COPYRIGHT AND CITATION CONSIDERATIONS FOR THIS THESIS/ DISSERTATION

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorse you or your use.

- NonCommercial — You may not use the material for commercial purposes.

- ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

How to cite this thesis

The impact of South Africa’s approach to skills development on the economy

by

SHIVANTHINI NAGALINGAM

A dissertation submitted in partial fulfilment of the requirements for the degree of

Master of Commerce in Development Economics

at the

College of Business and Economics

UNIVERSITY OF JOHANNESBURG

Supervisor: Dr Hammed Amusa
Co-supervisor: Mr Talent Zwane

2017
DECLARATION

I certify that the *minor dissertation* submitted by me for the degree *Master of Commerce in Development Economics* at the University of Johannesburg is my independent work and has not been submitted by me for a degree at another university.

SHIVANTHINI NAGALINGAM
ACKNOWLEDGMENTS

I would like to acknowledge and express my gratitude to my supervisor, Dr Hammed Amusa, for the guidance and constructive comments through this process. Thank you for your patience, understanding and accommodating my schedule to deliver this minor dissertation.

I am grateful to my family for their support during this journey. To my sister Darshani, thank you for always enquiring on my progress and for your support.

To my mother and my late father, thank you for your sacrifices in making sure education was always important and for instilling a deep drive in me to excel.

To my beautiful sister Priya, I am thankful to have you in my life. I deeply appreciate the very many conversations and deliberations on this dissertation. Your input was incredibly valuable. Thank you for your continued love, encouragement and support.

And, finally, to my husband, Kingsley, I am deeply grateful for you. Thank you for your patience and love, the sacrifices you have endured and for always keeping me well looked after. With your humour and faith in me, your unwavering support has allowed me to complete this journey. You have, and will continue to inspire me to achieve more.
ABSTRACT

This dissertation empirically assesses the impact of South Africa’s policy approach to skills development on output and labour productivity for the period 2001 to 2015. Skills development is considered within the framework of endogenous growth theory, which assumes that human capital accumulation raises the productivity of both labour and physical capital. Human capital is represented by employment shares of low-skilled, semi-skilled and skilled labour. In order to assess whether human capital development initiatives, proxied by individuals trained, have contributed to output and productivity, it is considered as an additional variable of interest. Employing a panel data fixed effects regression analysis, the results indicate that the different levels of skilled labour have a significant effect on output and labour productivity. Skilled labour and low-skilled labour present a positive and significant relationship to output; semi-skilled labour is positively related to output, whilst negatively related to labour productivity. The skills development levies variable was found to be positive and significant across the regression models, which suggests that investment in education and skills development may contribute to economic growth. However, the training variable shows no significant impact on the economy.

Keywords: skills development, human capital, economic growth, endogenous growth
LIST OF TABLES

Table 2.1: Employment by skills level 1994 and 2017 ......................................................... 19
Table 2.2: Number of graduates in the post-school education and training sector .......... 22
Table 2.3: Individuals trained by SETA from 2010/11 to 2015/16 ......................................... 23
Table 2.4: Changes in employment per sector between 2010 and 2016 ......................... 23
Table 2.5: Changes in occupational structure of the employed between 2010 and 2016 ..... 25
Table 2.6: Objectives of NSDS I, II and III ........................................................................ 29
Table 3.1: Main features of exogenous and endogenous growth models ..................... 40
Table 5.1: SETAs categorised into sectors of the economy ............................................. 60
Table 6.1: Panel data descriptive statistics ........................................................................ 65
Table 6.2: Correlation matrix table .................................................................................. 65
Table 6.3: Hausman test results ....................................................................................... 66
Table 6.4: Regression results: Baseline model ................................................................. 67
Table 6.5: Regression results: Output model including all human capital variables ...... 68
Table 6.6: Regression results: Output model with number of individuals trained by SETAs 71
Table 6.7: Regression results: Labour productivity model including all human capital variables 72
Table 6.8: Regression results: Labour productivity model - individuals trained by SETAs ... 73
LIST OF FIGURES

Figure 2.1: Interaction of demand and supply of labour .......................................................... 9
Figure 2.2: Unemployment rate from 1994 to 2016 ............................................................. 10
Figure 2.3: Unemployment rate by education level, quarter one 2017 .................................. 11
Figure 2.4: Educational attainment among individuals aged 25-64 by population group ...... 18
Figure 2.5: National Senior Certificate pass rate, 1995-2016 .............................................. 21
Figure 6.1: Real GDP per sector from 2001 to 2015 ........................................................... 63
Figure 6.2: Employment share of low-skilled, semi-skilled and skilled labour per sector from 2001 to 2015........................................................................................................... 64
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>Cross-sectional Dependence</td>
</tr>
<tr>
<td>COSATU</td>
<td>Congress of South African Trade Unions</td>
</tr>
<tr>
<td>DBE</td>
<td>Department of Basic Education</td>
</tr>
<tr>
<td>DHET</td>
<td>Department of Higher Education and Training</td>
</tr>
<tr>
<td>DoL</td>
<td>Department of Labour</td>
</tr>
<tr>
<td>FE</td>
<td>Fixed Effects</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GFCF</td>
<td>Gross Fixed Capital Formation</td>
</tr>
<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>NQF</td>
<td>National Qualifications Framework</td>
</tr>
<tr>
<td>NSA</td>
<td>National Skills Authority</td>
</tr>
<tr>
<td>NSC</td>
<td>National Senior Certificate</td>
</tr>
<tr>
<td>NSDS</td>
<td>National Skills Development Strategy</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>QLFS</td>
<td>Quarterly Labour Force Survey</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>RE</td>
<td>Random Effects</td>
</tr>
<tr>
<td>SARB</td>
<td>South African Reserve Bank</td>
</tr>
<tr>
<td>SDA</td>
<td>Skills Development Act</td>
</tr>
<tr>
<td>SETAs</td>
<td>Sector Education and Training Authorities</td>
</tr>
<tr>
<td>Stats SA</td>
<td>Statistics South Africa</td>
</tr>
<tr>
<td>TFP</td>
<td>Total Factor Productivity</td>
</tr>
<tr>
<td>TVET</td>
<td>Technical and Vocational Education and Training</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

This study assesses the impact of South Africa’s policy approach to skills development over a 15-year period from 2001 to 2015, specifically evaluating whether the implementation of a national skills development strategy has through its established mechanisms produced the envisaged outcome of an appropriately skilled workforce for the country. An analysis of the outcomes of this strategy will be undertaken by assessing the impact of skills development on output in terms of real gross domestic product (GDP) and on labour productivity.

1.1. Background

Skills development and education are important factors for any economy, but have become progressively more critical in developing countries. Human capital and its role in contributing to economic development has been proven. For a developing country to compete regionally and globally; political, social and education systems within the country need to be dynamic. As Moloi, Gravett and Petersen (2009:279) assert, a developing country requires education to drive production and growth. Education is thus a necessary requirement for a progressive economy. Governments that recognise this importance have the power to direct policy and resource decisions in such a way as to address issues regarding skills within the country.

Becker (1962) defines the investment in human capital as activities directed at influencing human resources, which affect future income. This investment may take multiple forms, such as on-the-job training; education at primary, secondary and tertiary levels; medical and healthcare facilities; information on economic systems; adult study programmes; and migration of individuals and families (Schultz, 1961; Becker, 1962). According to the 1997 Green Paper on Skills Development Strategy for Economic and Employment Growth in South Africa, the term “skill” is defined as the “necessary competencies that can be expertly applied in a particular context for a defined purpose” (Department of Labour, 1997).

In South Africa, the issue of skills, specifically the lack of appropriate skills and the mismatch of skills to the needs of the labour market, has plagued the country for decades. Both these issues point to two salient problems: (1) the lack of a coherent skills development approach and the effect of state policy on the majority of the population during the apartheid period, and (2) the structural changes in the economy, which require a focussed approach to developing skills that are actually needed. Indeed, the links between education, skills, productivity and economic growth have been widely established. An appropriate skills base raises the productivity of both workers and firms, contributes to innovation and development, and
encourages foreign and domestic investment, which ultimately leads to growth in the economy. Barro (1997; 2001) has empirically established the significant and positive relationship between economic growth and the stock of human capital, while the early work of Becker (1964) has demonstrated the theoretical link between increased wages and human capital accumulation.

The education system itself in South Africa has, since democracy, undergone several structural and policy changes. Prior to 2009, the education system was under the purview of one national Department of Education and excluded skills development, which resided with the Department of Labour. In trying to simplify and integrate a complex education system, two separate education ministries were established in 2009: the Department of Basic Education (DBE), which oversees primary education, secondary education and adult literacy programmes; and the Department of Higher Education and Training (DHET), which is responsible for post-school education and training. Each department is assigned its own share of the national budget, and both are constitutionally mandated to provide basic education, including adult basic education and further education (Republic of South Africa, 1996). It is pertinent to note that in addition to its constitutional mandate, the DHET plays an integral role in economic and social development.

The South African approach to development policies has traditionally accounted for the consequences of both the colonial and apartheid periods. In 1994, the Reconstruction and Development Programme was introduced as one of the first developmental policies of the state. Realising the need for a more focussed macroeconomic framework, the government introduced the Growth, Employment and Redistribution (GEAR) strategy in 1996 to stimulate faster economic growth. GEAR was replaced by the Accelerated and Shared Growth Initiative for South Africa in 2005, which was subsequently replaced by the New Growth Path in 2010. The National Development Plan (NDP), the most prominent of all state plans, was then introduced in 2013, articulating a vision for 2030. The NDP emphasises, amongst other development goals, education, training and innovation. Prioritising education, training and skills development has been a common theme in all these strategies.

In terms of legislation, the Skills Development Act (SDA) of 1998 was formulated to address the issue of skills in the country. The SDA promulgated the establishment of Sector Education and Training Authorities (SETAs), the National Skills Fund, the National Skills Authority, the Skills Development Planning Unit and the National Skills Development Strategy (NSDS). The NSDS was the first post-apartheid strategy adopted by the South African government that
aimed not only to address the scarcity of skills in the country, but also tackle issues of transformation and inequality.

These frameworks and strategies were the primary tools through which policy makers sought to address skills scarcity and mismatch. One result produced by the SDA was the implementation of the NSDS by the SETAs (collectively mandated as one of the institutional bodies to do so). The skills development levy-grant system was introduced after the failure of many initiatives, such as tax incentives and voluntary levies, to promote skills development (Kraak, 2004). This levy-grant system, utilised as an employer-training incentive, is similar to systems utilised in Malaysia, Nigeria and the Netherlands.

For the purposes of this minor dissertation, only the categories of education and training will be considered as human capital, as these are the two primary aims of the NSDS. Whilst there are secondary aims in the form of transformational and developmental imperatives, it is not in the scope of this study to assess the performance of the strategy against these secondary objectives.

1.2. Real-World Problem

South Africa is a country with high levels of poverty, inequality and unemployment. Whilst taking the measure of these factors is often considered to be a multifaceted exercise requiring consideration of various factors and characteristics, statistics nevertheless show that these are serious challenges facing the country. In 2016 15.9 percent of the South African population were living in poverty¹ (World Bank, 2017). Statistics such as this are supported by figures from Statistics South Africa (Stats SA) (2014), which show that in 2011, 45.5 percent of the population could be categorised as poor, while 20.2 percent lived in extreme poverty.² In terms of inequality, South Africa is ranked amongst the top countries facing huge disparities between the rich and the poor. Moreover, the rate of unemployment in the country has persisted at over 20 percent for many years now.

Although one way of reducing poverty is through increasing productivity through quality education, as in most developing countries, it is the poor who lack access to such quality education. In South Africa, approximately 6.7 percent of the GDP was spent on education in

¹ Based on a poverty line of $1.90 per day at Purchasing Power Parity.
² Stats SA categorises poverty based on the food poverty line. The upper-bound poverty line (R620 per capita per month in 2011 prices) is categorised as poor. Extreme poverty is defined as those living below the food poverty line (R321 per capita per month in 2011 prices).
2009, in comparison to other middle-income countries whose spend amounted to approximately 4.5 percent. These other countries reported an 80 percent effectiveness rating of their education policies and programmes, something South Africa is yet to achieve (Moloi et al., 2009). The substantial investment by the state in education and training continues: for the 2016/17 financial year, approximately 15.6 percent of the GDP was allocated to the post-school education and training sector.

In terms of the results of such investment, Stats SA shows that in South Africa over the 20-year period from 1994 to 2014 there has been an increase of 4 percent of the skilled workforce, while the semi-skilled and low-skilled\(^3\) workforce has decreased by 1 percent and 3 percent respectively. While these results are encouraging and show an improvement towards a more skilled workforce, further analysis reveals that the movement towards a skilled workforce has not been proportional across all population groups. In terms of transformational imperatives, statistics indicate an uneven distribution of progress among population groups. The growth of skills, as a proportion, within black African employment, from 1994 to 2014, was considerably lower than in the other population groups. Moreover, the percentage of individuals with skilled employment within the black African 25-34 age group had in fact decreased over the 1994 to 2014 period (Stats SA, 2014). According to the 2017 quarter one Quarterly Labour Force Survey (QLFS), employment in the skilled occupations is dominated by the white and Indian/Asian population groups, whereas the majority of black African and coloured males are employed in semi-skilled and low-skilled occupations (Stats SA, 2017a).

The issue of inadequate skills levels has a far-reaching effect on the country, both socially and economically. Policy initiatives and revenue allocation decisions by the state recognise this interconnectedness. Mayer and Altman (2005:33) assert the need for skills development policies to address not only issues of poverty and unemployment, but also those of economic growth and global competitiveness. The NSDS, through its evolution from the first strategy in 2001 to its third strategy, which commenced in 2011, has sought not only to ensure an integrated approach to post-school education and training, but also to address the state’s other priorities, such as unemployment, transformation, inequality and poverty.

---

\(^3\) According to Stats SA, “skilled” includes manager, professional and technician occupations; “semi-skilled” includes clerk, sales and services, skilled agriculture, craft and related trade, and plant and machine operator occupations; and “low-skilled” includes elementary and domestic worker occupations.
1.3. Research Problem and Research Question

Economic theory predicts that an improvement in human capital levels should result in improved productivity. Since labour demand is a derived demand function, it is expected that as skills levels improve, the trickle-down effects should be evident in both the labour market and in the economy.

The funding of education and training in the country has thus progressively increased, with a continued focus on improving skills levels. Since 1998, firms have also been mandated to contribute skills development levies in the form of a compulsory deduction per employee under certain conditions. However, the question remains as to whether there has been a measurable impact of these directives that can be attributed to the NSDS. More specifically, it is important to understand if this national skills development strategy has affected the skills levels of the South African population, and if as a result there has been a progressive improvement in skills levels at an outcome level.

There are, however, some challenges with measuring or quantifying these results, such as problems arising from the nature of the outcome and the measurement indicators. Moreover, there have been three national strategies since 2001 (NSDS I, II and III), each with specific goals and related outcomes. Across the three strategies, some of the goals and outcomes are similar, whilst others are not comparable. Chapter 2 of this minor dissertation thus addresses the legislative framework for skills development and summarises the goals and objectives of each strategy.

In addition, the evaluation of skills development from the implementation of the first national skills development strategy has not been extensive. Attempts have been made to do so (for example, entities such as the National Skills Authority monitor training through the number of individuals that have completed training programmes, whilst Stats SA evaluates skills in terms of occupational groups and the nature of their construct over time). Yet whilst these approaches provide us with some information on training and the level of skills in the country, they do not assess impact on productivity and economic growth, nor offer an econometric analysis of the impact of training and skills development stemming from the NSDS.

Noting this gap in the literature, it is the primary aim of this study to investigate the success of the NSDS from 2001 to 2015 in terms of outcomes directly attributable to its strategy. This study seeks to assess the NSDS from an overall policy outcome perspective, focussing specifically on the skills development outcomes of SETAs, the primary delivery mechanism of
the NSDS. By employing econometric analysis techniques, the research seeks to ascertain if there has been an improvement in the skills levels in the country since the implementation of this strategy, and if there has been a consequential positive impact on the South African economy. As such, the proposed research question is as follows: What has been the impact of South Africa's approach to skills development on the economy?

1.4. Contribution to the Literature

A few studies investigating the success of the NSDS have been undertaken, with several investigating SETAs in particular. Examples of such studies include Allais (2012), Grawitzky (2007), and Turner, Halabi, Sartorius and Arendse (2013). These studies observed limited success of the national strategy and found mixed results with regards to the efficiency of SETAs. The only literature that exists that investigates the overall national skills strategy is that by Kraak (2008), but this study is outdated, as the period reviewed only includes the first NSDS, which was active from February 2001 to March 2005.

There have since been two progressive national strategies, NSDS II and NSDS III. The third phase of the strategy has been extended twice, with a potential revision of the SETA landscape expected to take place in 2020. The impact of all three strategies over the past 15 years, in terms of improving skills levels within the country, is still not known. In undertaking this research, the study contributes to and expands upon previous research into the skills shortages faced by the country and the progress made in addressing this challenge through the implementation of the NSDS.

Moreover, whilst the international empirical literature on the returns of training, education and skills development are vast, there are a limited number of studies in South Africa that have sought to investigate the impact of training and skills development. The existing empirical studies may be broadly categorised into either studies that assess impact at firm-level, or those that assess impact at employee-level. In South Africa, Bhorat and Naidoo (2016) and Labuschagne (2010) are examples of studies that use employee-level and industry-level analysis respectively within the South African manufacturing sector.

Most of the literature reviewed also restricts their focus on firm-level or employee-level data within specific sectors. This minor dissertation seeks to address this lacuna by focusing on all sectors of the economy, using sector-level data to gauge the impact on output growth and labour productivity. To the author's knowledge, there has been no other study undertaken of this nature in South Africa, i.e. one that includes all sectors of the economy, focuses on human
capital attributable to SETA training and employs panel data for the period 2001 to 2015. By employing a panel data set, this study is able to explore a large number of data points.

The South African government, as governments of other countries have done, has developed and implemented various complementary policies towards developing and supporting quality higher education and training, and promoting access to higher education, vocational education and skills development training opportunities. This research attempts to provide an analytical model through which the state can assess the success or failure of the NSDS, and may also provide some recommendations for evidence-based policy making in the future.

1.5. Significance of the Research

There is an important link between continued development and progress of an emerging economy, and the skills available within that economy to meet the demands of such development. However, currently, poor economic growth, high rates of unemployment and high levels of poverty and inequality continue to plague the country. From a demand-side, employers continue to look for skills to match their requirements, while from the supply-side, it appears that the country’s skills base predominantly comprises low-skilled individuals with limited access to post-school education and training, and are thus unable to be absorbed into the labour market. Yet although the importance of developing and maintaining skills within the country for the purpose of achieving sustainable economic growth has been recognised, the question remains as to whether the existing policies and mechanisms in place are relevant to achieving this goal.

1.6. Structure of the Minor Dissertation

This dissertation comprises seven chapters. Chapter 2 provides a description of the labour market in South Africa, offers a history of skills development in the country and outlines the existing skills development environment. Chapter 3 provides the theoretical framework on human capital development and its established relationship to economic development, while Chapter 4 reviews previous empirical literature on human capital and economic growth. The review is divided into two areas in order to provide a systematic overview: international literature on studies on human capital and economic growth, and the investment in human capital development in South Africa. Chapter 5 comprehensively outlines the research design and methodology. The main findings are then presented in Chapter 6 and discussed in relation to the research question, while the final chapter, Chapter 7, presents the conclusions based on the findings and analysis, and offers recommendations for further research.
Chapter 2: The Labour Market and Skills Development in South Africa

This chapter provides a brief overview of the labour market of the country to provide for a better understanding of the environment within which skills development operates. This chapter then explores the history of skills development as well as the current state of skills in the country, and concludes with a review of the legislative framework for skills development.

2.1. An Overview of the South African Labour Market

In examining the labour market dynamics of South Africa, one must account for the legacy of apartheid and the multifaceted manner in which it has shaped the labour market of the country today. As Edgren (2005) points out, the South African labour market may be considered unique owing to the underdevelopment of a large majority of the country’s older population, the considerable problem expressed by firms of the unavailability of certain skills, and the rigidity posed by industrial relations.

2.1.1. Theory of unemployment

One key measure of economic wellbeing is unemployment. The high rate of unemployment faced by a country may be considered one of the most crucial negative externalities posing a threat to both social and economic development. From a simplistic perspective, if a country’s economy maximised efficiency, unemployment would not exist as all individuals would be employed at some wage. Theoretically, however, different schools of economics differ in their views on employment and the market. One prominent theory, the classical theory, makes two main assumptions regarding employment: that there exists full employment where the demand for labour is equivalent to the supply of labour at every level of real wage, and that there exists wage and price flexibility. In terms of classical economics, an ideal labour market will always reach equilibrium over the long run. Unemployment is essentially a state of disequilibrium in the labour market.

Figure 2.1 provides a graphical representation of the labour market. The demand for labour is the aggregate demand for labour from each firm, while the supply of labour can be described as the aggregate of all utility functions. The assumption is that firms seek to maximise profit and individuals seek to maximise their happiness. At point C, the equilibrium level, the demand is equal to the supply of labour and the going wage rate is W1. At point B, the supply of labour at L3 is higher than the demand for labour at L2, at a higher wage rate of W2. Instead of being
unemployed, individuals will be prepared to take a lower wage, W1, and the thus employment will be at L1 (Barker, 2003).

**Figure 2.1: Interaction of demand and supply of labour**

![Diagram of labour demand and supply](image)

*Source: Barker, 2003*

Other theoretical views include that of the neo-classical and post-Keynesian economists. The neo-classicalist view holds that the market is self-correcting, is capable of working by itself and requires no state intervention or state-imposed policies. Further, they are ardent proponents that deregulated markets form an important condition making the achievement of an efficient economy and social welfare possible. The underlying belief of the neo-classicalists is that markets will adjust by themselves to regulate demand and supply differentials, and will ensure that employment always returns to its full level.

Any state intervention is thus deemed to lead to an inefficient labour market as the labour demand and supply model forms the basis for determining the wage levels. Any imposition of a wage level above the equilibrium wage (such as a minimum wage) will result in lower demand for labour, which would lead to an excess supply of labour and, ultimately, an economy with high levels of unemployment. According to the neo-classical economists, the introduction of a minimum wage actually contributes to increasing the number of low-skilled workers who are already earning lower wages, making them worse off in that they would be the first to exit the labour market upon the introduction of a minimum wage (Marchal, 2014).

In contrast, the post-Keynesian view asserts that state intervention is necessary to address market failures and improve social welfare. While the neo-classicalists are more focussed on
capital accumulation and take a microeconomic view on the labour market, the post-Keynesians hold a macroeconomic view, and consider the market to be a dynamic system that inherently requires intervention in order to maintain stability. The neo-classicalists also consider productivity to be an exogenous variable of the labour market, whereas the post-Keynesians consider productivity to be an endogenous factor. Essentially, in the post-Keynesian world, intervention in the wage factor positively influences productivity, employment and competition.

2.1.2. Unemployment in South Africa

The Quarterly Labour Force Survey (QLFS) from Stats SA details the labour market activities of persons aged between 15 and 64 years in South Africa. According to the 2017 quarter one QLFS, the official unemployment rate at the end of quarter one of 2017 was 27.7 percent. This figure can be said to be much higher (36.4 percent), however, if the expanded definition of unemployment were to be used (Stats SA, 2017a). Over past 22 years (from 1994 to 2016), the lowest rates of unemployment have been recorded in the periods of 1995 and 1996, at 16.9 percent and 19.3 percent respectively (as shown in Figure 2.2 below). On average, the unemployment rate has been at 23.8 percent. This average rate of unemployment is high when compared to other emerging economies such as Brazil and India, where the unemployment rate in 2014 was 6.8 percent and 3.6 percent respectively (World Bank, 2017).

Figure 2.2: Unemployment rate from 1994 to 2016

![Unemployment rate from 1994 to 2016](source: SARB, 1994-2016)
Further analysis of other key labour market indicators of the QLFS for quarter one of 2017 reveals the following: the working age population of the country is approximately 37 million, with absolute unemployment figures having increased by 491 000 from the previous year, and employment numbers increasing by over 1 million over the same period. The labour absorption rate, which represents the proportion of the working age population that is employed, is 43.7 percent. This low labour absorption rate has been consistently increasing. With a growing population and low economic growth levels, the lack of employment opportunities for the majority of the working population has remained a serious concern in the country.

Considering unemployment by education level is relevant to this paper, since it has been well established that education is a requirement for human capital development and productivity. While Chapter 3 of this study explores this premise in further detail, Figure 2.3 below shows the unemployment rate by education level for quarter one of 2017. The highest number of individuals that are unemployed have some secondary education, but have not completed this phase of education. This figure is critical to note: a review of the education levels of the South African working population at the end of 2016 shows that the 68 percent of individuals aged between 25 and 64 only have secondary school education (Stats SA, 2016). Thus, the highest rates of unemployment occur within the educational category within which the majority of the population falls.

Figure 2.3: Unemployment rate by education level, quarter one 2017

One issue that has persisted in the labour market is that race continues to be an important predictor of unemployment. In their assessment of the South African labour market between 1995 and 2002, Bhorat and Oosthuizen (2005) found that black African, coloured and
Indian/Asian individuals were all more likely to be unemployed than whites. Undeniably, the overarching labour market trend still indicates that the highest levels of unemployment have remained concentrated in the black African race group and amongst the youth. Notwithstanding the racial discrimination of the majority of the population during the apartheid period, the discriminatory impact in terms of access to education, skills development, job opportunities and entrepreneurial development, to mention a few, is vast and remains a major characteristic of the labour market.

2.1.3. Factors impacting the labour market

In order to effectively understand the labour market, an outline of the factors impacting the labour market will be presented as a point of departure. According to Bhorat (2004:944), the shift in focus of the economy after the apartheid period from the primary sector to the services sector has resulted in a significant change in the dynamics of the South African labour market, as seen in the nature and level of skills demand. Another important relationship worth noting is that of economic growth and employment. Generally, it is agreed that growth equates to employment. However, whilst Bhorat (2004: 951) accepts that this has been the case in the period 1995 to 2002 in South Africa, he contends that the benefits to growth in terms of employment gains have almost always been unevenly distributed according to age, gender, race, location and education. For instance, in 2014, 9.6 percent of people who did not have employment but held a tertiary qualification consequently found employment, compared to only 4.8 percent of those with an incomplete secondary education. Between 2010 and 2014, the transition rate into employment for those without jobs and a tertiary qualification increased by 2.5 percent, while the transition rate into employment for individuals who had completed a secondary education increased by 2.9 percent (Stats SA, 2015).

Festus, Kasango, Moses and Yu (2015), in their investigation of the changes in the South African labour market between the period of 1995 to 2013 by utilising the QLFS and the labour force survey, found that the labour force and the labour force participation rates have indeed increased since 1995. This factor can be said to have influenced the persistently high levels of unemployment in the country. Other factors identified in this study that have contributed to these high unemployment figures are the barriers to entry in the informal sector and an overall shift towards more skilled occupations. Similar to other studies, Festus et al. (2015) also found education to be a significant and important variable in addressing the high unemployment rate.

---

4 Stats SA defines the tertiary education category as individuals who have obtained an undergraduate or post-graduate degree or have completed secondary school as well as obtained a certificate or diploma of at least six months’ full-time duration of study.
The authors point out that aside from improving global competitiveness, a higher level of education is associated with lower levels of crime and higher standards of living.

Moreover, the effects of globalisation and trade liberalisation on the labour market cannot be ignored. With an ever-increasing demand for “new and better” skills, the majority of the working population find themselves unable to match the demand for skills from firms. Although the benefits of globalisation and trade liberalisation cannot be denied, the negative effects on the rates of unemployment within the country are starkly apparent. In Jenkins’ (2006) review of the different points of view on the effects of globalisation and trade liberalisation, it is noted that opponents of globalisation have argued that in developed countries, the effects have been seen in job losses in the manufacturing sectors and, more recently, in the services sector.

The increasing wage differences between the skilled and unskilled have also been attributed to globalisation. Interestingly, it has been held responsible for the increasing capital to labour ratio, thus posing a threat to labour standards. Critics have also accused this phenomenon of creating and promoting exploitative practices in developing economies. Yet advocates of globalisation have argued that its positive effects in developed countries are seen in increasing efficiency, the growth of economies and creation of skilled employment opportunities. The positive effects in developing economies include increased prospects for economic growth and employment creation.

In addition to globalisation, the types of employment contracts that individuals are engaged in also appear to have an impact on employment. According to the 2014 Labour Market Dynamics Report published by Stats SA, in 2010, one in every five people who had contracts of a limited duration found employment on a permanent basis. This rate however declined to 16.8 percent by 2014. Other findings to note from the report are that firstly, individuals in skilled occupations were more likely to remain in those occupations as compared to those in semi-skilled and low-skilled occupations. Secondly, those employed in the tertiary sector were also more likely to remain in that sector than those in the secondary and primary sectors. Finally, the role of education may be directly equated to finding a job: those that are better educated are more likely to enter employment compared to those less educated. The nature of employment within the different sectors of the country has changed significantly over the past three decades. There has been a rise in employment in the financial services and community, social and personal services sectors accompanied by a decline in employment in the manufacturing and construction sectors. These changes have pointed to a shift in skills demand with a limited number of low-skilled jobs being created.
Another factor responsible for South Africa's high level of unemployment is the labour market regulation in the country. Although a large number of labour regulations was historically established to protect white workers, South Africa is now seen as having some of the most progressive labour legislation and policies globally. Yet from an international perspective, South Africa performs badly in terms of cooperation between employers and employees, the flexibility of wage determination, the laws relating to hiring and firing of employees, and the link between productivity in wages. This perception has, however, subsequently been debunked by studies such as Bhorat, Naidoo and Yu (2014), which have found that in comparison to other countries, South Africa's labour market is not overly regulated.

Currently, there is no legislated national minimum wage in the country. The Basic Conditions of Employment Act however does provide for the setting of minimum terms and conditions of employment, including a minimum wage across various sectors. There are currently two mechanisms for wage determination in South Africa: collective bargaining, including through statutory institutions (referred to as bargaining councils); and Sectoral Determinations, which are published by the Minister of Labour and set minimum wages for an economic sector.

These legislated Sectoral Determinations apply to the following sectors: domestic work, contract cleaning, private security, wholesale and retail, farm work, forestry, taxi services, hospitality sector, learnerships, and children in the performance of advertising, artistic and cultural activities (Department of Labour, 2016). Currently, the average minimum wage in South Africa is R2,731.74 per month across all the private-sector bargaining councils, and approximately R2,362.36 across all the Sectoral Determinations. However, the debate on the setting of a national minimum wage remains prominent in the country, usually spear-headed by trade unions.

The main arguments posed by the Congress of South African Trade Unions (COSATU) are that current wage levels in the country for the average worker are simply insufficient to meet the increasing cost of living; South Africa lacks a coherent wage policy; collective bargaining is a continuous struggle; the remnants of the apartheid regime still persist, with the majority of black African workers living in poverty; large wage disparities are present across sectors and across levels; and the minimum wages in the sectoral determinations do not meet the required minimum of between R4,500 and 5,500 per month (COSATU, 2015). Regarding the political power of COSATU, along with other unions, Bhorat et al. (2014) argue that such power – measured by the labour union power index, which comprises an employee’s right to join a union and enjoy collective bargaining – is high in South Africa when compared to other countries globally. However, when measuring collective disputes, South Africa is below the
international average, which indicates that the protection available to workers during labour disputes is much less, leaving employees vulnerable. Ultimately, the effects of trade unions on the labour market, including the impact on average wages, show they in fact have had a relatively non-threatening impact on the economy (Bhorat et al., 2014).

2.2. The History of Skills Development

It is important to review how skills development has historically taken place in South Africa in order to provide a starting point for establishing the current status quo. The skills development challenge currently faced by the country has been attributed to the restrictive education and training policies of the past. It has been well established that pre-1994 education and training policies, legislation and practices have largely contributed to the skills deficiencies currently experienced in the South African labour market. In order to better understand this phenomenon, this section explores the education system, accompanying legislation, and the training policies and practices that were in place during the apartheid era.

While education before 1948 in South Africa for the majority of the population was delivered by churches and missions, a change in political regime in 1948 was accompanied by a review of education provision. From 1953, following the Report of the Commission of Enquiry into Native Education 1949–51, referred to as the Eiselen Commission Report in1951, the Bantu Education Act (later retitled the Black Education Act) had forced the segregation of education both at primary, secondary and tertiary levels based upon race. The reason for this segregation is that the government at the time wished to ensure that the black African population group received education that was poor in quality, and that such education delivered skills limited to jobs within the mining, agricultural and domestic services sectors of the economy. This approach thus ensured a cheap supply of labour, while at the same time restricted black African individuals from accessing jobs within other, more highly skilled sectors (Giliomee, 2009 and Fiske & Ladd, 2004). Kraak (2003) notes that the education system in apartheid era was characterised by poor quality infrastructure, curricula and pedagogy, specifically directed at the education system for non-whites.

Allocation of funding too was restricted by a tiered system based on race. According to Giliomee (2012), the gap in ratio of per capita spending on black African education to white education in 1970 was as wide as 18 to 1. Yet years after the end of apartheid, and despite progressive increases in spending on black African education, the trend of underinvestment in education has remained. According to Fiske and Ladd (2004), in 1994 the amount spent per student in white schools was more than two and a half times than that spent on the
education of black African students. Other major factors that contributed to inequalities in education at this time included the insufficient number of black African teachers, which also impacted the ratio of teachers to students in a classroom. The student to teacher ratio in black African schools ranged from 50:1 to 70:1 from the inception of the Bantu education system, and remained as such up to 1993. In contrast, the student to teacher ratio in white, state-run schools maintained at the mid-20s level during this period (Giliomee, 2012).

Tertiary education followed similar discriminatory practices. Students were sent to different universities based upon race. Between 1959 and 1982, ten new universities and seven new technikons for black African students were established. These institutions served to provide vocational training, whereas the universities provided the traditional academic education and research to white students. The technikons were plagued by chronic underfunding, limited infrastructure investment, financial mismanagement and poor quality pedagogy. The geographical placement in rural areas of these institutions also limited access for both students and teachers (Fiske and Ladd, 2004).

Training at the workplace too was impacted by racially motivated policies. One example of such legislation was workplace-based training, commonly known as the apprenticeship system, which exclusively catered to the up-skilling of the white minority segment of the population. This type of training ideally delivered a workforce with intermediate-level skills, encompassing a combination of theoretical and workplace-based training. The move towards a more inclusive apprenticeship system only took form in the late 1970s, and was formalised through the Manpower Training Act in 1981. Despite providing increased training to the larger black segment of the population, such inclusiveness resulted in a decrease in qualified artisans in the country (Kraak, 2007). Moreover, training initiated or funded by employers during the period was limited. Different reasons have offered, including the lack of incentives and the absence of the tradition of formal training provided for by employers (Kraak, 2003 and Mummenthey, 2008); the fact that the majority of employers trained on basic, non-accredited skills, which served the interests of the employer only; and with the exception of the apprenticeship system, industry or workplace-based training lacked the motivation and investment to up-skill employees.

In summary, the disintegrative and discriminatory education and training practices during the apartheid period resulted in a poorly formulated and highly fragmented education system. In 1994, the new democratic government “…inherited networks of educational institutions defined by the race of the students they served and governed through a convoluted, even bizarre, set of structures designed to bolster the system of apartheid” (Fiske and Ladd, 2004).
Since the end of apartheid, efforts have been made to address the longstanding effects of these structures, with varying degrees of success.

### 2.3. The Current State of Skills in South Africa

The historical practices of previous governments had put in place a challenging education and training system that the new democratic government had to address in 1994. Since then, the recognition of the skills crisis facing the country and the need to address this shortcoming has been evidenced by the prioritisation of education and skills development in national policy. This section reviews the current state of skills in the country and aims to assess what progress, if any, has been made in improving the population’s skill set, with a focus on the individuals who would comprise the labour force.

According to Stats SA (2017b), inequality in qualifications and skills significantly contribute to income poverty and inequality. This conclusion has been drawn based on a study by Leibbrandt, Woolard, Finn and Argent (2010), who found that in South Africa, wage income accounts for 70 percent of income and labour income accounts for 85 percent of inequality. According to Reddy et al. (2016), the level of tertiary education of the labour force is a vital indicator for industrialised emerging economies. According to the 2017 quarter one QLFS, 21.3 percent of the employed in South Africa have some tertiary level of education (Stats SA, 2017a). Although it has been acknowledged that the poor skills base that existed in 1994 still has effects today, in order to support economic growth and increased productivity, the level of tertiary education of the population must be addressed.

Figure 2.4 shows the educational attainment among individuals aged between 25 and 64 by population group in 2016. Across all population groups, the highest level of education attained by the largest proportion is secondary level. With 38.3 percent of the population having attained some tertiary level education, the white population group has the highest levels of educational attainment. In comparison, tertiary level educational attainment for both the black African and coloured population groups is below the national average, with 9.1 percent and 8.1 percent respectively. Similarly, the percentage of black African and coloured individuals that have only primary schooling is higher than the national average of 13.6 percent.

If the premise holds that there exists a significant correlation between skills levels and poverty and inequality, then poverty and inequality would mostly occur in the population groups with the lowest levels of education and skills. In South Africa, it has been well established that the
highest levels of poverty and inequality exists within the black African population segment – the largest population group in the country, and also the segment of the population that comparatively overall has the lowest level of skills. Thus, intervention to address skills issues within the country is required to address the triple challenges of unemployment, poverty and inequality.

Figure 2.4: Educational attainment among individuals aged 25-64 by population group, 2016

The figures regarding employment by skills level are provided in Table 2.1, which shows the growth of the skills groups between 1994 and 2017. Skills levels are not directly available from the QLFS; data relating to skills has been estimated utilising the types of occupations or occupational categories. In terms of absolute numbers, the highest growth figures are seen in the semi-skilled group, with an 82.8 percent increase from 1994 to 2017. This growth may be partly attributable to it being the largest group in terms of workforce during both periods. In relative terms, the highest growth rate was within the high-skilled group, with a 106.3 percent positive change over the period as a whole, compared with 82.8 percent for semi-skilled and 66.1 percent for low-skilled.

The last three columns of Table 2.1 provide figures on the composition of the workforce by skill level. For the labour force as a whole, there has been an increase towards skilled labour of 2.7 percent, and a decrease away from low-skilled labour of 2.9 percent.
Table 2.1: Employment by skills level 1994 and 2017

<table>
<thead>
<tr>
<th>Skill Level</th>
<th>1994 R’000</th>
<th>2017 R’000</th>
<th>Change</th>
<th>Change (%)</th>
<th>1994 % of total</th>
<th>2017 % of total</th>
<th>Change (%) points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled</td>
<td>1 831</td>
<td>3 777</td>
<td>+1 946</td>
<td>106.3</td>
<td>20.6</td>
<td>23.3</td>
<td>+2.7</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>4 184</td>
<td>7 648</td>
<td>+3 464</td>
<td>82.8</td>
<td>47.0</td>
<td>47.2</td>
<td>+0.1</td>
</tr>
<tr>
<td>Low-skilled</td>
<td>2 882</td>
<td>4787</td>
<td>+1 905</td>
<td>66.1</td>
<td>32.4</td>
<td>29.5</td>
<td>-2.9</td>
</tr>
<tr>
<td>Total</td>
<td>8 896</td>
<td>16 212</td>
<td>+7 315</td>
<td>82.2</td>
<td>100.0</td>
<td>100.0</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Author’s own calculations using data from Stats SA (2014; 2017a)

Whilst the move away from a low-skilled population is encouraging, there is a need for analysis in terms of population groups. For instance, Stats SA concluded a comparative study in 2014 of youth employment, unemployment, skills and economic growth between 1994 and 2014. The findings in terms of the composition of the employed population by population group show that there was an increase in the skilled labour category across all population groups. In the semi-skilled category, however, there was a significant increase of 19.2 percent for the black African population group and a significant decrease of 13.7 percent for the white population group. Moreover, there was a decrease in low-skilled labour across all population groups except within the black African population group, where an increase of 3.1 percent was seen.

Further analysis shows that there has been a decrease in the proportion of skilled white employment and a corresponding increase in the proportion of the other population groups within skilled employment between 1994 and 2014. This shift may be indicative of concerted efforts and investment by the state to transform the skills and labour profile of the country. However, further investigation of skills levels by population group shows that that within population groups, the white population still had the highest proportion of skilled employment in 1994: 42.2 percent compared with 15.1 percent in the black African population. Moreover, although population profiles show that between 1994 and 2014 there was a general increase in the proportion of skilled employment for all population groups, the percentages of such increases differ greatly across the groups. The lowest increase was from 15.1 percent to 17.9 percent, within the black African population, and the highest increase was within the Indian/Asian population, with 25.5 percent. Skilled employment within the white population group was 61.5 percent in 2014, compared to only 17.9 percent within the majority black African population. These figures demonstrate some of the lingering effects of apartheid.

---

5 The figures provided for 2017 are based on data obtained from the end of quarter one of 2017.
practices, which skewed skills and employment towards the white population, and are indicative that vast disparities in terms of skills still exist when considering population profiles.

2.3.1. Skills supply

Theoretically, equilibrium within the labour market is achieved when supply meets demand. A brief supply side analysis is presented in this section to ascertain the nature of the skills flowing into the labour market from the secondary and post-school\(^6\) education sectors. For this analysis, the formal schooling system, made up of the primary and secondary education levels, is used as a starting point. The number of individuals obtaining a National Senior Certificate (NSC) (commonly known as a Matric in South Africa) at the end of the secondary education phase and the achievement levels of this NSC are used. These are the individuals who feed into the further and higher education sectors, and directly supply labour to occupations that do not require tertiary or post-school qualifications.

The NSC pass rate over the past 22 years is provided in Figure 2.5, which shows that significant improvement has been achieved in the number of students graduating with a secondary education. A 19.1 percent increase from 1995 to 2016 indicates that the skills levels of the population was improving. However, there was a decreasing trend in the pass rate between 2013 and 2015, as the pass rate dropped from 78 percent in 2013 to 70.7 percent in 2015. The Department of Basic Education attributed this decline to changes in policy that affected the learning and teaching of the 2014 and 2015 cohorts.

Yet while the progression has been positive over the past 22 years, a number of arguments have been raised with regards to the throughput of learners from primary school to the completion of Matric, as well as the quality of the NSC pass rates. A simple pass does not automatically qualify the learner for entrance into post-school education. Moreover, the number of students passing matric with a mathematics pass rate of over 50 percent was only 28 percent in 2014 (Reddy et al., 2016), which is indicative of the restricted number of students who were able to progress into fields such as science-, engineering- and technology-related post-school education and training.

\(^6\) The post-school education sector comprises two distinct sub-sectors: universities and Technical and Vocation Education and Training colleges.
In order to access post-school education in South Africa, an individual would have to attend a university, or a Technical and Vocational Education and Training (TVET) college. TVET colleges, which were previously referred to as Further Education and Training colleges, provide vocational education and training, as well as educational opportunities to those who have not completed their secondary education, but have, at minimum, a grade 9 level of education. There are currently 26 public universities and 50 public TVET colleges. A key challenge of the post-secondary school education or tertiary sector is the poor basic education base with which students enter the tertiary education sector. According to the Reddy et al. (2016), the sector is forced “to find ways to accommodate students with poor schooling outcomes, especially poor performance in secondary school mathematics, languages and science”.

As such, the TVET college system is viewed as a critical building block for the improvement in skills levels and to support young individuals who have no access to university education. However, there are significant issues with the TVET system. Most individuals who qualify to enter tertiary education prefer to enrol at universities. The TVET system has been regarded as providing poor quality education – an issue that has been compounded by poor administration, lack of resources and low infrastructure investment. The DHET, which is mandated to oversee post-school education and training, has in recent years invested significantly in the TVET system in order to strengthen and expand these colleges and transform them into preferred institutions for school leavers through “improving their management and governance, developing the quality of teaching and learning, increasing
their responsiveness to local labour markets, improving student support services, and developing their infrastructure” (DHET, 2013).

The number of graduates in the post-school education and training sector from 2010 to 2015, categorised according to undergraduate, postgraduate and TVET college graduates, is displayed in Table 2.2 below. From 2010 to 2015 there was a general increase in the number of graduates from universities. Within the TVET sector, the number of graduates produced from 2010 to 2014 more than tripled. Yet while access to post-school education and training has improved and the completion rates at universities and TVET colleges have increased, challenges still remain regarding the progression of students and completion of the relevant qualifications. The Council on Higher Education’s Report of the Task Team on Undergraduate Curriculum Structure (2013) found that only one in four students in contact institutions graduate in regulation time, with poor completion rates specifically in the Engineering, Science and Professional Commerce degrees.

Table 2.2: Number of graduates in the post-school education and training sector

<table>
<thead>
<tr>
<th>Year</th>
<th>University undergraduates</th>
<th>University post graduates</th>
<th>TVET College graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>113 183</td>
<td>40 142</td>
<td>21 693</td>
</tr>
<tr>
<td>2011</td>
<td>117 559</td>
<td>43 066</td>
<td>10 492</td>
</tr>
<tr>
<td>2012</td>
<td>120 396</td>
<td>45 597</td>
<td>12 644</td>
</tr>
<tr>
<td>2013</td>
<td>130 050</td>
<td>50 773</td>
<td>53 116</td>
</tr>
<tr>
<td>2014</td>
<td>133 371</td>
<td>52 002</td>
<td>72 691</td>
</tr>
<tr>
<td>2015</td>
<td>140 135</td>
<td>51 389</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s own calculations from HEMIS 2010 to 2015 (DHET, 2015) and DHET (2016)

The SETAs too contribute to the education and training of both the employed and the unemployed in their respective economic sectors through the provision of learnerships, artisan training, skills programmes and internships.

Table 2.3 shows the number of employed and unemployed individuals that have been trained through the SETA system. It is evident that there has been an increasing trend across all training categories. These training programmes predominantly address the semi-skilled category and are intended to up-skill those already in employment in order to enable progression to higher occupational levels or generic training skills. The role of SETAs is also to provide training to unemployed individuals to allow them to access available employment opportunities.
Table 2.3: Individuals trained by SETA from 2010/11 to 2015/16

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learnerships⁷</td>
<td>30 864</td>
<td>29 197</td>
<td>37 158</td>
<td>38 796</td>
<td>40 891</td>
<td>43 322</td>
</tr>
<tr>
<td>Artisan training</td>
<td>3 432</td>
<td>14 023</td>
<td>15 277</td>
<td>18 110</td>
<td>14 389</td>
<td>16 114</td>
</tr>
<tr>
<td>Skills programmes⁸</td>
<td>75 531</td>
<td>87 527</td>
<td>86 491</td>
<td>109 547</td>
<td>106 459</td>
<td>127 144</td>
</tr>
<tr>
<td>Internship⁹</td>
<td>-</td>
<td>878</td>
<td>2 195</td>
<td>2 510</td>
<td>3 663</td>
<td>3 352</td>
</tr>
</tbody>
</table>

Source: DHET (2015; 2016)

2.3.2. Skills demand

The demand for skills is employer-led. Skills planning in South Africa currently resides with the DHET, which, through various mechanisms, aims to ensure that the skills gaps between demand and supply are identified and addressed. Skills demand in this minor dissertation is established by examining the changes in employment distribution per economic sector as well as the changes in occupational categories. Table 2.4 illustrates the changes in employment from 2010 to 2016.

Table 2.4: Changes in employment per sector between 2010 and 2016

<table>
<thead>
<tr>
<th>Sector</th>
<th>Shares of employment in 2010 (%)</th>
<th>Absolute changes 2010 to 2016 '000</th>
<th>% Change</th>
<th>Relative employment shifts¹⁰</th>
<th>Shares of employment in 2016 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>4.7</td>
<td>270</td>
<td>41.7</td>
<td>2.67</td>
<td>5.7</td>
</tr>
<tr>
<td>Mining</td>
<td>2.3</td>
<td>101</td>
<td>31.4</td>
<td>2.01</td>
<td>2.6</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>13.6</td>
<td>-161</td>
<td>-8.5</td>
<td>-0.55</td>
<td>10.7</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.7</td>
<td>35</td>
<td>36.4</td>
<td>2.33</td>
<td>0.8</td>
</tr>
<tr>
<td>Construction</td>
<td>8.0</td>
<td>368</td>
<td>33.0</td>
<td>2.11</td>
<td>9.2</td>
</tr>
<tr>
<td>Trade</td>
<td>22.5</td>
<td>96</td>
<td>3.1</td>
<td>0.20</td>
<td>20.1</td>
</tr>
<tr>
<td>Transport</td>
<td>5.8</td>
<td>157</td>
<td>19.5</td>
<td>1.25</td>
<td>6.0</td>
</tr>
<tr>
<td>Finance</td>
<td>12.2</td>
<td>629</td>
<td>37.0</td>
<td>2.37</td>
<td>14.5</td>
</tr>
<tr>
<td>Community and social services</td>
<td>21.5</td>
<td>586</td>
<td>19.6</td>
<td>1.26</td>
<td>22.2</td>
</tr>
<tr>
<td>Private households</td>
<td>8.7</td>
<td>86</td>
<td>7.1</td>
<td>0.46</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>2 170</strong></td>
<td><strong>15.6</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s own calculations from Stats SA (2017a)

---

⁷ The category “Learnerships” refers to a learning programme that leads to an occupational qualification or part qualification, and includes an apprenticeship and cadetship (DHET, 2016).
⁸ The category “Skills Programmes” refers to a part-qualification (DHET, 2016).
⁹ The category “Internships” refers to the structured work experience component of an occupational qualification registered by the Quality Council for Trades and Occupations (DHET, 2016).
¹⁰ This phrase refers to how each sector shifts relative to the average and is calculated by percentage change of each sector divided by percentage change nationally (Reddy et al., 2016)
The sector that employed the largest number of individuals in 2010 was the trade sector (22.5 percent), followed by the community and social services sector (21.5 percent). The sectors employing the fewest number of individuals were the utilities sector (0.7 percent) and the mining sector (2.3 percent). The largest changes in employment between 2010 and 2016 were seen in the agriculture, finance, utilities and construction sectors, with changes of 41.7 percent, 37 percent, 36.4 percent and 33 percent respectively. The manufacturing sector, which comprised approximately 13.6 percent of employment in the country in 2010, decreased by 8.5 percent in 2016.

The manufacturing sector with a 10.7 percent share in employment, contributes significantly to the South African GDP. The skills level of employees within this sector is predominantly the semi-skilled (Reddy et al, 2016). In addition, although the emergence of competitive, low-cost manufacturing practices globally has impacted the manufacturing sector, which has been experiencing negative growth, this sector continues to play a role in the provision of employment. The finance sector is also notable in that it has increased its share of employment in 2016, and is now the third largest employer. This sector has been relatively stable and continues to be comparable with international sector standards.

The occupational structure of the labour market must also be examined in order to better understand how demand is impacting upon the occupational structure, and to establish which skills are required in the country.

Table 2.5 provides figures on the structure of the employed labour force between 2010 and 2014 according to occupational category. The largest changes in structure are seen within the elementary (26.8 percent) followed by the sales and service (24.2 percent) occupational categories. These two occupational categories also account for the largest shares of employment in 2016, which suggests that the longer-term shift in occupational structure is towards semi- and low-skilled employment. Education and training for entry into these occupational levels is relatively short in terms of time. There was a decrease in the number of technicians and skilled agricultural occupational categories from 2010 to 2016, and a fair increase in the manager and professional categories, with changes of 19.9 percent and 11.1 percent respectively. Reddy et al. (2016) asserts that such changes in these occupational categories could be attributed either to a lack of jobs or a lack of workers.
Table 2.5: Changes in occupational structure of the employed between 2010 and 2016

<table>
<thead>
<tr>
<th>Occupational category</th>
<th>2010 '000</th>
<th>2016 '000</th>
<th>% Change</th>
<th>Shares of employment in 2016 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>1 184</td>
<td>1 420</td>
<td>19.9</td>
<td>8.8</td>
</tr>
<tr>
<td>Professional</td>
<td>802</td>
<td>892</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Technician</td>
<td>1 559</td>
<td>1 479</td>
<td>-5.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Clerk</td>
<td>1 502</td>
<td>1 681</td>
<td>11.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Sales and services</td>
<td>2 000</td>
<td>2 484</td>
<td>24.2</td>
<td>15.5</td>
</tr>
<tr>
<td>Skilled agriculture</td>
<td>74</td>
<td>66</td>
<td>-11.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Craft and related trade</td>
<td>1 659</td>
<td>1 977</td>
<td>19.1</td>
<td>12.3</td>
</tr>
<tr>
<td>Plant and machine operator</td>
<td>1 205</td>
<td>1 319</td>
<td>9.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Elementary</td>
<td>2 964</td>
<td>3 758</td>
<td>26.8</td>
<td>23.4</td>
</tr>
<tr>
<td>Domestic worker</td>
<td>947</td>
<td>993</td>
<td>4.8</td>
<td>6.2</td>
</tr>
<tr>
<td>Total</td>
<td>13 898</td>
<td>16 069</td>
<td>15.6</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s own calculations from Stats SA (2017a)

A list of occupations in high demand has been gazetted by DHET from 2014, which defines such as “those occupations that show relatively strong employment growth, or are experiencing shortages in the labour market” (DHET, 2016). The main purpose of the list is to support planning processes in the post-school education and training sector. The list is further intended to provide insight into the occupational skills mismatches in the country. In total, 331 jobs are listed, which when classified by major occupational groupings are as follows:

- Managers: 32 jobs;
- Professionals: 153 jobs;
- Technicians and associate professionals: 60 jobs;
- Clerical support workers: 10 jobs;
- Service and sales workers: 7 jobs;
- Skilled agricultural, forestry, fishery, craft and related trades workers: 35 jobs; and
- Plant and machine operators and assemblers: 34 jobs.

2.4. The Legislative Framework for Skills Development

The Constitution of the Republic of South Africa section 29 states that

“(1) Everyone has the right –

a) to a basic education, including adult basic education; and
b) to further education, which the State, through reasonable measures, must make progressively available and accessible…”
The DBE and DHET are the primary departments mandated to deliver on this constitutional requirement. Education and skills development have always been at the centre of growth policies of the state. The NDP recognises the inadequacies of the South African education and training system and acknowledges the importance of addressing these urgently to ensure that the relevant skills are developed for higher levels of growth in GDP and employment. In particular, chapter 9 of the NDP, titled “Improving education, training and innovation” focuses on this challenge. The points that follow summarise the pertinent sections of the NDP relevant to the state of the education and training system in the country:

- The “four key features” of South Africa’s “low growth, middle income trap” are: weak competition for goods and services; high unemployment; low savings; and a “poor skills profile” (NDP: 110).
- The labour environment is characterised by “weak skills” (NDP: 132).
- “South African employers spend too little on training their staff and investing in their long-term potential” (NDP: 138).
- The “quality of education for most black children is poor” (NDP: 48).
- “South Africa loses half of every cohort that enters the school system by the end of the 12-year schooling period, wasting significant human potential and harming the life-chances of many young people” (NDP: 305).
- The “South African post-school system is not well designed to meet the skills development needs of either the youth or the economy … Though some institutions perform well and have the academic expertise and infrastructure to be internationally competitive, many lack adequate capacity, are under-resourced and inefficient” (NDP: 316).
- The TVET system is “not effective. It is too small and the output quality is poor. Continuous quality improvement is needed as the system expands” (NDP: 50).
- “Approximately 65 percent of college students are unable to find work experience … The college sector is intended as a pathway for those who do not follow an academic path, but it suffers from a poor reputation due to the low rate of employment of college graduates” (NDP: 320).
- “The performance of existing higher education institutions ranges from world-class to mediocre” (NDP: 50).
- “The data on the quality of university education is disturbing … The need to improve quality is demonstrated by the reports of graduates who are unable to find employment …” (NDP: 317).

To address the “skills crisis”, the NDP identifies “improving the quality of education outcomes throughout the education system as one of the highest priorities over the next 18 years, and
beyond. This includes the post-school system which the [National Planning] Commission believes must provide quality learning opportunities for young people; adults who want to change careers or upgrade skills; people who have left school before completing their secondary education; and unemployed people who wish to start a career” (NDP: 133). The country “must reform the system of skills training to provide for the needs of the economy … and of society as a whole” (NDP: 144).

In an endeavour to create an integrated system of education and training in post-apartheid South Africa, the NSDS was introduced in 2001. The first phase of this strategy spanned four years and its main enabling legislation was the SDA. The overarching purpose of the SDA is to develop the skills of the country’s workforce through the active participation of employers in skills development and to improve employment opportunities through increased levels of investment in education and training in the labour market.

In pursuing these aims, a number of implementation mechanisms have since been established, including the National Skills Authority, the National Skills Fund, provincial offices of the Department of Labour (DoL), labour centres, the National Artisan Moderating Body, the Quality Council for Trades and Occupations, Productivity South Africa, the SETAs and a skills development levy-financing scheme as proposed and described in the Skills Development Levies Act. The latter, more commonly referred to as the levy-grant system, stems from the Skills Development Levies Act of 1999, which regulates a compulsory levy scheme to fund education and training within firms across the various sectors of the economy. The intended goal of this piece of legislation, as a complementary act to the SDA, is to increase the supply of skilled labour in the economy, thereby positively influencing productivity.

Skills development levies of one percent of the monthly payroll are thus payable by all firms that are required to be registered with the South African Revenue Services as per the Income Tax Act and have an annual payroll exceeding R500 000 per annum. Firms are classified into economic sectors based on the Standard Industrial Classification code, an internationally accepted set of codes used in South Africa for the standard classification of all economic activities. Levies paid by firms are apportioned between the National Skills Fund and the SETAs, with 20 percent going to the former and the remaining 80 percent utilised by latter. Firms are able to claim back a portion of their levies in the form of grants by submitting training plans and reports to their respective SETA.

During NSDS I, a total of 25 SETAs were established, each responding to the skills needs of specific economic sectors of the country. These were later re-established into 23 SETAs in
the second phase, and currently comprise 21 SETAs in the third strategy. The SETAs, addressing the skills needs of different economic sectors, were set up through the levy-grant system and are meant to function as stakeholder bodies, incentivising employers to train, supporting training of both the employed and unemployed and collecting data on training taking place and scarce skills within their respective sectors.

The NSDS thus serves as the overarching framework within which skills development in the country should take place. Each version of the strategy has particular success indicators associated with them as measures of their achievement. The main emphasis of the first NSDS, which was implemented from April 2001 to March 2005, was on addressing the structural problems of the labour market and improving the skills levels in the country (Visser & Kruss, 2009). This approach was later revised in NSDS II, which was active from April 2005 to March 2010, in a conscious shift to ensuring quality and impact of training (Grawitzky, 2007). The second strategy was then extended for a further period of one year, ending in March 2011. The third NSDS followed from the second strategy with additional emphasis on promoting technical and vocational education. This third strategy commenced in April 2011 was set to end in March 2016.

Because the licence period of a SETA is traditionally linked to the duration of the NSDS, March 2016 represented the end of the SETAs’ lifespan, which meant that the terms of office for SETA boards, Chief Executives and staff should have come to an end. However, in order to ensure stability and continuity of the post-school education and training system whilst a review of the SETA landscape was underway, the DHET re-licenced SETAs and extended the NSDS by a further two years, to end in March 2018. In December 2016, the Minister of Higher Education and Training further extended NSDS III from 1 April 2018 until 31 March 2020. Along with the extension of the NSDS, the licence periods of SETAs were also extended to March 2020.

As the DHET, the SETAs and the National Skills Fund are the key drivers of the NSDS III, to better understand the three national skills development strategies, the objectives and/or goals of each strategy have been summarised in Table 2.6:
### Table 2.6: Objectives of NSDS I, II and III

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5 objectives, 12 success indicators</td>
<td>5 objectives, 20 success indicators</td>
<td>7 objectives, 16 success indicators</td>
</tr>
<tr>
<td>3 equity targets – beneficiaries to be 85% black; 54% women; 4% persons with disabilities</td>
<td>4 equity targets – beneficiaries to be 85% black; 54% women; 4% persons with disabilities, including youth in all categories</td>
<td>7 developmental and transformational imperatives – focussed on race, class, gender, geography, age, disability and HIV/AIDS</td>
</tr>
<tr>
<td>Objective 1: Developing a culture of high quality life-long learning</td>
<td>Objective 1: Prioritising and communicating critical skills for sustainable growth, development and equity</td>
<td>Goal 1: Establishing a credible institutional mechanism for skills planning</td>
</tr>
<tr>
<td>Objective 2: Fostering skills development in the formal economy for productivity and employment growth</td>
<td>Objective 2: Promoting and accelerating quality training for all in the workplace</td>
<td>Goal 2: Increasing access to occupation-directed programmes</td>
</tr>
<tr>
<td>Objective 3: Stimulating and supporting skills development in small business</td>
<td>Objective 3: Promoting employability and sustainable livelihoods through skills development</td>
<td>Goal 3: Promoting the growth of a public FET college system that is responsive to sector, local, regional and national skills needs and priorities</td>
</tr>
<tr>
<td>Objective 4: Promoting skills development for employability and sustainable livelihoods through social development initiatives</td>
<td>Objective 4: Assisting designated groups, including new entrants, to participate in accredited work, integrated learning and work-based programmes to acquire critical skills in order to enter the labour market and self-employment</td>
<td>Goal 4: Addressing the low level of youth and adult language and numeracy skills to enable additional training</td>
</tr>
<tr>
<td>Objective 5: Assisting new entrants into employment</td>
<td>Objective 5: Improving the quality and relevance of provision</td>
<td>Goal 5: Encouraging better use of workplace-based skills development</td>
</tr>
<tr>
<td>Goal 6: Encouraging and supporting cooperatives, small enterprises, worker initiated, NGO and community training initiatives</td>
<td>Goal 6: Encouraging and supporting cooperatives, small enterprises, worker initiated, NGO and community training initiatives</td>
<td></td>
</tr>
<tr>
<td>Goal 7: Increasing public sector capacity for improved service delivery and supporting the building of a developmental state</td>
<td>Goal 7: Increasing public sector capacity for improved service delivery and supporting the building of a developmental state</td>
<td></td>
</tr>
<tr>
<td>Goal 8: Building career and vocational guidance</td>
<td>Goal 8: Building career and vocational guidance</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** NSDS I, II and III

---

1. The NSDS III consists of goals and outcomes versus the objectives and success indicators that comprised NSDS I and II.
The NSDS III has been the most comprehensive of the three national strategies. It is also a subcomponent of the Human Resource Development Strategy, and was initially envisaged to operate concurrently with the first five-year term of the country’s second Human Resource Development Strategy for South Africa. The delivery of the NSDS through the levy-grant system takes place as follows:

i. SETAs: Part of the mandate of the SETAs of delivering the NSDS is that one of their core responsibilities is the development and annual update of a Sector Skills Plan. This plan should provide labour market intelligence and identify sector-specific skills interventions. The Sector Skills Plans must outline current and future learning and qualifications needs of workers and their employers. This information should be utilised by the SETAs to develop interventions that are agreed upon with stakeholders and that can bridge the gap between education and training supply and demand. SETAs should ensure that strategies to address sector-specific needs are implemented, and the impact thereof must be measured. SETAs must be able to coordinate the skills needs of levy-paying and non-levy paying employers in their respective sectors. The DHET undertakes the role of monitoring the functioning and performance of all SETAs (DHET, 2010)

ii. The National Skills Fund: This is a “catalytic” fund utilised by the state to drive key skills strategies identified as national skills priorities, specifically: “priorities that advance the Human Resource Development Strategy, priorities identified by the Minister after consultation with the National Skills Authority (NSA), and projects that are in alignment with the NSDS and support the new economic growth path, the Industrial Policy Action Plan, rural development, skills to support the green economy, and skills development in education and health, and that contribute towards capacity building and skills development for institutions dedicated to the fight against crime and corruption, as key priorities of government” (DHET, 2010).

Other key policies and legislation within the context of post-school education and training are the Higher Education Act of 1997, the National Student Financial Aid Scheme Act of 1999, the Continuing Education and Training Colleges Act of 2006, the National Qualifications Framework (NQF) Act of 2008, the Adult Education and Training Act of 2000 and the National Education Policy Act of 1996. It is, however, outside the scope of this minor dissertation to review these Acts in detail.

Another pertinent legislative driver of post-school education and training introduced in 2013 is the White Paper for post-school education and training. This White Paper (DHET, 2013) sets out strategies for an improved post-school education and training system that will meet the
needs of South Africa by 2030. A sharpened focus of the SETAs is proposed, limiting the scope of a SETA to the training of employees within the relevant sector and unemployed persons wishing to enter the sector. It is proposed that SETAs will be further employed to provide supply-side data towards the development of a national skills system. The focus of the SETA mandatory grant will be exclusively on gathering accurate data on sector skills needs. SETA discretionary grant funding will be intended for programmes aimed at supporting both existing workers and potential new entrants to the labour market. As it currently stands, the White Paper reinforces the vision of the NDP.

2.5. The Nature of SETAs and How They Have Evolved

As indicated earlier, SETAs were established through the SDA in order to address sector specific needs. Primarily, SETAs are mandated to identify skills shortages, facilitate education and training and encourage the investment in skills development to increase competence and capacity in their respective sectors. SETA priorities further include improving employment for the previously disadvantaged, assisting work-seekers and retrenched workers to enter the labour market, supporting employers to find suitably qualified employees and promoting skills development for self-employment.

Initially, 25 SETAs were established – a number that has been reduced over the years through amalgamations to the current number of 21 SETAs. These public entities have also evolved in terms of their approach to education and training over the past 15 years. In addition, the NSA (2013) notes that the capacity of SETAs vary from entity to entity in terms of governance, management, responsiveness and financial status. Indeed, governance and management challenges have led to certain SETAs being placed under administration, whilst others continue to perform poorly in terms of achieving their service-level agreements. Nevertheless, all SETAs are governed by a board that plays the role of accounting authority, and reports to the DHET as the executive authority.

In terms of funding, the dispersal of monies received by SETAs through the Skills Development Levies Act has since 2013 been specifically regulated. Over the entire 15-year period, the levy percentage payable back to employers has followed a decreasing trend from the initial 50 percent to the current 20 percent of their total levies. Employers are required to submit a workplace skills plans and annual training report (also referred to as an annexure A) which serves as an application for a mandatory grant, i.e. to claim 20 percent of their total levies paid in a year. The workplace skills plans and annual training reports are meant to provide SETAs with firm- and employee-level data on skills needs, and planned and current
training within firms. Utilising 10.5 percent of the levies for administrative purposes, SETAs are required to disburse the remaining funds back into their respective sector for skills development purposes.

There are, however, problems regarding the functioning the SETAs. For instance, the transfer of SETAs from one department, the DoL, to the DHET brought about instability. Also impacting SETAs, were the 2008 amendments to the SDA, which established the Quality Council for Trades and Occupations, and the release of the NQF Act, No 67 of 2008. The NQF repealed the South African Qualifications Authority Act, No 58 of 1995, and consequently Regulation 1127, which established the Education and Training Quality Assurance Bodies. These measures changed the education and training legislation, which ultimately impacted upon the operations of the SETA.

Another change to the current NSDS III is that SETAs are required to operate with a more comprehensive approach to skills development, departing from the target-driven strategy of NSDS I and II to a more outcomes-driven strategy. Systems for reporting, monitoring and evaluation of SETA training and projects are also continually being improved upon, with a shifting focus to measuring impact.

As it stands, the future of the SETAs remains unclear. The perception of the majority of SETAs continues to be negative, characterised by a call from business associations for better management and oversight of these entities. Looking forward, the DHET has thus proposed a new National Skills Development Plan and different SETA landscape post 2020. The proposed change to the SETAs include making these entities permanent with standardised processes to improve their efficiency. However, no official determination has yet been made with regard to the nature and shape of SETAs post 2020.
Chapter 3: Theoretical Framework

The primary purpose of this chapter is to review human capital theory and examine its established relationship to economic growth. Both exogenous and endogenous growth models are explored to provide an overview of the role of human capital in the process of economic growth. It must be noted that this review does not exhaust all theories of growth in which human capital features, but rather is restricted to the prominent models utilised most widely. The final section of this chapter discusses the role of the state in investing in human capital development.

3.1. Human Capital Development and Economic Growth

The definition of human capital is an acknowledged terminological issue; it is a complex concept with no uniform definition. For the purposes of this minor dissertation, human capital is considered to be resources in individuals. The OECD (1998) similarly defines human capital as “the knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity”. Important to note is that similar to physical capital, human capital also experiences diminishing returns and depreciation. Schultz (1961), an ardent proponent of investment in human capital, also refutes the classical view that labour as an economic variable excludes components of knowledge and skill. Like other economists (Becker, 1962; Kraak 2005), he believes that knowledge and skills have great economic value. One implication of Becker’s theoretical analysis of investment in human capital (1962) is that unemployment rates and the level of skill tend to be negatively related. Becker (1962) further argues that theories of firm behaviour have a serious shortcoming: their failure to take into account the effect of the productive process itself on worker productivity.

3.1.1. Exogenous growth models

3.1.1.1. Solow growth model

According to Holland, Liadze, Rienzo and Wilkinson (2013), the majority of empirical studies utilise the simple Cobb-Douglas production function to assess the relationship between economic growth and education. This production function is:

\[ Y = AK^{\alpha}H^{1-\alpha} \]
where $Y$ is output, $A$ is total factor productivity (TFP), $K$ is the stock of physical capital, and $H$ is the stock of human capital. This section will briefly summarise the classical Solow model (1956) as a point of departure. The Solow model focuses on four variables: output ($Y$), capital ($K$), labour ($L$) and “knowledge/technology” ($A$). The production function takes the form:

$$Y = F(K, AL) = K^\alpha AL^{1-\alpha}$$

The technology variable $A$ is “labour augmenting” or “Harrod neutral”. $AL$ represents effective labour, and each unit of labour is more productive/effective when $A$ rises over time. The assumptions of this neoclassical model include constant returns to scale, decreasing returns to each input and a positive and constant elasticity of substitution. Although technological progress is unexplained, it is required for growth to take place. Without technological growth, per capita income growth will eventually become zero as diminishing returns to capital set in. In the steady state, the growth rate of output per worker and capital per worker are both at the exogenous rate of technological progress. It may offset diminishing returns and ensure that economies experience sustained growth. In the long run, economic growth is unaffected by changes in the rate of saving or population growth.

### 3.1.1.2. Human-capital augmented Solow model

Mankiw, Romer and Weil (1992) enhanced the Solow growth model by introducing human capital accumulation as a separate input into the Cobb-Douglas production function. In this human-capital augmented Solow model, the production function becomes:

$$Y = K^\alpha H^\beta (AL)^{1-\alpha - \beta}$$

where the new variable $H$ is the stock of human capital and $L$ is “raw” labour. This model comprises a three-factor production process, with labour and human capital treated as separate variables. This model assumes that human capital depreciates at the same rate as physical capital, and that the coefficients $\alpha + \beta < 1$, implying diminishing returns to all capital and constant returns to scale. $\alpha$, $\beta$ and $1- \alpha - \beta$ measure the elasticity of output to the respective inputs (Schüt, 2003).

As with the Solow growth model, technological growth is the constant rate $g$, population growth is at the constant rate $n$, and $\delta$ is the rate at which the capital stock depreciates owing to wear and tear. As human capital depreciates at the same rate as physical capital, the rate of human capital depreciation is also assumed to be $\delta$. Importantly, Mankiw et al. (1992) assume that
investment in human capital ($s_h$) takes place just as investment in physical capital does ($s_k$). Accumulation of human capital takes place by investing a fraction of income in its production.

In the steady state, output per worker, physical capital per worker and human capital per worker all grow at $g$, the exogenous rate of technological progress, which implies that any increase in $s_h$, the investment in human capital, has no effect on the long-run growth rate. There does however exist a level effect, where the accumulation of human capital shifts the steady-state level of income upwards, leading to a higher long-run growth path. Similar to the classical Solow model, long-run growth is exogenous, and the rate of growth take place at the same rate as that of technology.

An important prediction of Solow's neoclassical model is the following: countries that have the same steady state also have the same levels of technology, investment rates and population growth rates. The convergence hypothesis should hold: poor countries should on average grow faster than rich countries and converge to the same state.

However, the Solow neoclassical model is not without controversy, and multiple critics have argued that there are shortcomings to this model, which may briefly be summarised as follows: firstly, the exogenous treatment of growth rates restricts the model's ability to explain a change in technological growth rate. Secondly, the significant and persistent differentials in per capita income across countries and regions cannot be explained, particularly between developed and developing countries. Finally, the focus on investment and capital leaves the important factor of TFP unexplained.

### 3.1.2. Endogenous growth models

In the Solow model technology is left unexplained; that is, it is exogenously determined. Much of the work of “new” endogenous growth theory initiated by economists since the mid-1980s tries to explain the economic forces that drive technological progress. An important contribution of this work is the assertion that technological progress occurs as profit-maximising firms or inventors seek out new and better ideas. In the field of endogenous growth theory, Romer (1986) and Lucas (1988) have established themselves as the pioneers. Accordingly, the endogenous models reviewed here will be those developed by these two theorists.
3.1.2.1. Growth driven by human capital accumulation

Lucas (1988) formulated a growth model in which human capital is considered as the “engine” of growth. A key feature of the model is the principle that human capital accumulation raises the productivity of both labour and physical capital. Lucas’s model has a two-sector structure, with the first comprising physical capital and the second human capital. Individuals in an economy have control over two variables: the level of consumption and time. The level of consumption determines the accumulation of physical capital, whereas the division of time between work and skills acquisition affects an individual’s future productivity and potentially future wages.

Lucas (1988) presents a growth model in which output is generated through a production function of the form:

$$ Y = AK^\alpha (uhL)^{1-\alpha} h^\gamma a $$

where $Y$, $A$, $K$ and $L$ represent output, technology, capital and labour respectively; $u$ represents the fraction of an individual’s time allocated to work; $h$ is the skill level or human capital; and $h_a$ is the average human capital level. It follows that $1 - u$ represents the fraction of time spent accumulating human capital.

Lucas assumes technology ($A$) to be constant and population growth to be exogenous. The inclusion of $h_a$ allows for the consideration for the external effect of human capital, which can also influence other firms, for example higher average skills allow workers to communicate better. An important assumption of the model is that of a linearity of the function relating the fraction of time spent on accumulating human capital ($1 - u$) to the growth rate of human capital. This assumption implies that the human capital growth rate is independent of its level. It is able to generate endogenous growth owing to the zero diminishing returns to the acquisition of skills. In the steady state, output, physical and human capital per capita grow at the same rate.

Contrary to Mankiw et al. (1992), in which the assumption is made that accumulation of human capital takes place by investing a fraction of income in its production, Lucas (1988) assumes that individuals invest in human capital by spending part of their time acquiring skills. Important to note, however, is that the depreciation of human capital is not considered by Lucas. As in the augmented Solow model, a one-off increase in the stock of human capital has no effect on growth in the Lucas model. A rate effect is only seen when there is a permanent change in the variable governing the accumulation of human capital.
3.1.2.1. **AK-style endogenous growth models**

Learning-by-doing formed the basis of the first model of endogenous growth theory, which is known as the AK model. The AK model, considered to be the simplest endogenous model, assumes that when people accumulate capital, learning-by-doing generates technological progress, which tends to raise the marginal product of capital, thus offsetting the tendency for the marginal product to diminish when technology is unchanged (Aghion and Howitt, 2008).

The AK-style endogenous growth models, also referred to as the learning-by-doing models, consider technology or knowledge to be by-products of production. These models have constant returns to capital, in contrast with the neoclassical Solow model, which assumes diminishing returns to capital. A significant characteristic of the AK-style models is the prediction of long-run permanent growth effects from government policy, which affect investment rates. The AK-style endogenous growth model, referred to as the AK growth model henceforth, is defined below. An important assumption of the model is that the marginal product of capital is constant and aggregate output \( Y \) is proportional to the aggregate capital stock \( K \):

\[
Y = AK
\]

where \( A \) is constant and the equation above illustrates the name “AK” model. This AK growth model is based on the paper by Romer (1986). An important assumption of zero population growth implies that the growth rate of output per worker is equal to the growth rate of capital per worker. In an economy, the long-run growth rate \( g \) is dependent upon the saving rates \( s \). The growth rate is given by

\[
g = sA - \delta
\]

where \( \delta \) represents the rate of depreciation.

If there is some permanent rise in the saving or investment rate, there will be a permanent higher growth rate. The assumption of constant returns to capital gives rise to the treatment of capital as a broad concept, which includes physical, intangible and human capital (McGrattan, 1998). In contrast to the key implications of the neoclassical growth models, the AK growth model assumes indefinite growth, as capital is considered to be non-diminishing. Government policies affecting investment rates are desirable, as the resultant effect is seen in permanent growth effects. Another important distinction between the neoclassical and AK growth models is that according to the latter, income levels do not tend to converge, whereas
in the former, output per capita tends to converge to the steady state (Cunado, Gil-Alana & Perez de Gracia, 2009).

There has been continual debate between the predictions of the AK growth model to that of the neoclassical approach. One of the advantages of the AK growth model is that it takes into account the growth rates of per capita GDP, which the neoclassical model does not. Conversely, arguments in favour of the neoclassical model include that the neoclassical approach takes into account cross-country convergence, which is absent in the AK growth model (see chapter four for a review of the empirical literature). The next section addresses Romer’s contribution (1990) to the theory of endogenous growth models through the incorporation of research and development in the growth model.

3.1.2.2. R&D models

The specific model explored here follows Romer’s “Endogenous Technological Change” (1990). This research and development (R&D) model is focussed on the role of human capital stock in the processes of innovation and adoption of new technologies. The R&D model considers two sectors: physical capital and human capital. The aggregate production function describes how the capital stock \( K \) and labour \( (L_Y) \) combine to produce output \( Y \) using the stock of ideas \( A \). The model takes the functional form of:

\[
Y = K^\alpha (AL_Y)^{1-\alpha}
\]

where \( \alpha \) is a parameter between zero and one. The accumulation equations for capital and labour are identical to those of the Solow model. Capital accumulation in the economy takes place owing to some fraction of output \( (s_K) \) being devoted to saving/investment (i.e., as people in the economy forego consumption at some rate \( s_K \) and depreciates at rate \( \delta \). The population grows at a constant rate \( (n) \).

In Solow’s neoclassical model, \( A \) grows exogenously at a constant rate. In the Romer model, \( A \) is endogenised – that is, it is explained in terms of some variables, and accomplished with the production function for new ideas. An example is that just as more automobile workers can produce more cars, more researchers can produce more new ideas. The general production function for ideas is:

\[
\dot{A} = L^\lambda A^\rho
\]
where 0< Φ <1 is constant, ȶ is the number of new ideas, which is equal to the number of people attempting to discover new ideas (LA) multiplied by the rate at which they discover new ideas (θ). Each additional unit to the stock of knowledge is slightly less productive than the previous unit. New ideas will, therefore, increase with additions to A, but at a decreasing rate. Eventually the growth rate of technology will approach zero and, by implication, the growth rate of output per worker as well. To offset diminishing returns to the stock of technology – that is, to ensure that the number of new ideas is expanding over time – population growth is required to sustain growth in the number of researchers creating new inventions.

The final part of the model looks at how much labour works to produce output (LY) and how much works to produce ideas (LA). As in the Solow model, output per worker, capital per worker and the stock of ideas must all grow at the same rate, and without technological progress, there is no long-run growth along a balanced growth path. Technology depends on the labour force and the share of the labour force devoted to R&D. Government policy can, therefore, potentially alter the long-run growth rate of technology if it can alter the share of the labour force engaged in research.

It is important to qualify that this model is relevant to the advanced countries that conduct R&D as a whole: “worldwide” population growth (n) generates “worldwide” output per worker growth. R&D and population growth in the advanced economies determine technological progress, which is also the long-run growth rate of the underdeveloped country.

This model is consistent with the Solow model in that for a given technological growth rate, the high population growth in the underdeveloped country with no R&D makes it poorer relative to other countries with low population growth rates. Thus, the Solow model emphasises the negative impact of population growth across individual countries, while the R&D model emphasises the positive long-run effect of “worldwide” population growth on “worldwide” output per worker growth.

To recap the various economic growth models, Table 3.1 summarises the main features of the exogenous and endogenous models outlined in this chapter.
<table>
<thead>
<tr>
<th></th>
<th>Augmented Solow model</th>
<th>Lucas model</th>
<th>R&amp;D model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rate</td>
<td>Determined outside the model</td>
<td>Determined within the model</td>
<td>Determined within the model</td>
</tr>
<tr>
<td>Role of human capital</td>
<td>Input in production</td>
<td>Input in production of output and human capital</td>
<td>Input in production of output and stock of ideas</td>
</tr>
<tr>
<td>Determinant of long-run growth</td>
<td>Exogenous technological change</td>
<td>Rate of human capital accumulation</td>
<td>Stock of human capital</td>
</tr>
<tr>
<td>Accumulation of human capital</td>
<td>Through investing a fraction of income</td>
<td>Through spending a fraction of time acquiring skills</td>
<td>Not modelled</td>
</tr>
</tbody>
</table>

### 3.2. Investment in Human Capital – The Role of the State

The preceding section has examined the theory of human capital development and its role in economic growth. In this section, the role of the state through intervention in the form of policies is explored. The effect of policies in the Solow model with exogenous technological change differs from the effect of policies on the endogenous growth models. In the Solow model with exogenous growth, state policies only affect the steady-state income per capita, and therefore only transitional growth towards the new steady state. In the endogenous growth models, however, government policies have effects on the long-run permanent growth rate of the economy.

It is generally accepted that in order for a developing country to pursue economic growth, human capital development is imperative. In addressing the development of skills, the approach taken may need to be considerate of the available methods. As such, Shrivastava and Shrivastava (2014) argue that should a country such as South Africa allocate the functions related to skills development to market forces alone, the likely result would be increased inequality and unstable economies. Hall and Jones (1999) hypothesise that institutions and government policies in the form of social infrastructure account for the differences in capital accumulation, productivity and output per worker. An environment conducive to productive activities supports capital accumulation, skills acquisition, research and development and technological progress.
The state plays a significant and important role in policy development and implementation, funding education and skills development, and encouraging firm-training behaviour through incentives and other means. Shrivastava and Shrivastava (2014) believe that these functions cannot be undertaken by market forces alone, owing to the public and private benefits obtained from both education and the development of skills. They do however, acknowledge the inadequacies of governments of most developing countries. These inadequacies are seen in insufficient funding for higher education, a decline in academic standards, and politicisation and loss of autonomy. Shrivastava and Shrivastava’s (2014) assessment appears to be correct, because as Meager (2009) illustrates, active labour market policies are initiated and promulgated through the state. For example, measures such as tax incentives, subsidies, career guidance and regulatory measures may be restricted to coordination by the state. As a case in point, in South Africa the implementation of the SDA and SDLA has obligated South African firms to prioritise skills training of its workforce (Jinabhia, 2005).

In considering approaches to human capital investment, Allais (2012) expands upon the “varieties of capitalism” literature, which divides the OECD countries into two main models of political economy: liberal market economies and coordinated market economies. In comparing South Africa with the characteristics of advanced economies, Allais (2012:639) is of the view that there is a disconnect between education and training and social policy. She further argues that certain aspects of the South African environment, such as inadequate social systems, high job insecurity and increased inequality, serve as obstacles to the development of a coherent and robust skills development system. This claim can indeed be supported by the state of skills and unemployment in the country, where the official unemployment rate has persisted above the 20 percent mark for the past several years (Stats SA, 2017a).

South African state policies need to be targeted at addressing an imbalance that may in part be attributed to, on the one hand, an apartheid system, which ensured that funding for education and training favoured a certain segment of the population, and, on the other, policies in a post-apartheid dispensation that was not initially focused on ensuring that skills development responded to changing structural dynamics that the economy faced. One inherent feature of South Africa’s current labour market policies is the secondary aim to address issues of both inequality and transformation. This approach by the state is supported by Mayer and Altman (2005), who advocate the role of skills development in not only having direct effects in terms of improving skills levels, but also indirect effects on the country’s income inequality and poverty challenges.
According to Horwitz (2013:2435), the South African state has enacted some of the most progressive legislative measures in terms of skills development, such as the Labour Relations Act of 1998, the SDA, the Employment Equity Act of 1998, the Broad-Based Black Economic Empowerment Act of 2003 and the Promotion of Equality Act. Yet despite this approach, many economists believe that it has not had the necessary impact in terms of developing the required skills in the country. Skills development, education and training have been consistently identified as lacking in the labour force. To address this issue, and according to Kraak (2004), the integrated system of the NSDS has enabled the state to play a more critical and influential role in ensuring that employers are providing training and that grants are being made available for the purposes of developing skills.

Badroodien and McGrath (2005) argue that in the field of skills development, policies formulated by states should also exist in close relationship with practices emerging in workplaces. Globalisation and the increasing responsibility of a government to ensure it maintains its competitive advantage also play a role in the state’s development and investment in human capital, seen in the direction of state interventions – which are moulded by markets, businesses, commercial concepts and practices – and finances (Moloi, Gravett & Petersen, 2009). Thus in order for labour market policies to work in unison with skills development, the approach must be inclusive of market needs. Investigation into the state of skills in South Africa shows that there may be a disjuncture between skills development policies and skills required by the market.

Moreover, policy interventions aimed at halving the unemployment rate by 2014 have not been translated into the labour market, evidenced by the increase in the unemployment rate over the past 20 years. Thus to conclude, while South African policies have been recognised as some of the most progressive legislation in the world, the implementation of these policies has often been ineffective and much criticism has been levelled at the mechanisms used to implement them.
Chapter 4: Literature Review

Chapter 3 presented the theory of human capital in terms of economic growth models. Essentially, there are two broad theories that establish the role of human capital in economic growth models: the exogenous growth model and the endogenous growth model. There are a vast number of empirical studies that consider human capital in their growth regressions, with varying proxies for human capital. Some of the more common proxies are the use of school enrolment rates, adult literacy rates or educational attainment measured in years of schooling.

This literature review highlights empirical studies that have assessed the impact of human capital on economics. The chapter begins with a review of international empirical literature, focussing on developing countries, and then examines studies conducted in South Africa, including those that have assessed the impact of the NSDS and SETAs.

4.1. Evidence from Developing Countries

Empirical studies on human capital investment in the form of education and on-the-job training have appeared as early as that of Becker (1962), in which the significance of human capital on the growth rate of the United States was investigated. Since the late 1990s, such studies have become increasing replicated in developing countries. Before delving into a review of these studies, it is important to note that the results of the research range from human capital having no statistically significant impact on growth, to confirmation of the significant role human capital plays in economic growth.

Also of relevance is Schütt’s observation (2003) that the results of most studies are subject to methodological and conceptual weaknesses. Specifically, questions relating to the adequacy of empirical human capital proxies and reverse causality are raised. Although on balance the majority of studies appear to find results that indicate a positive relationship between human capital and output growth, other economists, such as Pritchett (2001) and Barro (2001), have also found that many studies have produced vulnerable empirical results owing to a lack of data and the choice of econometric techniques utilised.

The human-capital augmented Solow model from Mankiw et al. (1992), reviewed earlier in chapter three, has specifically been criticised by Pritchett (2001) for the use of enrolment rates as a proxy for human capital in growth regressions. Mankiw et al. (1992), using single cross-sectional data for a sample of 98 countries for the period from 1960 to 1985, estimate regressions for two subsamples: one sample consisting of only OECD countries, and the other
comprising other countries (excluding least-developed countries). They find positive significant results for the coefficient on schooling for the second sample only, and conclude that human capital contributes positively to output growth. For the first sample of OECD countries, schooling is found to be insignificant.

Pritchett’s (2001) main argument is that for enrolment rates to adequately represent a country’s steady state stock of human capital, the enrolment rates would need to be constant over time. However, with the increasing availability of schooling in developing countries, it would not be possible for such countries to maintain a constant school enrolment rate. Schütt (2003) also points out the potential problems with the model estimation of a constant rate of technological progress for all countries.

Driven by the implications suggested by Mankiw et al. (1992), other studies have sought to further investigate the model and its validity. Knight, Loayza and Villanueva (1993), in an attempt to re-examine the time series evidence of the augmented Solow model, follow Mankiw et al.’s methodology (1992) by reviewing data from 98 countries, but utilise a technique using a panel of time series and cross-sectional data. The key determinants examined in their study are quantitative importance for economic growth of both country-specific and time-varying factors such as human capital, public investment and outward-oriented trade policies. The results from the time series analysis indicate that human capital has a significant impact on growth. The same applies to the other factors considered in the study. Knight et al. (1993) conclude that the evidence analysed supports the model purported by Mankiw et al. (1992). They do, however, point out that there is evidence of significant country-specific effects in their extended approach.

Another study of the exogenous growth model is the empirical study by Vinod and Kaushik (2007), in which the augmented Solow model was applied to a panel of 18 large developing countries. By reviewing data over 20 years, from 1982 to 2001, using time series and panel regressions, they found that human capital, as measured by the percentage of literate adults, has a statistically significant impact on economic growth in large developing countries. The Ordinary Least Squares (OLS) method employed further showed that the elasticity of GDP with respect to human capital (adult literacy) was greater than that value of 1 for 13 of the 18 countries sampled.

Benhabib and Spiegel (1994) similarly investigate human capital through two methods by analysing the cross-country evidence on the determinants of economic growth. Firstly, they utilise the simple Cobb-Douglas production function, in which human, labour and physical
capital are factors of production. They find an insignificant and negative effect of human capital on growth per capita. Temple (1999) replicates the results of Benhabib and Speigel (1994), and explains this inconsistency between theory and evidence by contending that simple cross-country regressions do not detect an effect of human capital. This phenomenon may be owing to a small number of countries in which human capital accumulation possibly has had little or no effect.

The second approach used by Benhabib and Spiegel (1994) considers Romer’s R&D model (1990), in which human capital influences productivity through its role in the processes of innovation and adoption of new technologies. A further adaptation to the model is the assumption that human capital levels affect the speed of technological progress. This second approach produces different, more encouraging results, where high levels of human capital stocks result in higher levels of technological progress.

In a later study, Mamuneas, Savvides and Stengos (2006) estimate a general model for economic growth by considering physical, labour and human capital to vary across two dimensions: countries and time. They also find a positive impact of human capital upon economic growth in the groups of high-, middle-, and low-income countries across continents. The method they employ includes of an index of TFP growth, which encompasses the contributions of physical and labour as inputs. This index is then utilised to assess the impact of human capital growth on TFP growth. An important contribution of this study is its accounting for individual human capital effects on aggregate output.

Other studies have been conducted on regional and cross-country analysis. For instance, the World Bank produced a World Development Report on labour, in which an absence of a correlation between growth and education expansion was found (World Bank, 1995). Lau, Jamison and Louat (1991) estimated the effects of education by level of schooling for five regions, finding that primary education was only positive and significant in East Asia, while there was an estimated negative effect in Africa and insignificant effects in South Asia and Latin America. Studies where adult literacy rates were used as a proxy for human capital includes those of Behrman (1987) and Dasgupta and Weale (1992) – both of which find that there is no significant correlation between the changes in adult literacy and the changes in output.

As this minor dissertation is focussed on impact within a specific country, it is important to review country-specific studies. Countries such as Brazil, Malaysia and Botswana (to name a few) share the same characteristics as South Africa in terms of development and income
classification. The Department of Economic and Social Affairs of the United Nations Secretariat (2017) classifies these countries, along with South Africa, as developing, upper-middle income\textsuperscript{12} countries. Thus, empirical studies based in these countries will be briefly considered here.

Reviewing cross-sectional evidence from Brazil, Lau, Jamison, Liu and Rivkin (1993) estimate an aggregate production function to four inputs: physical capital, labour, human capital and technological progress. Human capital in this study is measured as the average number of years of formal education per person of the labour force. Based on data from individual Brazilian states in 1970 and 1980, Lau et al. (1993) find that one additional year of average education per person of the labour force increases real output by approximately 20 percent. They do, however, caution that this large measured effect may be owing to a threshold of minimum average education somewhere between three and four years in order for education to begin to have an impact. Based on the results of other studies, Lau et al. estimate that a more realistic effect of one additional year of average education per person in the labour force on real output to be approximately 5 percent.

Another Brazilian study utilising an array of proxies for human capital and using panel data for the period 1985 to 2004 finds a positive effect of human capital on growth. However, accounting for regional differences, these results vary. Different levels of human capital have different responses to growth depending on the level of regional development. This finding relates to Hall and Jones’ hypothesis (1999), reviewed in chapter three, that institutions and government policies in the form of social infrastructure account for the differences in capital accumulation, productivity and output per worker.

The number of studies within the Malaysian context on human capital and its role in economic growth are vast. Of relevance is Jantan and Chen’s test (2005) of the role of human capital on output in Malaysia. They found that estimates for human capital measure show a weak positive impact on GDP. More recently, Rusli and Hamid (2014) estimated the long- and short-run relationships between human capital and economic growth in Malaysia using a time series analysis for the period from 1970 to 2008. Education represented by gross school enrolment and aggregated by primary, secondary and tertiary years of schooling is the proxy utilised for human capital. They found that there is a significant positive relationship between human capital.

\textsuperscript{12} The classification of countries into developed economies, economies in transition and developing economies is intended to reflect basic economic country conditions. Countries have been grouped as high-income, upper middle-income, lower middle-income and low-income. To maintain compatibility with similar classifications used elsewhere, the threshold levels of GNI per capita are those established by the World Bank. Countries with between $4,036 and $12,475 are classified as upper middle-income countries (United Nations, 2017).
capital and economic growth in the long run. These positive results are supported by Islam, Ghani, Kusuma and Theseira (2016).

Through a multiple linear model analysis, Islam et al. (2016) explored the relationship between education and economic growth as well as the relationship between human capital and economic growth in Malaysia. They concluded that education and human capital shows a significant positive outcome with economic growth. Similarly, positive results are seen with a study by Mat, Mansur and Mahmud (2015) within a particular province in Malaysia. OLS regression analysis on the effects of human capital investment utilising time series data from 1980 to 2010 shows that human capital (where literacy rate is used as a proxy) has a positive relationship with economic development (Mat, Mansur and Mahmud, 2015).

Using Botswana as a case study, Mandlebe (2014) in his doctoral thesis explored the relationship between human capital and growth in the country. Lucas’s endogenous growth theory formed the theoretical basis of this study. Utilising multiple regression analysis, he found that expenditure on education and school enrolments, as proxies for human capital, were significantly and positively related to the national income. According to Mandlebe (2014), over 99 percent of the variation in GDP is explained by the previous year’s GDP, gross fixed capital formation, expenditure of education, school enrolment and pupil-teacher ratio. He concluded that investment in human capital may be explored as an additional source for economic growth.

### 4.2. Evidence from South Africa

In the South African context, there have been a limited number of studies undertaken exploring the impact of human capital on growth by employing endogenous or exogenous models. Fedderke (2005) is one such study. Analysing manufacturing sector panel data from 1970 to 1997, he finds a statistically significant and positive relationship between human capital and efficiency gains within the South African manufacturing sector. He emphasises that the positive impact is seen as an association of the quality of human capital and not necessarily the quantity of human capital. The proxies for human capital in this study take into account the established education bias in population groups within South Africa. Accordingly, primary and secondary school enrolment rates are controlled for separately to account for the quality differential among the types of schooling provided for the different racial groups.

Utilising a growth accounting exercise, Liu (2007) assessed output growth in the country from the 1970s to the early 2000s. His findings show that in the 1970s and 1980s, output growth
was mainly attributable to high growth of physical capital stock. However, as South Africa moved into the 1990s, technology accumulation mainly accounted for output growth. A noted shortcoming of this study is the assumption of constant returns to scale – an assumption that has been challenged by the new growth theoretical models.

In a different approach, Pouris and Inglesi-Lotz (2014) advocate that the role of higher education or tertiary education in providing research and skilled graduates is essential. Indeed, as evidenced by Fedderke’s study (2005) reviewed earlier, the quality of a country’s human capital is important and a key determinant of economic growth. Pouris and Inglesi-Lotz (2014) then found that the contribution to the economy from this source of human capital may be categorised into two types: indirect effects, which comprise goods and services purchased from other sectors of the economy, and induced effects, which consist of the income spent by university employees on goods and services that in turn provide for income for other employees, thus creating a ripple effect. This study concedes that investment in higher or tertiary education in South Africa is limited when compared to other OECD countries – a finding corroborated by the fact that government expenditure on universities is lower than the OECD average (Pouris & Inglesi-Lotz, 2014).

Other studies in South Africa have explored human capital, skills development, education and training and the role they play in terms of development. Many of the studies into the South African labour market assert the need for skills development or human capital development in order to address the issue of unemployment, which inevitably has an effect on poverty and inequality. Groener (2013), for instance, looks at the impact of skills development in addressing the structural inequalities in post-apartheid South Africa. The skills system implemented was aimed at both assisting unemployed persons in gaining skills and up-skilling employed workers. However, the promise of equity in the labour market did not take into account the role that the market plays in providing employment opportunities. Transformation, according to most government policies, including skills development policies, remains one of the main areas of emphasis for improving training, the skills levels of the country and the education system. Skills development initiatives are necessary for addressing the income inequality in South Africa, by aiming to improve the skills of the unemployed, thus increasing their employability. Yet as Groener (2013) argues, if employment is not available, then inequality cannot be redressed.

While the campaign for a more skilled labour force continues, an important finding from the study undertaken by Bhorat and Oosthuizen (2005) is that there has been a rapid growth in unemployment even amongst those individuals with matric and tertiary levels of education.
They find that this problem is particularly severe amongst the black African demographic, and attribute this finding to the perceived quality of graduates from the historically disadvantaged higher education institutions. Thus, despite the skills shortage in South Africa, there are increasing numbers of highly educated individuals without employment. One of the most challenging aspects that the state may need to deal with is ensuring the production of the relevant skills in high demand while assuring a quality higher education system. Addressing this problem however may not be easy, as qualified or educated job entrants may still have to contend with misconceptions and stereotypes about certain institutions in terms of education quality from employers.

### 4.2.1. Research on the SETAs and the NSDS

Since it is the primary aim of this minor dissertation to investigate the success of the NSDS from 2001 to 2015, it is important that studies on the NSDS and SETAs be reviewed. The efficiency of the SETAs has increasingly been questioned, with much criticism levelled at the lack of relevant skills available in the country. A study conducted by Turner, Halabi, Sartorius and Arendse (2013), utilising an input/output model and a Random Effects GLS regression model, found mixed results with regards to the efficiency of SETAs. While some SETAs from the sample were found to have excessive cash reserves, others reported poor achievement of targets. The vast amounts of money invested in this mechanism may need to be reconsidered and redirected to other modes of skills development. The issue is such that even in sectors where there has been improvement, these improvements have been limited and insufficient to meet the country’s need for skilled labour.

Despite these institutions having been central to the development and improvement of skills since 2000, Turner et al. (2013) argue that most businesses in South Africa claim that their biggest constraint to growth is the lack of a skilled workforce. Taking into consideration the findings of the study, the question as to whether or not the current policies and instruments in place are sufficient is pertinent. Implications of such findings are important to government, as well as sectors that require critical skills. Addressing this issue is crucial, as it impacts the country’s economy and any progress towards its sustainable development.

Another relevant study is that of McGrath, Badroodien, Kraak and Unwin (2004), who investigate the NSDS by reviewing studies conducted from 1999 to 2002 with particular emphasis on enterprise training. The aim of their review was to offer indicators that may be employed in assessing the success of the NSDS. Badroodien et al. (2004) found that firstly, there is a failure of the levy-grant system to attract employers to increase training. Secondly,
there is a failure of SETAs in carrying out their mandate of both training and dispersion of grants to employers. Badroodien et al. (2004) conclude that whilst the evidence is not very encouraging, the NSDS does have the potential to improve the low skills levels in the country. Similarly, the DoL, which took responsibility of skills development at the time, utilised six specific measures to ascertain the success of the national strategy in promoting skills development. These indicators included looking at levels of educational attainment; large, medium and small firms receiving grants; uptake of learnerships and participation of workers in structured learning programmes.

Similar to the conclusions drawn by Badroodien et al. (2004), Daniels (2007) declares that the government in South Africa has not taken the relationship of skills to productivity into consideration in describing skills shortages, resulting in variances regarding the stated required skills in the country. He points out that at a policy level, the skills development success measures are ineffective. An important aspect of measuring success of the skills development institutions has been utilising targets and achievements. This approach, however, according to Daniels (2007), does not readily translate into completion of training programmes, or throughput into employment. Daniels (2007) further reviewed the perception of SETAs by employers, finding that a relatively large number thought this mechanism to be unsuccessful, with faults in capacity and operational efficiency.

Mayer and Altman (2005) then look at the implications for skills development based on the economic trajectory of the country. In their view, the current policy emphasis in South Africa is on increasing the knowledge-based skills with limited attention given to the semi-skilled and unskilled who form the majority of the unemployed population. Mayer and Altman (2005) question whether the NSDS is able to address the low level of skills within the country. They further point out that policy interventions, which were aimed at halving the unemployment rate by 2014, have not been realised. Their study provides some information regarding the lack of delivery and limited success of government’s skills development policy.

Furthermore, Kraak (2008) argues that the promise of this national strategy, the NSDS, has failed, attributing this to three main issues: lack of political motivation, governance issues and deficiencies in execution. These problems, further compounded by insufficient buy-in from employers and trade unions, have resulted in a failure of the envisioned integrated skills system in the country. In his view, any assertion of an improvement to the education and training system still lacks the support of credible data.
Moreover, because employers play a critical role in the labour market, and although employers are required to participate in the skills development levy system, according to Kraak (2008), most of these employers disregard the system and treat the levy as an additional tax burden. In addition, the SETAs’ operations are centred on performance targeting, which some may argue neglects sectoral skills needs. This approach leads to the possible deduction that the sectoral approach to skills development may not necessarily be ideal for the South African environment.

Examining the success of the SETAs in improving the skills system, Horwitz (2013) investigates skills development at a higher level, policy initiatives in the form of state- and firm-level policies, and the existing skills system within South Africa. He claims that whilst the mechanism of the SETAs have played a role in improving the skills system, this progress has been limited to only certain sectors of the economy, while most have not seen any improvement. In trying to address legacy issues pertaining to skills development, the introduction of the new system of the SETAs have failed to keep up with and produce the requisite demand of skills. In his view, the effectiveness of the system is questionable. An emerging economy, such as that of South Africa, requires particular skills, like that of artisans, in order to compete with its counterparts. However, Horwitz (2013) claims that these skills are scarce in South Africa.

McGrath and Akoojee (2007) and Allais (2012) agree with Kraak (2008) and Horwitz (2013), finding that the SETA mechanism does not sufficiently address all sectoral needs, and that the continued weakness in the operational capacity of these institutions has led to vast variations in development in the different sectors of the economy. Moreover, a common consensus is that the levy-grant system has created a practice of malicious compliance from the employer’s perspective, rather than promoting training. Employers, they argue, are not attracted to participate in the levy-grant system, and the vast amounts of money invested into the system has not benefitted the economy by way of improved skills.

In summary, the majority of studies reviewed find shortcomings with the South African state’s approach to skills development. The main criticisms relate to the disjuncture between state policy and employer participation, the ineffectiveness and operational inefficiencies of SETA, the nature of the measures taken by the NSDS and the type of skills required for the country to support economic growth.

Although the creation of a knowledge economy has traditionally been the goal of developing economies, this view has been a point of contention. Warhurst (2008) argues that such
countries require a broader range of skills and other labour market interventions, which are not only focussed on creating and developing so called “thinking” skills. In a knowledge economy, the state plays the key role of intervention in the supply-side of the labour market. However, while this aspect of Warhurst’s claim (2008) may be correct, the argument cannot be seen in absolute terms. The state’s role in pursuing active labour market policies is critical in ensuring that a developing country, participating at a global level, is able to create and maintain a competitive skills and knowledge human resource base (Jinabhia, 2005). This resource base, however, must contain an inclusive set of skills at high, intermediate and low levels, and recognition of such must be a priority for any state that promotes skills development.

Essentially, the labour market is arguably the most important factor in an economy, impacting lives in different ways. It has been established both theoretically and through empirical studies that human capital in most developing countries has had a positive and significant role to play in economic growth. This minor dissertation will contribute to the existing literature by focussing on the human capital produced as a result of the NSDS to establish its impact on output growth in the country.
Chapter 5: Research Design and Methodology

This chapter of the minor dissertation discusses the empirical framework that will be utilised to assess the impact of the NSDS through SETAs. This impact will be analysed through two perspectives: impact on output in terms of real GDP and impact on labour productivity. The chapter specifically discusses the endogenous growth driven by human capital accumulation model, which is used to determine the estimation model, the chosen variables, the data and data sources, and the estimation techniques employed. The regression model employs panel data analysis of the nine sectors\textsuperscript{13} of the economy over a 15-year period.

5.1. Empirical Framework

Across the literature, the examination of the effect of human capital on economic growth is broadly conducted using the exogenous or endogenous growth models. Following Lucas (1988) and Romer (1986), in this study the impact of human capital on economic growth is conventionally estimated using an endogenous growth model as follows, starting with a Cobb-Douglas production function:

\[
Y_t = AK_t^\alpha H_t^{1-\alpha} 
\]

(1)

On the basis of this production function, Lucas (1988) proposes the following production function, which includes human capital as part of the production process:

\[
Y_t = AK_t^\alpha (u_t h_t L_t)^{1-\alpha} h_t^\alpha 
\]

(2)

where \( Y, A, K \) and \( L \) represent output, technology, capital and labour respectively, \( u \) represents the fraction of an individual's time allocated to work, \( h \) is the skill level or human capital, and \( h_\alpha \) is the average human capital level. It follows that \( 1 - u_t \) represents the fraction of time spent accumulating human capital. This model has constant returns to scale, with \( 0 < \alpha < 1 \), and \( \gamma \geq 0 \). The level of technology, \( A \) is assumed to be constant.

Another important assumption of the model is that the function relating \( 1 - u_t \) to the growth rate of human capital, \( \frac{h_t}{h_t} \) follows a linear form, so that

\textsuperscript{13} Stats SA delineates the economy into nine industries and into the formal and informal sector. This minor dissertation employs the word "sector" to refer to the nine economic sectors (or industries) of the economy.
\[
\dot{h}_t = h_t \delta (1 - u_t) \leftrightarrow \frac{\dot{h}_t}{h_t} = \delta (1 - u_t)
\] (3)

where the parameter \( \delta \) is the maximum attainable growth rate of \( h \), which is the skill level or human capital. It thus leads from this linearity assumption that the growth rate of human capital is independent of its level. In this model, human capital formation itself, by non-decreasing marginal returns, creates endogenous growth. The model further assumes equal growth rates of output and capital to that of human capital, i.e.:

\[
\frac{\dot{y}_t}{y_t} = \frac{k_t}{k_t} = \frac{\dot{h}_t}{h_t}
\] (4)

In general, direct estimation of aggregate production functions are faced with the challenge of limited data on capital stocks, which has resulted in a limited number of empirical studies employing this methodology. Benhabib and Spiegel (1994) was one of the first studies where various measures of capital stock, along with human capital were estimated to determine the effect on output growth. Another study is that of Krueger and Lindahl (2001), who re-estimate the equation from Benhabib and Spiegel (1994) without including the growth of physical capital.

Taking into consideration available data on human capital, the Lucas (1988) model has been chosen over the augmented Solow model (which also accounts for human capital within the production function). The data available corresponds more closely to the level of human capital than to the rate of human capital accumulation, which is required by the augmented Solow model.

Ismail (2009) then utilises the production function to investigate the impact of human capital attainment on output and labour productivity of Malay firms. Ismail (2009) and Ismail, Noor and Awang (2011) further include an external factor variable \( U \) to equation (2) to account for the human capital obtained from learning-by-doing. A common proxy for this variable is the previous year’s output, \( Y_{t-1} \), owing to difficulty in measurement.

According to Cörvers (1996), by accounting for the inputs of human capital, one may compute effective labour \( L' \). So doing allows for the inclusion of various characteristics with regards to human capital, such as years’ experience in work, level of education and participation in training. Cörvers (1996) presents effective labour input \( L' \) by a Cobb-Douglas production function, where low-, intermediate- and highly-skilled labour serve as input variables. Adapting
from Cörvers’ (1996) study, the employment shares of low-skilled, semi-skilled and skilled labour per sector are used as approximations for the input of human capital. Thus, from equation (2), effective labour is represented by 

\[ \dot{L}' = (u_t h_t L_{t}) \] 

and

\[ L' = L \ast L_1^{\theta_1} L_2^{\theta_2} L_3^{\theta_3} \] (5)

Where \( L \) = quantity of labour, \( L_1 \) = number of workers within the low-skilled category, \( L_2 \) = number of workers within the semi-skilled category, \( L_3 \) = number of workers within the skilled category, and \( \theta_i \) = the effect of human capital at different levels of skills, where 1 = low-skilled, 2 = semi-skilled and 3 = skilled.

Equation (2) is rewritten as:

\[ Y_t = A K_t^{\alpha} L_t^{\beta} Y_{t-1} \] (6)

As the research focus is on the impact of the NSDS delivered through SETAs, it is crucial to account for sector-specific differences. Thus, a panel data model is utilised, in which sector-specific and time-specific effects are accounted for. Impact of the NSDS through SETAs on both output and labour productivity is assessed.

In order to analyse the impact of human capital on labour productivity, from Cörvers’ (1996) adaptation of the Cobb-Douglas production function:

\[ Y_i = A K_i^{\alpha} L_i^{\beta} \] (7)

where \( \alpha \) and \( \beta \) represent the output elasticities of physical capital (\( K \)) and labour (\( L \)) respectively, all other variables remain as per the production function in equation (1), and \( i \) represents each sector. The labour productivity of a sector can be written as:

\[ \frac{Y_i}{L_i} = \frac{(A K_i^{\alpha} L_i^{\beta})}{L_i} \] (8)

The labour productivity equation is derived by substituting \( L' \):

\[ \frac{Y}{L} = A \left( \frac{K}{L} \right)^{\alpha} L^{\alpha+\beta-1} L_1^{\theta_1} L_2^{\theta_2} L_3^{\theta_3} \] (9)

Taking natural logs of equation (9):
\[\ln \frac{Y}{L} = \ln A + \alpha \ln \left(\frac{K}{L}\right) + (\alpha + \beta - 1) \ln L + \beta \theta_1 \ln L_1 + \beta \theta_2 \ln L_2 + \beta \theta_3 \ln L_3 \] (10)

The output elasticity of low-skilled, semi-skilled and skilled labour is derived by differentiating equation (10) with respect to \(L_1, L_2\) and \(L_3\) respectively, i.e.

\[
\frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_1}, \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_2}, \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_3}
\]

such that

\[
\theta_1 = \left(\frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_1} \div \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_1} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_2} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_3}\right); \quad \theta_2 = \left(\frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_2} \div \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_1} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_2} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_3}\right); \quad \theta_3 = \left(\frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_3} \div \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_1} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_2} + \frac{\partial \ln \left(\frac{Y}{L}\right)}{\partial L_3}\right) \] (11)

5.2. Model Specification

The use of panel data allows for the control of variables that cannot be observed or measured, such as differences in training practices across sectors, geographic location and innate skills of an individual. So doing accounts for individual heterogeneity, and serves to control for omitted variable bias. The use of panel data also allows for a sufficient number of observations, as both time and cross-sections are considered. From equation (7) and equation (10), the specified models are:

\[\ln RGDP_{i,t} = \beta_1 \ln K_{i,t} + \beta_2 \ln L_{1i,t} + \beta_3 \ln L_{2i,t} + \beta_4 \ln L_{3i,t} + \beta_5 \ln TR_{i,t} + \beta_6 \ln SDL_{i,t} + \eta_i + \xi_t + \mu_{i,t} \] (12)

\[\ln \left(\frac{RGDP}{L}\right)_{i,t} = \beta_7 \ln \left(\frac{K}{L}\right)_{i,t} + \beta_8 \ln L_{1i,t} + \beta_9 \ln L_{2i,t} + \beta_{10} \ln L_{3i,t} + \beta_{11} \ln \left(\frac{TR}{L}\right)_{i,t} + \beta_{12} \ln \left(\frac{SDL}{L}\right)_{i,t} + \eta_i + \xi_t + \mu_{i,t} \] (13)

The subscript \(i\) represents the nine sectors, such that \(i = 1, 2, \ldots, 9\); \(t\) represents the time periods, i.e. \(t = 1, 2, \ldots, 15\); and \(\ln\) is natural logarithm, RGDP = real gross domestic product, \(K\) = gross fixed capital formation, \(L\) = total number of employees, \(L_1\) = employment shares of low-skilled labour, \(L_2\) = employment shares of semi-skilled labour, \(L_3\) = employment shares of skilled labour, \(TR\) = number of individuals trained by SETAs, SDL = skills development levies,
\( \eta_i \) = sector specific fixed effect that controls for time-invariant heterogeneity, \( \xi_t \) = time specific effect, and \( \mu_{i,t} \) = error term which is normally and independently distributed.

Given that the focus of this study is on the impact of SETAs, an analysis of equations (12) and (13), excluding the employment share of labour variable, i.e. \( L_1, L_2 \) and \( L_3 \), is also required. Thus, two additional estimations of the following equations are conducted:

\[
\ln \, RGDPP_{i,t} = \beta_{13} \ln K_{i,t} + \beta_{14} \ln TR_{i,t} + \beta_{15} \ln SDL_{i,t} + \eta_i + \xi_t + \mu_{i,t}
\]  

\( (14) \)

\[
\ln \left( \frac{RGDP}{L} \right)_{i,t} = \beta_{16} \ln \left( \frac{K}{L} \right)_{i,t} + \beta_{17} \ln \left( \frac{TR}{L} \right)_{i,t} + \beta_{18} \ln \left( \frac{SDL}{L} \right)_{i,t} + \eta_i + \xi_t + \mu_{i,t}
\]  

\( (15) \)

The regression analysis of equations (12), (13), (14) and (15) will be estimated using both the fixed effects (FE) and random effects (RE) estimation. The Hausman test for the exogeneity of the unobserved error component will be utilised to substantiate the choice between FE and RE. Section 5.4 briefly outlines the FE and RE panel models.

The period selected for the analysis is from 2001 to 2015.\(^{14}\) This period has been chosen because the NSDS was launched in 2001. At the commencement of the NSDS, there were a total of 25 SETAs. This figure has been reduced to 21 as a result of the amalgamation of certain SETAs, as discussed in Chapter 2 of this minor dissertation. The categorisation of SETAs into the main economic sector of the economy will be discussed in detail in section 5.3.

Data considerations, existing literature and economic theory have guided the selection of variables. Across the literature reviewed, a central issue has been the selection of the most appropriate proxy for human capital, along with other explanatory variables. For instance, Cohen and Soto (2001) use an estimate of average school years at ten-year intervals, and include urbanisation rates and developing-country dummies to account for technological differences in their cross-country regression analysis. Bassanini and Scarpetta (2001) use the pooled mean group estimation, with one-year intervals and years of schooling as a proxy for human capital.

\(^{14}\) The SETA financial year commences on 01 April and ends on 31 March of the following year. SETA data on training and skills development levies follow this cycle; however, the other data is based on calendar years. It is preferable to have data that is consistent in terms of the years to undertake this analysis. However, owing to the differences in planning cycles across the economy, data in one standard year format is not available. Budgeting and planning within the SETA context is guided by National Treasury as the SETA is a public entity. Thus, planning and budgeting takes place in the current calendar for the next financial year. Accordingly, each SETA financial year is aligned to the calendar year in which it commences.
In a study of the impact of human capital development on economic growth in Nigeria, Adelakun (2011) analyses through an OLS method this relationship using GDP as proxy for economic growth, total government expenditure on education and health and the enrolment pattern of tertiary, secondary and primary schools as proxy for human capital. Similarly, Arabi and Abdalla (2013) empirically investigate the impact of human capital on economic growth in Sudan for the period 1982-2009, but use a simultaneous equation model that links human capital (i.e. school attainment) and investment in education and health to economic growth, total productivity, foreign direct investment, and human development index. Evidently, the choice of explanatory variables differs across the various studies.

Although figures for throughput – i.e. absorption into employment after the conclusion of a training programme – is an important consideration, such data is not available in South Africa. The tracking of individuals that have engaged in a SETA training programme ends at the completion of the programme. No further data on whether or not individuals enter into employment as a result of this training is available, and has thus been excluded from this study.

Below is a discussion on the variables used in this study:

**Real GDP:** real GDP is used as the measure of output as it accounts for the total value produced using constant prices, isolating the effect of price changes. Real GDP is transformed by using the natural logarithm (ln) to transform this variable, which may be highly skewed, to one that is more approximately normal by removing the underlying trend. Other studies assessing the impact of human capital on economic growth, such as Adelakun (2011) and Arabi and Abdalla (2013), have utilised real GDP and real GDP growth rates as measures of economic output. A number of other studies such as Jin (2008), Katircioglu (2009) and Abbas and Peck (2008) have also utilised real GDP as a proxy for economic growth. In Lucas’s (1988) model, there theoretically exists a positive significant relationship between GDP and human capital. Thus, a positive relationship is postulated.

**Gross fixed capital formation:** fixed capital formation, calculated by the SARB, is a proxy for capital investment. Changes in the level of the capital stock differ considerably between the different sectors in the economy, owing to sector-specific influences impacting each sector uniquely. Thus, gross fixed capital formation (GFCF) per sector has been chosen to account for sector structural differences. It is expected that a positive relationship exists between GFCF and real GDP.
Total number of employees: in order to measure effective labour, Cörvers (1996) posits that the quantity of labour multiplied by some form of quality indicators provides a sufficient proxy for effective labour. Barro and Lee (1993) further argue that any measure of human capital should account for both educational achievement and on-the-job training, but such data is not collected in South Africa. Accordingly, this variable (total number of employees) has been chosen to provide the quantitative labour figures per sector.

Employment share of low-skilled, semi-skilled and skilled labour: this variable has been chosen as a proxy for the quantity and quality of labour in employment. Cörvers (1996) utilises employment shares of the three levels of labour as a proxy for effective labour, while Ismail et al. (2011) employ the data of occupational categories in their analysis of the impact of training on firm output. However, because of the focus of this study and the limitations in data in South Africa at an occupational level per sector, the employment shares of low-skilled, semi-skilled and skilled labour has been derived from available data on the number of workers by skill type per sector. The employment shares per category \( L_i \) have been calculated by taking the number of workers per skill category to the power of the elasticity of each skill category. The elasticity of each skill category has been derived using equation (11). It is expected that effective labour has a positive effect on real GDP.

Number of individuals trained: this variable accounts for individuals that have been on training programmes through SETAs and have completed such programmes. All training programmes are those that would lead to a qualification or part-qualification on the NQF. As the particular objective of this minor dissertation is to assess the impact of the NSDS through SETA, it is critical to include a variable that captures the training output of SETAs.

Skills development levies: the SETAs are funded through skills development levies, which are in the form of transfers currently from the DHET (and previously from the DoL). The skills development levies are used as an indication of expenditure of SETAs on training and skills development within the respective sectors of the economy. According to Barro (1990), public expenditure by government positively affects productivity through various avenues, including that of human capital. Thus, a positive relationship between this variable and the output variable is expected.
5.3. Data and Data Sources

Panel Data

Panel data comprises the same cross-sectional units surveyed over a period of time. According to Gujarati (2008), an acknowledged concern with the use of panel data is heterogeneity in the units being observed. However, estimation techniques of panel data can explicitly account for such heterogeneity by allowing for unit-specific variables. The combination of cross-sectional observations with time series data provides “more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency” (Baltagi in Gujarati, 2008).

The panel data for this minor dissertation is constructed by combining data for the nine sectors, i.e. nine cross sections, spanning the years 2001 through to 2015. Sector data across the time period has been pooled from various sources. As a sector approach is utilised, the advantage of panel data is that it minimises the possible bias that may arise from aggregating individual SETAs into broad aggregates. Furthermore, employing such data allows one to better assess the dynamics of change. A balanced panel comprises panel data where every unit has been surveyed for every time period. In an unbalanced panel, there may be missing observations.

The NSDS was implemented from 2001, and is currently envisaged to end by March 2020, then to be replaced by a fourth strategy. The 21 SETAs have been mapped to a particular sector of the economy based on their core scope. Table 5.1 below provides a summary of how the SETAs have been charted into the various sectors. Further details on the classification of SETAs into the economic sectors of the economy is provided in Appendix 2.

Table 5.1: SETAs categorised into sectors of the economy

<table>
<thead>
<tr>
<th>Sector</th>
<th>SETA(s)¹⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td></td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>AgriSETA</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>MQA</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>MERSETA, FP&amp;M SETA, CHIETA, FOODBEV SETA,</td>
</tr>
<tr>
<td>Electricity, gas and water (Utilities)</td>
<td>EWSETA, CETA</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
</tr>
</tbody>
</table>

¹⁵ Some SETAs have cross sector mandates and may fall within more than one sector. They have been allocated to the sector within which the majority of their mandated scope falls.
<table>
<thead>
<tr>
<th>Sector</th>
<th>SETA(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade, catering and accommodation services</td>
<td>CATHSSETA, W&amp;R SETA,</td>
</tr>
<tr>
<td>Transport, storage and communication</td>
<td>TETA, MICTSETA</td>
</tr>
<tr>
<td>Financial intermediation, insurance, real estate and business services</td>
<td>BANKSETA, FASSET, INSETA</td>
</tr>
<tr>
<td>Community, social and personal services(^{16})</td>
<td>SERVICES SETA, ETDP SETA, HWSETA, SASSETA, PSETA, LGSETA</td>
</tr>
</tbody>
</table>

The real GDP data per sector, in constant 2010 prices, is sourced from Stats SA. It is a widely used measure of the size of a country’s economy, and in this case the size of individual sectors in the economy. The responsibility for calculating South Africa’s GDP rests with Stats SA, and gross fixed capital formation data per sector is sourced from the SA Reserve Bank. This data is also taken at constant 2010 prices, or in real terms.

Data on employment figures per sector has been sourced from the Quantec database. The Quantec EasyData provides disaggregated and consistent long-term data on sectors of the South African economy. Employment figures include formal and informal employment per sector. Data on worker categories, i.e. number of low-skilled, semi-skilled and skilled workers, is obtained from the Quantec EasyData database. The data on skills levels on the Quantec database is derived from the Stats SA October Household Survey, QLFS, Quarterly Employment Statistics, Census 1996 and 2001 and the Community Survey (Quantec, 2017). This data was used for the calculation of the employment shares.

Annual reports of SETAs from 2001 to 2016 are utilised for figures reported in terms of the number of individuals that have completed training programmes. Annual reports of SETAs have been utilised in other studies such as Kraak (2008) and Tuner, Halabi, Sartorius and Arendse (2013) in critically reviewing the NSDS and the efficiency of SETAs respectively. SETA completion figures have been used over enrolment figures, indicating the successful completion of a particular training programme. It is important to note, however, that completion does not imply absorption into employment.

\(^{16}\) According to the Stats SA industry code list, general government fall within the community, social and personal services sector. The SARB, however, considers this as a separate sector. For the purposes of this analysis, general government services will be considered as per the Stats SA industry code list.
The data on skills development levies are sourced from annual reports of both the DHET and the DoL. Where such data has not been provided per SETA, the SETA annual report is used.

5.4. Estimation Techniques

The FE and RE panel data techniques are used to estimate equations (12), (13), (14) and (15). FE is assumed when analysing the impact of variables over time owing to the nature of the data – different sectors and different training entities implies unobserved heterogeneity. An important assumption with the FE technique is that the unobserved cross-sector heterogeneity is correlated with explanatory variables included in the models. In contrast, the RE model assumes no correlation between unobserved heterogeneity and the explanatory variables. And, if the null hypothesis of no correlation is accepted, the RE model produces consistent and efficient estimates. As the model considered in this study contains no time invariant variables, both the FE and RE estimations will be considered. The Hausman test is carried out to confirm the adoption of the most appropriate model. The diagnostic tests carried out in this minor dissertation are discussed in the next chapter.
Chapter 6: Findings and Analysis

This chapter presents the results of the models and data described in the preceding chapter. The chapter commences with a review of the data from a graphical perspective, and then proceeds with a review of the descriptive statistics. The results and analysis of the regression models are discussed, and the results of the various diagnostic tests will be presented in concluding this chapter.

6.1. Data Visual Representation, Correlation and Descriptive Statistics

Real GDP per sector for the past 15 years shows that all sectors have followed an increasing trend. Some sectors, however, such as the manufacturing sector, saw a decline in GDP from 2009 to 2011, before recovering to an increasing trend from 2012. The community, social and personal services sector experienced the highest overall growth over the period. The financial services sector, the employer of a larger proportion of skilled labour in the economy, relative to other sectors, has also followed a positive growth trajectory over this period.

Figure 6.1: Real GDP per sector from 2001 to 2015

Figure 6.2 represents the employment shares of low-skilled, semi-skilled and skilled labour per sector. The agriculture, mining and construction sectors have persistently had low-skilled labour dominating the share of employment over the 15-year period. Sectors such as financial intermediation and manufacturing appear to have their employment shares of all three skills categories very closely clustered, implying that the distribution of skills in these sectors are
close to even. The manufacturing sector, however, shows a considerable decline of semi-skilled labour from 2014.

Figure 6.2: Employment share of low-skilled, semi-skilled and skilled labour per sector from 2001 to 2015

The descriptive statistics of the data is presented as part of the results in Table 6.1. On average, real GDP was R304 107 million per sector, with an average of R54 475 million of gross fixed capital formation per sector and 1.5 million individuals employed. The number of individuals trained as well as the employment shares per skill category per sector varies substantially across the sectors. Within the variables of interest, i.e. employment shares of labour, the highest average share of employed labour is within the low-skilled category, whilst the lowest is within the high-skilled category. The minimum and maximum values of the data shows the extent of disparity in the variables across the nine sectors.
Table 6.1: Panel data descriptive statistics

<table>
<thead>
<tr>
<th>Name of variable</th>
<th>Short description</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP</td>
<td>RGDP</td>
<td>135</td>
<td>304 107</td>
<td>258 805</td>
<td>44 760</td>
<td>1 098 563</td>
</tr>
<tr>
<td>Gross fixed capital formation</td>
<td>K</td>
<td>135</td>
<td>54 475</td>
<td>35 710</td>
<td>3 929</td>
<td>132 600</td>
</tr>
<tr>
<td>Number of employed individuals</td>
<td>L</td>
<td>135</td>
<td>1 525 787</td>
<td>1 183 488</td>
<td>46 001</td>
<td>4 541 356</td>
</tr>
<tr>
<td>Employment share of low-skilled labour</td>
<td>L1</td>
<td>135</td>
<td>815 224</td>
<td>596 925</td>
<td>18906</td>
<td>2 299 211</td>
</tr>
<tr>
<td>Employment share of semi-skilled labour</td>
<td>L2</td>
<td>135</td>
<td>517 527</td>
<td>525 339</td>
<td>15 752</td>
<td>1 421 764</td>
</tr>
<tr>
<td>Employment share of skilled labour</td>
<td>L3</td>
<td>135</td>
<td>193 036</td>
<td>252 995</td>
<td>11 342</td>
<td>957 243</td>
</tr>
<tr>
<td>Number trained</td>
<td>TR</td>
<td>135</td>
<td>10 999</td>
<td>10 570</td>
<td>69</td>
<td>49 954</td>
</tr>
<tr>
<td>Skills development levies</td>
<td>SDL</td>
<td>135</td>
<td>691 376 901</td>
<td>625 643 766</td>
<td>38 757 000</td>
<td>3 065 232 000</td>
</tr>
</tbody>
</table>

Source: Output as generated using Stata.

Table 6.2, which follows below, captures the correlation between the variables. All explanatory variables are correlated with real GDP at the one percent level of significance. The most highly correlated variable with real GDP is employment share of skilled labour, followed by employment share of semi-skilled labour. The employment share of low-skilled labour variable does not have any significant correlation with GFCF. However, this variable has a very high significant positive relationship with labour. The other variable of interest, i.e. the number of individuals trained, is positively and significantly correlated to all other variables.

Table 6.2: Correlation matrix table

<table>
<thead>
<tr>
<th></th>
<th>lnRGDP</th>
<th>lnK</th>
<th>lnL</th>
<th>lnL1</th>
<th>lnL2</th>
<th>lnL3</th>
<th>lnTR</th>
<th>lnSDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnRGDP</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnK</td>
<td>0.7358***</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnL</td>
<td>0.6814***</td>
<td>0.2094**</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnL1</td>
<td>0.4960***</td>
<td>0.0119</td>
<td>0.9325***</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnL2</td>
<td>0.8619***</td>
<td>0.4824***</td>
<td>0.8510***</td>
<td>0.6381***</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2. Regression Analysis

Regression analysis of the models discussed in Chapter 5 was carried out. This section provides the regression results for both the FE and RE estimations. To objectively confirm the selection between FE and RE, the Hausman test was conducted, the results of which are presented in table 6.3 below.

Table 6.3: Hausman test results

<table>
<thead>
<tr>
<th></th>
<th>(b) fe</th>
<th>(B) re</th>
<th>(b-B) Difference</th>
<th>Sqrt (diag (V_b-V_B)) S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnK</td>
<td>0.0667</td>
<td>0.0106</td>
<td>0.0560</td>
<td>0.0151</td>
</tr>
<tr>
<td>lnL₁</td>
<td>0.3272</td>
<td>0.2531</td>
<td>0.0741</td>
<td>0.0151</td>
</tr>
<tr>
<td>lnL₂</td>
<td>0.0557</td>
<td>0.1053</td>
<td>-0.0496</td>
<td>0.1378</td>
</tr>
<tr>
<td>lnL₃</td>
<td>-0.6626</td>
<td>-0.3568</td>
<td>-0.3058</td>
<td>0.1471</td>
</tr>
<tr>
<td>lnTR</td>
<td>-0.0150</td>
<td>-0.0140</td>
<td>-0.0010</td>
<td>0.0003</td>
</tr>
<tr>
<td>lnSDL</td>
<td>0.2295</td>
<td>0.2383</td>
<td>-0.0087</td>
<td>0.0066</td>
</tr>
</tbody>
</table>

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

\[
\text{chi}^2(6) = (b-B) ^ {\top} [ (V_b-V_B) ^ {\top} (-1) ] (b-B) \\
= 53.85
\]

Prob > chi² = 0.0000

The Hausman test is commonly employed in panel data analysis to establish which estimation technique to use, FE or RE. The null hypothesis underlying the test is that the difference in coefficients is not systematic, i.e. random effects. The Hausman test essentially tests whether the unique errors (μ) are correlated with the regressors, and the null hypothesis is that they are not correlated (Greene, 2008). Given that the prob > chi² is less than 0.05 from table 6.3
above, the FE model is assumed. The regression results presented in the tables which follow provide both the FE and RE estimation results, however as the FE model has been selected on the basis of the result of the Hausman test, only the results of the FE estimation will be discussed.

6.2.1. Impact on output

The point of departure for this section is the review of the regression results from the standard production function, the baseline model of this study, which regresses real GDP with GFCF and labour. The results of the FE and RE regressions are presented in table 6.4.

Table 6.4: Regression results: Baseline model

<table>
<thead>
<tr>
<th>Variables</th>
<th>FE estimation</th>
<th>RE estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coeft.</td>
<td>t-stat.</td>
</tr>
<tr>
<td>lnK</td>
<td>0.203*** (0.036)</td>
<td></td>
</tr>
<tr>
<td>lnL</td>
<td>0.258*** (0.083)</td>
<td></td>
</tr>
<tr>
<td>_cons</td>
<td>17.532*** (0.953)</td>
<td></td>
</tr>
</tbody>
</table>

Observations | 135 | 135
R-squared | within = 0.4322 | within = 0.4312
           | between = 0.8069 | between = 0.7684
           | overall = 0.7794 | overall = 0.7475
rho | 0.959 | 0.890

Robust standard error in parentheses
*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.
Source: Output as generated using Stata.

From table 6.4, the results of the F-statistic suggest that the model and its parameters are statistically significant overall. The rho statistic, which provides an indication of the extent of interclass correlation, in both the FE and RE model is estimated at 0.959 and 0.89 respectively. This means that in the FE model, 95.9 percent of the variance in the dependent variable (output proxied by real GDP) is due to differences across panels (sectors).

As expected, there is a significant and positive relationship between real GDP and GFCF, as well as a statistically significant positive relationship between real GDP and labour. A one percent increase in GFCF will lead to increased real GDP with an elasticity of approximately
0.20. Similarly, a one percent increase in labour will lead to an increase in real GDP of 0.258 percent. This result implies that as the number of employed individuals increase, the chances of growth to the economy is apparent. The difference between the coefficients of GFCF and labour is very small, with the coefficient of labour slightly larger. This suggests that investment in labour brings slightly more returns than GFCF, which may be due to the flexibility of labour over time as compared to the immobility of GFCF.

The estimation results of equation (12) are presented in table 6.5 below.

| Table 6.5: Regression results: Output model including all human capital variables |
|---|---|---|
| Variables | FE Estimation | RE Estimation |
| lnK | 0.0667 | 0.010 |
| (0.034) | (0.037) | |
| lnL<sub>1</sub> | 0.327*** | 0.253*** |
| (0.087) | (0.042) | |
| lnL<sub>2</sub> | 0.055 | 0.105 |
| (0.249) | (0.171) | |
| lnL<sub>3</sub> | 0.662*** | 0.356 |
| (0.206) | (0.185) | |
| lnTR | -0.015 | -0.014 |
| (0.011) | (0.009) | |
| lnSDL | 0.229*** | 0.238*** |
| (0.032) | (0.025) | |
| _cons | 22.488*** | 20.581*** |
| (1.614) | (0.814) | |
| Observations | 135 | 135 |
| R-squared | within = 0.8457 | within = 0.8124 |
| | between = 0.3183 | between = 0.0158 |
| | overall = 0.2452 | overall = 0.0313 |
| rho | 0.997 | 0.962 |

Robust standard error in parentheses
*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Source: Output as generated using Stata

Overall, based on the p-value of the F-statistic, the model is statistically significant and the results related to some of the variables of interest are as expected. Specifically, employment share of skilled labour, L<sub>3</sub>, is found to be positively related to real GDP at the one percent level.
of significance. A one percent increase in skilled labour would result in a 0.66 percent increase in real GDP. From the other variables of interest—employment shares of low-skilled and semi-skilled labour ($L_1$ and $L_2$ respectively)—only low-skilled labour shows a statistically significant relationship to real GDP. This relationship, is a positive one, implying that a one percent increase in the employment share of low-skilled labour will lead to real GDP increasing by 0.32 percent, a very small but statistically significant amount. Table 6.5 shows that the employment share of semi-skilled labour does not have a statistically significant effect on output of a sector. However, the economic significance of a positive effect implies that semi-skilled labour has a contribution to economic output. It may be argued that the results of the semi-skilled labour may be explained by the likelihood that workers with only a secondary school level of education, are not productive simply owing to their initial schooling. If the premise holds that training is complementary to secondary schooling, then this category of labour may become more productive when exposed to some form of training.

The education level of the South African labour force is currently concentrated at almost 50 percent around the secondary education level, this education level is translated into the semi-skilled labour category. Gemmell (1996) emphasises the role of different education levels for countries at different stages of development. Based on Gemmell’s (1996) analysis, the primary level is important in the poorest, low-developed countries, whilst secondary and tertiary education levels would be more relevant to emerging countries such as South Africa. While the results of this study finds no statistically significant results of semi-skilled labour to real GDP, consideration must be taken of the underlying structural issues in the South African economy which may have also contributed to these results.

Increasingly, there have been changes in the type of jobs and the sectors in which employment is most concentrated. An acknowledged challenge in South Africa is the absence of low-wage jobs in the manufacturing sector, which according to Reddy et al. (2016) is in contrast to pathways charted by other recently industrialised economies. This absence of jobs has contributed to the high levels of unemployment within the majority low-skilled portion of the working population. Moreover, there has been a structural shift towards a service and knowledge economy, requiring semi-skilled and skilled labour. Particularly in the financial services sector, there has been a high dependence on high level skills, however, limited opportunities for employment growth. Employment growth has been significant in the general government services sector (which is considered in this study as part of the community, social and personal services sectors). This growth however is not sustainable (Reddy et al., 2016).
The other variable whose results show statistical significance is SDL. As these levy amounts are directly derived from the payroll of individual firms, it is expected that a positive relationship to real GDP exists, which is confirmed by the regression results. If SDL is viewed as a form of government expenditure on education and skills development, economic theory holds that government expenditure supports economic growth.

Many other empirical studies on developing countries have found varying results in their analysis of skills and economic growth at the economy-wide level. Ullar and Rauf (2013), using the FE model for Asian countries, found no statistical relationship between human capital and GDP. Conversely, Nkhola (2014), who undertook an econometric analysis of the impact of education on economic growth in South Africa, found positive and significant results using a RE panel regression, employing primary, secondary and tertiary enrolment rates as a proxy for education. It is expected that higher levels of skilled labour would contribute positively to economic growth. Thus, the results of this regression analysis are consistent with theoretical expectations and results of other empirical studies.

As the focus of this study is on SETA outcomes, the results of the regression analysis of equation (14) are discussed next where the only human capital variable included in the estimation is that of TR - the number of individuals trained. The results are presented in table 6.6 below. The only significant variable is SDL, which indicates that a one percent increase in levies will lead to increased real GDP with an elasticity of 0.27. Again, contrary to expectations, the results show that there is a negative relationship between number of individuals trained and output. This relationship is, however, not statistically significant.

It is worth noting that the variable of number of individuals trained does not account for any quality measure of human capital, but rather focuses only on quantity. There has been much contention concerning the correct measure of human capital, as discussed in detail in earlier chapters of this minor dissertation. Indeed, some economists attribute the lack of a significant and positive relationship between human capital and labour to the issue of the variable chosen as a proxy. Islam (1995) notes that in the absence of a proxy indicator for human capital, which does incorporate any quality differential, results of regression analysis may produce a negative temporal relationship between economic growth and human capital. Accordingly, the results in table 6.6 should be considered with caution. In order to address the issue of a quality indicator for labour, the employment shares of low-skilled, semi-skilled and skilled labour have been included in other regression estimations of this study.
Table 6.6: Regression results: Output model with number of individuals trained by SETAs

<table>
<thead>
<tr>
<th>Variables</th>
<th>FE Estimation</th>
<th>RE Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnK</td>
<td>-0.028 (0.090)</td>
<td>-0.013 (0.037)</td>
</tr>
<tr>
<td>lnTR</td>
<td>-0.015 (0.017)</td>
<td>-0.015 (0.011)</td>
</tr>
<tr>
<td>lnSDL</td>
<td>0.272*** (0.056)</td>
<td>0.272*** (0.028)</td>
</tr>
<tr>
<td>_cons</td>
<td>21.456*** (1.908)</td>
<td>21.098*** (0.648)</td>
</tr>
</tbody>
</table>

Observations 135 135
R-squared within = 0.6912 0.6907
between = 0.8404 0.8577
overall = 0.6872 0.7027
rho .985 0.962

Robust standard error in parentheses
*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Source: Output as generated using Stata.

6.2.2. Impact on productivity

The next set of regression results look at the impact of human capital on productivity. Tables 6.7 and 6.8 below provide the estimation results of equations (13) and (15) respectively. The rho statistic of the FE model shows that 99.8 percent of the variance in labour productivity is due to differences across sectors. These results of the FE estimation show that only the SDL and employment share of skilled labour variables are statistically significant at the one percent level. Similar to the results of table 6.5, employment share of skilled labour has a positive effect on productivity and is highly significant. The estimated coefficient for skilled labour is 0.75, implying that labour productivity increases by 0.75 percent from a one percent increase in skilled labour. Interestingly, the other variables of interest – i.e. employment shares of low-skilled, semi-skilled, and number of individuals trained show negative relationships. Analysis of these results in the context of the structural constraints in the South African economy follows.

Capital-intensive sectors such as the financial services and trade sectors, employing mostly skilled and semi-skilled labour, have been the predominant growth drivers in the economy. In
comparison, the labour-intensive sectors like manufacturing and agriculture, which employ predominantly low-skilled labour, have contributed to economic growth to a smaller extent. Bhorat et al. (2014) find that unlike in other emerging middle income countries, in South Africa there has not been a development shift from employment in low-productivity sectors (like agriculture) to high-productivity sectors (like manufacturing) and ultimately to high skilled sectors (like the services sectors). Bhorat et al. (2014) assert that following such a development path would lead to higher economic growth and employment.

Table 6.7: Regression results: Labour productivity model including all human capital variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>FE Estimation</th>
<th>RE Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnKL</td>
<td>0.033</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>lnL1</td>
<td>-0.034</td>
<td>-0.132***</td>
</tr>
<tr>
<td></td>
<td>(0.0687)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>lnL2</td>
<td>-0.195</td>
<td>-0.113</td>
</tr>
<tr>
<td></td>
<td>(0.235)</td>
<td>(0.179)</td>
</tr>
<tr>
<td>lnL3</td>
<td>0.757***</td>
<td>0.516***</td>
</tr>
<tr>
<td></td>
<td>(0.171)</td>
<td>(0.184)</td>
</tr>
<tr>
<td>lnTRL</td>
<td>-0.006</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>lnSDLL</td>
<td>0.237***</td>
<td>0.248***</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>_cons</td>
<td>21.843***</td>
<td>19.824***</td>
</tr>
<tr>
<td></td>
<td>(1.297)</td>
<td>(0.803)</td>
</tr>
</tbody>
</table>

Observations | 135 | 135
R-squared | within = 0.8457 | within = 0.8192
           | between = 0.1380 | between = 0.2079
           | overall = 0.1443 | overall = 0.2158
rho | .998 | 0.966

Robust standard error in parentheses
*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.
Source: Output as generated using Stata.
From table 6.8 which follows below, the impact of SETA training, represented by the number of individuals trained, continues to exhibit a negative and insignificant relationship to labour productivity, whilst SDL is statistically significant and positive at the one percent level of significance. This result implies that the number of individuals trained does not have a significant effect on labour productivity. As with the previous results, the only significant and positive relationship exhibited by this model is between SDL and labour productivity, where a one percent increase in SDL would yield a 0.21 percent increase in productivity. Thus, excluding the employment share variables of low-skilled, semi-skilled and skilled labour from the regression analysis leads to insignificant results of human capital represented by the number of individuals trained.

Table 6.8: Regression results: Labour productivity model with number of individuals trained by SETAs

<table>
<thead>
<tr>
<th>Variables</th>
<th>FE Estimation</th>
<th>RE Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnKL</td>
<td>-0.090 (0.119)</td>
<td>0.032 (0.055)</td>
</tr>
<tr>
<td>lnTRL</td>
<td>-0.001 (0.016)</td>
<td>-0.004 (0.016)</td>
</tr>
<tr>
<td>lnSDL</td>
<td>0.211*** (0.072)</td>
<td>0.181*** (0.040)</td>
</tr>
<tr>
<td>_cons</td>
<td>11.947*** (1.394)</td>
<td>10.808*** (0.529)</td>
</tr>
</tbody>
</table>

| Observations | 135 | 135 |
| R-squared    | within = 0.3075 | within = 0.2804 |
|             | between = 0.4595 | between = 0.8933 |
|             | overall = 0.2695 | overall = 0.7618 |
| rho         | .976 | .875 |

Robust standard error in parentheses

*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Source: Output as generated using Stata.

This negative result of human capital represented by the number of individuals trained from table 6.8 above may be explained by analysing this outcome in relation to the coefficients of low-skilled and semi-skilled labour from the labour productivity regression estimation. Both these variables also show negative effects on labour productivity. As SETA programmes predominantly take the form of training at low and semi-skilled levels, this implies that these
training programmes have not had the desired impact in addressing the existing skills issues faced by the economy. Based on the results of other empirical research (such as Reddy et al., 2016), where the majority of the workforce has skills ranging between the low and semi-skilled levels, the continued training of individuals at these levels will not have the desired impact of increased productivity, as evidenced by the results of this minor dissertation.

Overall, the results from the regression analysis support the theory of human capital contributing to increasing labour productivity and ultimately impacting economic growth positively. From a policy perspective, the results of the regression analysis suggest that continued emphasis on skills development is required, as it contributes to output. Low-skilled labour, albeit at smaller than expected levels also contributes to output in terms of real GDP. However, the extent of the emphasis on skills development, particularly the contribution of SETAs in terms of number of individuals trained, is questionable based on the significance and values of the estimated coefficients. The inclusion of a quality component to effective labour has provided further information on how employment shares at the three different skills levels interact with output and labour productivity. These findings may serve to guide future policy direction, which will be explored in the next chapter.

6.3. Diagnostic Tests

Diagnostic tests are conducted in order to ensure that the estimates reported are reliable, consistent and unbiased. The various diagnostic tests carried out for this minor dissertation are discussed next, with a brief summary of the test and the results. The actual results are contained in Appendix 1.

6.3.1. Test for heterogeneity in cross-section

Since panel data relates to individuals, firms, states, countries, etc., and in this case to sectors over time, there is an inevitability of the presence of heterogeneity in these units. The F-test is utilised to confirm the existence of individual unit-specific heterogeneity in the data. The null hypothesis of no variances across sectors, i.e. \( \text{Var} (\mu) = 0 \), is rejected from the F-test, which confirms that OLS is not an appropriate model, and thus endorses the selection of FE estimation.
6.3.2. Test for cross-sectional dependence

According to Baltagi (2008), while cross-sectional dependence is a problem in macro panels with long time series, i.e. over 20 years, cross-sectional dependence is not as much of a problem in micro panels where there is a large number of units and few time periods. In this minor dissertation, the number of time periods is greater than the number of units, i.e. $T > N$. However, test for cross-sectional dependence is conducted in this study to validate the robustness of the chosen model. Cross-sectional dependence leads to efficiency loss for least squares and invalidates conventional t-tests and F-tests, which use standard variance-covariance estimators (Baltagi, Feng & Kao, 2011). Hoechle (2007) argues that the testing of mutual dependence between cross-sectional units in panel data is necessary in order to ensure the validity of any statistical inference.

In order to test for cross-sectional dependence in a FE regression, the Pesaran (2004) cross-sectional dependence (CD) test is employed. The null hypothesis of this test is that the residuals are cross-sectionally uncorrelated. The results of the CD test are presented in Appendix 1. As the null hypothesis of uncorrelated residuals is not rejected, the FE estimation produces residuals that have no cross-sectional dependence.

6.3.3. Test for heteroscedasticity

The presence of heteroscedasticity in the model may result in a serious problem of biased standard errors. Heteroscedasticity is present when the variance of the error terms differ across observations. Biased standard errors lead to incorrect conclusions about the significance of the regression coefficients. Baltagi (2008) found that in the presence of heteroscedasticity and autocorrelation in a FE model, the estimates produced are both inefficient and inconsistent. In order to test for the presence of heteroscedasticity in a FE model, the Modified Wald test for group-wise heteroscedasticity is conducted. The null hypothesis of constant variances or homoscedasticity is rejected, given that the prob > chi2 of is less than 0.05, and conclude heteroscedasticity. To counter heteroscedasticity, the FE model is estimated using the robust standard errors option in STATA.

6.3.4. Test for serial correlation

Serial correlation presents itself when the error terms from different time periods are correlated. The occurrence of such causes the standard errors of the coefficients to be smaller than they actually are, and makes them less efficient. The result of the Wooldridge test for
autocorrelation is provided in Appendix 1. The null hypothesis of no first order autocorrelation is rejected as the results show a p-value of 0.0024, thus concluding that serial correlation is present in the model. To counter this presence, the robust standard error generated by STATA is used in the FE estimation.
Chapter 7: Conclusion and Recommendations

The objective of this minor dissertation was to assess the impact of South Africa's approach to skills development by specifically assessing impact on output and productivity. A panel data set over a 15-year period across nine sectors of the economy was analysed using the fixed effects estimation. This chapter presents a summary of key findings and the conclusions, and outlines some policy recommendations as well as areas for further research.

7.1. Summary of Key Findings

The results of this quantitative study show that there are varying outcomes when assessing the impact of the various skill levels on output and labour productivity.

*Skilled labour:* Importantly, human capital in the form of skilled labour has a significant effect on output and labour productivity. The employment share of skilled labour is found to be positively related to real GDP at the one percent level of significance, with a one percent increase in skilled labour resulting in a 0.66 percent increase in real GDP. Similarly, the employment share of skilled labour has a positive effect on productivity and is highly significant; with labour productivity increasing by 0.75 percent from a one percent increase in skilled labour. Thus, the results suggest that improving skill levels would contribute positively to the economy of the country. Moreover, there has been a structural shift towards a service and knowledge economy, requiring skilled labour. Particularly in the financial services sector, there has been a high dependence on high level skills; however, these skills have limited opportunities for employment growth.

*Semi-skilled labour:* Semi-skilled labour is positively related to output, whilst negatively related to labour productivity. The employment share of semi-skilled labour does not have a statistically significant effect on output of a sector. However, the economic significance of a positive effect implies that semi-skilled labour has a contribution to economic output. This result may vary if low-skilled labour is exposed to some form of training, thus enabling this category of labour to become more productive. While the results of this study finds no statistically significant results of semi-skilled labour to real GDP, consideration must be taken of the underlying structural issues in the South African economy which may have also contributed to these results. Increasingly, there have been changes in the type of jobs and the sectors in which employment is most concentrated. An acknowledged challenge in South Africa is the absence of low-wage jobs in the manufacturing sector, which according to Reddy...
et al. (2016) is in contrast to pathways charted by other recently industrialised economies. This absence of jobs has contributed to the high levels of unemployment within the majority low-skilled portion of the working population.

**Low-skilled labour:** This variable shows a statistically significant relationship to real GDP. This relationship is a positive one, implying that a one percent increase in the employment share of low-skilled labour will lead to real GDP increasing by 0.32 percent, a very small but statistically significant amount. Conversely low-skilled labour shows a negative relationship to labour productivity. These results may be further explained by the fact that in South Africa, labour-intensive sectors like manufacturing and agriculture, which employ predominantly low-skilled, have increasingly contributed to economic growth to a smaller extent. Thus, while low-skilled labour is still required, it is in declining proportions as compared to skilled and semi-skilled labour.

**Number of individuals trained:** Contrary to expectations, the results show that there is a negative relationship between number of individuals trained and output. This relationship is, however, not statistically significant. It is worth noting that the variable of number of individuals trained does not account for any quality measure of human capital, but rather focuses only on quantity. Accordingly, these results should be considered with caution. Furthermore, SETA programmes predominantly take the form of training at low and semi-skilled levels, which implies that these training programmes have not had the intended impact in addressing the existing skills issues faced by the economy. Based on the results of other empirical research (such as Reddy et al., 2016), where the majority of the workforce has skills ranging between the low and semi-skilled levels, the continued training of individuals at these levels will not have the desired impact of increased productivity, as evidenced by the results of this minor dissertation.

**Skills development levies:** From the estimation results, the skills development levies variable was found to be positive and significant across the regression models, which suggests that investment in education and skills development may contribute to economic growth. If SDL is viewed as a form of government expenditure on education and skills development, economic theory holds that government expenditure supports economic growth. The current form of the levy-grant system (through which skills development levies are collected and disbursed) appears to have a positive impact in that financial resources invested in training and education have a positive relationship to growth of the economy.
From literature reviewed, it is noted that a structural issue with the South African labour market is the mismatch between labour demand and supply: the labour market demands skilled labour, whereas there is a surplus supply of low-skilled labour. In South Africa, the structural mismatch between labour demand and supply has been credited with being a key constraint to sustainable employment. The positive, significant result of skilled labour implies that more skilled labour will result in higher levels of economic growth.

In summary, one can conclude that education and skills development contribute to economic output and, ultimately, higher levels of economic growth in the country. This contribution is, however, higher at higher skills levels.

7.2. Policy Recommendations

Monitoring and evaluation of training

Although the NSDS III has been well articulated, the translation of the policy into implementation, which falls within the ambit of the SETAs, seemingly lacks the appropriate mechanisms to allow for tracking and measurement. A noted shortcoming of the NSDS and the SETAs has been the lack of monitoring and tracking of SETA training. SETAs, since inception, have reported on numbers as a measure of the NSDS outcomes rather than impact. Individuals that have participated in some form of SETA training are not assessed and tracked prior to entry and post completion of training. Thus, evaluation of the impact of training in the forms of, for example, social and economic impact, is not possible. Long-term tracking studies to better assess the efficacy of training conducted by SETAs is recommended.

Administration and governance

Across the literature reviewed on SETAs, an emerging theme has been the administrative and governance challenges experienced by these structures. Ultimately, the success of any national skills development policy is dependent on the mechanisms through which skills delivery takes place. As such, addressing SETA administrative and governance challenges must be prioritised to ensure that an appropriate post-school education and training system, supported by efficient and effective sectoral structures, is in place. In addition, the state, in its review of the NSDS III and the SETA landscape, should take cognizance of the limited contribution that SETA training has had to date, and improve upon existing monitoring and evaluation frameworks to capture the performance of the strategy.
Mismatch between skills demand and supply

Investment in education and skills development will improve overall economic growth, however, consideration of the type of skills and the level of skills required to match the demand of individual sectors is critical. In South Africa, research has shown that investment in semi-skilled and skilled labour are the main categories in which skills development is required. Currently, literature reviewed indicates that there is a high occurrence of low-skilled labour, in contradiction to a high demand of skilled labour. Accordingly, the focus of skills development and training policies should be on accurately identifying skills required per sector and developing these accordingly.

7.3. Conclusion and Areas for Future Research

This minor dissertation has provided some insight into the NSDS, SETAs and the post-school education and training system in South Africa. However, further research into these areas is required. Specifically, impact analysis of beneficiaries of training from SETA interventions would substantially contribute to assessing the success of the NSDS. Also, research into sector-level analysis may delve further into the level of skills required for each sector, and estimation of their impact may produce different results when taking sector-level nuances into account.

An aspect of the Skills Development Act levy-grant system that has not been explored in this study is the mandatory grant component, i.e. the portion of skills development levies that firms are able to claim back from SETAs. An outcome of the NSDS is the promotion of firm-level training. An expectation is that the mandatory grant component of the skills development levy is fed back into skills development and training workers, thus improving workers’ skills levels. Subject to data availability, an assessment of these mandatory grants, as part of the NSDS and SETA system, could be explored.

The results of this study supports economic theory that human capital is a critical input to the production process, and contributes to output and labour productivity. South Africa, with its varied political history, stratified economic divisions underpinned by a malaise of education incongruities, is a country that needs to dramatically focus on policies which emphasise impact. Further, a stronger, more meaningful relationship between state policy and real world economic needs is required to ensure a better match between skills needs and skills supply.
REFERENCES


Appendix 1 – Diagnostic Tests

All diagnostic tests and their results that have been carried out in the analysis in Chapter 6 are included in this appendix, i.e.: testing the Hausman test, tests for heterogeneity in the cross-section, test for heterogeneity in the cross-section, heteroscedasticity and serial correlation.

A1.1: Hausman test

```
. hausman fe re, sigmamore

<table>
<thead>
<tr>
<th></th>
<th>(b)</th>
<th>(B)</th>
<th>(b-B)</th>
<th>sqrt(diag(V_b-V_B))</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnK</td>
<td>.0667118</td>
<td>.0106404</td>
<td>.0560714</td>
<td>.0151051</td>
</tr>
<tr>
<td>lnL1</td>
<td>.3272408</td>
<td>.2531163</td>
<td>.0741246</td>
<td>.0151728</td>
</tr>
<tr>
<td>lnL2</td>
<td>.0557116</td>
<td>.1053656</td>
<td>-.049654</td>
<td>.1378601</td>
</tr>
<tr>
<td>lnL3</td>
<td>-.6626769</td>
<td>-.3568027</td>
<td>-.3058743</td>
<td>.1471764</td>
</tr>
<tr>
<td>lnTR</td>
<td>-.0150615</td>
<td>-.014024</td>
<td>-.0010375</td>
<td>.0003478</td>
</tr>
<tr>
<td>lnSDL</td>
<td>.2295123</td>
<td>.2383076</td>
<td>-.0087952</td>
<td>.0066104</td>
</tr>
</tbody>
</table>
```

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho: difference in coefficients not systematic

\[
\text{chi2}(6) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 53.85
\]

Prob>chi2 = 0.0000

A1.2: Test for heterogeneity in the cross-section

F test that all u_i=0:  \( F(8, 120) = 279.36 \)  
Prob > F = 0.0000

A1.3: Test for cross-sectional dependence

Breusch-Pagan LM test of independence: \( \text{chi2}(36) = 95.369, \text{Pr} = 0.0000 \)

Based on 15 complete observations over panel units

```
. xtdsd, pesaran abs

Pesaran’s test of cross sectional independence = 1.211, Pr = 0.2260
Average absolute value of the off-diagonal elements = 0.348
```
A1.4: Test for heteroscedasticity

. xttest3

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model

H0: \( \sigma(i)^2 = \sigma^2 \) for all i

\( \chi^2 (9) = 2001.25 \)

Prob>\(\chi^2\) = 0.0000

A1.5: Test for serial correlation

. xtserial lnRGDP lnK lnL1 lnL2 lnL3 lnTR lnSDL

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

\( F(1, 8) = 19.041 \)

Prob > F = 0.0024
## Appendix 2 – Classification of SETAs

Classification of SETAs into economic sectors of the economy.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Name of SETA</th>
<th>Nature of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, forestry and</td>
<td>Agriculture Sector Education and Training Authority (AgriSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td>fishing</td>
<td></td>
<td>both primary and secondary agriculture sectors</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>Mining Qualifications Authority (MQA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the mining and mineral sector</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Manufacturing, Engineering and Related Services Sector Education and Training</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td>Authority (MERSETA)</td>
<td>the manufacturing, engineering and related services sector</td>
</tr>
<tr>
<td></td>
<td>Fibre, Processing and Manufacturing Sector Education and Training Authority</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td>(FP&amp;MSETA)</td>
<td>the Fibre, Processing and Manufacturing sector</td>
</tr>
<tr>
<td></td>
<td>Food and Beverages Sector Education and Training Authority (FOODBEV-SETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the food and beverages sector</td>
</tr>
<tr>
<td></td>
<td>Chemical Industries Education and Training Authority (CHIETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the Chemical Industries sector</td>
</tr>
<tr>
<td>Electricity, gas and water</td>
<td>Energy and Water Sector Education and Training Authority (EWSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td>(Utilities)</td>
<td></td>
<td>the energy and water sector</td>
</tr>
<tr>
<td>Construction</td>
<td>Construction Sector Education and Training Authority (CETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the construction industry</td>
</tr>
<tr>
<td>Tertiary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade, catering and</td>
<td>Culture, Arts, Tourism, Hospitality and Sports Sector Education and Training</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td>accommodation services</td>
<td>Authority (CATHSSETA)</td>
<td>the culture, arts tourism, hospitality and sport sector</td>
</tr>
<tr>
<td></td>
<td>Wholesale and Retail Sector Education and Training Authority (W&amp;RSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the wholesale and retail sector</td>
</tr>
<tr>
<td>Transport, storage and</td>
<td>Transport Education and Training Authority (TETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in</td>
</tr>
<tr>
<td>communication</td>
<td></td>
<td>the transport sector</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Sector</th>
<th>Name of SETA</th>
<th>Nature of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media, Information and Communication Technologies Sector Education and Training Authority (MICT-SETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the information system, electronics and telecommunications technologies sector</td>
<td></td>
</tr>
<tr>
<td>Financial intermediation, insurance, real estate and business services</td>
<td>Banking Sector Education and Training Authority (BANKSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the banking and microfinance sector</td>
</tr>
<tr>
<td>Financial and Accounting Services Sector Education and Training Authority (FASSET)</td>
<td>Provision of relevant, quality and accessible education, training and development in the financial and accounting sector</td>
<td></td>
</tr>
<tr>
<td>Insurance Sector Education and Training Authority (INSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the insurance sector</td>
<td></td>
</tr>
<tr>
<td>Financial and Accounting Services Sector Education and Training Authority (FASSET)</td>
<td>Provision of relevant, quality and accessible education, training and development in the banking and microfinance sector</td>
<td></td>
</tr>
<tr>
<td>Community, social and personal services</td>
<td>Services Sector Education and Training Authority (SERVICES SETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the services sector</td>
</tr>
<tr>
<td>Education, Training and Development Practices Sector Education and Training Authority (ETDP-SETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the education, training and development practices sector</td>
<td></td>
</tr>
<tr>
<td>Health and Welfare Sector Education and Training Authority (HWSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the health and welfare sector</td>
<td></td>
</tr>
<tr>
<td>Safety and Security Sector Education and Training Authority (SASSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the safety and security sector</td>
<td></td>
</tr>
<tr>
<td>Public Service Sector Education and Training Authority (PSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the public service sector</td>
<td></td>
</tr>
<tr>
<td>Local Government Sector Education and Training Authority (LGSETA)</td>
<td>Provision of relevant, quality and accessible education, training and development in the local government sector</td>
<td></td>
</tr>
</tbody>
</table>