	0.053	0.046	0.142	0.080*	0.062	0.048	0.121	0.057	0.050	0.051
40 hours	0.346	0.236	0.423*	0.511*	0.000*	0.000*	0.000*	0.000*	0.221*	0.096*	0.148*	0.230*	0.333	0.243	0.378	0.388
41 to 45 hours	0.200	0.191	0.156*	0.137*	0.000*	0.000*	0.000*	0.000*	0.144*	0.098*	0.100*	0.107*	0.219	0.217	0.195	0.175
Above 45 hours	0.233*	0.421	0.239*	0.177*	0.000*	0.000*	0.000*	0.000*	0.324	0.412	0.297	0.238*	0.305	0.437	0.327	0.332
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>43.01*</i>	<i>46.54*</i>	<i>43.06*</i>	<i>41.18*</i>	<i>22.91*</i>	<i>17.74*</i>	<i>19.65*</i>	<i>19.28*</i>	<i>42.81*</i>	<i>41.55*</i>	<i>38.16*</i>	<i>36.04*</i>	<i>45.15</i>	<i>47.88</i>	<i>45.76</i>	<i>45.41</i>
Willing to work longer hours																
Yes	0.751*	0.151*	0.129*	0.091	1.000*	1.000*	1.000*	1.000*	0.685	0.227*	0.264*	0.282*	0.693	0.091	0.097	0.076
No	0.249*	0.849*	0.871*	0.909	0.000*	0.000*	0.000*	0.000*	0.315	0.773*	0.736*	0.718*	0.307	0.909	0.903	0.924
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Skills level																
Unskilled	0.493*	0.466*	0.448*	0.182*	0.342*	0.424*	0.625*	0.652*	0.862*	0.537*	0.603*	0.588*	0.257	0.189	0.227	0.272
Semi-skilled	0.409*	0.347*	0.153*	0.313*	0.337*	0.497*	0.289*	0.253*	0.124*	0.443*	0.332*	0.339*	0.525	0.540	0.521	0.498
Highly skilled	0.098*	0.187*	0.399*	0.505*	0.321*	0.079*	0.086*	0.095*	0.014*	0.020*	0.066*	0.072*	0.219	0.271	0.252	0.230
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

⁴⁸ For OHS 1995, total hours worked in the last seven days was used as a proxy for the usual weekly hours as the latter variable was not captured in this survey.

Table A3: Continued

Variable	Overeducation				Time-related				Income-related				Fully employed			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Sector of industry																
Primary	0.111*	0.159*	0.055*	0.049*	0.095*	0.172*	0.021*	0.037*	0.325*	0.344*	0.060	0.085	0.182	0.138	0.074	0.089
Secondary	0.276*	0.240	0.171*	0.178*	0.111*	0.156*	0.156*	0.146*	0.042*	0.093*	0.175*	0.191	0.219	0.228	0.236	0.214
Tertiary	0.613	0.601*	0.774*	0.773*	0.795*	0.673	0.823*	0.817*	0.633*	0.563*	0.765*	0.724	0.599	0.634	0.690	0.697
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Tenure																
0 to 1 year	0.164*	0.213*	0.170	0.134*	0.163*	0.234*	0.447*	0.354*	0.225*	0.223*	0.368*	0.268*	0.116	0.149	0.193	0.197
1 to 3 years	0.188*	0.180*	0.256	0.184*	0.169	0.140	0.233	0.278*	0.204*	0.125*	0.263	0.253*	0.152	0.150	0.234	0.215
3 to 5 years	0.122	0.130	0.150	0.145	0.124	0.072*	0.095*	0.133	0.105	0.070*	0.102*	0.126	0.116	0.123	0.152	0.136
5 to 10 years	0.261	0.111*	0.170	0.225	0.185*	0.056*	0.136*	0.149*	0.210*	0.068*	0.122*	0.177	0.242	0.167	0.173	0.211
10 to 15 years	0.100*	0.058*	0.106	0.122	0.103*	0.019*	0.052*	0.052*	0.094*	0.039*	0.068*	0.076	0.135	0.113	0.104	0.098
More than 15 years	0.165*	0.308	0.150	0.189*	0.256	0.479*	0.038*	0.034*	0.162*	0.474*	0.078*	0.100*	0.239	0.297	0.145	0.144
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>5.82*</i>	<i>4.93*</i>	<i>7.18</i>	<i>8.62*</i>	<i>6.84*</i>	<i>2.64*</i>	<i>3.49*</i>	<i>3.70*</i>	<i>5.73*</i>	<i>4.14*</i>	<i>4.54*</i>	<i>5.68*</i>	<i>8.06</i>	<i>7.99</i>	<i>6.96</i>	<i>7.13</i>
Industry																
Agriculture	0.069*	0.121*	0.026*	0.014*	0.081*	0.170*	0.020*	0.036*	0.321*	0.341*	0.057	0.064	0.127	0.073	0.050	0.062
Mining	0.037*	0.036*	0.028	0.035	0.012*	0.001*	0.001*	0.001*	0.001*	0.003*	0.003*	0.021	0.053	0.064	0.024	0.027
Manufacturing	0.219*	0.204*	0.119*	0.098	0.073*	0.087*	0.051*	0.032*	0.028*	0.050*	0.079*	0.073*	0.154	0.157	0.145	0.114
Electricity	0.012	0.007	0.007	0.026*	0.002*	0.000	0.001*	0.003	0.001*	0.000	0.003	0.004	0.009	0.009	0.007	0.007
Construction	0.032*	0.027*	0.045*	0.053*	0.033*	0.068	0.105	0.111	0.013*	0.042*	0.093	0.114	0.052	0.060	0.084	0.093
Wholesale & retail trade	0.166	0.181	0.199	0.085*	0.178	0.252*	0.211	0.175*	0.086*	0.230*	0.242	0.184*	0.183	0.186	0.228	0.212
Transport	0.055	0.065	0.049	0.056	0.025*	0.020*	0.017*	0.032*	0.007*	0.012*	0.034*	0.035*	0.054	0.059	0.062	0.063
Financial intermediation	0.071	0.095*	0.130	0.184	0.053	0.040*	0.058*	0.073*	0.002*	0.016*	0.048*	0.070*	0.065	0.116	0.129	0.150
Community services	0.180*	0.118*	0.311*	0.334*	0.355*	0.108*	0.158*	0.217*	0.027*	0.049*	0.167*	0.269*	0.242	0.224	0.205	0.209
Private households	0.114*	0.136*	0.086	0.114*	0.167*	0.251*	0.379*	0.320*	0.505*	0.255*	0.274*	0.167*	0.046	0.045	0.066	0.062
Others/Unspecified	0.046*	0.008	0.000	0.000	0.020	0.003	0.000	0.000	0.010	0.002*	0.000	0.000	0.014	0.007	0.000	0.000
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

* The estimate is significantly different from that of fully employed in the same year at $\alpha = 5\%$.

Table A4: Monthly real earnings of the underemployed

Period	Overeducation			Time-related			Income-related			Fully employed		
	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)
OHS1995	8 426	5 155	175.66	5 874	3 854	151.31	550	584	4.46	7 744	4 983	55.92
OHS1996	10 385	6 026	306.51	3 655	2 258	219.58	383	394	1.37	7 267	3 841	78.69
OHS1997	8 990	5 663	187.40	3 787	2 150	143.10	486	497	3.81	6 989	4 629	55.67
OHS1998	8 234	5 188	234.34	3 377	1 749	216.81	535	536	4.57	6 840	4 558	75.31
OHS1999	8 635	5 103	216.62	2 617	1 214	117.54	466	475	4.16	6 844	4 222	63.94
LFS2000a	7 561	3 510	293.08	1 158	521	87.99	255	104	5.68	6 230	3 906	92.20
LFS2000b	7 180	3 396	167.42	1 271	646	64.29	320	297	4.02	7 113	4 356	63.28
LFS2001a	7 319	3 606	161.92	1 418	732	75.34	387	385	3.68	6 438	4 087	54.74
LFS2001b	7 742	4 152	184.55	1 954	948	125.88	455	474	4.20	6 907	4 600	59.48
LFS2002a	6 876	3 386	156.20	1 113	491	54.85	356	339	3.93	6 843	4 383	59.58
LFS2002b	7 195	3 191	201.10	1 465	638	118.35	439	463	4.11	6 935	4 139	60.34
LFS2003a	6 845	2 673	202.94	1 260	711	67.30	436	445	4.14	6 805	4 009	59.37
LFS2003b	7 533	3 571	207.91	1 494	719	82.46	427	446	4.74	6 839	4 018	59.49
LFS2004a	7 543	3 673	205.13	1 439	715	84.86	447	449	4.69	7 174	4 082	62.00
LFS2004b	8 131	3 644	221.02	1 621	880	103.02	412	425	4.69	6 785	4 049	56.47
LFS2005a	6 921	2 588	215.15	1 606	794	98.34	375	397	4.36	6 987	3 968	57.57
LFS2005b	10 927	3 778	394.66	1 749	844	103.61	424	485	4.24	7 303	3 883	69.70
LFS2006a	9 538	3 744	249.17	1 469	835	90.93	351	384	4.35	7 049	4 173	57.42
LFS2006b	10 135	4 011	273.59	1 767	923	94.97	386	401	4.70	6 903	3 875	57.32
LFS2007a	10 105	3 931	270.39	1 635	995	81.85	378	393	4.69	6 909	3 978	55.37
LFS2007b	12 162	6 831	287.61	2 085	1 269	146.02	437	516	4.97	6 708	4 131	54.32
2010Q1	12 370	7 163	287.68	2 209	1 289	136.86	591	645	6.36	7 470	4 298	70.91
2010Q2	12 739	7 932	299.70	2 407	1 381	152.15	587	637	6.21	7 790	4 296	76.69
2010Q3	11 836	7 032	282.11	1 971	1 218	138.21	600	661	5.99	7 873	4 266	78.47
2010Q4	12 786	7 647	307.04	2 138	1 261	129.38	607	658	5.86	8 012	4 482	78.15

Table A4: Continued

Period	Overeducation			Time-related			Income-related			Fully employed		
	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)
2011Q1	12 283	7 607	305.78	2 281	1 107	166.86	597	622	6.08	8 382	4 426	86.32
2011Q2	12 746	7 588	297.05	2 744	1 355	261.28	588	650	6.14	8 092	4 404	83.32
2011Q3	12 350	7 343	310.89	3 124	1 215	296.23	598	641	6.21	8 287	4 406	84.40
2011Q4	16 461	13 193	382.26	2 330	1 319	177.83	591	633	6.21	8 273	4 617	80.47
2012Q1	16 364	13 038	371.09	2 253	1 129	194.49	592	652	7.22	7 846	4 519	73.37
2012Q2	16 677	14 121	375.28	1 965	1 220	118.01	504	642	8.27	7 907	4 493	76.37
2012Q3	17 628	15 267	396.17	2 324	1 102	220.64	506	636	6.91	7 713	4 198	78.65
2012Q4	15 893	13 750	366.68	2 055	1 083	142.41	489	613	6.83	7 918	4 375	82.50
2013Q1	17 412	14 778	409.52	2 349	1 067	210.17	475	557	6.60	7 593	4 108	81.06
2013Q2	14 653	12 151	437.72	2 283	1 052	179.11	504	608	6.33	8 313	4 253	87.50
2013Q3	14 653	11 962	428.96	2 045	1 036	136.09	494	598	6.07	8 224	4 187	83.99
2013Q4	14 390	10 558	424.29	3 185	1 186	320.43	489	593	5.77	8 264	4 152	88.29
2014Q1	12 825	6 977	438.45	2 692	1 163	296.46	483	581	5.69	8 251	4 302	86.59
2014Q2	13 070	7 551	427.25	2 174	1 026	149.26	487	570	5.44	7 798	4 105	82.15
2014Q3	13 096	8 365	370.02	2 119	1 124	175.32	478	562	5.39	7 771	3 933	83.15
2014Q4	12 013	6 726	405.76	2 176	1 068	184.42	480	561	5.30	8 152	4 260	87.80
2015Q1	12 816	7 830	453.31	2 638	1 119	231.08	493	559	5.94	7 791	3 915	90.30
2015Q2	13 576	8 724	460.78	2 369	1 047	231.03	505	545	5.95	7 636	3 817	89.66
2015Q3	14 368	9 130	491.45	2 200	1 074	195.10	537	602	5.89	7 824	3 798	93.03
2015Q4	13 530	8 351	477.68	2 332	1 071	231.12	546	642	6.02	7 994	4 069	95.47
2016Q1	14 061	8 377	518.84	1 766	1 047	114.26	546	628	6.02	8 123	4 084	99.59
2016Q2	14 379	8 718	559.88	2 008	1 231	132.71	528	615	6.22	7 916	4 000	100.47
2016Q3	14 106	8 612	502.38	2 189	1 013	231.15	542	608	5.91	7 500	3 749	92.96
2016Q4	14 208	10 037	475.03	1 863	1 004	114.72	525	602	6.15	7 726	3 914	93.11

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered.

Table A5: Hourly real wages of the underemployed

Period	Overeducation			Time-related			Income-related			Fully employed		
	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)
OHS1995	47.34	29.87	0.97	72.64	45.29	2.76	3.74	3.20	0.09	41.72	26.97	0.36
OHS1996	57.90	35.04	2.05	41.22	21.88	2.69	2.99	2.29	0.10	41.05	25.03	0.47
OHS1997	48.83	29.27	1.06	43.17	24.64	1.90	2.86	2.43	0.05	37.43	24.18	0.31
OHS1998	45.79	26.81	1.58	43.94	18.33	4.12	3.38	2.77	0.07	37.41	22.27	0.53
OHS1999	46.76	25.05	1.30	37.47	16.67	2.12	3.68	2.65	0.08	36.74	21.19	0.39
LFS2000a	39.97	20.19	1.52	17.05	6.73	1.95	2.04	0.63	0.09	32.69	19.68	0.51
LFS2000b	39.27	18.77	1.08	21.09	9.59	1.77	2.93	1.73	0.08	38.43	21.59	0.40
LFS2001a	38.18	18.63	0.90	22.63	9.98	2.12	2.89	2.08	0.06	34.45	19.88	0.33
LFS2001b	41.24	20.97	1.07	25.68	13.78	1.46	3.53	2.62	0.09	36.87	22.29	0.33
LFS2002a	37.62	17.56	1.10	17.81	7.61	1.86	2.59	1.93	0.06	36.62	21.00	0.35
LFS2002b	38.11	16.49	1.15	25.33	8.84	2.51	3.37	2.47	0.09	38.66	21.51	1.31
LFS2003a	35.86	15.54	1.04	19.42	9.21	1.37	3.35	2.59	0.08	36.77	21.18	0.35
LFS2003b	42.09	19.38	1.29	22.30	10.61	1.54	3.78	2.60	0.11	37.09	21.49	0.34
LFS2004a	41.10	18.57	1.19	20.99	9.89	1.35	3.72	2.64	0.13	38.36	21.36	0.35
LFS2004b	43.38	19.15	1.14	21.15	11.70	1.24	3.84	2.57	0.12	36.97	21.32	0.34
LFS2005a	38.15	14.33	1.25	21.46	11.15	1.43	3.36	2.23	0.09	38.09	22.29	0.40
LFS2005b	59.22	17.59	2.42	27.10	11.78	1.99	3.91	2.46	0.10	38.24	20.07	0.38
LFS2006a	52.51	21.74	1.39	20.11	12.94	1.05	3.69	2.09	0.11	38.64	22.05	0.35
LFS2006b	54.60	23.24	1.47	23.67	12.44	1.25	3.68	2.34	0.11	37.57	20.94	0.35
LFS2007a	54.31	22.86	1.49	24.02	13.71	1.83	3.57	2.10	0.11	37.25	21.03	0.32
LFS2007b	68.86	39.71	1.58	29.68	14.50	1.72	4.34	2.80	0.16	36.87	21.75	0.33
2010Q1	70.03	38.32	1.96	45.24	16.47	4.68	5.37	3.75	0.17	41.40	22.21	0.53
2010Q2	69.80	41.18	1.97	41.35	16.47	3.35	5.45	3.76	0.19	42.26	22.27	0.45
2010Q3	67.10	36.34	1.84	38.40	15.95	3.01	5.97	4.09	0.24	42.41	22.90	0.46
2010Q4	70.03	39.09	1.80	46.21	16.29	4.17	5.44	4.07	0.17	43.68	23.52	0.50

Table A5: Continued

Period	Overeducation			Time-related			Income-related			Fully employed		
	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)	Mean	Median	SE(mean)
2011Q1	68.08	40.21	1.78	38.71	15.68	2.62	5.28	3.86	0.18	44.82	23.23	0.49
2011Q2	73.73	40.34	2.08	45.06	17.07	4.10	5.84	3.94	0.28	43.72	22.76	0.50
2011Q3	67.23	38.04	1.70	50.53	16.82	7.70	5.60	3.88	0.23	46.12	22.60	0.89
2011Q4	92.40	76.70	2.22	39.11	15.95	4.40	5.51	3.99	0.16	44.75	23.27	0.47
2012Q1	93.00	75.80	2.22	36.30	15.16	3.15	5.54	4.10	0.16	42.55	22.77	0.42
2012Q2	98.73	82.10	2.84	45.29	14.93	4.82	4.95	3.38	0.20	43.15	22.75	0.49
2012Q3	106.80	85.48	3.27	43.45	14.79	4.42	4.81	3.39	0.13	42.02	22.19	0.44
2012Q4	94.64	79.94	2.37	39.32	14.53	2.64	4.93	3.27	0.21	43.24	22.04	0.47
2013Q1	98.69	80.55	2.27	44.95	15.50	3.83	4.47	3.18	0.18	41.73	21.48	0.59
2013Q2	85.61	70.64	2.58	42.45	14.13	4.96	4.49	3.39	0.16	46.51	22.61	0.62
2013Q3	84.30	64.68	2.76	42.91	15.07	4.70	4.48	3.16	0.11	45.81	22.77	0.73
2013Q4	81.26	55.17	2.51	54.86	15.93	5.11	4.47	3.07	0.11	45.37	22.41	0.54
2014Q1	72.07	43.27	2.30	45.74	16.22	4.12	4.49	3.15	0.12	45.31	22.53	0.52
2014Q2	79.48	41.89	3.77	41.83	14.35	3.78	4.51	3.22	0.13	43.42	21.55	0.62
2014Q3	76.85	45.73	2.23	37.77	15.10	3.87	4.66	3.27	0.15	42.85	21.56	0.50
2014Q4	68.96	37.25	2.27	40.43	14.26	3.06	4.56	3.26	0.14	44.55	22.16	0.49
2015Q1	77.28	43.36	3.13	52.01	16.10	4.90	5.16	3.25	0.22	43.05	20.81	0.56
2015Q2	78.03	44.38	2.89	45.82	14.79	3.69	4.86	3.38	0.12	43.30	20.29	0.76
2015Q3	80.81	48.04	2.87	41.87	14.99	3.88	5.10	3.75	0.16	43.08	20.82	0.56
2015Q4	74.43	43.16	2.52	36.89	14.94	2.99	5.06	3.73	0.17	44.13	21.16	0.57
2016Q1	76.98	42.62	2.67	35.86	13.92	3.11	5.48	3.65	0.21	44.37	21.10	0.56
2016Q2	85.18	48.64	3.30	43.66	15.50	4.01	5.63	3.58	0.24	43.07	20.67	0.54
2016Q3	87.22	47.12	4.55	47.47	13.74	5.67	5.84	3.77	0.27	41.93	20.03	0.63
2016Q4	82.24	54.62	2.75	37.80	14.60	2.52	5.72	3.50	0.28	42.75	20.42	0.68

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered.

Table A6: Probit regressions on the likelihood of being time-related underemployed based on 40 hours per week threshold

Independent variable	Average marginal effects					
	2002		2010		2016	
Age	0.0020	(0.0014)	0.0046**	(0.0021)	0.0012	(0.0021)
Age squared	-0.0000	(0.0000)	-0.0000*	(0.0000)	0.0000	(0.0000)
Female	-0.0039**	(0.0019)	-0.0015	(0.0025)	-0.0034	(0.0026)
African	0.0060**	(0.0026)	0.0065*	(0.0039)	0.0148***	(0.0040)
Coloured	0.0119**	(0.0056)	0.0030	(0.0054)	0.0222**	(0.0103)
Indian	-0.0060	(0.0048)	-0.0084	(0.0066)	-0.0000	(0.0100)
Experience	-0.0006	(0.0009)	-0.0028**	(0.0014)	-0.0018	(0.0014)
Experience squared	0.0000	(0.0000)	0.0000	(0.0000)	-0.0000	(0.0000)
Eastern Cape	0.0082	(0.0052)	-0.0169***	(0.0034)	0.0337***	(0.0108)
Northern Cape	-0.0042	(0.0046)	0.0193**	(0.0077)	0.0981***	(0.0205)
Free State	0.0183***	(0.0071)	-0.0038	(0.0048)	0.0120	(0.0107)
KwaZulu-Natal	0.0003	(0.0043)	-0.0069	(0.0043)	0.0245***	(0.0094)
North West	0.0140**	(0.0065)	-0.0240***	(0.0026)	-0.0106	(0.0070)
Gauteng	0.0235***	(0.0062)	-0.0008	(0.0044)	0.0272***	(0.0079)
Mpumalanga	0.0126*	(0.0065)	0.0007	(0.0054)	0.1046***	(0.0188)
Limpopo	0.0112*	(0.0063)	-0.0224***	(0.0029)	0.0371***	(0.0120)
Mining	0.0023	(0.0056)	-0.0037	(0.0101)	-0.0003	(0.0091)
Manufacturing	0.0188***	(0.0063)	0.0205**	(0.0096)	0.0142*	(0.0086)
Water & electricity	0.0178	(0.0162)	0.0253	(0.0226)	0.0563**	(0.0256)
Wholesale & retail	0.0197**	(0.0083)	0.0213**	(0.0107)	0.0232**	(0.0100)
Construction	0.0049	(0.0046)	0.0014	(0.0068)	-0.0065	(0.0055)
Communication	0.0040	(0.0063)	0.0045	(0.0088)	-0.0082	(0.0062)
Finance	0.0062	(0.0058)	0.0070	(0.0080)	0.0004	(0.0066)
Community services	0.0073	(0.0058)	0.0060	(0.0079)	0.0130	(0.0079)
Private households	0.0142**	(0.0067)	0.0166*	(0.0095)	0.0038	(0.0074)
Employee	-0.0042	(0.0035)	-0.0003	(0.0044)	0.0106***	(0.0035)
Informal	-0.0031	(0.0030)	-0.0010	(0.0043)	-0.0022	(0.0040)
Public	0.0051	(0.0043)	0.0036	(0.0052)	-0.0094***	(0.0035)
No education	-0.0082	(0.0076)	0.0036	(0.0196)	0.0263	(0.0327)
Primary education	-0.0063	(0.0064)	0.0056	(0.0125)	0.0076	(0.0137)
Matric	0.0003	(0.0048)	0.0054	(0.0063)	0.0079	(0.0059)
Diploma/certificate	-0.0002	(0.0046)	-0.0016	(0.0059)	-0.0015	(0.0059)
Observations	24 758		19 544		18 130	
LR chi2	148.95		177.56		302.93	
Prob > chi2	0.0000		0.0000		0.0000	
Pseudo R2	0.0321		0.0356		0.0682	
Obs. P	0.0189		0.0279		0.0265	
Pred. P (at X bar)	0.0164		0.0238		0.0202	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reference groups: male; white; western cape; skilled agriculture; self-employed; formal sector; private sector

Table A7: Probit regressions on the likelihood of being underemployed in at least one approach – Africans only

Dependent variable	Average marginal effects							
	1995		2002		2010		2016	
Age	0.0268***	(0.0041)	0.0290***	(0.0045)	0.0438***	(0.0055)	0.0190***	(0.0053)
Age squared	0.0000	(0.0000)	-0.0001*	(0.0001)	-0.0002***	(0.0001)	-0.0002***	(0.0001)
Female	0.0616***	(0.0074)	0.0805***	(0.0073)	0.0782***	(0.0073)	0.0524***	(0.0069)
Experience	-0.0379***	(0.0028)	-0.0389***	(0.0028)	-0.0424***	(0.0035)	-0.0121***	(0.0035)
Experience squared	0.0001***	(0.0000)	0.0002***	(0.0000)	0.0002***	(0.0000)	0.0002***	(0.0000)
Eastern Cape	0.0900***	(0.0210)	0.1926***	(0.0180)	0.0757***	(0.0228)	0.1331***	(0.0222)
Northern Cape	0.0853***	(0.0303)	0.0890***	(0.0247)	-0.0047	(0.0260)	0.0749**	(0.0315)
Free State	0.1450***	(0.0221)	0.1974***	(0.0181)	0.0738***	(0.0222)	0.1393***	(0.0250)
KwaZulu-Natal	0.0369*	(0.0192)	0.1010***	(0.0169)	0.0570***	(0.0206)	0.0883***	(0.0195)
North West	0.0453**	(0.0210)	0.1106***	(0.0178)	0.0221	(0.0217)	0.0526**	(0.0228)
Gauteng	0.0183	(0.0197)	0.0505***	(0.0170)	0.0108	(0.0191)	0.0744***	(0.0174)
Mpumalanga	0.0251	(0.0203)	0.1097***	(0.0180)	0.0544**	(0.0218)	0.1052***	(0.0221)
Limpopo	0.0407*	(0.0213)	0.1533***	(0.0179)	0.0661***	(0.0222)	0.0911***	(0.0209)
Mining	-0.1739***	(0.0095)	-0.3208***	(0.0088)	-0.0590***	(0.0225)	0.0208	(0.0257)
Manufacturing	-0.1065***	(0.0096)	-0.2442***	(0.0092)	-0.0548***	(0.0162)	-0.0440***	(0.0160)
Water & electricity	-0.0981***	(0.0266)	-0.2647***	(0.0223)	-0.1179***	(0.0316)	0.0034	(0.0370)
Wholesale & retail	-0.1376***	(0.0117)	-0.2669***	(0.0097)	-0.0382**	(0.0176)	0.0003	(0.0176)
Construction	-0.1349***	(0.0088)	-0.2441***	(0.0080)	-0.0723***	(0.0153)	-0.0575***	(0.0147)
Communication	-0.1503***	(0.0110)	-0.2671***	(0.0105)	-0.0822***	(0.0170)	-0.0335*	(0.0182)
Finance	-0.1567***	(0.0116)	-0.2928***	(0.0093)	-0.1017***	(0.0147)	-0.0679***	(0.0145)
Community services	-0.1317***	(0.0206)	-0.3156***	(0.0113)	-0.1044***	(0.0156)	-0.0541***	(0.0153)
Private households	0.1233***	(0.0208)	0.0560***	(0.0128)	0.1980***	(0.0213)	0.2037***	(0.0228)
Employee	-0.1267***	(0.0198)	-0.2399***	(0.0117)	-0.0602***	(0.0132)	-0.0364***	(0.0123)
Informal	-0.0160	(0.0183)	0.0955***	(0.0111)	0.1473***	(0.0133)	0.1030***	(0.0125)
Public	-0.1104***	(0.0210)	-0.1397***	(0.0150)	0.0402***	(0.0148)	0.0724***	(0.0129)
No education	0.2535***	(0.0479)	0.1654***	(0.0408)	-0.0791**	(0.0358)	-0.1600***	(0.0129)
Primary education	-0.0037	(0.0293)	-0.0109	(0.0283)	-0.1799***	(0.0185)	-0.1619***	(0.0140)
Matric	-0.0211	(0.0217)	-0.0941***	(0.0208)	-0.4004***	(0.0181)	-0.3393***	(0.0197)
Diploma/certificate	0.0426*	(0.0223)	-0.2126***	(0.0171)	-0.2623***	(0.0055)	-0.1529***	(0.0074)
Observations	17 611		16 695		13 800		13 847	
LR chi2	3151.82		5950.00		2305.28		1572.98	
Prob > chi2	0.0000		0.0000		0.0000		0.0000	
Pseudo R2	0.1587		0.2694		0.1534		0.1184	
Obs. P	0.2513		0.3748		0.2343		0.1856	
Pred. P (at X bar)	0.2181		0.3312		0.2063		0.1593	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reference groups: male; western cape; skilled agriculture; self-employed; formal sector; private sector

Table A8: Multinomial logit regression on underemployment status (2010)

Independent variable	Relative risk ratio							
	Overeducation only		Time-related underemployment only		Income-related underemployment only		Underemployed in ant two or all three approaches	
Age	1.8162***	(0.1926)	1.0531	(0.1568)	0.7087***	(0.0648)	1.2256	(0.2221)
Age squared	1.0096***	(0.0014)	0.9992	(0.0017)	1.0018*	(0.0010)	0.9975	(0.0020)
Female	0.8391**	(0.0674)	1.7677***	(0.3576)	3.0065***	(0.4168)	3.5049***	(0.8515)
African	2.3161***	(0.2787)	1.7023	(0.7769)	28.8528***	(29.0842)	2.0583	(1.1348)
Coloured	2.1197***	(0.3308)	1.8380	(0.8963)	25.9269***	(26.6470)	0.4529	(0.3137)
Indian	0.5110***	(0.1292)	1.3340	(0.9376)	8.2994*	(9.6754)	0.0000	(0.0005)
Experience	0.3937***	(0.0243)	0.9393	(0.0788)	1.3118***	(0.0658)	0.9299	(0.0929)
Experience square	0.9894***	(0.0015)	1.0012	(0.0013)	0.9983**	(0.0007)	1.0016	(0.0014)
Eastern Cape	1.0564	(0.1843)	0.7008	(0.2657)	4.7792***	(1.4764)	0.6103	(0.2776)
Northern Cape	1.0039	(0.2009)	0.7038	(0.2512)	1.0511	(0.3932)	0.2888**	(0.1763)
Free State	1.2627	(0.2164)	0.4635*	(0.1960)	3.8542***	(1.2570)	0.5935	(0.2812)
KwaZulu-Natal	1.1345	(0.1770)	0.8536	(0.3002)	2.6727***	(0.8691)	1.2062	(0.4900)
North West	1.3848*	(0.2575)	0.1680***	(0.1093)	2.1561**	(0.7608)	0.2205**	(0.1387)
Gauteng	1.0270	(0.1451)	0.8273	(0.2736)	1.7088	(0.5686)	0.5749	(0.2536)
Mpumalanga	1.4472**	(0.2582)	0.9371	(0.3826)	1.8038	(0.6736)	0.3352*	(0.1966)
Limpopo	0.7219	(0.1491)	0.3756**	(0.1839)	3.4157***	(1.1671)	0.8012	(0.3687)
Skilled agriculture	12.1101***	(2.9422)	0.3300	(0.2665)	0.8192	(0.2845)	1.4523	(0.8633)
Mining	3.0876***	(0.7019)	0.0000	(0.0032)	1.1986	(0.7831)	0.0000	(0.0039)
Manufacturing	3.2115***	(0.4981)	1.4185	(0.6242)	1.5988	(0.5009)	0.9906	(0.5762)
Water & electricity	0.9923	(0.3957)	2.5410	(2.7511)	3.0002	(2.0191)	0.0000	(0.0012)
Whole & retail	3.0510***	(0.6724)	1.0109	(0.4887)	2.2743**	(0.7299)	4.4895***	(2.0947)
Construction	2.0334***	(0.3149)	1.5819	(0.6147)	1.3402	(0.3896)	1.1853	(0.6049)
Communication	1.9892***	(0.4095)	0.2976	(0.3160)	1.8572	(0.7212)	1.2040	(0.8782)
Community services	0.8688	(0.1482)	2.0789*	(0.8629)	1.3575	(0.4119)	0.8396	(0.4129)
Private households	78.9545***	(31.4853)	4.1780***	(2.5766)	1.0037	(0.4253)	5.0446**	(4.0861)
Informal	1.7523	(0.7285)	1.0552	(0.5408)	0.9782	(0.3431)	3.2223	(2.3357)
Public	1.0769	(0.1674)	1.1337	(0.4130)	2.6554***	(0.5637)	7.0984***	(2.3304)
Permanent contract	0.5497***	(0.0658)	0.1066***	(0.0221)	0.5186***	(0.0764)	0.1465***	(0.0364)
Verbal contract	1.0424	(0.2389)	0.3361***	(0.0781)	0.5558***	(0.0979)	0.4344***	(0.1217)
Firm size-1 worker	0.4056**	(0.1560)	4.1256***	(2.2322)	2.4034**	(0.8532)	1.1115	(0.7807)
Firm size-2 to 4 workers	0.4342***	(0.1227)	3.3511**	(1.6403)	1.9747**	(0.6028)	0.6119	(0.4294)
Firm size-5 to 9 workers	0.6894**	(0.1109)	2.5260***	(0.8599)	1.3528	(0.2914)	0.8963	(0.3249)
Firm size-10 to 19 workers	0.9189	(0.1038)	1.4484	(0.4892)	0.9394	(0.1891)	0.6221	(0.2171)
Firm size-20 to 49 workers	1.1158	(0.1123)	1.1175	(0.3972)	1.1474	(0.2152)	0.9361	(0.2883)
Union member	1.0724	(0.1094)	0.4800*	(0.1829)	0.3994***	(0.0773)	0.1571***	(0.0718)
Constant	0.0000***	(0.0000)	0.0297	(0.0684)	0.0919	(0.1597)	0.0008**	(0.0022)
Observations	12 115							
LR chi-square	5450.97							
Prob > chi-square	0.0000							
Pseudo R squared	0.3720							

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Base category: fully employed
Reference groups: male; white; western cape; finance; self-employed; formal sector; private sector; degree; temporary contract; written contract; firm size (50 or more workers); no in the union

Table A9: Multinomial logit regression on underemployment status (2016)

Independent variable	Relative risk ratio						
	Overeducation only		Time-related underemployment only		Income-related underemployment only		Underemployed in ant two or all three approaches
Age	4.6868***	(0.6229)	0.6753**	(0.1092)	0.8492**	(0.0696)	1.0271 (0.1580)
Age squared	1.0002	(0.0016)	1.0033*	(0.0018)	1.0005	(0.0009)	0.9989 (0.0017)
Female	0.9133	(0.1010)	1.4306	(0.3547)	1.4824***	(0.1562)	1.9177*** (0.3750)
African	1.8229***	(0.2855)	1.3877	(0.8765)	1.3615	(0.2992)	0.5959 (0.2337)
Coloured	1.7594**	(0.4344)	2.6494	(1.8113)	1.4545	(0.4133)	0.7769 (0.4018)
Indian	2.2048***	(0.5995)	0.9160	(1.1135)	1.9021*	(0.6257)	0.6162 (0.5042)
Experience	0.2069***	(0.0161)	1.3019***	(0.1236)	1.1694***	(0.0551)	1.1302 (0.0949)
Experience square	1.0001	(0.0016)	0.9972**	(0.0014)	0.9995	(0.0007)	0.9991 (0.0012)
Eastern Cape	2.1741***	(0.5131)	1.4338	(0.6615)	6.6685***	(1.9818)	8.4710*** (4.3321)
Northern Cape	1.1043	(0.4433)	1.4283	(0.6886)	4.6925***	(1.5444)	2.2308 (1.4027)
Free State	1.1598	(0.3482)	2.1056	(1.1197)	9.6575***	(3.0159)	10.7491*** (5.8410)
KwaZulu-Natal	1.3656	(0.3024)	0.8468	(0.4305)	5.1216***	(1.5418)	5.5723*** (2.9026)
North West	1.3878	(0.4182)	0.6961	(0.4934)	3.6517***	(1.2611)	2.1025 (1.3703)
Gauteng	1.4069*	(0.2566)	1.3874	(0.5991)	4.7921***	(1.3971)	3.3897** (1.7779)
Mpumalanga	1.2055	(0.3373)	2.6288**	(1.2919)	4.4268***	(1.4631)	4.3203** (2.4761)
Limpopo	1.1782	(0.2956)	1.0231	(0.5713)	3.8543***	(1.2659)	3.1551** (1.8459)
Skilled agriculture	3.3365**	(1.9180)	0.0904**	(0.0982)	0.7479	(0.2082)	1.1589 (0.4809)
Mining	11.327***	(3.7318)	0.0000	(0.0022)	2.7996***	(0.8128)	2.5368 (2.0200)
Manufacturing	3.8136***	(0.8618)	0.5424	(0.3344)	1.4946*	(0.3199)	0.3483 (0.2256)
Water & electricity	6.2123***	(2.4911)	0.0000	(0.0037)	0.9818	(0.6071)	0.8781 (0.9475)
Whole & retail	11.579***	(3.4454)	1.1401	(0.5647)	2.0220***	(0.4551)	1.8893* (0.7012)
Construction	2.7496***	(0.7010)	0.6631	(0.3305)	0.8847	(0.1943)	0.5014 (0.2514)
Communication	4.8311***	(1.3429)	1.1249	(0.7747)	1.7636**	(0.4803)	0.3037 (0.3209)
Community services	0.7979	(0.1679)	2.3165**	(0.9560)	1.8999***	(0.3715)	0.7660 (0.2666)
Private	313.19***	(156.39)	1.5198	(1.2753)	0.3992*	(0.1904)	2.2774 (1.8112)
Informal	0.7221	(0.5375)	1.1376	(0.8320)	0.3499***	(0.1362)	0.5285 (0.4126)
Public	0.9164	(0.1777)	0.8315	(0.2719)	1.5356***	(0.2260)	7.4343*** (1.8567)
Permanent contract	0.8937	(0.1645)	0.1575***	(0.0399)	0.4912***	(0.0606)	0.1713*** (0.0381)
Verbal contract	1.3171	(0.4015)	0.5137**	(0.1634)	0.6554*	(0.1455)	0.5468* (0.1920)
Firm size-1 worker	1.2513	(0.5927)	5.0839**	(3.9473)	1.2934	(0.5776)	1.5609 (1.1614)
Firm size-2 to 4 workers	0.6797	(0.2448)	1.8993	(1.3525)	1.1939	(0.3349)	0.4396 (0.2985)
Firm size-5 to 9 workers	0.7100	(0.1833)	1.1198	(0.4911)	0.8098	(0.1517)	0.2600*** (0.1069)
Firm size-10 to 19 workers	0.6301***	(0.1047)	1.3113	(0.4775)	0.8208	(0.1208)	0.8439 (0.1971)
Firm size-20 to 49 workers	0.8554	(0.1187)	1.0341	(0.3659)	0.8664	(0.1128)	0.6010** (0.1466)
Union member	1.0477	(0.1521)	0.3971**	(0.1774)	0.7404**	(0.0987)	0.2558*** (0.0786)
Constant	0.0000***	(0.0000)	6.3773	(15.9348)	0.1492	(0.1967)	0.0044** (0.0109)
Observations	10 703						
LR chi-square	4889.88						
Prob > chi-square	0.0000						
Pseudo R squared	0.3764						

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Base category: fully employed
Reference groups: male; white; western cape; finance; self-employed; formal sector; private sector; degree;
temporary contract; written contract; firm size (50 or more workers); no in the union

Table A10: Educational requirements of occupational classifications (for the job analysis approach)

Broad occupation category	Skills level	Education level required
Legislators, senior officials and managers	Most highly-skilled	Tertiary (Degree or above)
Professionals	Most highly-skilled	Tertiary (Degree or above)
Technicians and associate professionals	Highly-skilled	Tertiary (Not equivalent to degree)
Clerks	Semi-skilled	Secondary (Up to Matric)
Service workers and shop and market sales workers	Semi-skilled	Secondary (Up to Matric)
Skilled agricultural and fishery worker	Semi-skilled	Secondary (Up to Matric)
Craft and related trade workers	Semi-skilled	Secondary (Up to Matric)
Plant and machinery operators and assemblers	Semi-skilled	Secondary (Up to Matric)
Elementary occupations	Unskilled	Primary (Up to Grade 7)
Domestic workers	Unskilled	Primary (Up to Grade 7)

Source: Statistics South Africa (2008).

Table A11: The incidence of mismatch by gender (%), selected periods

	1995			2002 Sep			2010Q3			2016Q3		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Overeducated	7.17	4.96	12.14	7.32	4.85	12.17	6.52	5.53	12.05	3.68	4.12	7.79
Undereducated	9.18	4.96	14.13	8.93	5.65	14.58	8.02	5.54	13.56	7.83	4.61	12.44
Adequately educated	42.22	27.60	69.81	39.15	28.75	67.90	40.83	31.03	71.86	43.87	33.74	77.61

Table A12: Correlation coefficients based on QLFS 2008-2016

Variable	Coefficient
Overeducation and work experience	-0.0131
Undereducation and work experience	0.2575
Adequate education and work experience	0.0641
Years of education and work experience	-0.4681

Table A13: Number and percentage of mismatched and adequately educated workers

Period	Overeducated		Undereducated		Adequately educated	
	Number	Percentage	Number	Percentage	Number	Percentage
1995	1 152 768	12.14	1 342 702	14.13	6 631 866	69.81
1996	1 051 655	11.73	1 273 025	14.20	5 780 622	64.47
1997	1 231 219	13.54	1 335 065	14.68	6 039 638	66.42
1998	1 157 055	12.35	1 379 850	14.73	6 380 659	68.10
1999	1 350 448	13.04	1 468 070	14.18	6 775 414	65.42
2000a	1 793 609	15.10	1 926 327	16.22	7 746 555	65.24
2000b	1 722 035	14.09	1 892 608	15.48	7 968 227	65.18
2001a	1 788 094	14.58	1 830 142	14.93	8 090 356	65.99
2001b	1 570 733	14.07	1 595 938	14.29	7 658 626	68.58
2002a	1 717 663	14.80	1 697 676	14.63	7 873 985	67.86
2002b	1 372 974	12.17	1 645 192	14.58	7 666 034	67.94
2003a	1 356 137	12.00	1 609 977	14.25	7 737 888	68.49
2003b	1 417 385	12.42	1 615 023	14.15	7 868 645	68.95
2004a	1 378 677	12.12	1 681 861	14.78	7 790 693	68.47
2004b	1 567 785	13.48	1 606 874	13.82	8 157 795	70.14
2005a	1 347 755	11.33	1 635 770	13.75	8 871 017	74.58
2005b	1 177 002	9.58	1 730 664	14.08	8 939 809	72.75
2006a	1 374 196	11.05	1 717 339	13.81	8 946 779	71.93
2006b	1 335 246	10.44	1 782 750	13.94	9 293 962	72.68
2007a	1 375 242	10.88	1 801 768	14.26	9 078 753	71.85
2007b	1 657 894	12.47	1 785 700	13.43	9 471 056	71.25
2008Q1	1 642 180	11.36	2 081 300	14.40	10 377 262	71.81
2008Q2	1 680 074	11.50	1 969 050	13.48	10 594 408	72.54
2008Q3	1 631 188	11.20	1 971 387	13.54	10 626 648	72.98
2008Q4	1 663 313	11.25	1 891 025	12.79	10 881 847	73.60
2009Q1	1 841 750	12.59	1 833 766	12.53	10 662 720	72.87
2009Q2	1 671 487	11.63	1 812 247	12.61	10 456 806	72.74
2009Q3	1 609 140	11.63	1 805 812	13.05	10 069 567	72.75
2009Q4	1 665 257	11.91	1 795 568	12.84	10 230 289	73.16
2010Q1	1 726 380	12.49	1 718 030	12.43	10 044 569	72.68
2010Q2	1 641 696	11.87	1 768 309	12.78	9 945 386	71.89
2010Q3	1 647 632	12.05	1 853 117	13.56	9 822 734	71.86
2010Q4	1 656 817	11.91	1 854 002	13.32	9 929 274	71.35
2011Q1	1 619 485	11.64	1 927 715	13.85	9 906 066	71.18
2011Q2	1 761 023	12.64	1 744 070	12.52	10 084 479	72.38
2011Q3	1 602 590	11.34	1 903 011	13.47	10 161 227	71.90
2011Q4	1 100 622	7.67	1 789 773	12.47	11 001 297	76.66
2012Q1	1 145 844	8.01	1 817 782	12.71	11 032 311	77.16
2012Q2	1 233 003	8.59	1 788 376	12.46	10 971 437	76.46
2012Q3	1 352 788	9.28	1 882 449	12.91	11 039 750	75.70
2012Q4	1 287 950	8.86	1 893 931	13.02	11 057 744	76.04
2013Q1	1 447 829	9.94	1 893 981	13.00	10 832 890	74.35
2013Q2	964 485	6.56	1 869 509	12.71	11 352 521	77.19
2013Q3	1 029 285	6.83	1 974 735	13.11	11 546 261	76.66
2013Q4	1 098 146	7.23	1 917 445	12.62	11 777 192	77.50
2014Q1	1 040 941	6.91	1 886 847	12.52	11 642 282	77.24
2014Q2	1 176 314	7.78	1 863 985	12.33	11 522 446	76.25
2014Q3	1 421 115	9.38	1 841 780	12.16	11 336 479	74.85
2014Q4	1 164 103	7.58	1 918 215	12.49	11 928 631	77.70
2015Q1	1 120 745	7.24	1 822 829	11.77	12 140 888	78.39
2015Q2	1 181 844	7.54	1 993 664	12.72	12 085 890	77.10
2015Q3	1 215 883	7.66	1 901 105	11.98	12 344 639	77.80
2015Q4	1 162 888	7.25	1 823 027	11.36	12 631 695	78.72
2016Q1	1 127 023	7.18	1 866 899	11.90	11 915 727	75.94
2016Q2	1 105 621	7.10	1 858 810	11.93	11 832 735	75.97
2016Q3	1 236 537	7.79	1 973 225	12.44	12 311 068	77.61
2016Q4	1 251 258	7.77	1 915 345	11.90	12 540 629	77.92

Table A14: The share of education mismatch, selected periods

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Tenure												
0 to 5 years	0.569*	0.555*	0.657	0.518*	0.421*	0.369*	0.596*	0.574*	0.490	0.488	0.681	0.634
6 to 10 years	0.200	0.087*	0.138	0.206	0.164*	0.096*	0.138	0.158	0.199	0.123	0.142	0.180
11 to 15 years	0.080*	0.047*	0.074	0.090	0.106	0.070	0.088*	0.071	0.108	0.081	0.069	0.074
16 to 20 years	0.029*	0.024*	0.051	0.069	0.067	0.055	0.065*	0.080*	0.057	0.044	0.039	0.044
21 to 25 years	0.014	0.014*	0.028	0.039	0.043*	0.050*	0.036	0.033	0.027	0.031	0.027	0.024
More than 25 years	0.108	0.273*	0.051	0.078*	0.199*	0.360*	0.078*	0.084*	0.119	0.233	0.043	0.044
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>Mean</i>	<i>5.82*</i>	<i>4.93*</i>	<i>6.93</i>	<i>8.56*</i>	<i>9.14*</i>	<i>9.10*</i>	<i>8.07*</i>	<i>8.05*</i>	<i>7.59</i>	<i>7.05</i>	<i>6.38</i>	<i>6.56</i>
Industry												
Agriculture	0.069*	0.121	0.034	0.014*	0.244*	0.245*	0.111*	0.110*	0.124	0.108	0.041	0.052
Mining	0.037	0.036*	0.030	0.028	0.058	0.075*	0.022	0.028	0.048	0.048	0.023	0.028
Manufacturing	0.219*	0.204*	0.110*	0.095	0.110*	0.097*	0.122	0.091*	0.153	0.148	0.140	0.111
Electricity	0.012	0.007	0.009	0.016	0.008	0.005	0.005	0.005	0.009	0.008	0.007	0.007
Construction	0.032	0.027*	0.050*	0.047*	0.063*	0.088*	0.104	0.139*	0.047	0.054	0.083	0.093
Wholesale & retail trade	0.166	0.181	0.182*	0.086*	0.172	0.189	0.234	0.220	0.185	0.208	0.235	0.213
Transport	0.055	0.065	0.051	0.035*	0.053	0.041	0.055	0.054	0.050	0.052	0.062	0.061
Financial intermediation	0.071	0.095	0.131	0.179	0.022*	0.036*	0.071*	0.072*	0.064	0.100	0.129	0.152
Community services	0.180*	0.118*	0.310*	0.382*	0.131*	0.097*	0.150*	0.164*	0.232	0.190	0.197	0.209
Private households	0.114*	0.136*	0.093	0.121*	0.117*	0.125*	0.127*	0.116*	0.076	0.082	0.082	0.072
Others/Unspecified	0.046*	0.008	0.001	0.000	0.020*	0.003	0.000	0.000	0.013	0.003	0.000	0.000
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Province												
Western Cape	0.155	0.153	0.137	0.159	0.095*	0.080*	0.112*	0.130	0.151	0.145	0.152	0.147
Eastern Cape	0.069*	0.087*	0.077	0.070*	0.106	0.114	0.106	0.100	0.099	0.115	0.095	0.094
Northern Cape	0.015	0.019	0.015	0.010	0.037*	0.035*	0.025	0.028	0.021	0.021	0.021	0.019
Free State	0.056*	0.052*	0.054	0.030*	0.086	0.092	0.059	0.059	0.084	0.071	0.056	0.050
KwaZulu-Natal	0.207*	0.207	0.160	0.130*	0.181	0.197	0.178	0.167	0.176	0.187	0.170	0.161
North West	0.059*	0.060	0.048	0.033*	0.103*	0.106*	0.079*	0.071	0.079	0.074	0.058	0.057
Gauteng	0.341*	0.302*	0.372*	0.434*	0.171*	0.161*	0.253*	0.243*	0.286	0.262	0.318	0.316
Mpumalanga	0.054	0.068	0.067	0.058	0.112*	0.102*	0.098*	0.102*	0.053	0.059	0.066	0.071
Limpopo	0.044	0.051	0.070	0.075	0.109*	0.114*	0.088*	0.101	0.051	0.067	0.065	0.084
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

* The estimate is significantly different from that of adequately educated workers in the same year at $\alpha = 5\%$.

Table A15: Mean real hourly wages of mismatched and matched workers

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Race												
African	32.01	23.47	45.60	67.94	22.64	12.41	20.43	26.95	30.48	20.41	31.24	33.50
Coloured	28.02	25.40	51.71	87.19	20.38	17.39	28.20	25.00	29.17	31.16	37.04	36.53
Indian	54.35	46.19	117.95	102.58	54.06	36.44	64.36	56.85	52.58	42.92	58.15	69.79
White	92.15	94.10	119.65	136.86	72.98	78.76	64.31	71.60	79.73	78.03	87.27	80.11
Gender												
Male	55.25	46.94	73.93	109.82	25.55	16.85	27.42	32.80	44.94	34.63	43.73	42.79
Female	36.02	25.27	59.38	67.56	21.53	11.35	20.20	22.91	35.41	27.87	38.18	34.87
Age												
15 to 24 years	28.96	19.74	30.45	61.73	16.62	9.48	19.70	21.25	26.15	16.97	30.37	25.93
25 to 34 years	41.30	31.95	50.79	71.34	19.54	12.20	25.34	25.59	38.03	29.47	35.09	33.84
35 to 44 years	56.00	50.86	69.02	81.97	24.89	15.69	23.16	39.58	45.11	39.10	42.14	39.73
45 to 54 years	70.43	56.86	101.49	111.63	27.25	16.40	23.04	25.78	49.14	34.13	49.41	47.23
55 to 65 years	83.87	70.68	106.44	113.14	27.11	13.95	28.91	27.67	50.18	34.36	65.73	58.61
Province												
Western Cape	50.51	42.36	87.34	119.10	24.84	20.15	32.33	26.72	36.53	37.18	43.63	36.07
Eastern Cape	49.20	25.48	71.15	77.03	22.80	8.65	20.88	19.95	37.29	21.46	36.33	34.42
Northern Cape	40.63	36.71	76.06	76.62	14.42	10.94	19.36	29.76	31.80	31.39	36.76	37.41
Free State	40.44	34.39	59.84	77.30	13.48	11.19	20.59	17.57	26.11	22.17	34.70	32.23
KwaZulu-Natal	37.30	28.06	65.96	72.48	24.21	12.06	20.49	21.86	39.95	27.02	38.85	33.03
North West	40.17	32.78	55.32	81.06	24.14	14.30	21.78	24.66	35.60	24.39	38.66	41.19
Gauteng	56.12	56.12	66.57	88.82	29.52	25.02	31.26	43.03	52.22	46.66	47.21	48.60
Mpumalanga	38.18	27.01	55.37	64.58	21.31	12.13	20.10	38.81	34.03	24.89	42.66	36.58
Limpopo	42.99	17.81	52.67	104.14	31.17	14.85	18.76	18.71	49.47	22.67	29.24	30.64
Years of work experience												
1 to 5 years	34.44	32.07	46.20	76.46	41.91	36.65	37.46	16.25	34.41	21.08	36.54	31.40
6 to 10 years	39.10	30.88	51.69	82.50	24.61	15.99	20.50	37.71	37.64	26.14	34.47	30.54
11 to 15 years	45.89	34.61	53.76	66.96	23.31	17.46	39.63	29.88	40.84	32.25	36.78	37.35
16 to 20 years	51.40	44.48	65.84	86.58	18.85	15.80	19.38	26.81	43.16	44.12	42.02	37.05
21 to 25 years	52.92	40.45	75.02	79.18	27.03	13.22	22.16	33.02	41.18	33.94	41.29	40.06
26 to 30 years	63.98	55.65	101.31	124.09	22.90	21.86	23.77	48.54	45.70	30.13	43.11	46.15
Above 30 years	65.31	55.87	92.31	98.68	24.67	13.18	24.32	25.09	41.29	29.07	50.56	46.32
Tenure												
0 to 5 years	36.86	30.23	49.14	71.12	17.47	10.96	21.79	26.28	31.23	24.43	35.03	31.81
6 to 10 years	48.02	47.53	76.49	88.25	20.44	14.36	22.62	31.89	42.55	36.14	46.66	45.03
11 to 15 years	56.44	63.89	82.52	110.62	23.56	23.27	24.54	32.72	43.72	41.83	53.35	49.06
16 to 20 years	52.47	55.16	96.78	100.72	26.58	22.01	31.59	34.62	49.98	45.09	55.87	46.24
21 to 25 years	89.78	52.69	106.69	96.82	31.79	19.57	24.12	26.90	62.56	44.65	57.62	66.03
More than 25 years	92.44	42.46	132.07	154.80	43.43	15.07	38.63	36.46	75.00	35.82	60.25	71.51

Table A15: Continued

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Occupation												
Managers	166.20	117.57	136.78	131.35	66.56	44.81	69.89	55.91	109.68	107.94	99.83	100.63
Professionals	N/A	N/A	139.36	147.32	49.66	93.51	56.14	90.56	77.64	81.51	85.18	121.65
Technicians	106.86	91.44	103.64	81.45	59.47	25.31	44.79	86.73	73.94	63.43	71.64	62.54
Clerks	55.24	79.57	85.36	66.28	31.51	23.69	30.65	29.95	44.90	42.66	47.37	43.77
Service workers	55.93	74.86	75.08	107.94	20.59	10.42	14.83	21.57	35.61	22.57	30.05	32.52
Skilled agriculture	131.21	26.26	79.36	131.19	15.89	4.01	11.75	17.94	70.65	7.69	60.21	42.54
Trade workers	80.39	61.11	85.19	133.11	25.32	17.12	23.18	23.21	45.62	28.85	33.63	37.16
Operators	43.48	28.72	47.30	39.38	20.71	14.49	23.40	28.72	28.66	19.66	26.64	28.37
Elementary	27.41	18.29	26.11	30.74	14.70	8.28	13.11	14.86	17.71	11.28	18.26	19.72
Domestic workers	12.35	7.80	15.10	15.03	8.08	6.43	11.35	15.99	9.54	6.92	13.32	14.62
Industry												
Agriculture	28.29	20.23	37.19	106.67	10.81	4.81	9.85	13.76	15.59	7.10	21.28	19.96
Mining	51.41	42.61	66.35	102.27	24.88	22.08	36.32	37.13	42.18	31.41	52.56	52.02
Manufacturing	50.68	46.02	56.69	80.95	27.01	18.07	25.45	27.21	43.88	37.58	40.11	39.52
Electricity	73.66	46.11	69.61	74.97	32.98	21.29	36.70	36.74	58.28	42.43	62.59	64.97
Construction	63.33	41.48	71.21	104.59	27.23	19.34	32.49	25.97	40.85	21.12	39.39	40.04
Wholesale & retail trade	49.08	27.71	40.16	103.39	31.95	13.86	20.47	28.24	43.59	23.08	32.72	32.17
Transport	51.98	31.80	59.83	74.52	45.51	27.42	36.03	40.89	51.74	39.76	47.32	46.57
Financial intermediation	73.58	82.76	86.60	117.74	43.39	37.28	35.56	65.69	63.33	64.41	51.68	48.90
Community services	51.89	66.45	97.25	96.26	34.72	26.63	34.33	35.95	52.11	47.07	58.17	49.17
Private households	12.97	8.04	16.25	15.17	9.50	6.30	11.75	14.52	10.19	7.22	13.49	16.24
Others/Unspecified	55.73	86.22	159.45	N/A	29.71	12.35	N/A	N/A	39.70	50.76	130.83	92.02

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered

N/A: No observation

Table A16: Average real hourly wages and monthly earnings of mismatched workers

Period	Real hourly wages			Real monthly earnings		
	Overeducated	Undereducated	Adequately educated	Overeducated	Undereducated	Adequately educated
OHS1995	47.34	24.14	41.16	8 426	4 110	7 252
OHS1996	57.90	21.81	37.96	10 385	3 832	6 597
OHS1997	48.83	17.83	36.74	8 990	3 413	6 668
OHS1998	45.79	15.98	35.30	8 234	2 998	6 344
OHS1999	46.76	17.16	33.35	8 635	3 059	5 896
LFS2000a	39.97	11.95	26.10	7 561	2 077	4 880
LFS2000b	39.27	14.70	30.47	7 180	2 598	5 520
LFS2001a	38.18	13.87	27.24	7 319	2 531	4 961
LFS2001b	41.24	15.23	32.80	7 742	2 869	5 980
LFS2002a	37.62	13.42	30.75	6 876	2 483	5 632
LFS2002b	38.11	14.71	31.76	7 195	2 630	5 540
LFS2003a	35.86	14.21	30.18	6 845	2 600	5 520
LFS2003b	42.09	16.62	31.64	7 533	2 989	5 684
LFS2004a	41.10	15.51	33.11	7 543	2 837	6 142
LFS2004b	43.38	17.49	32.38	8 131	2 957	5 862
LFS2005a	38.15	17.13	34.40	6 921	3 107	6 215
LFS2005b	59.22	15.08	33.42	10 927	2 743	6 287
LFS2006a	52.51	18.31	33.03	9 538	3 323	5 935
LFS2006b	54.60	19.47	33.39	10 135	3 472	6 062
LFS2007a	54.31	16.73	34.28	10 105	3 068	6 272
LFS2007b	68.86	20.34	34.27	12 162	3 598	6 118
2010Q1	70.53	22.68	40.93	11 955	4 034	7 038
2010Q2	70.62	25.34	40.43	12 168	4 230	7 133
2010Q3	67.15	24.47	41.33	11 526	4 310	7 371
2010Q4	70.03	28.78	41.44	12 271	4 707	7 321
2011Q1	68.46	25.46	42.68	11 943	4 266	7 701
2011Q2	73.72	23.75	43.16	12 556	4 047	7 673
2011Q3	67.23	24.19	44.65	11 997	4 282	7 713
2011Q4	92.40	25.75	42.56	16 274	4 481	7 554
2012Q1	92.99	23.51	41.73	16 210	4 018	7 465
2012Q2	98.73	23.43	42.25	16 801	4 093	7 417
2012Q3	106.80	25.38	39.93	17 463	4 646	7 066
2012Q4	94.69	23.21	41.40	16 055	4 116	7 342
2013Q1	98.72	25.20	38.57	17 192	4 287	6 774
2013Q2	85.68	24.62	41.70	14 743	4 129	7 294
2013Q3	84.30	24.03	41.68	14 366	4 170	7 138
2013Q4	81.26	24.75	43.16	14 013	4 319	7 449
2014Q1	72.07	28.39	41.43	12 707	4 909	7 234
2014Q2	79.49	27.61	39.17	13 158	4 620	6 714
2014Q3	76.79	28.32	37.94	13 024	4 800	6 681
2014Q4	68.98	29.59	41.35	12 056	5 045	7 290
2015Q1	77.28	29.53	40.34	12 551	4 920	6 950
2015Q2	78.10	27.42	40.56	13 229	4 568	6 827
2015Q3	80.81	27.59	39.62	14 030	4 708	6 886
2015Q4	74.43	28.69	40.32	13 319	4 907	7 085
2016Q1	76.98	27.01	38.81	13 681	4 601	6 888
2016Q2	85.18	28.64	38.31	14 387	4 769	6 720
2016Q3	87.22	29.13	39.34	13 953	4 671	6 814
2016Q4	82.24	24.84	40.71	13 975	4 317	7 071

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered.

Table A17: Mean real monthly earnings of mismatched and matched workers

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Race												
African	5 376	4 190	7 616	11 313	3 798	2 160	3 674	4 201	5 054	3 709	5 506	5 780
Coloured	4 777	4 708	9 000	14 457	3 539	3 169	4 821	4 470	5 109	5 262	6 426	6 245
Indian	10 265	9 370	20 700	17 306	10 261	6 781	11 277	9 506	9 888	8 191	10 791	11 638
White	17 210	18 428	20 978	20 479	13 396	16 027	10 392	12 826	14 925	12 899	15 900	14 248
Gender												
Male	10 310	9 091	13 257	17 623	4 549	3 093	4 923	5 346	8 304	6 062	8 056	7 647
Female	5 734	4 448	9 544	10 759	3 295	1 903	3 422	3 525	5 655	4 832	6 468	5 734
Age												
15 to 24 years	4 869	3 403	4 722	10 553	2 987	1 949	3 537	3 517	4 547	3 101	5 299	4 429
25 to 34 years	7 275	5 979	8 992	12 058	3 418	2 370	4 521	4 943	6 737	5 399	6 402	5 897
35 to 44 years	10 274	9 696	12 133	13 129	4 098	2 576	4 085	5 179	7 856	6 087	7 556	7 015
45 to 54 years	13 057	11 311	16 547	16 584	4 824	3 029	4 084	4 331	8 878	6 426	8 770	7 993
55 to 65 years	13 488	13 085	18 469	18 547	4 389	2 474	4 971	4 660	8 662	6 280	11 040	9 945
Province												
Western Cape	9 224	7 456	14 159	13 514	4 333	3 938	5 516	4 842	6 705	6 463	7 615	6 282
Eastern Cape	7 800	4 509	12 321	12 223	3 601	1 431	3 041	3 187	6 094	3 728	6 488	5 790
Northern Cape	7 304	6 830	12 979	15 039	2 498	2 099	3 390	4 617	5 506	5 646	6 393	6 257
Free State	7 178	7 672	9 216	10 161	2 384	1 964	3 555	2 853	4 524	4 171	6 129	5 426
KwaZulu-Natal	6 586	5 388	11 206	12 857	4 172	2 276	3 927	3 415	7 047	5 029	6 544	5 667
North West	7 079	6 518	9 925	13 973	3 984	2 406	4 032	4 633	6 167	4 464	7 128	6 777
Gauteng	10 131	10 474	11 790	15 243	5 465	4 835	5 366	7 167	9 463	7 609	8 590	8 524
Mpumalanga	7 398	5 536	9 698	11 295	3 562	2 299	4 008	4 483	6 401	4 810	7 929	6 541
Limpopo	6 810	3 437	9 301	14 074	4 810	1 859	3 396	3 376	7 239	4 002	5 336	5 346
Years of work experience												
1 to 5 years	6 321	5 459	8 640	11 284	2 949	2 030	3 751	3 696	5 394	4 489	6 161	5 455
6 to 10 years	8 820	9 030	12 540	14 881	3 505	2 803	4 068	5 603	7 322	6 751	8 621	7 570
11 to 15 years	10 282	12 294	14 848	17 975	3 936	4 165	4 836	5 533	7 951	7 684	9 829	8 808
16 to 20 years	9 510	10 415	17 026	17 379	4 907	4 469	5 815	6 318	8 895	8 491	10 100	8 055
21 to 25 years	17 273	11 927	21 042	16 226	5 226	3 947	4 493	4 500	10 495	8 368	10 404	12 591
26 to 30 years	17 009	8 278	20 205	20 180	7 540	2 359	6 412	6 592	13 898	5 029	10 970	12 397
Above 30 years	6 321	5 459	8 640	11 284	2 949	2 030	3 751	3 696	5 394	4 489	6 161	5 455
Tenure												
0 to 5 years	6 321	5 459	8 640	11 284	2 949	2 030	3 751	3 696	5 394	4 489	6 161	5 455
6 to 10 years	8 820	9 030	12 540	14 881	3 505	2 803	4 068	5 603	7 322	6 751	8 621	7 570
11 to 15 years	10 282	12 294	14 848	17 975	3 936	4 165	4 836	5 533	7 951	7 684	9 829	8 808
16 to 20 years	9 510	10 415	17 026	17 379	4 907	4 469	5 815	6 318	8 895	8 491	10 100	8 055
21 to 25 years	17 273	11 927	21 042	16 226	5 226	3 947	4 493	4 500	10 495	8 368	10 404	12 591
More than 25 years	17 009	8 278	20 205	20 180	7 540	2 359	6 412	6 592	13 898	5 029	10 970	12 397

Table A17: Continued

Variable	Overeducated				Undereducated				Adequately educated			
	1995	2002	2010	2016	1995	2002	2010	2016	1995	2002	2010	2016
Occupation												
Managers	31 675	22 791	24 012	23 444	13 036	8 878	12 820	9 656	20 744	15 985	18 168	17 828
Professionals	N/A	N/A	23 777	24 556	9 914	17 381	9 377	16 018	14 302	15 809	15 072	21 078
Technicians	18 206	16 758	16 939	13 753	9 650	4 333	7 140	7 489	12 343	11 162	11 827	10 424
Clerks	9 076	14 544	15 190	10 830	5 059	4 192	5 483	5 500	7 729	7 749	8 441	7 499
Service workers	10 326	14 306	13 825	13 128	3 527	2 028	3 140	3 689	6 251	4 414	5 694	5 715
Skilled agriculture	31 183	5 748	13 743	27 456	2 724	651	2 369	2 986	15 515	1 184	11 400	7 689
Trade workers	15 088	11 987	15 007	15 316	4 152	2 532	4 050	4 147	8 606	4 879	6 091	6 591
Operators	7 953	5 522	9 375	7 532	3 699	2 915	4 754	5 642	5 303	4 070	5 207	5 420
Elementary	4 627	3 226	4 661	5 297	2 443	1 585	2 277	2 465	2 835	2 078	3 227	3 306
Domestic workers	1 907	1 201	2 005	2 078	1 222	914	1 511	1 978	1 359	1 027	1 698	1 962
Industry												
Agriculture	5 851	4 623	6 703	22 227	1 960	985	1 941	2 626	3 080	1 377	3 977	3 782
Mining	9 732	8 936	12 598	19 640	4 742	4 377	7 292	7 420	8 233	6 363	10 255	10 033
Manufacturing	9 099	8 649	10 309	12 515	4 858	3 437	4 751	4 871	7 940	6 586	7 377	7 108
Electricity	14 085	8 499	12 595	13 750	6 351	4 004	6 911	6 414	10 870	7 858	11 106	11 421
Construction	12 034	9 192	11 791	12 698	4 289	2 492	5 048	4 561	7 684	4 101	7 080	6 545
Wholesale & retail trade	8 521	5 174	7 652	12 505	5 550	2 628	3 984	5 140	7 588	4 434	6 181	5 843
Transport	9 713	6 628	11 586	13 341	8 708	5 218	6 789	7 579	9 900	8 002	8 610	8 853
Financial intermediation	12 820	15 158	15 389	19 974	7 254	6 628	6 309	6 489	11 488	8 841	9 202	8 312
Community services	9 105	11 722	15 763	15 928	5 137	4 637	5 639	5 494	8 512	8 316	9 885	8 220
Private households	1 934	1 208	2 064	2 086	1 398	910	1 581	1 783	1 487	1 047	1 741	2 071
Others/Unspecified	9 081	15 045	27 426	N/A	4 611	2 226	N/A	N/A	6 786	8 716	22 504	17 685

Note: Only individuals whose monthly earnings were between R0 and R83 333 were considered

N/A: No observation

Table A18: Probit regressions on labour force participation

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
25 to 34 years	0.4308***	(0.0003)	0.3816***	(0.0002)	0.4133***	(0.0002)	0.4074***	(0.0002)
35 to 44 years	0.4788***	(0.0003)	0.4051***	(0.0003)	0.4308***	(0.0002)	0.4390***	(0.0002)
45 to 54 years	0.4075***	(0.0004)	0.3291***	(0.0003)	0.3874***	(0.0003)	0.3808***	(0.0002)
55 to 65 years	0.1973***	(0.0005)	0.1586***	(0.0004)	0.2234***	(0.0004)	0.2108***	(0.0003)
Female	-0.2252***	(0.0002)	-0.1653***	(0.0002)	-0.1862***	(0.0002)	-0.1592***	(0.0002)
African	-0.0058***	(0.0004)	0.1018***	(0.0004)	0.0952***	(0.0004)	0.1086***	(0.0004)
Coloured	0.1065***	(0.0006)	0.1512***	(0.0005)	0.1112***	(0.0005)	0.0769***	(0.0005)
Indian	0.0162***	(0.0008)	0.0215***	(0.0007)	0.0681***	(0.0007)	-0.0082***	(0.0007)
Eastern Cape	-0.1501***	(0.0005)	-0.0604***	(0.0005)	-0.1114***	(0.0005)	-0.0858***	(0.0004)
Northern Cape	-0.0624***	(0.0008)	-0.0203***	(0.0008)	-0.0624***	(0.0007)	-0.0608***	(0.0007)
Free State	-0.0274***	(0.0006)	0.0206***	(0.0006)	-0.0286***	(0.0006)	-0.0400***	(0.0005)
KwaZulu-Natal	-0.0831***	(0.0005)	0.0243***	(0.0005)	-0.1204***	(0.0005)	-0.1149***	(0.0004)
North West	-0.0819***	(0.0006)	-0.0401***	(0.0005)	-0.0818***	(0.0005)	-0.1235***	(0.0005)
Gauteng	0.0075***	(0.0005)	0.0357***	(0.0004)	0.0004	(0.0004)	0.0194***	(0.0004)
Mpumalanga	-0.1024***	(0.0006)	0.0024***	(0.0006)	-0.0073***	(0.0005)	-0.0033***	(0.0005)
Limpopo	-0.2230***	(0.0006)	-0.1138***	(0.0005)	-0.1345***	(0.0005)	-0.0595***	(0.0005)
Urban	0.0253***	(0.0003)	0.0559***	(0.0003)	0.1210***	(0.0003)	0.1687***	(0.0003)
Education	-0.0271***	(0.0001)	-0.0296***	(0.0001)	-0.0244***	(0.0001)	-0.0152***	(0.0001)
Education squared	0.0031***	(0.0000)	0.0037***	(0.0000)	0.0039***	(0.0000)	0.0031***	(0.0000)
No. of children aged 0-15	-0.0177***	(0.0001)	-0.0193***	(0.0001)	-0.0202***	(0.0001)	-0.0160***	(0.0001)
No. of elderly above 60	-0.0974***	(0.0002)	-0.0871***	(0.0002)	-0.0936***	(0.0002)	-0.0896***	(0.0002)
Observations	23 968 482		28 273 033		32 879 627		34 450 295	
LR chi-square (21)	7 500 000		8 000 000		11 000 000		10 000 000	
Prob. > chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.2247		0.2077		0.2484		0.2182	
Observed Prob.	0.4771		0.5679		0.5502		0.5829	
Predicted Prob. (at x-bar)	0.4682		0.5860		0.5644		0.6055	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: 15-24 years; male; white; Western Cape; rural area

Table A19: Probit regression on the likelihood of employment conditional on labour force participation

Independent variable	Average marginal effects							
	1995		2002		2010		2016	
25 to 34 years	-0.0024***	(0.0008)	-0.0007	(0.0007)	0.0765***	(0.0007)	0.0277***	(0.0007)
35 to 44 years	0.0579***	(0.0009)	0.0947***	(0.0008)	0.1697***	(0.0007)	0.1100***	(0.0008)
45 to 54 years	0.0716***	(0.0008)	0.1284***	(0.0007)	0.2027***	(0.0007)	0.1693***	(0.0008)
55 to 65 years	0.1001***	(0.0005)	0.1743***	(0.0004)	0.1877***	(0.0005)	0.1863***	(0.0005)
Female	-0.0379***	(0.0004)	-0.0444***	(0.0003)	-0.0401***	(0.0003)	-0.0229***	(0.0003)
African	-0.0970***	(0.0004)	-0.2020***	(0.0004)	-0.1425***	(0.0004)	-0.1377***	(0.0004)
Coloured	-0.0497***	(0.0005)	-0.1157***	(0.0005)	-0.0735***	(0.0005)	-0.0884***	(0.0005)
Indian	-0.0147***	(0.0007)	-0.0640***	(0.0006)	-0.0389***	(0.0006)	-0.0550***	(0.0006)
Eastern Cape	-0.0207***	(0.0005)	-0.0286***	(0.0005)	0.0311***	(0.0005)	0.0207***	(0.0004)
Northern Cape	-0.0339***	(0.0008)	-0.0343***	(0.0007)	0.0071***	(0.0007)	-0.0314***	(0.0007)
Free State	0.0367***	(0.0006)	-0.0264***	(0.0005)	-0.0026***	(0.0005)	-0.0537***	(0.0005)
KwaZulu-Natal	-0.0212***	(0.0005)	-0.0566***	(0.0004)	0.0661***	(0.0005)	0.0401***	(0.0004)
North West	0.0052***	(0.0006)	-0.0299***	(0.0005)	0.0166***	(0.0005)	-0.0139***	(0.0005)
Gauteng	0.0032***	(0.0005)	-0.0463***	(0.0004)	-0.0078***	(0.0004)	-0.0464***	(0.0003)
Mpumalanga	0.0048***	(0.0006)	-0.0269***	(0.0005)	0.0168***	(0.0005)	-0.0085***	(0.0005)
Limpopo	0.0037***	(0.0007)	-0.0218***	(0.0005)	0.0593***	(0.0005)	0.0597***	(0.0005)
Urban	-0.0493***	(0.0003)	-0.0698***	(0.0003)	0.0019***	(0.0003)	0.0076***	(0.0004)
Education	-0.0091***	(0.0001)	-0.0168***	(0.0001)	-0.0206***	(0.0001)	-0.0243***	(0.0001)
Education squared	0.0009***	(0.0000)	0.0011***	(0.0000)	0.0017***	(0.0000)	0.0018***	(0.0000)
Lambda	-0.5758***	(0.0010)	-0.5881***	(0.0009)	-0.4856***	(0.0008)	-0.5372***	(0.0009)
Observations	23 968 482		28 273 033		32 879 627		34 450 295	
LR chi-square (21)	7 700 000		7 800 000		9 900 000		10 000 000	
Prob. > chi-square	0.0000		0.0000		0.0000		0.0000	
Pseudo R squared	0.2412		0.2058		0.2230		0.2182	
Observed Prob.	0.3930		0.3946		0.4099		0.4214	
Predicted Prob. (at x-bar)	0.3453		0.3567		0.3692		0.3800	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: 15-24 years; male; white; Western Cape; rural area

Table A20: Numerous wage models with Heckman correction for sample selection bias, before including the additional explanatory variables

Independent variable	Dependent variable: Log hourly real wage							
	1995		2002		2010		2016	
[A] Mincer model								
Education	0.0200***	(0.0043)	0.0477***	(0.0059)	-0.0166**	(0.0075)	-0.0587***	(0.0112)
Education squared	0.0102***	(0.0003)	0.0078***	(0.0004)	0.0091***	(0.0004)	0.0101***	(0.0006)
Experience	0.0164***	(0.0017)	-0.0050**	(0.0024)	-0.0276***	(0.0027)	-0.0140***	(0.0040)
Experience squared	0.0000	(0.0000)	0.0004***	(0.0000)	0.0008***	(0.0001)	0.0005***	(0.0001)
Lambda	-0.4746***	(0.0145)	-0.9449***	(0.0244)	-0.7413***	(0.0262)	-0.5689***	(0.0385)
Constant	2.0512***	(0.0336)	2.1519***	(0.0496)	2.9139***	(0.0618)	2.8444***	(0.0898)
Observations	30 227		22 042		19 487		13 908	
F Stat.	5157.14		3467.96		1880.15		676.13	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.4604		0.4404		0.3255		0.1956	
Adj. R-squared	0.4603		0.4402		0.3253		0.1953	
Root MSE	0.7856		0.9157		0.9007		1.0591	
[B] Verdugo & Verdugo model								
<i>Overeducation</i>	-0.4550***	(0.0143)	-0.6224***	(0.0198)	-0.5233***	(0.0233)	-0.4903***	(0.0425)
<i>Undereducation</i>	0.5493***	(0.0190)	0.4559***	(0.0278)	0.3751***	(0.0273)	0.5087***	(0.0385)
Education	0.1025***	(0.0052)	0.1107***	(0.0074)	-0.0084	(0.0088)	-0.0243*	(0.0133)
Education squared	0.0074***	(0.0003)	0.0065***	(0.0004)	0.0115***	(0.0005)	0.0112***	(0.0007)
Experience	0.0152***	(0.0017)	-0.0066***	(0.0023)	-0.0233***	(0.0027)	-0.0103***	(0.0040)
Experience squared	-0.0000	(0.0000)	0.0004***	(0.0000)	0.0007***	(0.0001)	0.0004***	(0.0001)
Lambda	-0.4524***	(0.0141)	-0.9029***	(0.0238)	-0.6815***	(0.0259)	-0.5282***	(0.0382)
Constant	1.5748***	(0.0372)	1.7128***	(0.0570)	2.4812***	(0.0688)	2.2581***	(0.1009)
Observations	30 227		22 042		19 487		13 908	
F Stat.	4182.63		2797.59		1486.31		535.68	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.4921		0.4706		0.3482		0.2125	
Adj. R-squared	0.4920		0.4704		0.3479		0.2121	
Root MSE	0.7622		0.8907		0.8855		1.0480	
[C] Duncan & Hoffman model								
<i>Overeducated</i>	0.1585***	(0.0035)	0.0904***	(0.0048)	0.0873***	(0.0059)	0.0905***	(0.0088)
<i>Undereducated</i>	-0.0675***	(0.0026)	-0.1067***	(0.0034)	-0.0708***	(0.0040)	-0.0339***	(0.0057)
<i>Required education</i>	0.2632***	(0.0021)	0.2631***	(0.0032)	0.2767***	(0.0043)	0.2769***	(0.0061)
Experience	0.0114***	(0.0016)	-0.0143***	(0.0022)	-0.0298***	(0.0026)	-0.0128***	(0.0038)
Experience squared	0.0000	(0.0000)	0.0005***	(0.0000)	0.0008***	(0.0000)	0.0004***	(0.0001)
Lambda	-0.4595***	(0.0134)	-0.9248***	(0.0222)	-0.7277***	(0.0246)	-0.5445***	(0.0365)
Constant	0.8465***	(0.0397)	1.1328***	(0.0627)	1.0210***	(0.0781)	0.4749***	(0.1147)
Observations	30 227		22 042		19 487		13 908	
F Stat.	5362.99		3635.27		2049.34		773.51	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.5157		0.4975		0.3870		0.2503	
Adj. R-squared	0.5156		0.4973		0.3868		0.2500	
Root MSE	0.7443		0.8677		0.8587		1.0225	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Table A21: Numerous earnings models with Heckman correction for sample selection bias, before including the additional explanatory variables

Independent variable	Dependent variable: Log monthly real earnings							
	1995		2002		2010		2016	
[A] Mincer model								
Education	0.0282***	(0.0041)	0.0594***	(0.0057)	-0.0061	(0.0074)	-0.0284**	(0.0111)
Education squared	0.0090***	(0.0003)	0.0066***	(0.0004)	0.0081***	(0.0004)	0.0085***	(0.0006)
Experience	0.0096***	(0.0016)	-0.0108***	(0.0023)	-0.0339***	(0.0027)	-0.0210***	(0.0040)
Experience squared	0.0001***	(0.0000)	0.0005***	(0.0000)	0.0009***	(0.0001)	0.0006***	(0.0001)
Lambda	-0.6035***	(0.0139)	-1.0802***	(0.0235)	-0.8562***	(0.0258)	-0.7071***	(0.0382)
Constant	7.4655***	(0.0322)	7.6036***	(0.0478)	8.3024***	(0.0608)	8.1070***	(0.0891)
Observations	30 227		22 072		19 487		13 909	
F Stat.	5611.28		3807.88		2007.02		755.32	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.4814		0.4632		0.3400		0.2136	
Adj. R-squared	0.4813		0.4631		0.3398		0.2133	
Root MSE	0.7516		0.8827		0.8866		1.0511	
[B] Verdugo & Verdogo model								
<i>Overeducation</i>	-0.4757***	(0.0136)	-0.6194***	(0.0190)	-0.5736***	(0.0229)	-0.5962***	(0.0420)
<i>Undereducation</i>	0.5231***	(0.0181)	0.4878***	(0.0267)	0.4310***	(0.0268)	0.6178***	(0.0380)
Education	0.1060***	(0.0049)	0.1280***	(0.0071)	0.0061	(0.0087)	0.0133	(0.0132)
Education squared	0.0065***	(0.0003)	0.0050***	(0.0004)	0.0106***	(0.0005)	0.0097***	(0.0007)
Experience	0.0082***	(0.0016)	-0.0122***	(0.0022)	-0.0292***	(0.0026)	-0.0165***	(0.0039)
Experience squared	0.0001***	(0.0000)	0.0005***	(0.0000)	0.0008***	(0.0001)	0.0005***	(0.0001)
Lambda	-0.5819***	(0.0134)	-1.0359***	(0.0228)	-0.7903***	(0.0253)	-0.6576***	(0.0377)
Constant	7.0153***	(0.0355)	7.1284***	(0.0548)	7.8048***	(0.0674)	7.3951***	(0.0996)
Observations	30,227		22,072		19,487		13,909	
F Stat.	4584.05		3091		1621.87		621.27	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.5150		0.4951		0.3682		0.2383	
Adj. R-squared	0.5149		0.4950		0.3680		0.2379	
Root MSE	0.7269		0.8561		0.8675		1.0346	
[C] Duncan & Hoffman model								
<i>Overeducated</i>	0.1413***	(0.0033)	0.0816***	(0.0046)	0.0747***	(0.0057)	0.0726***	(0.0087)
<i>Undereducated</i>	-0.0675***	(0.0024)	-0.1008***	(0.0033)	-0.0626***	(0.0038)	-0.0358***	(0.0056)
<i>Required education</i>	0.2499***	(0.0020)	0.2576***	(0.0030)	0.2803***	(0.0041)	0.2884***	(0.0060)
Experience	0.0054***	(0.0015)	-0.0170***	(0.0021)	-0.0332***	(0.0025)	-0.0152***	(0.0037)
Experience squared	0.0001***	(0.0000)	0.0005***	(0.0000)	0.0008***	(0.0000)	0.0004***	(0.0001)
Lambda	-0.5820***	(0.0128)	-1.0224***	(0.0212)	-0.8098***	(0.0239)	-0.6402***	(0.0357)
Constant	6.3480***	(0.0378)	6.5618***	(0.0598)	6.3232***	(0.0758)	5.6800***	(0.1124)
Observations	30 227		22 072		19 487		13 909	
F Stat.	5890.88		4101.51		2320.76		927.26	
Prob. > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.5391		0.5273		0.4168		0.2858	
Adj. R-squared	0.5390		0.5271		0.4167		0.2855	
Root MSE	0.7086		0.8284		0.8334		1.0018	

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Table A22: Mincer wage model with Heckman correction for sample bias – Africans only

Independent variable	Dependent variable: Log real hourly wage							
	1995		2002		2010		2016	
25 to 34 years	-0.0496	(0.0435)	-0.2818***	(0.0498)	-0.1349**	(0.0598)	-0.0397	(0.0836)
35 to 44 years	-0.0976*	(0.0586)	-0.4002***	(0.0710)	-0.2083***	(0.0801)	-0.0756	(0.1128)
45 to 54 years	-0.0770	(0.0677)	-0.4499***	(0.0820)	-0.2805***	(0.0942)	-0.1420	(0.1343)
55 to 65 years	-0.0758	(0.0755)	-0.4526***	(0.0921)	-0.2726***	(0.1016)	-0.0387	(0.1452)
Female	-0.1661***	(0.0206)	-0.1222***	(0.0221)	-0.1415***	(0.0224)	-0.1387***	(0.0281)
Eastern Cape	-0.0692**	(0.0318)	-0.3660***	(0.0353)	-0.1803***	(0.0359)	-0.3250***	(0.0512)
Northern Cape	-0.0570	(0.0544)	-0.2189**	(0.0614)	-0.0662	(0.0615)	-0.2016**	(0.1004)
Free State	-0.5313***	(0.0297)	-0.5089***	(0.0357)	-0.2537***	(0.0381)	-0.3800***	(0.0572)
KwaZulu-Natal	0.0258	(0.0288)	-0.1684***	(0.0321)	-0.1380***	(0.0329)	-0.3977***	(0.0486)
North West	-0.0612**	(0.0300)	-0.1799***	(0.0360)	-0.0515	(0.0389)	-0.1381**	(0.0606)
Gauteng	0.0770***	(0.0267)	-0.0393	(0.0311)	-0.0133	(0.0307)	-0.1339***	(0.0446)
Mpumalanga	-0.0481	(0.0323)	-0.1823***	(0.0359)	0.0052	(0.0372)	-0.1614***	(0.0528)
Limpopo	0.1788***	(0.0353)	-0.3118***	(0.0376)	-0.2017***	(0.0385)	-0.3326***	(0.0548)
Mining	0.5361***	(0.0279)	0.8229***	(0.0364)	0.6605***	(0.0512)	0.5737***	(0.0871)
Manufacturing	0.5525***	(0.0229)	0.6404***	(0.0303)	0.3101***	(0.0379)	0.2662***	(0.0603)
Water & electricity	0.7647***	(0.0603)	0.7694***	(0.0701)	0.3511***	(0.0873)	0.4699***	(0.1148)
Wholesale & retail	0.4843***	(0.0309)	0.6664***	(0.0366)	0.2781***	(0.0413)	0.1546**	(0.0614)
Construction	0.4757***	(0.0226)	0.4628***	(0.0288)	0.1682***	(0.0366)	0.1274**	(0.0574)
Communication	0.6139***	(0.0301)	0.6233***	(0.0377)	0.2235***	(0.0437)	0.2113***	(0.0682)
Finance	0.6146***	(0.0336)	0.6712***	(0.0358)	0.2262***	(0.0388)	0.1508**	(0.0588)
Community services	0.5297***	(0.0418)	0.5792***	(0.0355)	0.2730***	(0.0414)	0.2034***	(0.0593)
Private households	0.1077***	(0.0396)	0.3542***	(0.0651)	0.1584***	(0.0490)	0.0601	(0.0786)
Managers	0.0890*	(0.0530)	0.2631***	(0.0579)	0.3360***	(0.0491)	-0.0661	(0.0732)
Technicians	0.0407	(0.0402)	-0.0731	(0.0478)			-0.5876***	(0.0603)
Clerks	-0.2383***	(0.0434)	-0.2996***	(0.0517)	-0.1895***	(0.0307)	-0.8377***	(0.0615)
Service workers	-0.4053***	(0.0436)	-0.7295***	(0.0510)	-0.5871***	(0.0294)	-1.1763***	(0.0608)
Skilled agriculture	-0.3360***	(0.0794)	-0.5341***	(0.0661)	-0.6787***	(0.1254)	-1.1665***	(0.2210)
Trade workers	-0.3179***	(0.0464)	-0.4991***	(0.0538)	-0.3743***	(0.0348)	-0.9734***	(0.0676)
Operators	-0.3628***	(0.0455)	-0.5417***	(0.0535)	-0.4903***	(0.0336)	-1.2163***	(0.0683)
Elementary workers	-0.5105***	(0.0446)	-0.7139***	(0.0516)	-0.5850***	(0.0297)	-1.3032***	(0.0622)
Domestic workers	-1.1654***	(0.0753)	-0.9216***	(0.0839)	-0.6166***	(0.0535)	-1.2119***	(0.0927)
Employees	-0.3822***	(0.0460)	-0.0662**	(0.0275)				
Public	0.1957***	(0.0397)	0.4434***	(0.0290)	0.3397***	(0.0290)	0.1057***	(0.0344)
Urban	0.1680***	(0.0134)	0.1737***	(0.0156)	0.1908***	(0.0208)	0.1974***	(0.0342)
Informal	-0.1731***	(0.0413)	-0.4760***	(0.0261)	-0.3472***	(0.0260)	-0.2693***	(0.0348)
Union member	0.1499***	(0.0125)	0.3327***	(0.0181)	0.3110***	(0.0181)	0.2693***	(0.0254)
Education	-0.0131**	(0.0056)	0.0036	(0.0074)	-0.0194**	(0.0090)	-0.0157	(0.0137)
Education squared	0.0059***	(0.0004)	0.0046***	(0.0005)	0.0051***	(0.0006)	0.0038***	(0.0008)
Experience	0.0274***	(0.0031)	0.0333***	(0.0038)	0.0110***	(0.0042)	0.0118*	(0.0061)
Experience squared	-0.0003***	(0.0001)	-0.0003***	(0.0001)	0.0000	(0.0001)	-0.0000	(0.0001)
lambda	-0.1227***	(0.0413)	-0.2838***	(0.0554)	-0.2305***	(0.0618)	-0.1230	(0.0867)
Constant	2.5571***	(0.0983)	2.1918***	(0.1160)	2.7560***	(0.1325)	3.4745***	(0.2045)
Observations	17 439		15 220		11 568		9 410	
R-squared	0.5763		0.5696		0.4735		0.3293	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reference groups: 15-24 years; male; white; western cape; skilled agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Table A23: V & V wage model with Heckman correction for sample bias – Africans only

Independent variable	Dependent variable: Log hourly real wage							
	1995		2002		2010		2016	
25 to 34 years	-0.0487	(0.0435)	-0.2839***	(0.0498)	-0.1266**	(0.0599)	-0.0373	(0.0838)
35 to 44 years	-0.0963	(0.0586)	-0.4030***	(0.0711)	-0.1981**	(0.0802)	-0.0722	(0.1130)
45 to 54 years	-0.0752	(0.0678)	-0.4538***	(0.0821)	-0.2706***	(0.0942)	-0.1382	(0.1346)
55 to 65 years	-0.0742	(0.0755)	-0.4571***	(0.0921)	-0.2673***	(0.1016)	-0.0355	(0.1454)
Female	-0.1657***	(0.0206)	-0.1223***	(0.0222)	-0.1451***	(0.0224)	-0.1396***	(0.0282)
Eastern Cape	-0.0702**	(0.0318)	-0.3674***	(0.0354)	-0.1814***	(0.0359)	-0.3247***	(0.0512)
Northern Cape	-0.0576	(0.0544)	-0.2198***	(0.0614)	-0.0689	(0.0615)	-0.2022**	(0.1004)
Free State	-0.5327***	(0.0297)	-0.5106***	(0.0357)	-0.2544***	(0.0381)	-0.3807***	(0.0573)
KwaZulu-Natal	0.0262	(0.0288)	-0.1686***	(0.0321)	-0.1386***	(0.0329)	-0.3979***	(0.0486)
North West	-0.0618**	(0.0300)	-0.1816***	(0.0360)	-0.0528	(0.0389)	-0.1388**	(0.0607)
Gauteng	0.0769***	(0.0267)	-0.0407	(0.0311)	-0.0130	(0.0307)	-0.1342***	(0.0446)
Mpumalanga	-0.0477	(0.0323)	-0.1833***	(0.0359)	0.0056	(0.0372)	-0.1615***	(0.0529)
Limpopo	0.1789***	(0.0353)	-0.3128***	(0.0376)	-0.2031***	(0.0385)	-0.3325***	(0.0549)
Mining	0.5395***	(0.0280)	0.8261***	(0.0364)	0.6681***	(0.0513)	0.5724***	(0.0871)
Manufacturing	0.5554***	(0.0230)	0.6448***	(0.0303)	0.3158***	(0.0380)	0.2646***	(0.0603)
Water & electricity	0.7693***	(0.0603)	0.7717***	(0.0701)	0.3564***	(0.0873)	0.4674***	(0.1149)
Wholesale & retail	0.4878***	(0.0309)	0.6697***	(0.0366)	0.2819***	(0.0414)	0.1536**	(0.0614)
Construction	0.4785***	(0.0226)	0.4655***	(0.0289)	0.1730***	(0.0367)	0.1256**	(0.0575)
Communication	0.6171***	(0.0301)	0.6268***	(0.0377)	0.2276***	(0.0437)	0.2093***	(0.0682)
Finance	0.6169***	(0.0336)	0.6725***	(0.0358)	0.2281***	(0.0388)	0.1493**	(0.0588)
Community service	0.5329***	(0.0419)	0.5825***	(0.0355)	0.2758***	(0.0414)	0.2018***	(0.0594)
Private households	0.1088***	(0.0396)	0.3536***	(0.0651)	0.1572***	(0.0490)	0.0601	(0.0786)
Managers	0.1157**	(0.0549)	0.2948***	(0.0605)	0.1916***	(0.0571)	-0.0563	(0.0746)
Technicians	0.0570	(0.0412)	-0.0508	(0.0496)	-0.1366***	(0.0428)	-0.5758***	(0.0628)
Clerks	-0.2127***	(0.0454)	-0.2739***	(0.0538)	-0.3273***	(0.0431)	-0.8254***	(0.0642)
Service workers	-0.3785***	(0.0464)	-0.7035***	(0.0541)	-0.7340***	(0.0429)	-1.1621***	(0.0645)
Skilled agriculture	-0.3019***	(0.0819)	-0.5032***	(0.0727)	-0.8274***	(0.1299)	-1.1487***	(0.2227)
Trade workers	-0.2888***	(0.0498)	-0.4703***	(0.0581)	-0.5249***	(0.0484)	-0.9565***	(0.0722)
Operators	-0.3293***	(0.0503)	-0.5071***	(0.0600)	-0.6412***	(0.0474)	-1.1994***	(0.0729)
Elementary workers	-0.4739***	(0.0515)	-0.6783***	(0.0594)	-0.7307***	(0.0470)	-1.2842***	(0.0685)
Domestic workers	-1.1296***	(0.0799)	-0.8827***	(0.0901)	-0.7669***	(0.0649)	-1.1886***	(0.0991)
Employees	-0.3845***	(0.0460)	-0.0677**	(0.0275)				
Public	0.1941***	(0.0397)	0.4395***	(0.0291)	0.3368***	(0.0290)	0.1059***	(0.0344)
Urban	0.1682***	(0.0134)	0.1735***	(0.0156)	0.1921***	(0.0208)	0.1981***	(0.0342)
Informal	-0.1723***	(0.0413)	-0.4738***	(0.0261)	-0.3472***	(0.0259)	-0.2690***	(0.0349)
Union member	0.1493***	(0.0125)	0.3324***	(0.0181)	0.3113***	(0.0181)	0.2689***	(0.0254)
Overeducation	-0.0373*	(0.0220)	-0.0422	(0.0270)	-0.0296	(0.0286)	-0.0296	(0.0498)
Undereducation	-0.0145	(0.0239)	-0.0385	(0.0300)	-0.0908***	(0.0323)	0.0196	(0.0473)
Education	-0.0175**	(0.0069)	-0.0054	(0.0089)	-0.0366***	(0.0103)	-0.0160	(0.0162)
Education squared	0.0063***	(0.0005)	0.0052***	(0.0006)	0.0058***	(0.0007)	0.0040***	(0.0010)
Experience	0.0272***	(0.0031)	0.0329***	(0.0038)	0.0109***	(0.0042)	0.0118*	(0.0061)
Experience squared	-0.0003***	(0.0001)	-0.0002***	(0.0001)	0.0000	(0.0001)	-0.0000	(0.0001)
lambda	-0.1231***	(0.0413)	-0.2881***	(0.0554)	-0.2204***	(0.0619)	-0.1194	(0.0871)
Constant	2.5396***	(0.1060)	2.2085***	(0.1267)	2.9920***	(0.1451)	3.4318***	(0.2187)
Observations	17,439		15,220		11,568		9,410	
R-squared	0.5764		0.5697		0.4740		0.3293	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reference groups: 15-24 years; male; white; western cape; skilled agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Table A24: D & H wage model with Heckman correction for sample bias – Africans only

Independent variable	Dependent variable: Log real hourly wage							
	1995		2002		2010		2016	
25 to 34 years	-0.2099***	(0.0417)	-0.4151***	(0.0480)	-0.3204***	(0.0577)	-0.0963	(0.0819)
34 to 44 years	-0.2934***	(0.0567)	-0.5768***	(0.0688)	-0.4283***	(0.0780)	-0.1415	(0.1111)
45 to 54 years	-0.2822***	(0.0659)	-0.6345***	(0.0800)	-0.5291***	(0.0921)	-0.2206*	(0.1323)
55 to 65 years	-0.2319***	(0.0748)	-0.6049***	(0.0910)	-0.4824***	(0.1004)	-0.1110	(0.1436)
Female	-0.0793***	(0.0194)	-0.0466**	(0.0206)	-0.0731***	(0.0216)	-0.1179***	(0.0274)
Eastern Cape	0.0075	(0.0313)	-0.3291***	(0.0352)	-0.1681***	(0.0360)	-0.3163***	(0.0512)
Northern Cape	-0.0079	(0.0545)	-0.1812***	(0.0614)	-0.0578	(0.0617)	-0.1894*	(0.1004)
Free State	-0.5272***	(0.0298)	-0.4990***	(0.0358)	-0.2545***	(0.0382)	-0.3668***	(0.0571)
KwaZulu-Natal	0.0764***	(0.0286)	-0.1426***	(0.0320)	-0.1319***	(0.0330)	-0.3887***	(0.0486)
North West	-0.0260	(0.0300)	-0.1431***	(0.0358)	-0.0396	(0.0390)	-0.1213**	(0.0604)
Gauteng	0.0880***	(0.0268)	-0.0200	(0.0310)	-0.0138	(0.0308)	-0.1269***	(0.0446)
Mpumalanga	0.0007	(0.0322)	-0.1579***	(0.0359)	0.0012	(0.0373)	-0.1588***	(0.0529)
Limpopo	0.2762***	(0.0346)	-0.2511***	(0.0370)	-0.1910***	(0.0386)	-0.3301***	(0.0549)
Mining	0.5146***	(0.0281)	0.7987***	(0.0364)	0.6333***	(0.0513)	0.5645***	(0.0872)
Manufacturing	0.5490***	(0.0231)	0.6296***	(0.0303)	0.2923***	(0.0380)	0.2559***	(0.0603)
Water & electricity	0.7500***	(0.0606)	0.7633***	(0.0703)	0.3401***	(0.0876)	0.4641***	(0.1149)
Wholesale & retail	0.4733***	(0.0311)	0.6531***	(0.0366)	0.2543***	(0.0414)	0.1475**	(0.0614)
Construction	0.4641***	(0.0227)	0.4536***	(0.0289)	0.1480***	(0.0366)	0.1157**	(0.0574)
Communication	0.6024***	(0.0302)	0.6109***	(0.0378)	0.2054***	(0.0438)	0.2020***	(0.0682)
Finance	0.6264***	(0.0338)	0.6667***	(0.0359)	0.2089***	(0.0388)	0.1447**	(0.0588)
Community services	0.5115***	(0.0421)	0.5678***	(0.0356)	0.2589***	(0.0415)	0.1975***	(0.0594)
Private households	0.1011**	(0.0398)	0.3471***	(0.0652)	0.1464***	(0.0492)	0.0642	(0.0786)
Managers	0.4034***	(0.0450)	0.5034***	(0.0515)	0.3710***	(0.0538)	0.3560***	(0.0676)
Technicians	0.2423***	(0.0342)	0.1530***	(0.0405)	-0.0323	(0.0384)	-0.1673***	(0.0513)
Clerks	0.0585	(0.0370)	-0.0360	(0.0438)	-0.1423***	(0.0364)	-0.3343***	(0.0513)
Service workers	0.0932**	(0.0402)	-0.2934***	(0.0468)	-0.3709***	(0.0354)	-0.4676***	(0.0534)
Skilled agriculture	0.0044	(0.0733)	0.3459***	(0.0500)	-0.3003**	(0.1276)	-0.2845	(0.2204)
Trade workers	0.3078***	(0.0450)	0.1249***	(0.0568)	-0.0033	(0.0436)	-0.0843	(0.0658)
Operators	0.4199***	(0.0501)	0.1426***	(0.0592)	-0.1519***	(0.0420)	-0.3654***	(0.0655)
Elementary workers	0.5406***	(0.0577)	0.1014	(0.0632)	-0.0814**	(0.0405)	-0.2361***	(0.0623)
Employees	-0.3667***	(0.0462)	-0.0689**	(0.0276)				
Public	0.2146***	(0.0399)	0.4656***	(0.0290)	0.3609***	(0.0290)	0.1144***	(0.0344)
Urban	0.1772***	(0.0135)	0.1821**	(0.0156)	0.1490***	(0.0207)	0.1777***	(0.0337)
Informal	-0.1842***	(0.0414)	-0.4806***	(0.0261)	-0.3521***	(0.0260)	-0.2716***	(0.0349)
Union member	0.1540***	(0.0125)	0.3390***	(0.0181)	0.3186***	(0.0181)	0.2707***	(0.0254)
Overeducation	0.0792***	(0.0047)	0.0668***	(0.0060)	0.0505***	(0.0081)	0.0735***	(0.0118)
Undereducation	-0.0428***	(0.0034)	-0.0552***	(0.0041)	-0.0471***	(0.0052)	-0.0274***	(0.0076)
Required education	0.2096***	(0.0081)	0.1827***	(0.0095)	0.1823***	(0.0112)	0.2371***	(0.0143)
Experience	0.0200***	(0.0031)	0.0251***	(0.0037)	0.0031	(0.0041)	0.0075	(0.0060)
Experience squared	-0.0001***	(0.0000)	-0.0001	(0.0001)	0.0002***	(0.0001)	0.0001	(0.0001)
lambda	-0.3457***	(0.0374)	-0.5264***	(0.0494)	-0.5026***	(0.0574)	-0.2155***	(0.0821)
Constant	0.7872***	(0.1066)	0.8253***	(0.1551)	1.5031***	(0.1881)	0.6341**	(0.2790)
Observations	17 439		15 220		11 568		9 410	
R-squared	0.5726		0.5676		0.4701		0.3285	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reference groups: 15-24 years; male; white; western cape; skilled agriculture; professionals; self-employed; private sector; rural area; formal sector; not a trade union member

Figure A1: Number and percentage of time-related underemployed workers (40-hour threshold)

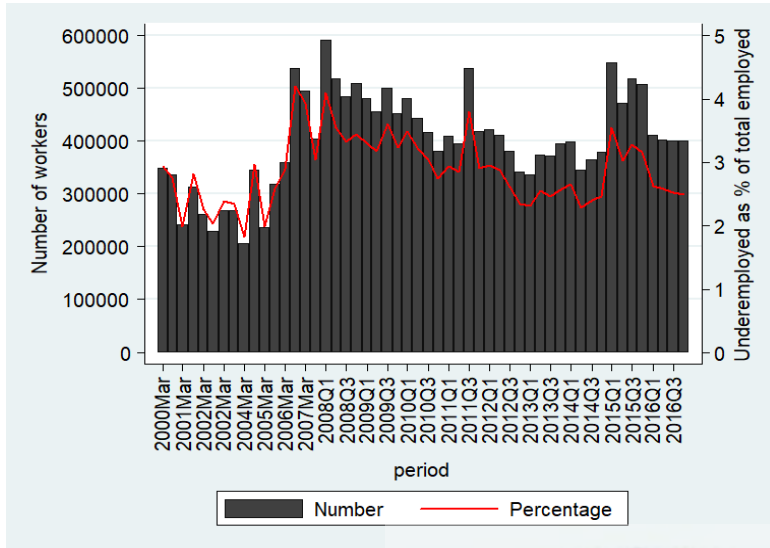


Figure A2: Number and percentage of overeducated workers (Job analysis approach)

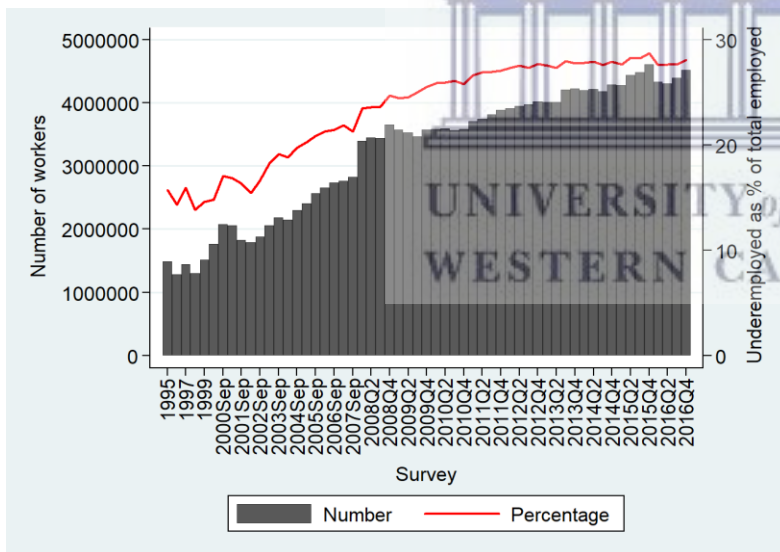


Figure A3: Number and percentage of overeducated workers (statistical method-mode)

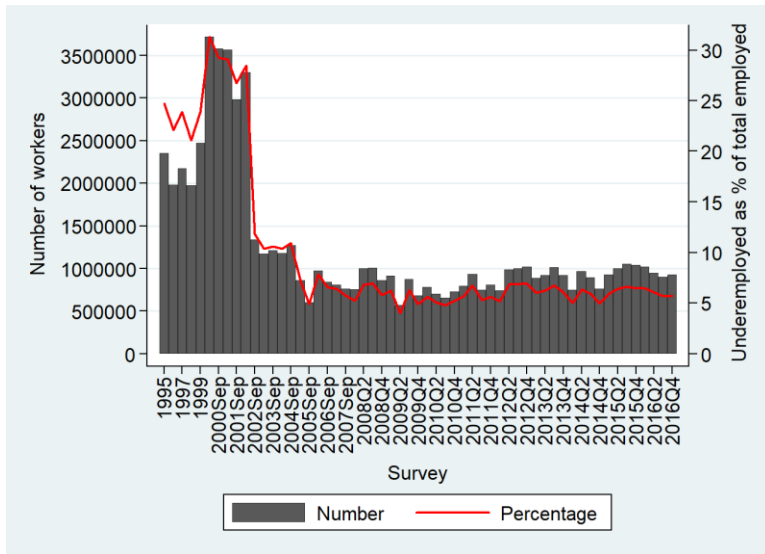


Figure A4: Relationship between wages and education (2008-2016)

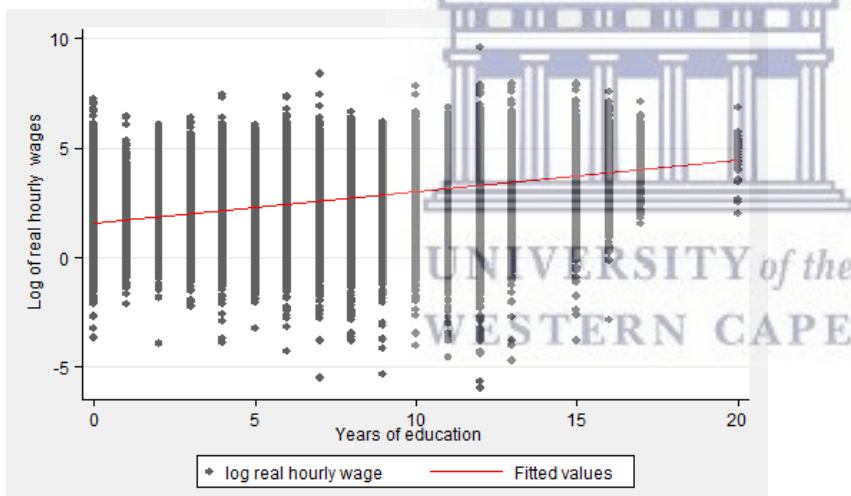


Table A25: Number and percentage of underemployed workers

Wave	Employed	Overeducated	Income-related underemployed				
			Earn less than 125% of the poverty line		Earn 20% less than previous period		
			Number	Percentage	Number	Percentage	
Wave 1	13 709 476	1 183 982	8.64	1 941 417	14.16		
Wave 2	13 047 199	1 358 757	10.41	1 960 554	15.03	2 295 366	17.59
Wave 3	14 995 896	1 403 863	9.36	1 766 828	11.78	2 669 915	17.80
Wave 4	17 368 336	1 629 886	9.38	2 369 523	13.64	2 413 347	13.90

Table A26: Number of workers employed across the waves

	Unweighted	Weighted
Employed in both waves 1 & 2	2 956	8 590 144
Employed in both waves 2 & 3	3 213	9 617 214
Employed in both waves 3 & 4	4 357	9 855 460
Employed in both waves 1 & 4	3 127	8 352 474
Employed in all four waves	1 564	4 290 909

Table A27: Number and percentage of underemployed workers: NIDS versus QLFS

	Overeducated		Income-related underemployed					
	NIDS		QLFS		NIDS		QLFS	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2008	1 183 982	8.64	1 663 313	11.25	1 941 417	14.16	N/A	N/A
2010	1 358 757	10.41	1 656 817	11.91	1 960 554	15.03	904 567	6.50
2012	1 403 863	9.36	1 287 950	8.86	1 766 828	11.78	1 135 576	7.81
2014	1 629 886	9.38	1 164 103	7.58	2 369 523	13.64	1 456 747	9.49

Table A28: Relationship between real per capita income decile and income-related underemployment (earn 125% < poverty threshold)

Deciles	Proportion (%)			
	Wave 1	Wave 2	Wave 3	Wave 4
1	9.68	10.30	13.56	14.55
2	17.54	14.54	17.78	16.23
3	13.34	16.10	13.93	19.28
4	15.61	14.35	17.15	14.95
5	15.49	13.04	14.05	11.44
6	12.89	12.38	11.11	8.82
7	7.51	9.55	7.64	5.52
8	3.61	3.71	3.07	4.33
9	2.09	4.18	1.44	3.36
10	2.25	1.86	0.27	1.53
	100.00	100.00	100.00	100.00

Table A29: Relationship between real per capita income decile and income-related underemployment (earn 20% < previous income)

Deciles	Proportion (%)		
	Wave 2	Wave 3	Wave 4
1	3.63	4.65	4.47
2	3.73	6.15	7.51
3	5.86	6.29	9.91
4	6.97	8.68	11.11
5	8.93	10.19	8.86
6	8.46	9.68	11.35
7	13.09	10.99	10.69
8	14.00	13.72	12.70
9	17.15	16.69	14.09
10	18.19	12.96	9.31
	100.00	100.00	100.00

Table A30: Probability of income-related underemployment (earn 125% < poverty threshold), by real per capita income decile

Deciles	Probability (%)			
	Wave 1	Wave 2	Wave 3	Wave 4
1	87.42	73.22	74.48	69.30
2	68.24	65.73	51.74	45.55
3	41.41	46.06	33.02	40.76
4	34.78	33.83	27.41	25.68
5	28.08	22.33	18.48	16.97
6	17.04	17.53	12.25	11.35
7	9.42	10.93	7.35	6.04
8	3.59	3.84	2.48	4.23
9	1.89	3.72	1.01	3.02
10	2.01	1.59	0.19	1.41

Table A31: Probability of income-related underemployment (earn 20% < previous income), by real per capita income decile

Deciles	Probability (%)		
	Wave 2	Wave 3	Wave 4
1	72.97	64.61	51.51
2	47.95	44.10	44.04
3	34.01	39.37	39.21
4	32.66	38.26	38.53
5	31.18	33.03	25.35
6	22.00	25.81	26.16
7	26.98	23.45	21.39
8	24.11	25.92	20.22
9	26.17	25.42	20.60
10	25.93	20.94	14.88

Table A32: Relationship between the two types of income-related underemployment

Wave 2		
Earn 20% less than previous period	Earn 125% less than poverty line	
	No	Yes
No	95.47	4.53
Yes	75.65	24.35

Wave 3		
Earn 20% less than previous period	Earn 125% less than poverty line	
	No	Yes
No	95.95	4.05
Yes	79.57	20.43

Wave 4		
Earn 20% less than previous period	Earn 125% less than poverty line	
	No	Yes
No	96.29	3.71
Yes	75.62	24.38

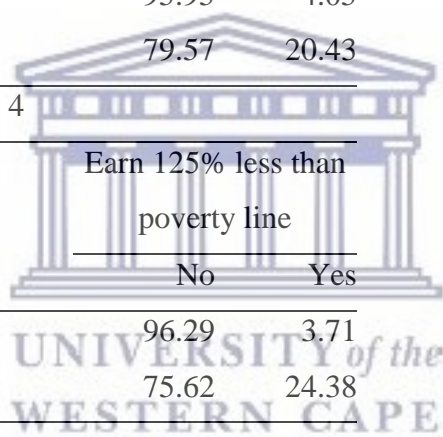


Table A33: Transitory of permanent nature of underemployment

	Overeducation			Income-related underemployment					
	Never	Transitory	Chronic	Earnings < 20% of previous income			Earnings < 125% of poverty threshold		
				Never	Transitory	Chronic	Never	Transitory	Chronic
Labour market status									
Employee	86.92	87.18	92.28	95.36	84.36	53.16	92.14	72.12	32.86
Self-employed	9.44	9.81	7.72	3.42	11.58	39.74	6.61	17.25	43.30
Casual workers	3.39	2.53	0.00	1.22	3.92	7.10	1.25	10.02	23.83
Unclassified	0.25	0.48	0.00	0.00	0.14	0.00	0.00	0.61	0.00
Industry									
Agriculture	6.84	3.72	2.21	6.25	6.04	0.00	5.19	11.23	4.01
Mining	3.48	12.55	8.56	8.94	3.48	0.00	6.25	0.74	0.00
Manufacturing	11.72	8.38	11.86	12.29	10.68	0.00	11.81	8.65	4.11
Utilities	1.02	1.79	3.01	1.94	0.96	3.65	1.53	0.22	0.00
Construction	6.49	7.91	0.27	3.60	7.83	7.10	5.84	9.31	8.17
Wholesale & Retail	14.40	18.43	1.08	12.20	14.72	0.00	12.49	18.66	32.72
Transport & comm.	7.40	3.76	4.64	4.43	7.46	49.51	6.83	6.04	1.03
Financial intermediation	9.53	11.49	14.73	7.07	11.83	0.00	10.97	7.30	0.00
Community services	29.71	24.64	53.65	36.40	27.79	39.74	32.92	20.86	13.89
Private households	7.97	6.85	0.00	6.38	7.89	0.00	5.23	16.06	29.42
Other/unspecified	1.44	0.48	0.00	0.49	1.32	0.00	0.93	0.92	6.65
Occupation									
Managers	6.57	10.89	17.74	6.81	8.21	39.74	8.61	4.75	0.00
Professionals	9.56	12.71	40.40	14.89	10.85	0.00	13.89	4.23	1.06
Technicians	5.57	9.80	4.38	8.72	5.05	0.00	7.28	1.54	0.00
Clerks	7.90	8.35	5.44	7.43	7.84	7.10	8.58	3.90	0.00
Service workers	18.08	9.08	13.00	14.02	17.09	49.51	14.43	20.44	56.69
Skilled agriculture	0.41	1.54	0.00	0.36	0.53	0.00	0.50	0.36	0.00
Trade	14.93	15.21	7.70	11.52	16.50	0.00	14.62	17.23	2.61
Operators	15.22	14.95	3.38	13.85	14.60	0.00	15.20	11.25	0.00
Elementary occupations	20.28	15.78	7.96	21.07	18.12	0.00	15.63	35.48	35.71
Other/unspecified	1.48	1.70	0.00	1.32	1.20	3.65	1.26	0.83	3.93
Sector									
Informal	25.39	17.83	7.01	19.76	24.29	46.84	17.29	43.81	94.85
Formal	74.36	81.69	92.99	80.24	75.57	53.16	82.71	55.58	5.15
Unclassified	0.25	0.48	0.00	0.00	0.14	0.00	0.00	0.61	0.00

**Table A34: Adequately educated in period t , determinants of change in status in period $t+1$
– multinomial logit**

Independent variable	Relative risk ratio							
	Unemployment or inactive		Undereducation		Overeducation		Employed but unclassified	
Age	0.7339***	(0.0341)	0.4994***	(0.0521)	2.2368***	(0.4124)	1.0183	(0.1197)
Age squared	1.0024***	(0.0006)	1.0020	(0.0012)	1.0008	(0.0023)	0.9995	(0.0014)
Female	1.7298***	(0.0986)	1.1312	(0.1301)	0.6859***	(0.0893)	0.7566**	(0.1035)
African	1.7519***	(0.2883)	0.9993	(0.3731)	1.0471	(0.2431)	0.4739***	(0.1103)
Coloured	1.6951***	(0.2939)	0.8255	(0.3216)	0.5815*	(0.1687)	0.4421***	(0.1114)
Indian	1.4814	(0.4041)	0.2233	(0.2412)	0.9911	(0.4684)	0.1913**	(0.1440)
Experience	1.1129***	(0.0306)	1.9502***	(0.1270)	0.4248***	(0.0459)	0.9741	(0.0699)
Experience squared	1.0003	(0.0005)	0.9979*	(0.0011)	0.9997	(0.0024)	1.0012	(0.0013)
Eastern Cape	1.2617**	(0.1462)	0.8173	(0.1979)	0.9438	(0.2878)	0.6051*	(0.1615)
Northern Cape	1.4464***	(0.1551)	0.8881	(0.1886)	1.6342*	(0.4497)	0.6056*	(0.1583)
Free State	1.2254	(0.1646)	1.1298	(0.2900)	1.2222	(0.3744)	0.3349***	(0.1288)
KwaZulu-Natal	1.5044***	(0.1604)	1.0442	(0.2265)	0.9094	(0.2403)	0.6509*	(0.1518)
North West	1.6130***	(0.2249)	0.9215	(0.2689)	1.5657	(0.4775)	1.1121	(0.3179)
Gauteng	0.9430	(0.1068)	1.0109	(0.2258)	0.9011	(0.2324)	0.6038**	(0.1359)
Mpumalanga	1.1528	(0.1498)	0.8366	(0.2251)	1.1593	(0.3292)	0.3196***	(0.1097)
Limpopo	1.3484**	(0.1874)	1.3783	(0.3745)	1.5934	(0.4727)	0.5874	(0.1989)
Skilled agriculture	0.7405**	(0.1084)	1.4612	(0.5256)	1.8278	(0.7167)	0.5594*	(0.1883)
Mining	0.7419	(0.1570)	1.5707	(0.7206)	2.3388**	(0.7822)	0.8128	(0.3531)
Manufacturing	0.8567	(0.1235)	1.3610	(0.5119)	1.7168*	(0.5138)	1.0911	(0.3164)
Utility	0.8664	(0.2632)	3.6155***	(1.8038)	1.4609	(0.9356)	0.5754	(0.4343)
Construction	1.5655***	(0.2398)	1.6214	(0.6462)	1.4088	(0.5642)	1.0586	(0.3639)
Wholesale & retail	1.0128	(0.1291)	1.9609*	(0.7079)	1.2109	(0.3201)	0.7668	(0.2132)
Transport	1.0851	(0.1910)	3.3845***	(1.3317)	2.0874**	(0.7004)	1.0145	(0.3696)
Community, personal & social serv.	0.6643***	(0.0846)	1.8593*	(0.6581)	0.7842	(0.1918)	0.7660	(0.2017)
Private households	0.7673*	(0.1095)	0.7520	(0.2843)	1.7056	(0.6692)	0.3853**	(0.1594)
Industry: other	1.3325***	(0.1849)	0.8570	(0.3344)	1.5474	(0.4845)	1.3533	(0.3986)
Casual	1.8288***	(0.1779)	1.4663*	(0.3246)	1.1533	(0.4091)	1.5685*	(0.4130)
Self-employed	2.0990***	(0.2085)	2.0899***	(0.4456)	1.5886*	(0.4158)	1.7498**	(0.4198)
Informal	1.4171***	(0.0915)	1.0947	(0.1409)	0.7407*	(0.1274)	0.8623	(0.1418)
Constant	26.177***	(17.435)	546.14***	(790.14)	0.0000***	(0.0000)	0.1770	(0.3008)
Observations	9 513							
LR Chi-square (112)	2407.33							
Prob > Chi-square	0.0000							
Pseudo R Squared	0.1279							

Standard errors in parentheses

Base category: adequately educated

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Reference groups: male; white; Western Cape; finance; employee; formal sector

Table A35: Overeducated in period t , determinants of change in status in period $t+1$ – multinomial logit

Independent variable	Relative risk ratio							
	Unemployment or inactive		Undereducation		Adequate education		Employed but unclassified	
Age	0.3205***	(0.0833)	0.0000	(0.0000)	0.5428***	(0.1284)	0.2845***	(0.1110)
Age squared	1.0085***	(0.0031)	3,222.7	(1563472)	0.9986	(0.0030)	1.0123***	(0.0047)
Female	1.4175	(0.3147)	3E+43	(2E+47)	1.0393	(0.1949)	0.5097*	(0.1816)
African	1.9730	(0.9453)	9E+24	(1E+30)	1.1616	(0.4031)	1.1213	(0.6542)
Coloured	2.2357	(1.1950)	1E+142	(2E+147)	1.8885	(0.7456)	1.0518	(0.6677)
Indian	0.6243	(0.5749)	1E+72	(4E+76)	0.8506	(0.5473)	0.4297	(0.5239)
Experience	1.9262***	(0.3175)	2E+207	(5E+211)	1.8068***	(0.2457)	2.0340***	(0.4965)
Experience squared	0.9954	(0.0034)	0.0000	(0.0012)	1.0029	(0.0031)	0.9892**	(0.0052)
Eastern Cape	1.8784	(1.0455)	2E+31	(3E+36)	0.8554	(0.4186)	0.0000	(0.0000)
Northern Cape	0.7744	(0.3957)	9E+43	(7E+47)	0.7569	(0.2878)	1.6971	(0.9411)
Free State	0.9451	(0.5438)	0.0000	(0.0000)	1.4774	(0.6554)	0.2262	(0.2570)
KwaZulu-Natal	1.9844	(0.8970)	3E+30	(4E+35)	1.2055	(0.4585)	0.7194	(0.4503)
North West	1.6740	(0.9713)	4E+42	(5E+47)	1.5923	(0.7389)	0.7842	(0.6506)
Gauteng	0.9158	(0.4233)	0.0000	(0.1735)	1.4209	(0.5078)	0.5091	(0.3028)
Mpumalanga	0.6750	(0.3443)	6E+34	(2E+39)	1.2213	(0.4753)	0.2335	(0.2068)
Limpopo	2.0817	(1.0984)	1E+81	(4E+85)	1.3644	(0.6209)	1.1545	(0.8388)
Mining	1.1005	(0.7139)	0.0000	(0.0000)	0.9980	(0.5305)	0.1151**	(0.0995)
Manufacturing	0.4212	(0.3372)	0.0000	(0.0000)	1.1054	(0.6051)	0.1198**	(0.1164)
Utility	1.0507	(0.6291)	3E+50	(3E+55)	0.7402	(0.3584)	0.2043**	(0.1504)
Construction	0.0000	(0.0000)	2E+14	(3E+20)	0.3641	(0.3023)	0.0000	(0.0000)
Wholesale & retail	1.2009	(0.9490)	1E+124	(3E+129)	1.2810	(0.8114)	0.0000	(0.0000)
Transport	1.2258	(0.7407)	1E+26	(2E+31)	2.2935*	(1.0897)	0.5006	(0.3309)
Finance	0.7681	(0.5659)	4E+51	(6E+56)	1.5213	(0.8330)	0.0976**	(0.1135)
Community, personal & social serv.	0.4495	(0.2641)	0.0000	(0.0000)	0.8960	(0.4060)	0.1896***	(0.1215)
Private households	0.8969	(0.5927)	0.0001	(7.2719)	1.4458	(0.8084)	0.0883**	(0.1068)
Industry: other	0.7999	(0.5081)	4E+73	(4E+78)	0.6397	(0.3360)	0.1853**	(0.1417)
Casual	1.8199	(0.9303)	3E+50	(4E+54)	1.3649	(0.6678)	1.2957	(1.2701)
Self-employed	1.2510	(0.4909)	53.416	(520,928)	1.0305	(0.3453)	1.7398	(0.9967)
Informal	1.6024*	(0.4242)	0.0000	(0.0000)	0.8434	(0.1989)	0.7940	(0.3507)
Constant	8E+07***	(3E+08)			274,235***	(988,008)	8E+08***	(5E+09)
Observations	1 022							
LR Chi-square (112)	560.83							
Prob > Chi-square	0.0000							
Pseudo R Squared	0.2293							

Standard errors in parentheses

Base category: overeducated

*** p < 0.01, ** p < 0.05, * p < 0.10

Reference groups: male; white; Western Cape; skilled agriculture; employee; formal sector