Time-series analysis of the interactions between productivity, real wage, investment spending and sectoral employment in South Africa

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DECLARATION

I, Thomas Habanabakize, hereby declare that the content of this thesis is my own work and that the entire resources utilised are recognized by the means of references. This entire work or any of its parts have never been submitted at any university for award of any qualification or reward.

SIGNATURE

06 March 2019

DATE

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Soli Deo Gloria

DEDICATION

To my entire family, terrestrial and celestial, and to whoever contributed to my personal growth; be it physical, spiritual as well as intellectual. I will love and cherish you forever.

ABSTRACT

Maintaining a growing and sustainable level of employment within the unstable global market is crucial for establishing an enabling economic and social atmosphere for economic growth, development and social wellbeing. Different economic theories indicate that investment spending, labour productivity and real wage are some of vital indicators or determinants of employment levels. Nonetheless, the effect of these factors on employment patterns in a fast fluctuating and significantly unified global market economy remains a subject of discussion. Additionally, since employment and unemployment are depicted based on different factors, it is difficult to establish a common definition that includes various factors in distinct periods. Consequently, a number of theories suggest various solutions to create new jobs and reduce the unemployment rate.

Manifold empirical studies have shown a mixture of findings on the relationship between employment, labour productivity, and investment spending and real wage. Consequently, no single, unique or mutual empirical consensus has ever been presented. Additionally, various economic theories argue that potential effects of labour productivity, investment spending and real wage either in primary, secondary or tertiary sectors on country's employment patterns differ according to job orientation within distinct economic sectors.

In consideration to the abovementioned facts, this study was conducted with the main objective of investigating the interaction between investment spending, labour productivity, real wage and sectoral employment. The study considered the role of each category of economic sector (primary, secondary and tertiary) towards employment fluctuations. It was, therefore, ascertained that the long-run and short-run relationship exist between the mentioned economic variables from 1995 and 2017. Similarly, the study established the causal relationship and the direction of causality between investment spending, labour productivity, real wage and sectoral employment. Furthermore, the effect and causality between sectoral employments was analysed and the study depicted how changes in one sector's employment affects other sectors' employment. The study employed several statistical and econometric approaches and models, which included the descriptive analysis, the standard ARDL, the nonlinear ARDL, bound test for co-integration, the Toda-Yamamoto Granger

causality test and the dynamic multipliers analysis. These statistical and econometric approaches were applied on a set of macroeconomic time series namely investment spending, labour productivity, real wage and sectoral employment (employment in construction, financial, manufacturing, mining, trade and transport) for the period stretching from 1995 to 2017.

The empirical results revealed that both standard ARDL and NARDL reached the same core conclusion suggesting the existence of a long-run relationship between sectoral employment, investment spending, labour productivity and real wage. However, despite this general conclusion, the NARDL failed to determine positive and negative impacts from one variable to the other. It was found that growth within investment spending leads to job creation in most of the analysed sectors. In line with the growth theory, the results also revealed that an increase in real wage negatively influences job growth in most of the analysed sectors with the exception of the mining sector. Labour productivity does not influence sectoral employment and ineffectiveness of labour productivity towards employment growth can be a result of other factors, not investigated by the current study, such as advanced technology.

Comparing the effect of changes in one sector's employment towards other sectors' job creation, employment in construction sector was found more influential. Jobs created in this sector have a positive spill-overs in other four sectors' employment namely; finance, manufacturing, mining and trade sectors. The trade sector seconded the construction sector in affecting job creation across the South African major economic sectors. Positive changes in trade sector employment leads to job growth in construction, finance and mining. Although the finance sector was found to be positively influenced by wages, investment and productivity, its job growth has a positive effect only on trade and transport sectors; with negative effects towards employment growth in construction, manufacturing and mining sector. Analysing how sectoral employment affect investment spending, labour productivity and real wage, the study findings indicate that changes of employment in manufacturing, mining and trade sectors cause changes in investment spending. Employment level in finance and mining sectors are the short-term predictors of labour productivity, while real wage, in the short-run, can be predicted using only employment in mining sector. Considering the interplay between labour productivity, investment spending and real wage, it was

found that real wage possesses a long-run effect on investment spending and labour productivity. Finally, the study highlighted the significance of investment growth towards job creation in the South African economy. Additionally, without ignoring other economic sectors, financial and construction sectors require more support to boost employment in other sectors. The findings from this study can assist policymakers and economic authorities in developing strategies that are able to increase employment in South Africa and hence, reduce the consequences of unemployment on the South African economy and welfare.

Key words: Econometric analysis, nonlinear ARDL, economic sectors, employment and unemployment, investment spending, productivity, wages, South Africa.

TABLE OF CONTENTS

DECLARATION ..... **i**

ACKNOWLEDGEMENTS ..... **ii**

DEDICATION ..... **iii**

ABSTRACT ..... **iv**

TABLE OF CONTENTS ..... **vii**

LIST OF TABLES ..... **xiv**

LIST OF FIGURES ..... **xvi**

LIST OF ABBREVIATIONS AND ACRONYMS ..... **xviii**

CHAPTER 1 ..... **1**

INTRODUCTION AND RESEARCH BACKGROUND **1**

1.1 INTRODUCTION **1**

1.2 PROBLEM STATEMENT **5**

1.3 OBJECTIVES OF THE STUDY **7**

1.3.1 Primary objective 8

1.3.2 Theoretical objectives 8

1.3.3 Empirical objectives 8

1.4 METHODOLOGY **9**

1.4.1 Literature review 9

1.4.2 Empirical study 9

1.5 ETHICAL CONSIDERATION **11**

1.6 CHAPTER CLASSIFICATIONS **11**

1.7 CHAPTER SYNOPSIS **13**

CHAPTER 2 ..... **14**

THEORETICAL LITERATURE REVIEW **14**

2.1 INTRODUCTION **14**

2.2 CONCEPTUALIZATION AND DEFINITIONS 15

2.2.1 Employment and unemployment theories 15

2.2.2 Employment 16

2.2.3 Unemployment and underemployment definitions 17

2.2.4 Types, causes and effects of unemployment 19

2.2.5 Voluntary unemployment 26

2.2.6 Involuntary unemployment 26

2.2.7 Natural unemployment 26

2.2.8 Employment /unemployment measurement 27

2.2.9 Underemployment 30

2.2.10 Self-employment 31

2.2.11 Formal versus informal employment 32

2.2.12 Determinant of employment elasticity 33

2.3 GENERAL EMPLOYMENT THEORIES 44

2.3.1 Marx's economic theory 44

2.3.2 The classical and the Keynesian viewpoints of employment/unemployment 45

2.3.3 Flexible wages and employment in the Classical and Keynesian theory 52

2.4 INTERACTION OF MACROECONOMIC VARIABLES 54

2.4.1 Linkage between productivity, employment and real wage 54

2.4.2 The linkage between output, saving and employment 55

2.4.3 Technology growth, wage and labour demand trends 56

2.5 THE RELEVANCE OF EMPLOYMENT FOR INDIVIDUAL AND SOCIETY WELFARE 57

2.5.1 Loss of current output and fiscal burden 58

2.5.2 Loss of freedom and social exclusion 58

2.5.3 Skill loss and long run damage 58

2.5.4 Psychological and mental health harm 58

2.6 CHAPTER SYNOPSIS 59

CHAPTER 3 60

MACROECONOMIC VARIABLES TRENDS AND EMPLOYMENT POLICY ANALYSIS 60

3.1 INTRODUCTION 60

3.2 THE SOUTH AFRICAN LABOUR MARKET: 1994-2016 60

3.3 OVERVIEW OF THE SOUTH AFRICAN LABOUR FORCE TRENDS: 2008 – 2016 61

3.4 REVIEW OF MACROECONOMIC VARIABLE TRENDS 62

3.4.1 The South African employment trends 62

3.4.2 Domestic investment spending (GFCF) 66

3.4.3 Correlation between employment and the real wage trends 68

3.4.4 Productivity trends in South Africa 70

3.5 ANALYSIS OF THE SOUTH AFRICAN ECONOMIC POLICIES: 1994 – 2016 74

3.5.1 The Reconstruction and Development Programme (RDP) 74

3.5.2 Growth, Employment and Redistribution Programme (GEAR) 76

3.5.3 Expanded Public Works Programme (EPWP) 77

3.5.4 The Accelerated and Shared Growth Initiative (ASGISA) 78

3.5.5 The Medium Term Strategic Framework (MTSF) 81

3.5.6 New Growth Path 83

3.5.7 The National Development Plan (NDP) (2012) 86

3.5.8 Employment Tax Incentive (ETI) 87

3.6 THE EFFECT OF GLOBALIZATION ON THE SOUTH AFRICAN LABOUR MARKET AND EMPLOYMENT 88

3.7 CHAPTER SYNOPSIS 90

CHAPTER 4 92

REVIEW AND DISCUSSION OF EMPIRICAL LITERATURE 92

4.1 INTRODUCTION 92

4.2 THE EFFECT OF INVESTMENT SPENDING (GROSS FIXED CAPITAL FORMATION) ON ECONOMIC GROWTH AND EMPLOYMENT 92

4.3 LINKAGE BETWEEN REAL WAGE, MINIMUM WAGE AND EMPLOYMENT/ UNEMPLOYMENT 98

4.4 THE RELATIONSHIP BETWEEN PRODUCTIVITY AND EMPLOYMENT/ UNEMPLOYMENT 101

4.5 LINKAGE BETWEEN WAGES, PRODUCTIVITY AND EMPLOYMENT/ UNEMPLOYMENT 103

4.6 LINKAGE BETWEEN MINIMUM WAGE AND EMPLOYMENT/ UNEMPLOYMENT .. 110

4.7 LINKAGE BETWEEN EMPLOYMENT AND REAL WAGE AND PRODUCTIVITY IN THE SOUTH AFRICAN ECONOMY 112

4.7.1 Correlation between real wage and minimum wages on employment growth. 113

4.7.2 Labour productivity, real wage and employment relationship 114

4.8 CHAPTER SYNOPSIS..... 115

CHAPTER 5 116

RESEARCH DESIGN AND METHODOLOGY..... 116

5.1 INTRODUCTION..... 116

5.2 DATA DESCRIPTION, METHODOLOGY AND MODEL SPECIFICATION 117

5.2.1 Data acquisition and description 117

5.2.2 Description and measurement of independent variables (LINVES, LPROD, LRWAGE) 118

5.2.3 A concise description of economic sectors and employment growth (dependent variable) 120

5.3 METHODOLOGY AND ECONOMETRIC MODELS SPECIFICATION 132

5.3.1 Unit root and stationarity tests..... 133

5.3.2 Toda Yamamoto (T-Y) approach to Granger non-causality Test 140

5.3.3 The autoregressive distributed lag (ARDL) model or standard ARDL..... 142

5.4 MODEL SPECIFICATION FOR STANDARD OR LINEAR ARDL 143

5.5 NONLINEAR ASYMMETRIC COINTEGRATION 146

5.5.1 The Nonlinear Autoregressive Distributed Lag Model (NARDL) 150

5.6 EMPIRICAL MODEL 152

5.7 CHAPTER SYNOPSIS 154

CHAPTER 6 155

EMPIRICAL FINDINGS AND DISCUSSION 155

6.1 INTRODUCTION 155

6.2 PRELIMINARY ANALYSIS 156

6.2.1 Graphical analysis 156

6.2.2 Correlation analysis 158

6.3 ECONOMETRIC APPROACHES AND MODELS APPLICATION 162

6.3.1 Unit root and stationary tests 162

6.3.2 Breakpoint unit roots tests 166

6.3.3 Optimal lag lengths and model selection in ARDL and NARDL 167

6.4 ESTIMATION AND DISCUSSION OF SYMMETRIC RELATIONSHIPS .. 169

6.4.1 Analysis of long-run relationships among variables 170

6.4.2 Error correction model and short-run analysis 173

6.4.3 Estimation of linear long-run interaction among sectoral employment 176

6.4.4 Residual diagnostic tests 178

6.4.5 The ECM and linear short run dynamics between sectors 180

6.4.6 Estimation of linear relationships between investment spending, labour productivity and real wage 181

6.5 THE ASYMMETRIC RELATIONSHIPS BETWEEN SECTORAL EMPLOYMENT, INVESTMENT SPENDING, LABOUR PRODUCTIVITY, REAL WAGE . 187

6.5.1 Analysis of asymmetric long-run relationships 188

6.5.2 Diagnostic tests and model robustness 190

6.5.3 Error correction model and short-run relationships analysis 191

6.5.4 Analysis of asymmetric relationships among sectoral employment 192

6.5.5 Estimation of Asymmetric relationships between investment spending, labour productivity and real wage 200

6.5.6 Dynamic multipliers with long-run and short-run asymmetries 203

6.6 CHAPTER SYNOPSIS 211

CHAPTER 7 213

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 213

7.1 INTRODUCTION 213

7.2 SUMMARY OF THE STUDY 213

7.3 ACHIEVEMENT OF STUDY OBJECTIVES 217

7.3.1 Primary objective 217

7.3.2 Theoretical objectives 217

7.3.3 Empirical objectives 220

7.4 THE CONTRIBUTION OF THE STUDY TO THE EXISTING KNOWLEDGE 223

7.5 POLICY IMPLICATION OF THE STUDY FINDINGS 226

7.5.1 Establishment of special support towards construction sector 227

7.5.2 Endorsement of expansionary policy in favour of output and productivity growth 227

7.5.3 Implementation of sectoral employment strategies channelling job creation 227

7.5.4 Establishment of national and sectoral macroeconomic stability 228

7.5.5 Improvement of required workforce skills 228

7.5.6 Improvement of labour market flexibility and trade openness 229

7.5.7 Promotion of independence and connexion between economic and political institutions 229

7.5.8 Labour skills, productivity and technology diffusion enhancement 229

7.5.9 Economic growth and labour-intensive production oriented 230

7.5.10 Creation of labour market model 230

7.5.11 Establishing and implementing an effective wage policy 230

7.6 CHALLENGES OR STUDY LIMITATIONS 231

7.7 SUGGESTIONS FOR FUTURE STUDIES 231

7.8 FINAL REMARKS 232

BIBLIOGRAPHY 233

ANNEXURES 276

ANNEXURE A: BOUNDS TESTS RESULTS AND F-STATISTIC ESTIMATION..... 276

ANNEXURE B: INTERACTION BETWEEN INVESTMENT, PRODUCTIVITY, REAL WAGE AND SECTORAL EMPLOYMENT, STABILITY TEST RESULTS..... 278

ANNEXURE C: LETTER FROM THE LANGUAGE EDITOR..... 280

LIST OF TABLES

Table 3-1: Sectoral quarterly total and average employment in the South African economic sector (in thousands): 2010 -2016 64

Table 3-2: Employment growth (in percentage %) for each 4th quarter: 2010-2016 . 65

Table 3-3: Sectoral contribution to total employment (%) 66

Table 3-4: Sectoral job drivers in South African economy 84

Table 3-5: A framework for analysing the impact of globalization on workers 89

Table 5-1: Sectoral employment index growth between 1995 and 2017 122

Table 6-1: Correlation coefficients 161

Table 6-2: Results of ADF and PP Unit root test 163

Table 6-3: Results of the KPSS stationarity test 164

Table 6-4: Breakpoint unit root results 166

Table 6-5: Model selection 169

Table 6-6: Long run relationships 173

Table 6-7: Linear ARDL short run relationships and the ECM regression 175

Table 6-8: The symmetric long run relationships of sectoral employment 178

Table 6-9: Diagnostic test results 179

Table 6-10: A linear short run relationships of sectoral employment 181

Table 6-11: A linear long run relationship between LINVES, LPROD and LWAGE. 183

Table 6-12: A linear short-run relationships LINVES, LPROD and LWAGE 184

Table 6-13: Toda-Yamamoto Granger non-causality results 186

Table 6-14: Cointegration between sectoral employment, investment, productivity and real wage 190

Table 6-15: Diagnostic tests and model robustness 191

Table 6-16: ECM and short run relationships 192

Table 6-17: Long run coefficients and diagnostic tests.....196

Table 6-18: Short run coefficients and the error correction terms.....199

Table 6-19: Estimation of long run relationships among independent variables 201

Table 6-20: Short run relationships among independent variables.....202

LIST OF FIGURES

Figure 1-1 Trends in growth in average real wages and labour productivity.....2

Figure 2-1: Different types of unemployment 20

Figure 3-1: Trends in the South African labour force and its components (2008-2016) 62

Figure 3-2: Quarterly employment trend between 2008 and 2017 (in thousands).....63

Figure 3-3: Total capital formation between 1995 and 2016 (in millions) 67

Figure 3-4: Investment spending within five economic sectors (1995 -2016) 68

Figure 3-5: Correlation between real wage and total employment in non-agriculture sector.....70

Figure 3-6: Productivity trends in non-agriculture sector (1995-2016) 71

Figure 3-7: Productivity and employment trends 72

Figure 5-1: Sectoral composition of the South African economy in 2016 121

Figure 5-2: Employment index growth in the construction sector 124

Figure 5-3: Employment in the financial sector 126

Figure 5-4: Employment growth in the manufacturing sector 128

Figure 5-5: Employment growth in the mining sector.....129

Figure 5-6: Employment growth in the trade sector.....130

Figure 5-7: Employment index growth in the transport sector 131

Figure 6-1: Graphical representation of sectoral employment (dependent variables) 157

Figure 6-2: Graphical representation of investment, productivity and real wage (independent variables).....158

Figure 6-3: Correlation graph 159

Figure 6-4: Plots of CUSUM in the long run of all the models 179

Figure 6-5: Dynamic Multipliers with LR and SR Asymmetries in construction sector 204

Figure 6-6: Dynamic Multipliers with LR and SR Asymmetries in financial sector ...206

Figure 6-7: Dynamic Multipliers with LR and SR Asymmetries in financial sector ...207

Figure 6-8: Dynamic Multipliers with LR and SR Asymmetries in mining sector 208

Figure 6-9: Dynamic Multipliers with LR and SR Asymmetries in trade sector.....209

Figure 6-10: Dynamic Multipliers with LR and SR Asymmetries in mining sector....210

Figure 7-1: Interactions between investment spending, real wage, labour productivity and sectoral employment.....225

LIST OF ABBREVIATIONS AND ACRONYMS

ADF : Augmented Dickey-Fuller

AIC : Akaike Information Criterion

ANC : African National Congress

AR : Autoregressive

ARCH : Autoregressive conditional heteroscedastic

ARDL : Autoregressive Distributed Lag

ASGISA: The Accelerated and Shared Growth Initiative

BEA : Bureau of Economic Analysis

CIDB : Construction Industry Development Board

DW : Durbin-Watson

ECM : Error correction model

ECT : Error Correction Term

EPWP: Extended Public Works Programme

ETI : Employment Tax Incentive

FDI : Foreign direct investment

FMOLS: Fully Modified Ordinary Least Squares

GDP : Gross domestic product

GETS : General-To-Specific

GFCF : Gross fixed capital formation

GLS : Generalized least squares

GMM : Gaussian mixture model

H0 : Null hypothesis

H1 : Alternative hypothesis

IDC : Industrial Development Corporation

ILO : International Labour Organisation

IMF : IMF – International Monetary Fund

JIPSA : Joint Initiative on Priority Skills Acquisition

KPSS : Kwiatkowski–Phillips–Schmidt–Shin

L M : Langrange multiplier

NARDL: Nonlinear Autoregressive-Distributed Lag

NEPAD: New Partnership for Africa's Development

NGP : New Growth Path

OECD : Organisation for Economic Co-operation and Development

OLS : Ordinal least of square

PP : Phillip-Peron

RDP : Reconstruction and Development Programme

SADC : Southern African Development Community

SARB : South African reserve bank

SEDA : Small Enterprises Development Agency

STATS SA: Statistics South Africa

TAR : Threshold Autoregression

UECM: Unrestricted Error Correction Model

UECM: Unrestricted error correction models

USA : United States of America

VAR : Vector Autoregressive

VECM: Vector error correction mode

CHAPTER 1

INTRODUCTION AND RESEARCH BACKGROUND

1.1 INTRODUCTION

Globally, one of the critical macroeconomic concerns is the increasing level of unemployment (World Bank, 2017:3). Since the global economic crisis of 2008, unemployment gradually increased in both developing and developed countries. This diminishing rate of employment is, as stated by the International Labour Organization (ILO, 2016a), mostly due to the slow economic growth in most economies and the decline in commodity prices, which negatively affected real wage, productivity, spending as well as labour markets in general. The Organization for Economic Co-operation and Development (OECD, 2016a) observes that global unemployment increased by almost a million of jobless people and that the number of jobs lost was expected to increase by 3.4 million between 2015 and 2017. This report also revealed that from the 2008 global economic crisis up to 2015, more than 27 million jobs were lost. This justifies the reason why the total number of global jobless people was anticipated to increase up to 200.5 million people in 2017 and within a single year, between 2017 and 2018, global unemployment was expected to increase by 1 million (ILO, 2016a; ILO, 2017:11).

The ILO (2016a) report asserted that over 197.1 million people across the globe were unemployed in 2015. Growing unemployment rate affects economic growth as well as the standard of wellbeing within the worldwide society. However, consequences of joblessness are generally more severe in developing countries than developed ones. In spite of significant economic growth and high levels of income in developed countries, unemployment is gradually increasing within these countries (ILO, 2016b). Causes of unemployment in developing countries differ from those in developed countries. Unemployment growth in developed countries is mostly due to the declining of capital spending, weak factors of productivity growth, flagging global trade and declining labour force (World Bank, 2015:3). Additionally, worst cases are experienced in developing regions such as Latin America and the Caribbean, Northern Africa and

sub-Saharan Africa in which lower rate of productivity remains the major cause of unemployment growth (ILO, 2015a).

The mentioned factors that cause unemployment within developed countries with high income level are also supported by technology improvement which, in some of economic sectors increases productivity while destroying jobs or replacing human labour within the same sectors (Michelacci & Lopez-Salido, 2007; Mortensen & Pissarides, 1998:734).

The Organisation for Economic Co-operation and Development (OECD) (2016) stated that productivity growth depends on the number of people employed. If a country is facing unemployment, it is unlikely to enjoy economic growth and the low level of investment spending remains one of the major consequences of lower economic growth. Investment spending was found to be one of the crucial components of aggregate expenditure that generates economic growth and creates more jobs in different economic sectors (Habanabakize & Muzindutsi, 2015; Keynes, 1936; Onaran *et al.,* 2017). Therefore, employment, productivity, investment spending and economic growth are interconnected. Thus, a shock in one of these four economic variables may spill over to the sectoral employment.

Unemployment does not result only from ineffective labour productivity, but also from the real wage fluctuations. Meager and Speckesser (2011) asserted that the link between real wage and productivity may result from employment fluctuations. They also argued that high real wage encourages workers and boost the level of labour productivity. In the same vein, Sharpe *et al.* (2008) supported the hypothesis of a strong and positive relationship between real wage and productivity. Henceforth, real wage and productivity level work hand-in-hand to generate low or high employment. Nonetheless, despite the positive relationship between real wage growth and labour productivity growth in global economy, the level of labour productivity has been experiencing a growth rate compared to the real wage growth. Figure 1.1 depicts how the labour productivity and real wage growth have been decoupling between 199 and 2015 within developed countries. The gross decoupling between labour productivity and the real wage differs from one country to the other. However, this decoupling might result either from inequality and non-wage labour, non-wage labour costs (such

as pension contributions and healthcare benefits), a growing divergence between the GDP deflator and the consumer price deflator with the GDP price deflator rising much more slowly than measured consumer prices (Passao, 2013:10-11).

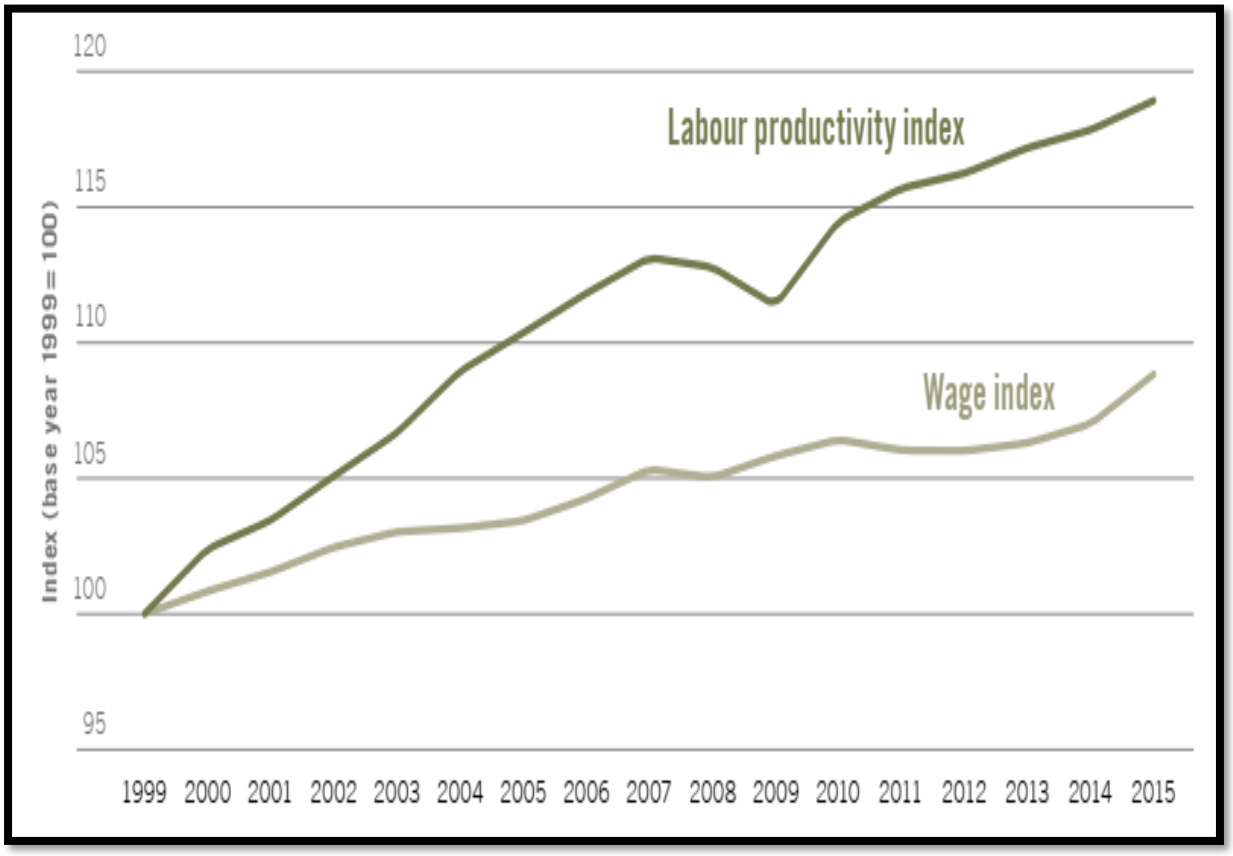

Figure 0-1 Trends in growth in average real wages and labour productivity

Source: ILO Global Wage Report (2016)

Although different scholars suggest various definitions, Black et al. (2013:129) defines employment as every activity executed by a person for his employer or for himself in exchange for wage or profits. In this regard, real wage can be depicted as employee's earnings expressed in terms of purchasing power (McConnell & Blue, 1992:638). In most cases, real wage rate is closely linked to labour productivity. Productivity in terms of labour, is defined as the output of one employee at a given time period (McConnell & Blue, 1992:637). Productive employees who receive decent wages contribute to the growth of investment spending. Investment spending is defined by Keynes (1936) as a portion of income invested for future production.

It is imperative to understand the meaning, significance and mechanisms of unemployment and employment in different countries so has to make a rational choice among economic variables such as real wage, productivity and investment spending in order to improve employment across sectors. Although there are a significant number of theories suggesting several solutions to the issue of unemployment, most of them are rooted into two main economic theories namely, the Classical and Keynesian theories (Landmann, 2004). In the view of the Classical theory, unemployment problem can be solved only if the wages and productivity are well handled, that is, improving labour productivity and efficiency wages (Akerlof & Yellen, 1990). This suggests that employment may depend on the level of productivity and real wage.

In contrast to the Classical theory, the Keynesian theory suggests that, to solve the unemployment problem, spending or demand for goods and services must increase, for the cause of unemployment has roots within the inefficiency of markets and ineffective demand (Maqbool, 2014:20). In support of the Classical theory, Mohd Noor (2011:69) asserts that real wage plays an important role in a country's employment sectors. He underscores that more labour is employed if the real wage is low. Higher rates of real wage cause the country's unemployment to rise. In contrast to Mohd Noor's argument, Lee-Peng *et al.* (2001:51) state that in the long-run, a positive relationship exists between real wage and productivity, thus resulting in future employment; suggesting that an increase in real wage may not necessarily lead to unemployment growth. In a Keynesian virtuous circle, growth model wages are the engine of demand growth. Productivity growth drives wage growth which fuels demand growth. This promotes full employment which provides the incentive to invest, which drives further productivity growth. Within this virtuous circle framework, finance is characterised by a public utility model.

In the South African context, the level of unemployment has been rising since the 1994 democratic election. Teal's (2000) conducted a study to determine the cause of unemployment within four of sub-Saharan countries namely Ghana, Ethiopia, Mauritius and South Africa. He discovered that one of various causes of the South African high unemployment rate was the lower real wage which resulted in inflexibility of the South African labour market. Low real wage tends to be associated with low

productivity or low output which in return curbs the level of economic growth. However, Tsoku and Matarise (2014)'s study on the close association between real wage and productivity in the South African economy opposes the idea of existence of a relationship between wages and productivity. Nonetheless, these findings were contradicted by the study conducted by Wakeford (2004a) who supported for a positive correlation between wages and productivity. Regardless of the above discussion, the reality is that South African is experiencing a concurrent growth of unemployment and real wage rates. The report of the Statistics South Africa (2016) asserts that, the official unemployment levels increased from 22 percent to 26.5 percent in 1994 and 2016 respectively. Furthermore, in the third quarter of 2018, South African unemployment rate reached the level of 27.2 percent (Stats.SA, 2018). Due to growing inflation, in 2017, the South African real wage was expected to increase by 15 percent (Businesstech, 2017).

The causes of unemployment and employment growth differ from sector to sector, reason being that each sector might have its own specific requirements for employment or hiring. Henceforth, it is possible to experience a high level of employment in one sector and a high level of unemployment within other sectors of the same economy or country depending on job opportunities and skills required in each sector. Furthermore, some sectors are labour-intensive production related, while others employ more capital intensive focusing more on machinery than human labour. For instance, due to the technology growth, employment turnover is likely to be high in the manufacturing sector than in other sectors, while construction sector is anticipated to be more labour-intensive with formal and informal jobs compared to other sectors (Gavin, 2013; CIDB, 2015:4).

In addition to the mentioned factors that cause unemployment in South Africa, the role of technology growth in job creation and destruction cannot be ignored. Innovation and technology have improved over time and this improvement leaves some workers unable to cope with the new ways of production for they lack skills required for the new jobs or employment, thus more jobs are destroyed (Kohler & Wrona, 2010:23; Rotman, 2013:3). That notwithstanding, innovations and technologies do also impact positively on employment growth in creating new jobs for the unemployed people and new workforce entries are able to cope with the working methods and strategies. Therefore,

it is important to analyse whether employment or unemployment is a result of labour productivity, wages and investment spending or technology changes. In this regard, sectors that are favoured by technology have to be identified in order to put more effort into them. If productivity growth does not result from labour increase or else from increase in working hours, the hypothesis should be that, machineries and technology growth are the cause of high productivity. Based on mentioned causes of sectoral employment, it is imperative to conduct a study on sectoral employment in the South African economy in order to identify an improved solution to the current problem of high rate of unemployment. Nonetheless, due to the lack of technology data, technology was not included in controlled variables.

1.2 PROBLEM STATEMENT

In the year 2013, the South African government had the burden of supporting 40 percent of the South African households to meet their basic needs by means of social-welfare grants (Schussler, 2013). This high dependency of households on the government social grants is caused by the lack of employment. Between 2013 and 2016, the unemployment rate increased by 2.5 from 24.1 percent to 26.6 percent in 2016. In other words, the number of households depending on government grants has increased (Stats.SA, 2016). In addition, in 2015, South Africa was ranked eighth on the world list of countries with a high unemployment rate (News 24, 2015) and the broad youth unemployment rate was fluctuating to approximately 37% (Stats.SA, 2015). The unemployed citizens should be contributing more to the nation's wealth and individual well-being. However, despite their skills and willingness to work, they are lying idle due to the lack of employment opportunities. The seriousness of the unemployment in South African manifests in different ways including economic instability, a higher rate of social problems, the high rates of strikes, and pressure of labour unions on South African government.

Furthermore, the problem of higher rates of unemployment is the root cause of a substantial amount of other challenges in the South African economy regarding economic growth and development (Kingdon & Knight, 2004:403; Malakwane, 2013:33). The South African government is allocating more resources to assist the poor and unemployed people, but this is a short-term solution that leaves the problem

of joblessness, poverty and inequality unsolved (Tcherneva, 2011:18). Job creation is indispensable to enhance economic independence, social welfare, and economic growth.

The findings of the study conducted by Habanabakize and Muzindutsi (2015: 653-656) on the South African unemployment situation suggested investment spending growth as one of the solutions to the employment and slow economic growth. However, this study did not specify sectors in which investment spending can generate employment. Some other studies, namely by Arora & Bhundia (2003), Bhorat *et al.* (2013), Strauss and Isaacs (2016), and Tsoku and Matarise (2014), were also conducted to determine the effect of real wage and productivity on employment in South Africa. However, none of these studies considered investment spending as one of the factors of employment growth. Moreover, these studies did not consider sectors in which sector real wages and productivity can boost or curb employment level, except Klein (2012) who considered only employment in the manufacturing sector. Therefore, it was important to conduct a new study in which the effect of real wage, productivity and investment spending on South African employment and to determine sectors in which each of three mentioned variables can be more effective towards employment growth. Employment level does not only depend on external factors, one sector employment can influence or be influenced by other sectors' employment level. Hence, there was a need to determine how sectoral employment interacts and how they are affected by investment spending, labour productivity and real wage fluctuations.

Although the South African government has attempted to solve the unemployment challenge at all cost, joblessness continues to rise, and the employment gap is growing (Ranchhod & Finn, 2016). In this regard, one may ask the following questions:

What would be the role of investment spending on the South African high unemployment?

What would be the relationship between real wage and unemployment rate into the South African economy?

The low level of real wage remuneration has even proved to be one of the sources of unemployment growth in some countries (OECD, 2015). Could this be the case of South African unemployment?

If wages, productivity and investment spending were the solutions to the issue of unemployment, which economic sector would favour employment growth under the mentioned economic tools?

What relationships exist between real wage rate and employment in the South African economy?

How does real wage rate affect the level of productivity within different economic sectors?

How does wage rate affect investment spending and what is the impact of this relationship on employment growth?

Which economic sector is more affected, regarding employment by the fluctuation of wages and productivity?

Which economic sector is more likely to be affected, regarding employment by investment spending?

Which sector's employment influence or is influenced by changes in other sector's employment?

Given the relationship between labour productivity, investment spending, real wage and sectoral employment, what policies would be improved to curb the high rate of unemployment in the South African current economy?

1.3 OBJECTIVES OF THE STUDY

The following objectives have been formulated for this study:

1.3.1 Primary objective

The primary objective of the study is to conduct a detailed econometric analysis of the interactions between productivity, real wage, investment spending and sectoral employment in South Africa.

1.3.2 Theoretical objectives

In order to achieve the primary objective of the study, the following theoretical objectives were formulated:

To define, contextualize and classify the concepts of employment and unemployment,

To depict theoretical aspects and different types, causes, consequences and measurement of employment/unemployment,

To review three of main theories of employment/unemployment,

Discuss different types of wages and how they affect employment level,

To define and elucidate labour market flexibility with the concepts of real wage, labour productivity and gross domestic investment spending,

To review empirical studies that investigated the relationship between employment, investment spending, labour productivity, real wage and employment, and

To discuss the macroeconomic trends and assess the effectiveness of some of the South African employment policies.

1.3.3 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives were formulated:

To determine the recent growth and trends of investment spending, labour productivity, real wage and sectoral employment rate;

To determine the long-run and short-run interaction between sectoral employment, investment spending, labour productivity and real wage in South African economy;

To analyse the responsiveness of each sector's employment towards changes in other sectors' employment;

To determine the interaction and causality between investment spending, productivity and real wage;

To identify the main driver of sectoral employment in South Africa between wages, productivity and investment spending; and

To analyse the investment spending, labour productivity and real wage multipliers effect towards sectoral employment.

1.4 METHODOLOGY

The methodology of this study considered a review of both literature and empirical studies.

1.4.1 Literature review

Secondary sources such as journals, thesis, books, academic and commercial abstracts, bibliographic databases and the internet search engine were utilised to access necessary information sources. The literature review included both theoretical literature as well as empirical literature to elucidate on the relationship that may exist between employment in South African economic sectors (mining, manufacturing, financial institutions, construction, trade and transport) productivity, wages and investment spending. These sectors were selected based on their contribution to the South African GDP that is, in return, estimated to be the main source of employment growth.

1.4.2 Empirical study

1.4.2.1 Data collection

Analysis of the relationship between employment, real wage and productivity require the availability of employment, wages, productivity and investment spending data of a specified timeframe. This study was based on quarterly time series data from 1995 to 2017. The decision to use data from 1995 was based on the fact that, the pre-1994

data are affected by the economic embargo on South Africa and in 1994 the democratic government policies were not yet fully implemented (Laverty, 2007:2). Analysis of fluctuations of independent and dependent variables over the period of 22 years assisted to determine the relationship between employment within different economic sectors, wages, productivity and spending.

The analysed data is available from the South African Reserve Bank (SARB) and the Statistics of South Africa (STAT. SA) websites. A total of 88 quarterly observations (22*4) were utilised for analysis. Six economic sectors (mining, manufacturing, finance, construction, trade and transport) were included in this study. These sectors were selected based on the major role they play in South African economic growth. In addition, these sectors have proved to create jobs in other developed and developing countries. Therefore, it was significant to conduct a deeper analysis on these sectors focussing on the South African context to determine if they can contribute in overcoming the current unemployment challenge.

1.4.2.2 Data analysis

The empirical objectives of the study were achieved by analysing the interaction among the selected economic variables (employment, real wage, productivity and investment spending) across selected sectors (mining, manufacturing, financial institutions, construction trade and transport). The analysis included various econometric approaches to determine the long-run and short-run relationships, causal and asymmetric relationship between economic variables affecting the South African sectoral employment environment. A stationarity test was the first step to determine the integration order for variables. The Autoregressive Distributed Lag model (ARDL) was utilised to determine the long-run relationship among variables (real wage, labour productivity, investment spending, and employment in mining, manufacturing, financial institutions, construction trade and transportation sectors). The model was applied in its two forms (linear and nonlinear) to capture the linear and nonlinear effect from one variable towards others. The linear and nonlinear ARDL model were utilised to embrace the structural changes of variables and capture the hidden cointegration. The Error Correction Model (ECM) was applied to determine the short-run relationships and the model speed of adjustment towards long-run equilibrium. The Toda

Yamamoto Granger non-causality test assisted in determining the short-run causal relationship among variables. To ensure the accuracy of the obtained results from different analyses, the study conducted the diagnostic test such as serial correlation, heteroscedasticity and parameter stability tests.

1.5 ETHICAL CONSIDERATION

The study is grounded on secondary data available in the public domain. The ethical clearance from the data provider (the South African Reserve Bank and the Statistics of South Africa) was not necessary. However, the study followed the North West University ethical guidelines.

1.6 CHAPTER CLASSIFICATIONS

Chapter 1: Introduction and research background

This chapter provides the background and brief of what the study is about. It also provides the objectives, problem statement, contribution of the study to the scope of existing knowledge; an outline of approaches and methodology employed by the study and the justification of the study.

Chapter 2: Theoretical literature review

This chapter reviews the theoretical aspects of sectoral employment and how employment in these sectors can be influenced by real wage, productivity and gross domestic spending. Different types of employment, wages, their measurement, determinants and impacts are thoroughly discussed. In this chapter, the relationship between each of the selected sectors and employment in South Africa is also discussed.

Chapter 3: Macroeconomic variables trends and employment policy analysis

This chapter assessed some key policies implemented in the South African economy and their effect on unemployment since 1995 until 2017. The study combines data (index) from 1995 to 2017 and 2008 to 2016 (real value) to analyse trends within variables.

Chapter 4: Review and discussion of empirical literature

This chapter reviews the empirical findings from different investigations conducted on theories elucidated in Chapter 2. This includes a review of the empirical studies on the relationship between real wage, productivity, and investment spending and sectoral employment.

Chapter 5: Research design and methodology

This chapter elucidated the sample period, data collection and different econometric approaches and models utilised to achieve the empirical objectives of the study. The description of variables and explanation of unit root tests preceded other econometric technics descriptions. The unit root test included Augmented Dick Fuller approach (ADF), Phillips–Perron (PP) test, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests and trends unit root test. In the second step, the Autoregressive Distributed Lag model (ARDL) in its linear and nonlinear was utilised to test the long-run relationship among variables. Thirdly, different econometric mechanics such as error vector, error correction model and Toda Yamamoto Granger non-causality test, that assist to test the short-run relationships, are depicted. Finally, the chapter elucidated the method and strategy utilised for residual tests and stability parameters.

Chapter 6: Empirical findings and discussion

This chapter presents from preliminary analysis, unit root, cointegration, short-run relationship and residual test results to parameter stability. The chapter also discusses findings on the interaction between real wage, labour productivity, investment spending and sectoral employment.

Chapter 7: Summary, conclusions and recommendations

Finally, chapter provides a summary of the study emphasising on the major findings, concluding remarks and suggests recommendations as well as policy implications of the study. Thereafter, the study limitations, suggestions for further research and final remarks are made.

1.7 CHAPTER SYNOPSIS

This chapter identified and introduced the relevant question of the study. It firstly provided a general background of unemployment issue in the global economy and particularly in the South African economy. The chapter also outlined theoretical and empirical objectives of the study and proposed different approaches to achieve them. The outline of chapters and the focus of each chapter has been provided in this chapter.

CHAPTER 2

THEORETICAL LITERATURE REVIEW

2.1 INTRODUCTION

When handling the unemployment issue, three major economic theories are considered. These theories are the Classical, Keynesian and Marxian. While the Marxian theory of unemployment emphasizes the role of capitalists concerning controversy between wages and profitability, Keynesian and Classical schools of thoughts focuss principally on full employment, economic equilibrium and the role of government into the economy. Contrary to the Marxian theory that blames capitalism system to be the cause of unemployment, Classical economists believe that visible hand of government in terms of regulations such as tax, minimum wage – making lower production causes unemployment growth (Presis, 2014:12). The main point of Classical employment theory resides in Jean Baptists Say's Law: "supply creates its own demand" (Torrens, 1965:135; Kates, 2005:51). Higher wage rate is the central cause of unemployment in the Classical theory's view. Contrary to these two mentioned theories – Marxian and Classical, Keynesian theory asserts that prevailing deficient demand for goods and services remains the cause of unemployment (Keynes, 1936).

Despite numerous divergences of these two theories (Classical and Keynesian) both put more attention on the influence of supply and demand for goods and services on the labour market. They also consider labour market fluctuations as a major determinant of employment/ unemployment (Elmslie & Criss, 1999:146). While Alfred Marshall argued that the increase in labour demand results from higher demand for goods and services, Keynes supported him when he argued that demand creates its own supply (Keynes, 1936; Hamermesh 1993). Demand for goods and services requires production and production requires demand for labour inputs. This implies that employment cannot be regarded as isolated macroeconomic variable, but rather as a component of a set of macrocosmic variables. Since labour demand is subjected to the level of the real wage, productivity and investment spending, it is absurd to

anticipate employment growth with low wages and productivity (Meager & Speckesser, 2011:7-68).

However, this study acknowledges that theoretical literature on employment, wages, productivity and investment spending form a vast field that cannot fully be explored in a single study. This vast literature, in its entirety, cannot be presented and discussed in this single thesis. The temptation to exhaust it is therefore beyond this study's scope. Nonetheless, it is important to broadly define these concepts and discuss the three major theories of employment with their linkages to the abovementioned macroeconomic variables. Henceforth, this chapter principally focusses on following concepts: employment/unemployment, investment spending or gross capital formation, productivity and wages. Besides definitions and discussion about these concepts, different types of employment and wages are also discussed in this chapter. Furthermore, this chapter represents a linkage among macroeconomic variables under consideration. Lastly, the relevance of employment towards individual and social welfare is presented followed by the chapter's summary and conclusion.

2.2 CONCEPTUALIZATION AND DEFINITIONS

The focus of the study is the analysis of the interaction between South African employment, investment spending, productivity and real wage. Thus, unemployment as a concept is used to indicate employment deficiency. Additionally, it appears preposterous to define and interpret employment while ignoring unemployment since these two terms or concepts are like the two sides of the coin. Thus, unemployment and employment definitions and measurements are provided consecutively. Besides definitions and discussion about these two economic indicators and their role in social and individual welfare, wages, productivity and investment spending are also discussed.

2.2.1 Employment and unemployment theories

Given that employment and unemployment are not like two sides of one coin, neither employment nor unemployment theory alone can be sufficient to depict the behaviour of the national economy. This is why Parker (2010:8) argued that the common fallacy often committed by inexperienced public members would be to conclude that if employment declines by 100 workers this will – ipso facto – cause unemployment to

rise by 100. In his view, a person might lose his job in one economic sector and directly get hired in other economic sector. Thus, the presumed number of jobs lost appears to be higher than the level of unemployment for those who left their employment in one sector are working for another sector. Correspondingly, when a firm employs 100 new workers it does not necessary means that 100 new jobs were created into the economy. Although a significant amount of these employed people might be new into the labour force in example of new graduates, other might have left their previous employment. Therefore, one should seek to know what is employment/unemployment and how are they measured.

2.2.2 Employment

The concept *unemployment* goes together with its opposite, which is, employment, *ceteris paribus*, and the presence of one offset the existence of the other. Consequently, defining employment remains difficult as well as it is the case for unemployment. One of multiple reasons that make employment difficult to define is that, employment refers either to the act of performing a task or to the person executing the task. Black *et al. (*2013:129) defines employment as every activity executed by a person – either for himself or his employer – that generates income in the form of wage or profits. Referring to the person who performs the activity, Krugman and Wells (2013:214) depict employment as the total number of people currently employed in the economy for part-time as well as full time jobs. On the other hand, employment means status of a person in labour force carrying out an economic activity for a determined period to generate income (Hussmanns, 2004:8). In this regard, the latter definition takes into account any activity executed to generate wages or profits.

From these two definitions, ILO (2003:5) classifies employment into two groups namely; paid employment and self-employment. Nevertheless, whether a person is self-employed or employed by someone else, it is important to mention that the number of hours worked remains a major criterion in countries' economy and individual or society well-being (ILO, 2016a:15). Therefore, other things being equal, working a considerable amount of hours per day implies significant amount of output, increased level of total and per capita income. Nevertheless, it is important to understand the difference between these two types of employment.

2.2.3 Unemployment and underemployment definitions

Although the concept of unemployment appears to be familiar to various people, it is not an easy concept to define and measure; for it is differently understood (Mohr, 2015:400). It is difficult to have a clear and common definition and measurement of unemployment for countries define their workforce constituents in different ways (Fourie & Burger, 2010:476). This difference makes some countries to include students in their workforces while others ignore them (Gorlich *et al.*, 2012). Additionally, underemployment hardens the way unemployment is defined.

Underemployment refers to the situation in which a person accepts to perform a job that requires less than his skills and abilities only because he does not have opportunity of getting a desired one (Dubihlela, 2010:25; Swanepoel & Van Zyl, 1999:263). With the intention of clearing this ambiguity, in 1954 the International Labour Organisation introduced the standard definition of unemployment. This standard definition aimed to enable countries to categorise when a person is considered to be employed, underemployed or unemployed. Therefore, an unemployed person is a person without work, seeking a work and available for work (ILO, 2005). Since the understanding of unemployment concept is complex, the orthodox definition from ILO served as a benchmark or guideline to economists who, in different periods, provided their own definitions. Kingdon and Knight (2001) asserted that more than 80 countries adopted the above-mentioned ILO's definition.

Kuper and Kuiper's (1996:241) supported the ILO definition, but yet argued that the ILO definition excludes some categories of people who do not have employment, yet not seeking jobs given the circumstances. In this regard, they mentioned women who are staying at home able and willing to work yet not seeking jobs. For instance, a person might not be seeking a job because of lack of information or financial means, yet ready for employment if ever he got that opportunity. Thus, Dwivedi (2005:493) stated that the ILO definition from the policy point of view lacks clarity since it does not specify the person considered as seeking jobs. He defined unemployment as a situation in which a person is able and willing to work at the available wage rate yet cannot find a job. He further stated that unemployment would be taken as the difference of the gap between employed and unemployed people.

Besides the abovementioned definitions, controversial arguments and definitions, regarding the concept of unemployment, were provided by numerous scholars to support the orthodox definition of employment. Consistent with Swanepoel and Van Zyl (1999:262), Mohr *et al.* (2009) and Maree (1978:16), a person with a desire and ability to work yet cannot find employment should be considered as unemployed. Furthermore, Fourie and Burger (2010:475), Lester & McCain (2001:133) and Forstater (2005) argued that a person in labour force without job but willing to take any kind of job that brings income is seen as unemployed. Strobl and Byrne (2002) also refuted the criteria that consider a person unemployed if he is seeking a job. In their view, especially in developing countries, a person might not be able to seek employment due to the lack of labour market information such as where job opportunities are available or due to the financial constraints.

These criticisms pushed the International Labour Organisation to revise its definition. The new definition of the ILO provided in 2015 considered unemployment as total number people within working age that are without paid or self-employment; available and seeking a work during the survey period. Based on the mentioned definitions, unemployment can either be defined in a broad or a narrow way.

In the South African context, the following are definitions provided by Statistic South Africa: In the strict way, the Statistics South Africa (2004) defines an unemployed person as a person whose age is between 15 and 64 who (1) is not in paying employment or self-employment, (2) is available for paying employment or self-employment during seven days prior to the period of interview or assessment, and (3) has been seeking a paying employment or self-employment during four weeks prior to the interview period. On the other hand, the expanded definition considers all options considered in strict definition but omits the option 3. In this second definition (broad definition), if a person meets option 1 and 2 s/he is considered as unemployed whether he/she is seeking a job or not (Mohr, 2015:400). While on one hand, the expanded definition is criticized for exaggerating the level of unemployment by including even a person who is slothful to find a job (Fourie & Burger, 2010:479). On the other hand, the strict (narrow) definition is criticised for ignoring the story and reality behind unemployment (Borjas, 2010:498; Kingdon & Knight, 2001:10).

Lack of information about where jobs can be found, technology improvement, change in employment requirement, desires for a better employment, changes in the real wage rate and new entrance into labour market and labour force are some of a significant amount of causes on unemployment growth. Nonetheless, unemployment is not always an economic evil for it is a channel through which skilled workers are matched with employers' job requirements (Sobel *et al.,* 2006:175). Henceforth, full employment is considered as the state of economy where the presence of unemployment depends only on the structural and frictional reasons. In this context, unemployment is a leader towards a dynamic match between job desired by job seekers and skills desired by employers (Sobel *et al.,* 2006:1769). Since unemployment results from different causes, it is obvious that various type of unemployment exists into the economy. The section below discusses some of unemployment types, their causes and effects.

2.2.4 Types, causes and effects of unemployment

Unemployment can take various forms and can also be divided into different categories depending on their causes and duration. According to Hughes and Perlman (1984:26), there are various ways to classify unemployment and none of these ways can be taken as definitive, correct or incorrect. Hughes and Perlman stated that more than 70 types of unemployment exist in the economy. Nevertheless, these different unemployment types rather than being independent they are interdependent to one other. A thorough understanding and knowledge on different types of unemployment can lead to right policies in addressing unemployment issue (Diamond, 1981). While unemployment can have different forms or types, in the economic context, four major types of unemployment are recognised. In the following diagram, these types of unemployment are enumerated, and their causes are discussed. Four classifications of unemployment namely seasonal, structural, frictional and cyclical are illustrated in Figure 2.1:

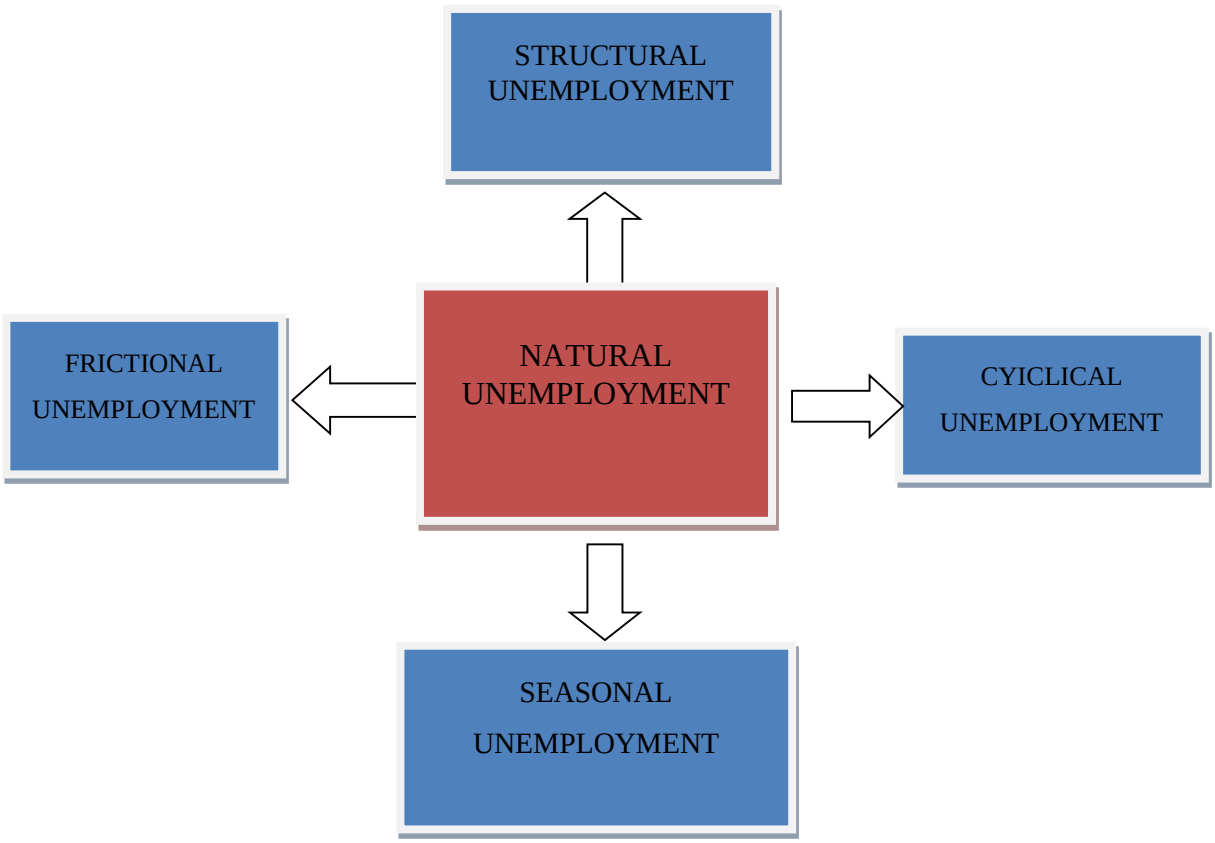

Figure 0-1: Different types of unemployment

Source: Compiled by the author

2.2.4.1 Cyclical (Demand-deficient) unemployment

The cyclical unemployment, which in some cases is referred to as Keynesian unemployment, is a type of unemployment that depends on the state of the business cycle or rather business trends. During economic upswings, more labour is demanded and yet this labour demand declines during the recession (Freeman, 1979:119). Consequently, through the business downswing, the level of cyclical unemployment increases. These downturns of business cycle may result from low consumption or rather low demand for goods and services, low investment and/or low exports reinforced by wage rigidity (Hughes & Perlman, 1984:30; Mafiri, 2005:9). Cyclical unemployment occurs mostly when an economy is experiencing a recession. In the recession period, some workers are retrenched, and few jobs are created to absorb the new entrants into the labour market.

Moreover, during the period of recession, demand for goods and services declines resulting in low labour demand. This type of unemployment is dominant during the

recession period that may lead companies to close or lay down a certain number of workers. Industries that produced durable goods are the most affected by cyclical unemployment because demand for durable goods during recession declines more than demand for non-durable goods (Tucker, 2011:172; Krugman & Wells, 2015:229; Hughes & Perlman, 1984:26). An inverse relationship exists between cyclical unemployment and the business cycle Mohr *et al.* (2009:500). The higher (at peak) is the business cycle the lower is the level of cyclical unemployment.

Nonetheless, a negative relationship exists between aggregate demand and cyclical unemployment. Increases in demand for goods and services allow firms to increase their hiring capacity and decreases retrenchment of workers. That is to say, the level of cyclical unemployment increases when economy's output is below its full-employment level. Hence, this type of unemployment is also known as situational or demand deficient unemployment. Cyclical unemployment may also result from government austere decisions such as increasing tax and reduction of government subsidies (Hughes & Perlman, 1984; Mafiri, 2005). Additionally, trade imbalance and under-consumption may cause cyclical unemployment. Unlike structural and frictional unemployment that are inevitable and may affect only some economic sectors, cyclical unemployment is more likely to affect the entire economy (Presis, 2014:13) and the seriousness of cyclical unemployment depend on economic performance (Mohr *et al.*, 2009:500; Swanepoel & Van Zyl, 1999:264).

Cyclical unemployment generates an aggressive competitive behaviour between unemployed people and employed ones. During this period, employed people are seeking better employment and both unemployed and employed workers have to apply for the same vacant position. In this regard, because they cannot observe workers' productivity, potential employers may infer unemployment to be an indicator of low productivity (Longhi & Taylor, 2013). Consequently, the odds for unemployed applicants to get jobs are more lessened in favour of employed applicants. The cyclical unemployment is harmful to the whole economy for its persistence leads to structural unemployment (Mathy, 2003; Zarnowitz, 1992).

2.2.4.2 Structural unemployment

Unemployment rate on its own does not provide sufficient information about the unemployment situation or how serious this unemployment should be. Apart from causes and consequences of unemployment, it is also important to consider the duration of unemployment (ILO, 2014). There are various causes of unemployment. Unemployment can either result from excess of labour supply or stem from labour market frictions (Mirko, 2005:52). Structural unemployment is the type of unemployment which is the most unpredictable and lasts for a long period. This type of unemployment arises due to the imbalance between jobseekers and the vacant post for jobs (Fourie & Burger, 2010:491). It refers to the economy's inability and labour market incapacity to absorb the total number of job seekers. More people are seeking jobs, yet few jobs are available.

Structural unemployment is mostly caused by a mismatch between available job skill requirements and the job seekers' skills. The effect of job skills mismatch can be profound as they result in inefficient use of human resources, loss of income and welfare cost to both economy and society (Farooq, 2011:19; Kirk, 2011:7; Levine, 2013). Accordingly, this type of unemployment exists even when the business cycle is at peak due to the lower demand for a certain type of workers (Tucker, 2011:171; Tuerck, 2015:157).

Contrary to the argument stipulating that structural unemployment results in economic inability to created sufficient jobs, Freeman (1979:118) argued that this type of unemployment may occur due to the labour market structural vicissitudes that frequently reduce employment prospects. Among others, skills mismatch, illiteracy, education and skills scarcity are some of labour market structural challenges. Moreover, technological changes, industries competitiveness and variation in consumers' preferences can also aggravate the rate of structural unemployment (Swanepoel and Van Zyl, 1999:264).

In regard to the consumer's preference, a decline in consumer's preferences leads to a decrease in demand for a certain type of product. A decline in demand of goods or services will result in job loss for employees in some industries, thus a rise in unemployment (Mohr *et al.*, 2009:500). Since some skills are not transferable from

one economic sector to the other, it will take long time for the laid-off employees to learn new skills so that they can be reemployed within other economic sectors (Borjas, 2010:505). The length of structural unemployment may also depend on austerity of labour market conditions and/or labour market incentives that may make unemployed person less interested in seeking a job (Freeman, 1979:119; Levine, 2013). Furthermore, alterations in demographics, age and geographical locations can influence the rate of structural unemployment (Swanepoel & Van Zyl, 1999:264). Employment opportunities are unevenly shared depending on locations or employee's age. In the South African context, job opportunities are found more in cities than in rural areas. These are some of the reasons why the structural unemployment might be long-term in nature.

Structural unemployment level is not affected by the level of aggregate demand. Subsequently, the structural unemployment exists even when business cycle is at its peak or economy at its full employment level. In the current global economy, technology improvement is one of the causes of structural unemployment for job structures change time to time and those who cannot adapt to the new working system and new job requirements are more likely to lose their jobs. This advanced technology that somehow changes environment working conditions could link this to the fourth industrial revolution and the fears that it can amplify structural unemployment challenges. With the fourth industrial revolution the megatrends (advanced robotics, new materials and digital) plays a significant role to the production of goods and services (Schwab, 2016). Additionally, structural unemployment can also exist due to the labour unrest, change in consumer tastes and preference, inadequate factors of production and production techniques changes.

Although structural unemployment affects different groups of workers, youths are most affected, and this is the case of the South African economy wherein the fourth quarter of 2016 more than 30.1 percent of youth aged between 15-24 years were unemployment (Stats.SA, 2015:10). Structural unemployment is the dominant type of unemployment in the South African economy (Chadha, 1994:23). The cause of structural unemployment growth for South African youth may due to the mismatch between skill and knowledge acquired from universities and the available job requirements.

The structural unemployment is one of country's natural unemployment rate. It comprises some features of frictional unemployment. The only difference between the two types of unemployment is the duration. The structural unemployment involves substantial costs to both individual and society in the form of output forgone (McConnell, R 1995: 547). Both types of unemployment, that is, frictional and structural arise because of the labour market imperfection and they are inevitable into the economy. Since the lack of access to information is one of causes of these two types unemployment, easy access to information can serve as cure to frictional unemployment (Hughes & Perlman, 1984:27-50).

2.2.4.3 Frictional unemployment

Contrary to cyclical and structural unemployment, frictional unemployment occurs during the period of new entrance into the labour force within the time people spend time seeking jobs. It also occurs or increases when some of these new entrance individuals do not want to take first available employment due to the remuneration or skills mismatch. Workers are seeking better jobs and employer are aiming to hire suitable employees (Sobel *et al.,* 2006:176). Frictional unemployment can grow due to a movement from one employment to other.

Frictional unemployment usually lasts for a short-term period, time for skills-job matching in labour markets (Gronau, 1971; Keynes, 1973; Lindbeck, 2015). Workers might not be satisfied in their current jobs and start seeking the ones considered to better off in terms of working conditions and wages remuneration; while employers would also be seeking eligible employees (Krugman & Wells, 2015:225; Tuerck, 2015:157). The frictional unemployment is not considered as a severe problem neither an alarm raising towards the economy (Borjas, 2010:504). It is a temporary type of unemployment. The length or duration of this type of unemployment depends on the length of time it takes job seekers to find new jobs (Mohr *et al.,* 2015:401).

Frictional unemployment does not last long, and it is easy to be reduced by improving access to labour market information allowing a quick matchmaking between job-seekers and employers (Barker, 1999:165). Nonetheless, this type of unemployment is inevitable, and it can occur any time in the economic cycle. It is normal that always some people are seeking jobs either new jobs or switching jobs and all firms cannot

fill vacant jobs at the same time (Bangane, 1999:11). Moreover, during the economic cycle, there are new workers entering the labour market while others are switching jobs, some employees quit their jobs while others are being retrenched. Consequently, frictional unemployment will always be there regardless of the economic performance and it is a sign of a well-organised labour market (Leonard, 1987:1; McConnell *et al.*, 2009).

2.2.4.4 Seasonal unemployment

Seasonal unemployment is due to nominal and expected changes in industries activities throughout the course of a year. Certain industries are busier during certain seasons of the year. During the busy seasons more workers are demanded. Seasonal unemployment is found in almost all economic sectors yet mostly in the agriculture, construction, tourism sector and other industries that produce seasonal outputs (Mourdoukoutas, 1988:316-325; Swanepoel & Van Zyl, 1999:264). A higher number of individuals are employed during the peak period and unemployed during off-peak period. Moreover, change in consumers' taste or preferences together with changes in fashion can cause seasonal unemployment. For instance, demand for some types of products is high during festival period such as Christmas and New Year, while some types of clothes are more demanded in winter than in summer and vice versa.

This type of unemployment is regular and can be predicted. Hence, it can be alleviated by government by creating jobs, such as manufacturing improvement during the off-peak season. Seasonal unemployment affects certain economic sector such as construction and agriculture sectors (ILO, 1951:3-4). Although it might affect the economy in one way or the other, seasonal unemployment appears not to be a serious problem for various countries especially developed ones for government intervention can curb this type of unemployment (Grady & Kapsalis, 2002:1-32). Seasonal unemployment does not fully meet the criteria of unemployment definition, because those who are unemployed in this season are waiting to be reemployed in the subsequent season (Borjas, 2010:504). These four mentioned types of unemployment are classified as involuntary unemployment. It is important to differentiate voluntary from involuntary unemployment. Voluntary unemployment includes frictional and structural unemployment while cyclical and natural rate of unemployment are considered as involuntary unemployment.

2.2.5 Voluntary unemployment

Voluntary unemployment occurs when an unemployed person is not willing to take off the job for the existing wage rate. It is not caused by the lack of job opportunities yet by the unwanted wages. This type of unemployment is not considered when counting the level of national unemployment. The reason is that, other things being constant, economy can achieve its full employment regardless the presence of voluntary unemployment (Mouhammed, 2010:55). Voluntary unemployment also includes those workers who decide to quit their jobs voluntarily, those who are excluded from employment because of their misconduct and those who do not want to take jobs because they judge the available wage rate to be lower than what they want (Hughes & Perlman, 1984:36).

2.2.6 Involuntary unemployment

Contrary to voluntary unemployment, involuntary unemployment is due to the lack of job opportunities. A job seeker is willing to work at the existing wage, yet he/she cannot find that opportunity. The difference between voluntary and involuntary unemployment is that the latter is caused by the lack of job opportunities; while the former is caused by individual choice of not taking available job only because the wage rate is lower compared to what unemployed person want to be paid or he/she is not interested in available jobs (Keynes, 1936).

2.2.7 Natural unemployment

Since frictional unemployment always exists in an economy and because numerous economies suffer from structural unemployment, it is normal that a certain number of workers will always be unemployed (Kruger &Wells, 2015:229). This type of unemployment is known as natural or normal unemployment. The natural unemployment exists when the economy is operating at full employment. In other words, natural unemployment does not depend on the business cycle, yet on divergence or the gap between labour demand and labour supply. Natural unemployment results in the fact that structural and frictional exist in recession as well as in expansion periods. The natural unemployment is the type of unemployment around which actual unemployment fluctuates. The difference between natural

unemployment and the actual unemployment is the cyclical unemployment. Therefore, natural and actual unemployment can be calculated as follows:

Natural unemployment = Frictional unemployment + Structural unemployment

Actual unemployment = Natural unemployment + Cyclical unemployment

Natural unemployment is the type of unemployment that is depicted by Keynes as an involuntary unemployment for the job seeker is able and willing to work at any level of payment, but employers are not able to create such job opportunity (Tucker2011:174; Tuerck, 2015:157).

2.2.8 Employment /unemployment measurement

Since the concept of unemployment and its types have been discussed, it is also important to give a snapshot of how employment/unemployment can be measured. Unlike the difficulty in defining employment, Gallin (2001:537) asserts that employment is one of the economic indicators that is easily measured. In his view, total employment is measured by subtracting the total number of people who are able and willing to work yet having no job during the period of assessment from the workforce. Nonetheless, some of scholars do not agree with Gallin. For instance, Hall and Taylor (2007:71) suggest two methods of measuring employment. In the first method, employment is measured by surveying households to determine who is employed and who is unemployed during the survey period. The second method consists of doing a survey through employers. In this method, employers are requested to provide the number of workers in their respective companies or institutions and from there a conclusion can be made about how many people are employed in each sector. Discussing measurement of employment, Mohr *et al.* (2015), Jones and Ridden (1999:147) and Kaufman and Hotchkiss (2006:6690) argued that measurement of employment might not be easy as it appears to be in the view of aforementioned scholars. They stated that it remains difficult to ensure when a person is fully employed, unemployed or counted as discouraged worker. Thus, it is not easy to determine group of people to include or exclude when measuring employment/unemployment.

Despite the divergence among scholars concerning the measurement of employment/unemployment, the common thing is that, each measurement considers

labour force and employed/unemployed people. Unemployment rate is obtained by calculating a ratio between unemployed people and the labour force (Janoski *et al.*, 2014:4). However, Sengenberger (2011:7) asserted that statistical results do not often reflect the real magnitude of unemployment issue. According to the ILO (2015a), the followings are the ways or methods to determine (measure) unemployment rate:

$$\text{UR (\%)} = \frac{\text{Persons unemployed}}{\text{Labour force}} \times 100$$

$$\text{UR (\%)} = \frac{\text{Persons unemployed}}{\text{Persons employed+person unemployed}} \times 100$$

Where, UR denotes unemployment rate.

Various methods are utilised when measuring unemployment. Yet, it is not possible to discuss all the existing methods in this single thesis. Therefore, three of these methods are discussed below:

2.2.8.1 Census method

The census method comprises counting the total number of a country's population to distinguish between those who are employed from unemployed ones (Janoski *et al.*, 2014:5). The census approach has been criticised of being inefficient and not reflecting the real magnitude of unemployment because of time lags between the census date and the time of statistics publication. Likewise, census is a yearly method, yet more changes may happen in labour force within a year (Kaufman & Hotchkiss, 2006:670; Mohr *et al.,* 2009:498). Furthermore, Swanepoel and Van Zyl (1999:266) pointed out that, on one hand, the census method employs questionnaires and some of questions are inadequate to fully understand the unemployment nature. On the other hand, the analysis and interpretation of the census questions may seriously affect the census data.

2.2.8.2 Registration method

The second approach that can be utilised to measure employment/unemployment is through registration method. With this method, employees are registered with their labour departments and return their registration to the department. Therefore, the department knows the employees who have registered (Barker, 2007:184). Workers

are motivated to do their registration for they desire to qualify for employment benefits (Mohr *et al.*, 2009:498). This method also has its shortcomings. One of the shortcomings that result in the use of registration is that data are collected nationally (OECD, 2014). According to Barker (2007:184), the registration method provides unemployment results that differs from the result obtained when other methods are utilised. It is highly possible for registration method results to differ from others due to significant amount of reasons that can cause employees not to register. Nonetheless, contrary to the census method which is conducted yearly, the registration approach is a precise measurement for short-run employment developments occurring month-to-month (Statistics Norway, 2007:16).

2.2.8.3 Survey method

The third method that can be utilised in measurement of unemployment is the survey method. According to Barker (2007:178), survey is undertaken among household to determine their economic status. This approach is also utilised to estimate the size of labour force, the total number of employed and unemployed people (Ohio, 2013:2). As it was seen in the two previous methods, the survey approach has also its limitations. The survey approach is highly influenced by responses provided by households. These responses might be far from the truth, this is because the sample size might affect the results, and difficult in adjustment (Summers, 1981:611). In contrast to the registration method that only provides the number of employed people, the survey approach determines in a broad way the relationship between population and labour market (Statistics Norway, 2007:16).

In the South African context, the survey approach is employed to measure the labour force on quarterly basis. The quarterly labour force survey (QLFS) is the current method utilised. It replaced the Labour force survey that was in use up to the year 2008. This labour force survey was criticised for being inaccurate regarding to the scope, timeline and frequency (Stats.SA, 2008:1). Prior to 1994, the strict definition of unemployment was use utilised d by the South African Statistics when measuring or estimating the rate of unemployment. This way of measuring unemployment was criticised for being too low because some of unemployed people were exclude by this definition. To solve this challenge, the Stats. SA adopted the expanded definition (considering the official definition from the International Labour Organisation) because

it was considered as being too high. Yet, in 1998 the Stats.SA reverted its previous measurement method of counting unemployed people based on strict definition (Mohr, 2015:400). In measuring unemployment, there are criteria to be utilised in order to ensure if a person is employed, underemployed, unemployed or a discouraged worker. The example of those criteria is one-hour criteria.

2.2.8.4 The one-hour criterion

When measuring the number of people who are employed in the economy, the number of hours worked plays an important role. In terms of labour force framework, ILO (2003) stated that one hour should be sufficient for a person to be considered as an employee. This one-hour criterion assists in capturing all types of employment that may exist in any single country. A one-hour criterion includes full-time, part-time, regular or irregular employment. This criterion is also utilised to determine whether the total labour input corresponds to the aggregate production. Under this criterion, the definition of unemployment would be restricted almost to the total lack of job opportunity because whoever has something to do within an hour would be considered as an employee, whether self-employed or employer-employee relationship job. Thus, job opportunities can be found in formal or informal economic sector.

2.2.9 Underemployment

Although most of the time more attention is given to the bilateral relationship that exist between employment and unemployment, underemployment is another element of unemployment which is, in most cases, overlooked by economists and policymakers when attempting to address unemployment issues. Underemployment occurs for the measurement of unemployment is not sufficient to understand the limitation of labour market in some countries. In some countries, especially the developing ones, statistics indicating the level of unemployment might seem to be lower, while the reality portrays the opposite.

The ILO (2003:52) describes underemployment as a situation in which a person whose employment level is below his capacity and preference. In other words, the person is working yet he/she is not fully employed in relation to the productivity and the duration of the work (by working few hours - less than normal duration, using less of his skills, getting lower income than it was supposed to be). During underemployment period the

worker is available and willing to perform any additional work that requires his/her skills (Liu & Wu, 1999:6). For different reasons they may decide to create their own employment. In the following section, self-employment is discussed in detail and why some people are interested in working for themselves.

2.2.10 Self-employment

Fields (2013:3) defines a self-employed person as a person operating individual enterprise either working alone or hiring others or a person who works in household enterprises. Beside employment provided by employers, which always comes with terms and conditions, some people prefer to be their own bosses (this is the case of entrepreneurs). Self-employment is one of core drivers of economic innovations. The benefit of self-employment is not limited to the income acquirement, but also to self-actualisation. The owner of a job (self-employed person) has the freedom to peruse the desires of his/her own heart. Additionally, the worker is in control of everything s/he does with working hours' flexibility and tax reduction (Alberta Labour, 2016:3). Regardless of the level of the person who is classified as self-employed, this type of employment is one of economic pillars in developing economies, though it is considered as of small-scale and low paying within the established economies. However, Emerging literature shows that freelancing has become a dominant employment feature in leading economies and it is common among the young who are interested in greater returns rather than job security.

For instance, in the rural areas one-third of people who are working is self-employed (Goetz *et al.,* 2012:315). In the Asian and African continents, self-employment is more dominant. For instance, in Bangladesh economy, 73 percent of non-agriculture employment is self-employment, in Kenya 66 percent, in Mali 83 percent and in Madagascar 85 percent and South Africa with the lowest statistics of 19 percent (Chen & Duane, 2008:5; Heintz & Valodia, 2008:9-10). Most of self-employed people select to do so either for they cannot find wage jobs or for they prefer to enjoy their autonomy and flexibility (de Mel *et al.,* 2010; Fields, 1975; Maloney, 2004; Tokman, 2007). Whether a person selects self-employment because of lack of waged employment or because of the desire to become own-boss; beyond the definitions of employment that seem to be generalising, Keynesian view of employment hold not. However, Hayes

(2006:46) argued the finality or final motivation of each of these choices remain a sum of money to acquire.

2.2.11 Formal versus informal employment

The inability of economy to create sufficient jobs for the labour force results in the creation of informal activities. These activities are created to generate income to those who lack formal job opportunities (Tokman, 2007:4). The informal economy plays an important role in the country's development especially concerning employment growth. Countries with high demographic rates, high number of the population is usually employed in informal economy than in the formal economy.

ILO (2016a:16) highlights informal employment as the one that lacks the legal identity, with poor working conditions, limited freedom of association and associated risky working conditions. Regardless the role played by the informal sector in economy, various studies on employment focussed on formal sector and ignored informal sector's contribution towards global economy. During era of technology and globalization, informal employment is encouraged for firms to increase their productivity or output at lower cost. Informal employees require lower wages and employers do not pay for all benefits that employees demand in formal employment (ILO, 2016b:83).

The Statistics South Africa (2015) defines informal employment as those activities performed in informal sectors by individuals without any form of formal agreement between employer and employees. These activities, unfortunately, are sometimes not secured and employees cannot enjoy employer's contributions such as pension and medical aid. Besides, informal employment refers to those employees who are working for non-registered companies. In contrast, formal employment refers to those activities performed in the formal sector by people who sign a binding agreement between them and their employers. Formal employment is secured, and employees enjoy different benefits from their employer contributions (Gallin, 2001: 537). The formal employment is found within registered companies and government sector. The two types of employment exist in both economic sectors namely private sector and public sector. Nonetheless, this study's analysis will only emphasise on formal employment given that informal employment is not easy to be quantified.

2.2.12 Determinant of employment elasticity

Employment growth is subject to the existence of other economic indicators (factors) and distortion in one of those factors significantly affects employment level (Keynes, 1937). Different economic indicators such as the domestic real exchange rate, real wage, labour productivity or output, investment spending and the technology improvement can have a major impact on employment. One of indicators that have been associated with the elasticity of employment is the level or growth of outputs. Mazumdar and Sarkar (2008:5) asserted that elasticity of employment depends more on the level of outputs and the real wage. Wages play an important role in terms of labour demand and supply. Regarding labour supply, Mazumdar (2003) highlighted two dimensions that must be considered: the number of employees and efficiency unit per employee. The efficiency unit per employee indicates the number of hours spent by a worker whether daily or weekly including the intensity of work performed per hour.

This suggests a positive correlation between the intensity of hourly work and hourly wage rate. For a firm to maximize its profit the selection of the number of workers to be employed has to be correlated to the cost (wages) that a firm is willing to pay, and the outcome expected from those workers. In other words, the cost of an extra worker to be employed must be equal to the value of extra units to be produced by this worker (Mkhize, 2012:41). Nevertheless, this condition overlooks other factors such as trade unions and job security legislation that influence labour market mobility or employers' decisions.

The other way wages can influence the level of employment is that, employers might instead of hiring new workers (thus creating new jobs), decide to increase the number of hours per existing workers, and increase per worker productivity with per worker wages (Mkhize, 2012:41). In this regard, all things being equal, a firm is capable of increasing its productivity using the same number of workers. Despite various opinions on the causation of unemployment and employment, numerous economists agree that the aggregate expenditure remains the direct cause of employment (Keynes, 1936; McConnell, 1995:145). Moreover, various factors stimulate firm to increase the number of employees or the number of hours worked by the existing employees. For instance, if hiring a new employee will demand the firm to implement training programs and this program cost more compared to overtime implementation, the firm chooses

to increase working hours rather than hiring new employees as long as those employees remain productive in those extra hours. Additionally, if government tax regulations are based on the number of employees hired by the firm, firms are more likely to employee few employees to evade high taxes (Stockman, 1996:496).

2.2.12.1 Labour Market and employment flexibility

Change in the level of employment depends on the absorption of new entrants into the labour market from the workforce. The major factors that influence labour market are productivity and wage rate. The impact of wages on employment differs from Classical theory point of view to the Keynesian view. The Keynesian theory argues that unemployment can be eradicated without focussing on the effect on wages rate, while Classical theory claims that the wage level determines the level of employment. In Classical theory where the wage rate is assumed to adjust to equate fluctuation in labour market, unemployment does not exist. In this theory, the wage is utilised as benchmark for any firm's decision relating to labour demand. Employment flexibility is referred to as work-time flexibility (Beatson, 1994) and it is usually measured by a proxy, i.e. type of contract. However, some macro-level research shows that in fact a lack of flexibility of contracts (e.g. part-time employment, temporary employment) on a labour market is related to high levels of job insecurity (Fullerton *et al.* 2011). The employment flexibility index reflects the indicators on hiring, working hours, redundancy rules and redundancy costs and allows a quantitative comparison of labour regulation across countries. Profit maximisation depends on wages that a firm is paying (Karl *et al.,* 2012:270). In other words, employment flexibility can also depend on wages flexibility. Ignoring the wage rigidity, the description of wage flexibility and it effects toward employment growth is discussed next.

2.2.12.2 The wages or earnings

According to Karl *et al.* (2012:42), the wage differentiation is the source of workers improvement and companies' innovation leading to competitiveness. Wages can be divided, according to the ILO (1973) into three main categories namely, direct wages and salaries for accomplished work and time employed to accomplish that task, remuneration for time not worked, and bonus and gratuities.

- **Direct wages and salaries for time worked and work done:** is the remuneration paid for the time and work accomplished. It includes payment for overtime, holiday work, commission paid for sales, allowances, and other benefits paid by employers to their employees (ILO, 1973).

- **Remuneration for time not worked:** this type of remuneration refers to the payment made by employer to employees with reference to the annual vacations, public holidays and any other type of payment granted by employers that does not relate to the work and time utilised for work.

- Bonus and gratuities: this type of remuneration covers seasonal and year-end bonuses plus other supplementary payment that may also include the profit-sharing bonuses.

These earnings have been depicted by International Labour Organisation to include cash and in-kind payments, though they have to be distinguished from each other. Besides the classification of wage definition, wages can also be categorised as nominal wages, real wage, efficiency-wage and minimum wage.

2.2.12.3 Real wage rate/real earning

Parkin *et al.* (2014:505) define real wage rate as the total amount of money paid to the employee divided by the cost (price level). The real wage can also be depicted as the wage paid to the employees after being adjusted for inflation and considered in terms of purchasing power per unit of good and service. Henceforth, real wage is considered as real earning (Stockman, 1996:471; Sobel *et al.,* 2006:551).

The value of real wage depends on the performance of goods and services in markets as well as the inflation rate. A positive relationship exists between labour market and goods and service markets. This implies that an increase of goods and services demand leads high labour demand. Additionally, real wage is considered as the quantity of good and service that one hour of work can produce. The real wage rate differs from the money wage rate for the latter denotes the amount of money that one hour of work can be paid for. The real wage rate is one of the major determinants of labour demand. What firms consider important is not how much they sell or pay for hourly work, rather how much quantity of the output that to be sold to earn or recover

that hourly cost. This is known as marginal revenue product principle. Nonetheless, there is an inverse relationship between the real wage rate and labour demand. An increase in real wage rate leads to a decline in labour demand (Doyle, 2005: 311-312; Parkin *et al.,* 2014:505).

Besides productivity, the real wage rate may also depend on workers preferences, types of task to be performed, the race and gender of employees, and geographical aspects (Sobel, 2006:555-557). While Classicists also believes that the real wage is flexible, Keynesian theory argues that wages might be "sticky" to increase demand for goods and services. The wage stickiness results in time that takes for market adjustment, minimum wages implementation and/or "insider - outsider's theory". Insiders – Outsiders' theory states that employees who already work for an organisation may keep their wages high by setting up different barriers that prevent their employers from retrenching them or hiring new and inexpensive workers (Dullien *et al.,* 2018).

Nonetheless, Hubbard *et al.* (2013:393) argued that the minimum wage would not be an issue for those workers who normally earn a good wage because they are not affected by the implementation of minimum wage. The minimum wage is only implemented in support of those individuals who earn lower wages.

2.2.12.4 Efficiency wage

Efficieny wage theory is a theory that elucidates the relationship between labour productivity and wages or earnings. This theory states that high wages lead to more labour efforts and high productivity as workers will be motivated. Thus, wages can serve as productivity incentive (Sari, 2000:35). The efficiency wage is based on the notion that, in order to attract workers, a firm may pay higher wages than it would normally pay. The firm may pay a higher wage either to attract more qualified and productive workers or to evade employees striking. Thus, the efficiency wages play the role of incentive to boost workers performance (Kruger & Wells, 2015:229). However, the efficiency wages can lead to the labour pool or labour oversupply resulting in structural unemployment (Parker, 2010:9).

Although the efficient wage is considered to be higher than necessary wages, it is beneficial for both employees and employers. Employees who are earning efficiency

wages are motivated, feel valuable and prevented from seeking better jobs elsewhere. Additionally, employers who pay efficient wages can hire skilled and productive workers; thus, evade the training cost for new employees (Dullien *et al.,* 2018). Nonetheless, efficient wage can also be the cause of unemployment since firms have to pay high wage, above the competitive wage rate, to keep their workers. With efficient wages, firms employ fewer workers than they would if they were paying normal wages. Furthermore, since firms do not pay a uniform efficient wage, it is difficult for some firms to keep their employees even if they pay high wages for there might be some other firms paying more efficiency wages than them (Bellante, 1994:27-28).

2.2.12.5 Minimum wage

The minimum wage is defined by the International Labour Organisation (2016) as the least amount of payment rewarded to the employees within a specified period in exchange to the service provided by that employee to his employer. This amount cannot be reduced neither by individual contract nor collective agreement. The minimum wage is introduced to protect the employees against overly low payment. Moreover, minimum wage also aims to reduce inequality and eradication of poverty or reinforcement of working and employment conditions (ILO, 2016a:4). The minimum wage also prevents the exploitation of employees by employers. During the period of scarce employment opportunities, employers may exploit employees by paying them the wages which are not equal to the tasks performed. Additionally, minimum wage enables all workers to maintain the minimum standard of living. Since workers are motivated, the minimum wages can result in productivity growth (Mohr, 2015:223).

Considering the Keynesian model where demand creates its own supply, the minimum wage can increase the demand level and firm's production resulting in employment growth. Despite the mentioned benefits of the minimum wages, Kruger and Wells (2015:227) asserted that the government intervention into the labour market (introducing minimum wages) may be the cause of structural unemployment. In this case, minimum wages come at the costs of job opportunities. With the introduction of minimum wages, labour supply may exceed labour demand.

Labour cost increases and employers hiring ability declines thus, a lower number of people are employed (Dullien *et al.,* 2018). Consequently, the loss of job opportunities may be associated to the minimum wages implementation.

2.2.12.6 Effects of Minimum wage

The role of minimum wages turns around three important arguments. The first argument is that minimum wage can serve as incentive to workers to become more efficient and more productive. In this case, the minimum wage benefits both the employees and the employers. The second argument suggests that, the wage should be high to enable workers to support their relatives who are without employment. Increasing the wages can also serve as tool to combat poverty, reduce inequality and improve standard of living. Lastly, since demand for labour depends principally on the level of economic growth, the minimum wage does not reduce labour demand. The strength of this third argument may differ from country to country because the general economic theory suggests an inverse relationship between wage and employment (Teal, 2000:18).

Although the minimum wage is in most cases perceived as the way to improve the low-skilled workers' earnings and welfare; it is important to state that high minimum wages benefit both employees and employers. Increase in minimum wages reduces the government burden, for it decreases the number of citizens that depends on government social grants (Brosnan & Rea, 1991:144-151). A firm or company with low minimum wage is likely to undergo low productivity. Contrary to the macroeconomic theory stipulating that lowering the level of wages could result in employment growth, Riveros and Bouton (1991:3) stated that the direct consequence of wages reduction could be a decline in labour productivity. Henceforth, a higher minimum wage becomes a solution to firms' low productivity issue (Riveros & Bouton, 1991:3). Snowballing minimum wages, not only does it enhance the level of productivity or income, it also boosts firms' competitiveness. Nonetheless, the benefit of minimum wages towards production growth is not a short-term strategy, but a long-term goal (Brosnan, 2003; Brosnan & Rea, 1991; Brosnan & Wilkinson, 1988 & 1989).

The presence of minimum wages regulation reduces wage imbalances. Besides, employers and those workers earning minimum wages, the minimum wages benefit

also employees who earn a high real wage rate. With minimum wage implementation, employers have to maintain the distinction in job status.

If low-skilled wages are increased, it is an imperative to improve the real wage for high-skilled workers too. Nevertheless, the spill-over of minimum wage goes to those workers whose wages are closer to the minimum wages. Therefore, the more you earn the less you are affected by the change in minimum wage (ILO, 2016b:69-70). Additionally, increase in minimum wage leads to productivity growth and inspires workers to return to the labour force (Elijah, 2007:7). Notwithstanding, though minimum wage is good for those workers with lower income, it can negatively affect the full package of those whose income is above minim wage. Some employers desire to cut off some employees' benefits to adjust for the minimum wage introduced by the government (Gordon, 2000:127). In the same vein, Abel *et al.* (2014:73) assert that aggregate labour demand being in downward sloping, labour demand depends on the labour productivity and the real wage. Thus, the lower the wages, the more is the number of labour demanded by firms.

2.2.12.7 Productivity

Productivity is generally defined as the ratio between the volume of the output and the inputs. It is an adequate tool to measure the efficiency of labour and capital utilised to produce a specific quantity of outputs. Additionally, productivity remains the key source and determinant of economic growth and competitiveness of firms or countries. There are numerous different productivity measures. The choice between them depends on the purpose of productivity measurement and, in many instances, on the availability of data. Broadly, productivity measures can be classified as single factor productivity measures (relating a measure of output to a single measure of input) or multifactor productivity measures (relating a measure of output to a bundle of inputs). Another distinction, of particular relevance at the industry or firm level is between productivity measures that relate some measure of gross output to one or several inputs and those which use a value-added concept to capture movements of output (OECD, 2001:12). None of these measurements independent; they are interdependent.

If all factors of production are considered, the level of productivity is measured by the ratio between the output and quantity of inputs:

$$P = \frac{\text{Aggregate output}}{\text{Aggregate inputs}}$$

Based on this formula, changes in each part of the equation will automatically affect the other and these changes depend also on the market situation (Jorgenson & Griliches, 1967:251). In this study, the contribution of capital inputs is not considered. The attention is given to the labour productivity.

Labour productivity is one of economic indicators that determine the level of competitiveness within an industry including social and economic development (Freeman, 2008). While various types of productivity such as multi-factor productivity or capital productivity exists, labour productivity is predominantly important when analysing country's economic development. It is also utilised to determine economic growth, competitiveness and the standard of living. The appropriate measure of labour productivity as a production input is to consider the aggregate number of hours worked rather than counting the total number of employees utilised to produce a specific quantity of output (Freeman, 2008:5). In most developing countries, given the lack of technology improvement, labour productivity is the mainstream source of economic growth and eventually the engine of future employment (McMillan & Harttgen, 2014:10).

Productivity plays an important role into the economy and it affects other economic variables. A quadruple relationship exists between economic growth, productivity, consumption and investment spending. The more is the quantity produced into the economy the higher is the consumption share and the share of saving and investment for future production (Abel *et al.,* 2014:60). Thus, the standard of living might also be determined by the level of labour productivity and gross capital formation. The quantity of goods and serves produced in the economy depends on the quantity of inputs. Among others, labour and capital are major factors of production. Yet, in the context of this study, the major focuss is on labour productivity.

Productivity is generally defined as the ratio between the volume of the output and the inputs. It is an adequate tool to measure the efficiency of labour and capital utilised to

produce a specific quantity of outputs. Additionally, productivity remains the key source and determinant of country's economic growth and firms' competitiveness. One the most commonly measures of productivity is the total growth product (GDP) per hour worked. This measure is preferable in measuring labour productivity, instead of measuring merely the output per labour, for it captures the use of labour inputs (Abel *et al.,* 2014).

The general representation of production function is the following:

$Q = (K, L, P, H)$ …… (2.1)

Where:

Q = represents the quantity of output produced;

K = physical capital (tangible assets created for use in production process);

L = labour (input of skilled and unskilled activities of human workers);

P = land (natural resource, raw material and energy sources);

H = *quality* of the business intelligence that applied to the production function.

Ignoring other production factors and consider only capital and labour inputs; the following is the production function:

$Q = AF(K, N)$ …….. 2.2

Where:

Q = represents the output produced in a given period of time;

A = a number measuring overall productivity;

K = the capital stock, or quantity of capital utilised in the period;

N = the number of workers employed in the period;

F = a function relating output Y to capital K and labour N.

Other things being held constant, the level of produced quantity depend on the number of labour employed. This clarifies why production fluctuates over time as results of changes in employment level. Different reasons cause labour employment to change. For instance, some firms might lay down some workers or request overtime from their workers. Additionally, some workers might decide to quit their jobs while others are entering the workforce (Abel *et al.,* 2014:70). All of these causes have a great impact on the quantity produced or rather total production. Further, quantity produced depends on labour productivity. While productivity denotes the ratio between the total output over the inputs during the production process, labour productivity refers to an economic indicator that assists in measuring the competitiveness, economic growth and standards of living in any economy (Freeman, 2008:5). Labour productivity is measured by taking the total volume of the output divided by the total employment or total number of hours utilised for producing that output. The following is the formula to calculate the labour productivity.

$$\text{Labour productivity} = \frac{\text{volume measure of outputs}}{\text{measure of timeutilised}}$$

Productivity is one of indicators that determine the number of employees desired by firms. However, wages play also an important role when firms are deciding to hire additional employees or laying off some of the existing workers. The decision of firms to hire will also depend on their capacity to pay. Factors such as deceleration in employment chock not only economic growth, but also the total output and labour productivity (ILO, 2015b:25). Thus, a brief on the relationship between productivity, labour demand and wages is important.

2.2.12.8 Investment spending

Investment spending in macroeconomics is one of four components of aggregate expenditure or gross domestic product (GDP). Since the GDP plays an important role in job creation, the share of investment spending on employment is also significant. Investment spending is defined by Keynes (1936) as a portion of income saved for the future production. Investment spending is the engine of most of economic activities and their fluctuations. The level of investment spending is independent to the level of income received. The effect of private and public sector on employment growth resides in their investment spending ability (Keynes, 1937:221). The higher or the lower the

level of investment spending is, determines the households' standard of living and the level of firms' future production (Mankiw & Taylor, 2008:540; Mohr *et al.*, 2015:322).

If improvement of investment spending results in employment growth, it is important to boost the level of investment spending so that future employment and economy can improve as well. Different method can be implied to boost the level of investment spending and two of these methods are investment tax credit (ITC) and the tax cut. In the Keynesian view, a tax reduction on any economic activity generates more of that activity and leads to economic improvement. However, this belief was criticised to be a stumbling block for investment spending growth, for ITC is not permanent but temporal; consequently, it can delay investment (Blinder, 2002).

Labour productivity exists because people are employed. However, employment is no possible if employers are lacking investment spending, for the latter remains the source of future production. When explaining how employment growth can be achieved, the Keynesian theory focusses more on investment. Their view is that, the level of employment depends more on how well a firm is able to invest for future production. Investment spending is one of the major economic indicators from which fluctuation causes not only employment decline, but also lead to economic recession. Investment spending is acquired by taking total income from households and institutions or companies minus expenses for goods and services. It differs from saving for the later, since it indicates the amount of money saved for future expenses; whilst the former refers to the quantity of money saved for future production such as new buildings and purchasing new plants, equipment and other valuable facilities for the future production (Saleh, 1997:2-3).

The level of investment spending depends on interest rate volatility. There is an inverse relationship between investment spending and the interest rate. Furthermore, the change in future economic growth, expected risk and profits results in fluctuation of investment spending (Delong &Olney, 2009:282-283, van Den Bogaerde, 1972:194). Investment either from both firms and households depends to the time and expectations (which involves risks and benefits) for in both ways the expected return (not only in monetary form but considers other benefits) remains the investors motivation. Uncertain future and lack of information on markets and competitors are some of the barriers for investment growth. If the recession is expected in the

economy, investors are not willing to increase their investments in building new plants for the quantity of good and services to be sold is expected to decline. The higher the expected sales of good and services, the more firms spend on investment (Case *et al.,* 2012:312).

Although investment (based on its subjectivity to time) is more volatile, it is the major determinant of income and employment level (Wray & Forstater, 2009:26). Capital formation is seen by Saleh (1997) and Helpman (2012) as with more importance to the business cycle. It is not limited only on tangible assets, but it comprises also spending on research and development and education. Gross domestic fixed capital formation is at its high level when productivity is maximised.

Investment spending or rather gross capital formation comprises of the acquisition capital goods planned to produce future goods and services. That is, postponing the current consumption with the intention of growing future production and the economic performance (Keynes, 1976). Investment spending can either be seen as autonomous or induced. It is induced when it is related to the level of national income such as being affected by increase in GDP level. On the other hand, investment spending is considered as autonomous when spent on production of goods unrelated to the level of national income (Hamberg & Schultze, 1961:54-58)

2.3 GENERAL EMPLOYMENT THEORIES

Having defined and categorised unemployment, it is necessary to review how the three major economic theories consider employment/unemployment. Although these theories share the common roots, and both consider the relationship between output, productivity, labour demand or labour market and employment (Brunner & Meltzer, 1978:3), they differ in portraying the causes of unemployment (Brunner & Meltzer, 1978:3).

2.3.1 Marx's economic theory

In economics, Classical and Keynesian theory are mostly referred to when capital, production and employment are discussed. However, Marx's view of economic growth should not be ignored for it is one of those theories that originated the modern. The Marxian economic theory is based on labour theory of value, in which the value of the

product depends on the number of workers employed to produce that same product. Thus, different products can have equal value if they can be produced using the same number of labours and thereafter they can be exchanged with one another. Contrary to Keynesian theory that find the solution of unemployment in managing a combination of aggregate demand and consumption, Marx's theory aims to establish economic law for long-run and benefiting all not selected group of individuals. The Marx's theory of reproduction becomes the prototype of economic growth (Morishima, 1973:2-8).

In Marx's context, the level of wages and quantity of labour to be employed depends on the state of capital. If capital increases, wages will rise and so will be demand for labour (Marx & Engels, 1969:33). Moreover, Marx argued that capital and production growth generate unemployment and deep poverty (Marx, 1967). This is because in aiming high production, more capital and technology are utilised rather than labour demand. In terms of wage cuts to eradicate unemployment issues, Marx provides a specific view. He argued that reducing wages because economy is facing the depression would not be a good solution that favours labour demand. Capitalist rather reduce wages to increase their profit at the expense of labour benefits (Pencavel, *et al.,* 2006). Consequently, wage reduction is a mystified form of labour exploitation. Despite the Marx intention to improve labour and social wellbeing, his economic theory did not dominate in economic field. Marx was criticised for being unable to understand and elucidate implication of his theory of capital on wages received by workers and profit gained by capitalists (Bhaduri, 1969:534).

2.3.2 The classical and the Keynesian viewpoints of employment/unemployment

One of the most important tools utilised in macroeconomics to analyse the level of employment is the aggregate demand and the aggregate supply framework. This framework is seen as the tool to overcome economics issues. Two antagonists yet dominant groups of economists namely Classical and Keynesian exist in the economic field. Classical theory believes that price, wages and interest rates adjustment can be the cure for economic recession especially unemployment problem (Champernowne, 1936).

In the event of unemployment, price, wages and interest will fall, allowing consumption, production and investment to grow. Subsequently, the economy will turn back to its original full employment equilibrium. In this regard, the market system has to be left alone - “Laissez-Faire theory”. The government intervention into the economy has a small positive impact or else makes things worse than before (Tcherneva, 2008:9). Say’s Law which is the cornerstone of the Classical theory is incompatible to the Keynesian theory of effective demand. In Say’s theory, aggregate expenditure is determined by the production level, while it is otherwise in the Keynesian theory (Mongiovi, 1990:69).

In contrast, the Keynesian theory argues that price, wages and interest rates follow economic lags, thus the adjustment mechanism for price, wages and interest is overpowered by income adjustment mechanism. During unemployment (recession) event, people’s income falls and causes both consumption and investment to decline resulting in lower production. Keynes agreed that under certain circumstances, the economy can rebound by itself but during a deep depression waiting for that self-adjustment would lead economy into deep spiral (Keynes, 1936). Since the economy is down and cannot rebound by itself, the only way to raise it up is to increase government spending because adequate government policies positively affect and improve economic conditions (Moudud, 1999).

Nowadays different theories are being utilised to discuss and elucidate on the unemployment issues. These theories are basically based on two major theories mentioned above: Classical and the Keynesian theory of employment (Rodríguez & Sorolla 2015:4). The Classical and Keynesian theories are the two major and influential employment theories that generally drive the economy. Although these theories seem to be antagonists, the common similarity is that they both expose economic problems and try to solve them yet using different approaches. Classical economics theory is rooted in the free market writings of Adam Smith, David Ricardo and Jean Say. For these economists, the unemployment problem is a natural problem, thus it forms a part of business cycles and it is self-resurrecting (Meng, 2006, 295-318). The Classical theory based on the Say’s Law believes the that economy operates at full capacity. The new activity, instead of being an addition, replaces the existing activities. Hence, they cannot lead to new employment. Keynes in contrary

argues that growth in demand of goods and services requires new activities that create new employment (Keynes, 1936:11-33).

2.3.2.1 The classical theory of unemployment

The Classical theories of employment are those theories of employment developed by economists during the period running between 1776 with the “Wealth of the Nations” of Adam Smith and the early 1936 with “The General Theory of Employment, Interest and Money” of John Maynard Keynes (Brancaccio & Fontana, 1911:28). The major portrait of the economy provided by the Classical theory is based on a free-flowing business cycle together with wages and prices freely adjusting to the economic peak. The Classical theory was most popular and prevailing until the Great Depression in 1930. The Classical economic theory is rooted in Classical economists such as Adam Smith, David Ricardo (1772), Say (1767), Mill (1806), Marshall (1920) and Pigou (1933). Among these economists, one of the most influential is Jean Baptist Say with his famous “Say’s Law”. He described unemployment to be a natural part of business cycle and a self-correcting phenomenon.

Only two types of unemployment namely frictional and structural exist in the Classical theory of unemployment. These two types of unemployment occur in the economy as a result of the dynamicity into the labour market (Hughes & Perlman, 1984:27). People always change their jobs for better ones and others search for jobs that match with their skills. Therefore, frictional and structural employment cannot be evaded. Because these types of unemployment are natural, the role of government is not desired to eradicate them.

The protagonists of the Classical theory of employment believe that unemployment results from a higher wage. In this view, labour market is free; workers are supplying their labour and employers demanding for it. Unemployed person can choose to sell his services or rather his skills for the existing wage rate; otherwise, he can choose to stay unemployed. No one is expected to be involuntarily unemployed; whoever desires a job for the existing real wage rate gets one. If involuntary unemployment occurs, it will only affect few industries and it will not persist or last for a long period (Sherman *et al.,* 2013:33). Other causes of involuntary unemployment would be the economic interference or external forces into the labour market such as minimum wages

implementation and an increase in tax (Neva *et al.,* 2006:2). During the recession, with the expectation of overcoming this economic malaise, unemployed person would choose to work for lower wage rate and this decision would be more profitable to firms into markets. Since firms are making profit because of inexpensive labour, they will be able and willing to employ a high number of workers.

The high labour demand will shift wages and employment level to the original equilibrium and the recession would end (Hubbard *et al.,* 2013:433). Henceforth, there is no reason for government to intervene into market operations. The Classical theory highlighted that frictional and structural unemployment are the only types of employment that may occur during economic cycle. The proponents of the Classical theory of employment also disagree with the theory stipulating that cyclical unemployment may result from aggregate demand shortage. The possibility of unemployment in the economy results from the wage rate that is above equilibrium wage rate, or else, the economy would never experience such a thing as unemployment (Sweezy, 1934: 807). Thus, wage flexibility and free market would bring a solution to the issue of unemployment if the market is free of government influences (Nitisha, 2016). The Classical theory suggests that a moderate unemployment would occur in the economy, but for a short-term. The proof is the different economic recession that occurred over centuries. In this regard, Classical theory believes that the economy operates always on full employment and involuntary unemployment is impossible even during recession period. If unemployment rise, wages decrease, and firms employ more people (Meng, 2006:303; Nitisha, 2016).

In the Classical theory, price adjustment and wages flexibility are mechanisms that play an important role leading to full employment after the economic recession. During unemployment period, prices, wages and interest rates fall. Consequently, consumption, investment and production will increase and as result, the economy will return to its full employment equilibrium. Additionally, when economy is sinking into a recession, government intervention makes the economic situation worse. Thus, the best way of solving economic recession issues would be to leave the markets operating on their own (free market or Laissez-faire). During recession, the economy experiences lower demand for goods and services. Prices fall, and unemployment increases leading to economic deflation. This deflation and higher unemployment

cause workers to accept lower wages. Falling of raw material prices and wages means that firms have current potentiality to make profit and starts hiring new workers shifting aggregate supply and rising employment (Welker, 2009).

In the Classical theory of unemployment, the level of labour demand depends on the quantity of outcome which might be income or production (Sherman *et al.,* 2013: 36-37). Classical economy claims that all income received by households is spent on total demand for goods and services. This argument is supported by the fact that investment spending is a share of the total demand.

For instance, if the total income for households is 20 million Rand and 18 million is spent by households, the remaining 2 million is utilised for saved. This saving is put into the bank. If the banks lend this money to firms or producers, the latter will use this money as investment spending for the future production. Thus, the total 20 million is spent (Sherman *et al.,* 2013, 32). This justifies the Say's statement stipulating that if production is based on consumers' taste and preferences, the total of quantity produced would be sold. If production is based on labour inputs, more production would generate or increase demand for goods and services together with labour demand. New workers are employed based on the need of the firm's production and real wage is determined by the total number of workers needed by the firm (Rodríguez & Sorolla, 2015:11). This idea of saving leading to investment spending (for future production) originated from Adam Smith (1776:321) where he stated the culminate aim of saving to be increased future production. This can be done either by the person who saved himself or through lending his saving to someone else who will use the borrowed amount for production.

2.3.2.2 Keynesian theory of unemployment

The Keynesian theory aiming to solve unemployment problem by increasing spending originated from Malthus theory. Both Keynes and Malthus agreed that the right way to increase employment level would also be to increase aggregate spending. Increase in spending by large landowners in Malthus view and increase government expenditures in Keynesian view, both lead to employment growth. Besides Malthus, the Keynesian theory also was inspired by other Classical economists such as Say, Ricardo and John Stuart Mill (Kates, 2008:9; Kates, 2005:56). One of differences between Keynesian

theory and the Classical theory was that Classical economists believed that, regardless the quantity produced in the economy, the community was able to purchase the total production. Consequently, in the Classical view, it was impossible for producers to produce more than the needed quantity. Contrary to this Classical school of thought stipulating that any quantity of goods and services produced is also purchased by the community, Keynes asserts that it is likely and possible for producers to produce more than what is needed. Thus, the aggregate supply can exceed the aggregate demand for goods and services (Kates, 2005:57).

Keynes revealed the Classical theory weaknesses with his interpretation of the 1930 economic great depression. The so-called self-correction could not solve the issue of recession and higher unemployment through wages and prices adjustment.

Thus, the Classical theory was rejected by Keynes and his followers, arguing that in certain circumstances, to overcome a recessionary situation, the economy needs the government intervention. Keynes also stated that the level of employment does not depend on the price of labour (labour) rather on the level of spending. His theory of employment asserts that the presence of equilibrium between aggregate demand and the aggregate supply does not necessarily imply the presence of full employment in the economy. It is possible to have equilibrium between aggregate demand and aggregate supplies whilst economy is not at full employment (Keynes, 1936:26). He stated that the cyclical unemployment is the consistent type of unemployment and it is caused by the deficiency of effective demand in which the level of investment remains the key factor. The uncertainty of the future demand for goods and services causes capitalists to invest less and employ fewer workers (Mouhammed, 2010:57). The theory suggests that a better way to recover from economic recession would be to involve government into the economy by means of the government spending increment.

Keynesian theory, coming after Classical theory, tried also to fulfil gaps left or created by Classical theory and correct some fallacies made by Classical economists. In regard to full employment and recession, these two theories are far away different (Kates, 2005:54-59). Contrary to the Classical theory (believing in market self-adjustment), Keynesian theory argues that during the unemployment or recession period, the country’s economy falls together with individual's income. Therefore,

peoples' expenditures and savings decline and as result the level of business investment and production declines. Trying to adjust price or income would lead economy into a deep recession rather than taking back economy to its full employment. Government intervention in Keynesian theory is considered as the economic pump. Keynesian economists believe that the government policies positively affect the country's economy. Keynesian theory further states that, labour market imperfection, price and wages do not adjust simultaneously, hence sometimes wage rate remains above the equilibrium (Dullien *et al,* 2018).

Furthermore, opposing to the Classical theory, in which unemployment results in higher real wage rate, Keynesian theory views the low effective demand as the source of unemployment growth. Keynes in the beginning of chapter one of his "*The general theory of employment and interest rate*" attested that Classical doctrine can be applied into economic activities for specific cases but not to the general economy (Keynes, 1936). Keynesian theory dismisses the classical theory asserting that "supply creates its own demand", replacing with its own "demand creates its own supply" (Keynes, 1936:18; Say, 1821:167).

In Keynes' view, the relationship between quantity of good and services produced and demanded plays a crucial role into the economy. A firm or producer expecting a rise in future demand will produce more products compared to the one expecting the demand to fall, thus the quantity of production depends on the expected future consumption not otherwise (Keynes, 1936:38). Instead of employment being dependent to wage rate, wages are determined by the level of employment (Hayes, 2008:50). Involuntary unemployment occurs in the economy because people who can work for the current rate of wages given the economic situation cannot find employment opportunities (Keynes, 1936:19). One of Keynesian economists, Davidson (1998: 817-831) considered ineffective demand for goods and services, unsteady exchange rate and low level of investment as some of causes of involuntary unemployment. While in the Classical theory, the bargaining between employers and employees plays a paramount role in determining the real wage rate, Keynesian theory argued that employment is determined by the level of the effective demand rather than the wages flexibility (Das *et al.,* 2017:43-44). In some instance, lower wages can help to reduce unemployment, but it cannot fully eradicate it.

In the Keynesian theory of employment, the value of the wage the worker is paid is equal to the productivity of that worker. In other words, other things being held constant, labour productivity value is what the firm would lose if one employee were to be laid off (Keynes, 1997:13). Keynes suggests four methods that can be utilised in order to reduce the rate of unemployment. The main cause of unemployment is not the failure of the labour markets, rather the failure of mechanism that reconciles aggregate demand and aggregate supply (Leijonhufvud, 1968:276). Subsequently, the solution to the trouble unemployment has to be found in the success of the demand and supply reconciliation.

Since both theories – Classical as well as Keynesian recognise the effect of wages on unemployment, the issue of unemployment can be solved or rather reduced through price and wage adjustment. While Classical theory supports wages flexibility to improve the level of employment, Keynesian theory argues that it is possible to increase the level of employment without affecting negatively the wage rate (Keynes 1939:401). The wages felicity in both Keynesian and Classical economic theory is discussed next.

2.3.3 Flexible wages and employment in the Classical and Keynesian theory

The effect of real wage in macroeconomic is subjected to the discussion between Classical theory of employment and Keynesian theory of employment. The former theory argued that wages determine the level of employment while the latter argued that wages are determined by the level of employment (Hayes, 2006:49). The general knowledge would suggest an inverse relationship between unemployment and wage rate. However, this belief is not shared by everyone. According to Davidson (1999:298), one of the strategies that can be implemented to reduce the level of unemployment is to reduce the wage rate and increase or develop skills that are required by new job opportunities.

In the Classical view, price and wage flexibility assure the full employment in the economy. If households decide to reduce their spending, aggregate demand will decline. This lower demand will consequently cause the price to fall for an inverse relationship exists between quantities demanded and price level. The law of demand introduced by Alfred Marshall in 1890 suggests that people are willing to purchase

more commodities if the price of those commodities is low (Marshall, 2015:122). Lower demand for goods and services will cause selling price to fall though producers would keep supplying the same quantity. Employers will have to reduce the price paid for labour (wages) in order to keep their profit in a steady state. By laying off some of employees will result in job loses thus unemployment growth. Hermann (1832:280) argued that wages may fluctuate due to the change in number of job seekers, available plants to be utilised by those job seekers and the level of profit that a firm is making. Thus, the number of people to be employed into the economy depends on firms' financial status and the labour market.

Briefly, the Classical theory argued that aggregate demand oscillations may have an impact only on price level (inputs price, output price and wage) leaving employment in its normal state. The theory belief that, unemployment that occur in the economy results from external shocks such war, natural disaster and the government policies. This type of unemployment would not prevail for long time because as the time goes by, the economy adjusts to its previous equilibrium. The only reason that can cause a persistent or prolonged unemployment, in the view of Classical theory, would only be caused by workers seeking higher or unreasonable wage rate that does not benefit their employers (Karl *et al.,* 2012:104). This is known as voluntary unemployment.

Given that the Classical theory believes in constant full employment in the economy, government has no role to play in the market mechanism. Nonetheless, both Classical and Keynesian theories agree that real wage rises when economy is in recession and falls during the expansion (Brunner & Meltzer, 1978:7).

In Keynesian view, it is not sufficient for prices and real wage fluctuation to drive economy at full employment equilibrium. In other words, involuntary unemployment will always be there. It is obvious that the lower wage rate reduces cost of production allowing firms to employ more people. However, this lower wage has also side effects on the households' income. Low income results in low spending and lower demand and consequently, production will fall together with employment; hence, a stable and balanced level of real wage rate in Keynesian view results in better economic condition rather than lower and flexible wages (Keynes, 1936:269-270).

2.4 INTERACTION OF MACROECONOMIC VARIABLES

2.4.1 Linkage between productivity, employment and real wage

Labour productivity, real wage and employment are interdependent. The oscillation in each of these variables causes variation into others. Other things being equal, an increase in real wage leads to labour productivity as it serves as employees' motivation. However, since the aim of any firm is to make profit and minimise the cost of production, when labour productivity increases, the level of labour demand declines. Hence, in some instances, an inverse relationship exists between labour productivity and employment (Rubery, 2003:33).

Nonetheless, it is difficult to interpret the exact correlation between productivity and employment. Some countries experience a better growth in productivity while they are undergoing high unemployment and others enjoy the higher level of employment while their productivity remains low. In some circumstances, high productivity crowds out employment and generates unemployment growth (Das *et al.,* 2017:41-42). When a firm invests in labour productivity growth, the aim is not only to increase quantity, but also to upsurge quality of production. Thus, the core objective of productivity growth is to increase quantity and quality produced by a unit of labour at low cost of production which results in low selling price and boost the competitiveness of the firm.

As mentioned in the above paragraph, in competitive markets, a close relationship exists between earning and labour productivity. In the medium-term, the labour market equilibrium is strongly determined by the correlation between the total labour productivity and the real wage rate (Das, 2017:44). Output which in some case refers to the productivity has a close link to the level of wage paid to workers. The higher the quantity of the output produced per hour by employee; the higher is the payment. Consequently, the level of the employee's wage is determined by the value of goods and services produced by the same worker (Sobel, 2006:560-561). Among various determinants of labour demand, productivity plays a major role for those employees who are highly productive are more likely to be demanded than those who are less productive. The theory of wage efficiency states that the level of productivity depends on the level of wages received by employees. Thus, employees are more productive

if the level of earning is high than when it is low. In this case, lowering the level of wages may result in poor labour productivity (Sobel, 2006:551).

Since the labour market is flexible, it is evident that a higher level of labour demand will result in wages increase. This wage will increase to the level at which the firm's marginal profit from the additional unit of labour equals to the marginal productivity of that additional labour. In the short-run, wages and productivity are treated as compliment while in the long-run, they become wage substitutes (Das *et al.,* 2017:43). Efficient wages mighty not increase directly the level of productivity but become a secondary effect. Lower level of wages may lead to poor nutrition and thereafter employees become unproductive. Additionally, workers are willing to work for a firm that pays well. Good workers leave or quit firms that pay inefficient wages, hence, in the absence of efficient wage firms cannot achieve high level of productivity (Elijah, 2007:7). Notwithstanding, a higher level of productivity as result of technology improvement is the cause of unemployment growth and inspires or discourages workers return to the labour force (Elijah, 2007:7).

2.4.2 The linkage between output, saving and employment

The Classical and Keynesian theories of employment have some common thoughts, but they are significantly different with regards to the relationship between employment and outputs. In the view of Classical model, idea of Jean Baptist Say, "supply creates its own demand, also known as Say's Law (Keynes, 1936:18), is under the assumption that whatever amount of goods and services produced in the economy will be sold. Stuart Mill's (1926:30; 1844:48-49) supporting Say's argument stated that the aggregate production is consumed either for gratification or production, while James Mill (1826:30) assumed supply and demand to be always equal. However, to produce, producers or firms need to acquire all necessary resources that will make production possible. These resources are in the form of rent, wages and interest (if the firm must borrow the capital). These payments (rent, wage and interest) are paid to the households who are supposed to spend their income on all output produced by firms. In this regard, the economy is at its full employment for in Classical view, unemployed people are willing to work for any amount of wage provided by employers provided that the wage is equivalent to their productivity; hence producers will be willing and

able to hire any job seeker. Employers will hire new workers until the full employment is reached (Kurz & Salvadori, 2003:289).

Nonetheless, what is ignored by Classical theory is that households might decide to save a portion of its earnings and this will result in lowering the quantity demanded leading to higher supply of goods and services that it is demanded. If supply exceeds demand, producers will have to reduce the quantity produced by laying off some employees, thus creating joblessness (Mouhammed, 2010: 57-58). Nevertheless, Classical theory does not see saving as an issue, for the money saved by the households, will be borrowed by producers to acquire resources for future production, and because the interest rate will depend on how borrower are willing to borrow (demand for money), if households save or invest more than needed by producers, interest rate will fall and households will shift from saving to spending their income. In either way, the total amount of income is spent. The issue will rise if households, given that their money are not secured in the baking system, choose to keep their income, (money) will be eliminated from circulation resulting in banks failure and lower spending resulting in unemployment creation. Classical theory believes that lower spending will not create unemployment but will rather lead to price and wage adjustment leaving employment constant.

2.4.3 Technology growth, wage and labour demand trends

The a priori belief is that an inverse relationship exists between technology growth and labour demand. The hypothesis is that technology growth lead to more productivity than labour does; the alternative is labour-augmenting technology and capital-augmenting technology. In regard to this idea of mismatch between technology growth and labour demand, Machin (2001:5) argued that technology operates as a two-sided sword. On one hand, the presence of technology growth becomes a treat to those low-skilled employees who cannot adapt with them. With that inability of coping with the new technology, they end up losing their jobs. On the other hand, the skilled unemployed people are employed to facilitate the production process using that same technology. Not only does technology create jobs to those previously unemployed, it also results in wage increase for the existing skilled-workers who can cope with new approach in the workplace. Technology is a base of quality and quantity improvement, and subsequently increases firms' profit (Bresnahan *et al*., 1999:2).

2.5 THE RELEVANCE OF EMPLOYMENT FOR INDIVIDUAL AND SOCIETY WELFARE

This entire chapter has been focussing on employment and how it increased as well as how unemployment should be evaded. In this section of the chapter, we examine the relevance of employment on why and how unemployment is economic malaise. The individual state of employment or unemployment is one of major factors that determine the quality of life that a person lives. Henceforth, unemployment is "bad" for both individual and the society for the burden of unemployment is a challenge to the whole society (Jahoda, 1982:2-3; Sen, 1997: 160). A paid work or employment is merely regarded as process of making or increasing income, ignoring that employment goes beyond monetary accumulation and financial status. This makes these economists to emphasise that unemployment impact mostly on income and on leisure, yet they ignore psychological and social impact of joblessness. This is because non-pecuniary is not the only stress caused by unemployment (Gill, 1999:726).

Employment or job plays an important role in the society's daily life. The importance of employment was highlighted by Freud (1961) whereas he considered love and work/employment as twine wellsprings of mental health. In his view, the loss of job/work or the absence of employment does not only cause financial crises but also the physical pain. Employment is not only the origin of income but also psychological and social benefit from which the individual status or identification within the society depends on. Additionally, the presence of jobs provides personal and social security resulting in individual's structure, transparent goals/purpose and social network (Jahoda, 1979: 309; Hartley, 1992). The future of unemployed individual is uncertain while a well-paying and sustainable employment is considered as the guaranty of bright future. Hereafter, Bakke (1933:72) stated that "with a job, there is a future; without a job, there is slow death of all that makes a man ambitious, industrious, and glad to be alive".

As gains of employment and jobs benefit not only those who are working and receive payments, but to the society by promoting individuals economic and social welfare, consequences and negative effect of unemployment affect the entire society. In the view of Sen (1997:155-171), unemployment is the root of different malaise that individuals and society face on daily bases. Some of unemployment consequences, that he outlined, are the following:

2.5.1 Loss of current output and fiscal burden

The national output is a set of production of all individuals in the country since some of these people are jobless; a portion of the total outputs is not achieved because of the joblessness. Unemployment curbs the total of production by making some individuals willing and able to work idle. Consequently, the government or the state should take care of jobless people and their families. Besides the fiscal burden caused by unemployment, even the outcome from those working has to be shared with those who are jobless in the form of income transfer or social grants and gifts.

2.5.2 Loss of freedom and social exclusion

Beyond the loss of income, unemployment is not only the cause of poverty, it results also in the loss of freedom and self-confidence despite the social support he /she might be receiving. This loss is seen by unemployed person a serious derivation and remains a large burden (Schokkaert & Van Ootegem, 1990). Because a jobless person cannot afford to enjoy the freedom and ambience as fully as working people, the former feel excluded from the community life.

2.5.3 Skill loss and long run damage

People acquire experience when working as it is famously known as “learning by doing”. Staying out of working place for a long period causes the loss of working abilities and skills depreciation. As result a jobless person loses his/her self-confidence and perceives sense of life as meaningless which leads to the lack of motivation and become discourage person.

2.5.4 Psychological and mental health harm

Unemployment can create chaos within a jobless person’s life which may result in mental challenges. Primary unemployed person become emotionally unstable resulting in the loss of common sense of values and morale. This person starts considering him/herself inferior towards those who are working (Eisenberg & Lazarsfeld, 1938:359; Liem & Liem, 1988:96). Thus, countries with a higher rate of unemployment are more likely to undergo the higher rate of social problems including crime, violence and suicidal cases (Boor, 1980). A persistent unemployment can be

the cause of stress, depression and mental health. While the presence of employment and decent job can improve one's mental health, unemployment affects mental ability and harden schooling process (Harrison, 1976; Schaufeli, 1997:282). In summary, unemployment costs not only the unemployed individuals in losing their income, experiences and human development, but also costs the society by causing the loss of income, causing government to increase social grants or support, causing high crime rate and other social insecurities (Mohr, 2015:401).

2.6 CHAPTER SYNOPSIS

This chapter served to extend discussion on different economic theories looking at their similarities and dissimilarities. It provided the view of unemployment and employment from the Classical and Keynesian theory schools of thoughts. While Marx theory blames capitalists to be the source of unemployment, the Classical theory views unemployment as a natural situation that has to happen in course of business cycle. Yet, Keynesian theory revealed that unemployment exists in the economy because of demand inefficiency and unlike structural and frictional, other types of employment can be evaded. Besides the two theories, different types of employment, their causes and consequences were also discussed. Based on reviewed literature, it can be concluded that among four types of unemployment discussed herein, structural unemployment remains the most prevalent and harmful to the economy due to its long-term duration.

Secondly, some of macroeconomics factors that can influence the level of employment were represent and discussed. Among these variables, different types of wages were highlighted and their effects on both employment and social-economic life in general. Because wage and productivity can be linked with the aim to improve the level of employment and the economy in general, productivity was also discussed in this chapter. The level of investment spending being on of employment determinants, it was presented and discussed. This chapter considered also the link or interdependence among macroeconomic variables. Finally, the last part of this chapter focussed on the relevance of employment towards individual and social welfare. The malaise of unemployment does not affect only unemployed people but the entire society. The subsequent chapter focusses on the macroeconomic variables trends, success and limitation of the implemented policies to eradicate unemployment challenges in South Africa.

CHAPTER 3

MACROECONOMIC VARIABLES TRENDS AND EMPLOYMENT POLICY ANALYSIS

3.1 INTRODUCTION

The previous chapter focutilised on the general theories of employment/unemployment. Those theories proved that employment growth results from various economic factors and unemployment being a malaise to the economy, in general, affects not only those who are unemployed but also those with jobs and the society as a whole. This chapter focuses on the South African economy. The chapter provides a thorough analysis of employment/unemployment trends and the effectiveness or failure of policies implemented to combat against the growing level of unemployment in the South African economy.

3.2 THE SOUTH AFRICAN LABOUR MARKET: 1994-2016

A relationship exists between the South African labour market and South African economy. Generally, the state of the economy determines employment level and vice versa. This justifies why, looking at the South African labour market and employment, one can derive a bilateral causal relationship between the two. The South African labour market, prior to 1994, experienced diverse barriers such as racism, limited education opportunities and skill-shortages that would limit some individuals or groups of people from entering the labour market. Fortunately, with the coming of democratic government in 1994, new legislation came into practice to address social inequalities and redress wrongs of the past (Laverty, 2007).

Different studies have been conducted to analyse the South African labour market in the post-1994 regime and its effect on employment growth. The study of Yu (2008) and Hodge (2009) found disparities between the South African labour market and employment growth. The labour force grew faster than job opportunities resulting in the inability of the labour market to absorb all new entrants. Burger and Woolard (2005), and Oosthuizen (2006) found a mismatch between the labour market and

labour-absorbing ability as result of low economic growth, while Yu (2008) found that skill-shortages and habitation area as the cause of unemployment growth. Furthermore, one recent study of Lyle *et al.* (2015) revealed four reasons that cause disequilibrium between labour market and labour absorption in South Africa. Firstly, the education system produces workers that lack skills need by employers. Secondly, wage rigidity, especially the legislation on minimum wage forces employers to pay a minimum wage that is above market clearing, thus employers are unable to employ as many workers as they should at a low wage. Thirdly, low wages make new graduates reluctant to work for a monthly salary that is below social grant they receive. Lastly, these scholars found that, as it is difficult to find formal employment, it also difficult to get employment within the informal sector. Even those who would enjoy self-employment cannot because of financial constraints.

Besides the mentioned constraints, the South African labour union policies such as focussing on decent job instead of job growth favours insiders (those who already have jobs) at the expense of lower skilled and unemployed people. This also adds to job creation barriers (CDE, 2013:4).

3.3 OVERVIEW OF THE SOUTH AFRICAN LABOUR FORCE TRENDS: 2008 - 2016

The Figure 3.1 exhibits the component of the South African labour force between the year 2008 and 2016. The analysis started from 2008 because data before this date are not presented in real numbers but as an index. It was important to use real figures to analyse the South African labour force trends. As it is depicted in the graph, the South African labour force gradually increased since 2008; from 82939.76 in 2008 to 98838.69 in 2016. Thus, it increased by 15898.93 within a period of 8 years. While the number of unemployed people has progressively increased during this period from 24600.32 in 2008 to 35711.92, the number of employed people declined from 58339.44 in 2008 to 57699.56 in 2012 but rebounded in 2013 reaching 63121.77 in 2016. Although the number of non-economically active people increased in this period, it grew at a slow pace compared to other components of the labour force. Therefore, the issue of unemployment growth in South Africa originates from other sources than just demographic growth (high birth rate).

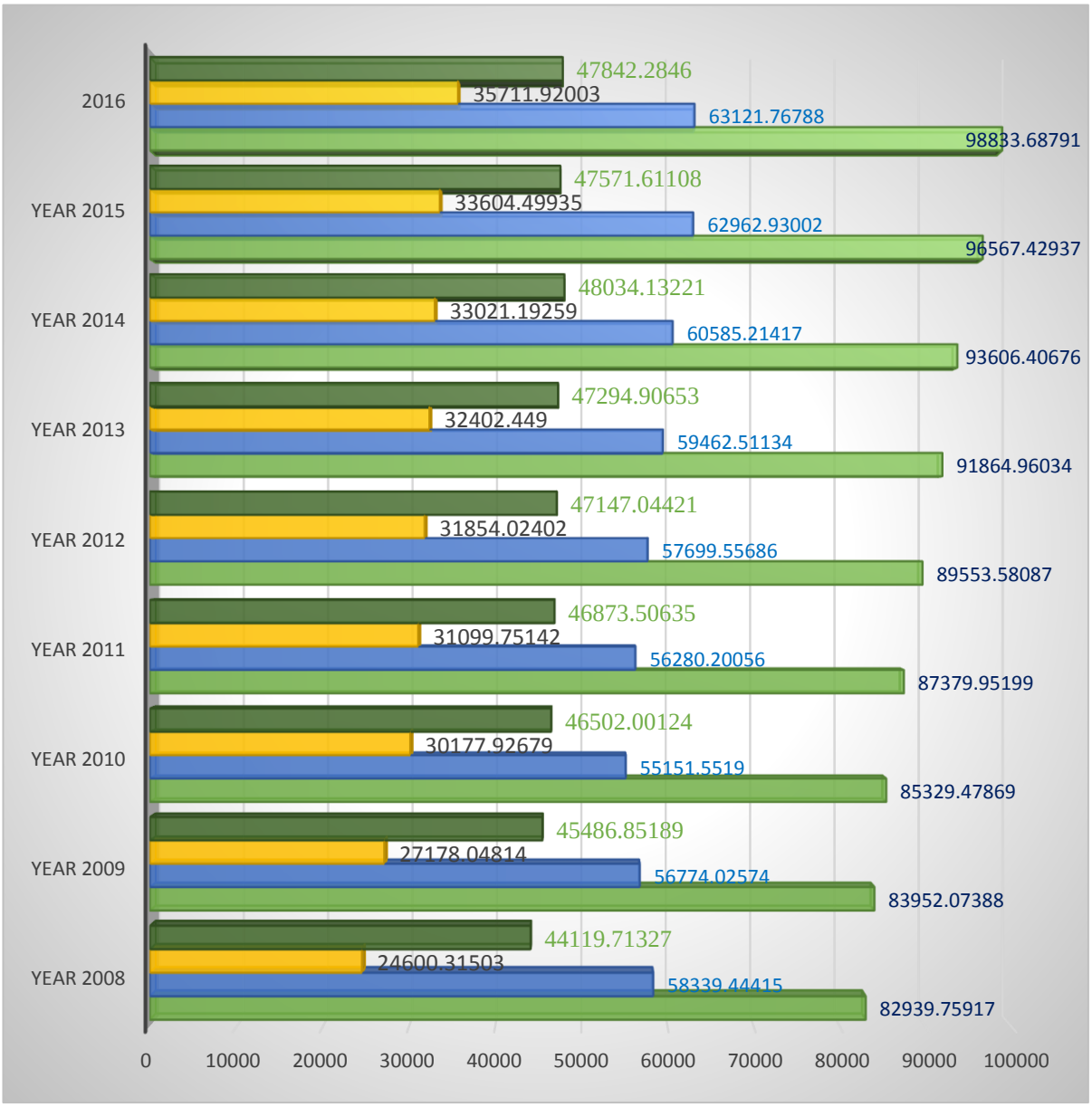

Figure 0-1: Trends in the South African labour force and its components (2008-2016)

Source: Author's compilation (data from Stats SA)

3.4 REVIEW OF MACROECONOMIC VARIABLE TRENDS

3.4.1 The South African employment trends

Employment growth plays an important role in improving the standard of living as well as shortening unemployment consequences such as poverty and inequality. However, in the South African context, a daunting economic growth and frightening employment level have been a stumbling block for the South Africans wellbeing (Lewis, 2001:1; Wray, 2009:3). Consequently, even after the 23 years of the democratic regime, the country is still suffering numerous economic and social disparities along the lines of

unemployment, poverty and inequality (Leibbrandt *et al*, 2010:4). A gradual increase of unemployment rate results in the disequilibrium between labour force and employment growth. For instance, between 1995 and 2003, the labour force annual growth was 4 percent, while within the same period the annual growth of employment was only 1.25 percent (Arora & Ricci, 2006:23).

Albeit a slight improvement was made in 2013 onwards, the numbers in Figure 3.2 prove that since 2008 economic crisis, the South African labour market was unable to absorb existing and new entrances labour. Consequently, unemployment kept increasing up to the rate of 26.7 percent in the first quarter of 2016 and increased to 27.7 percent in 2017 first quarter (Stats.SA, 2016a; Stats.SA, 2017b). In spite of relative trends in the level of employment growth, increase in labour force and low economic growth, the rate of labour absorption remains too low.

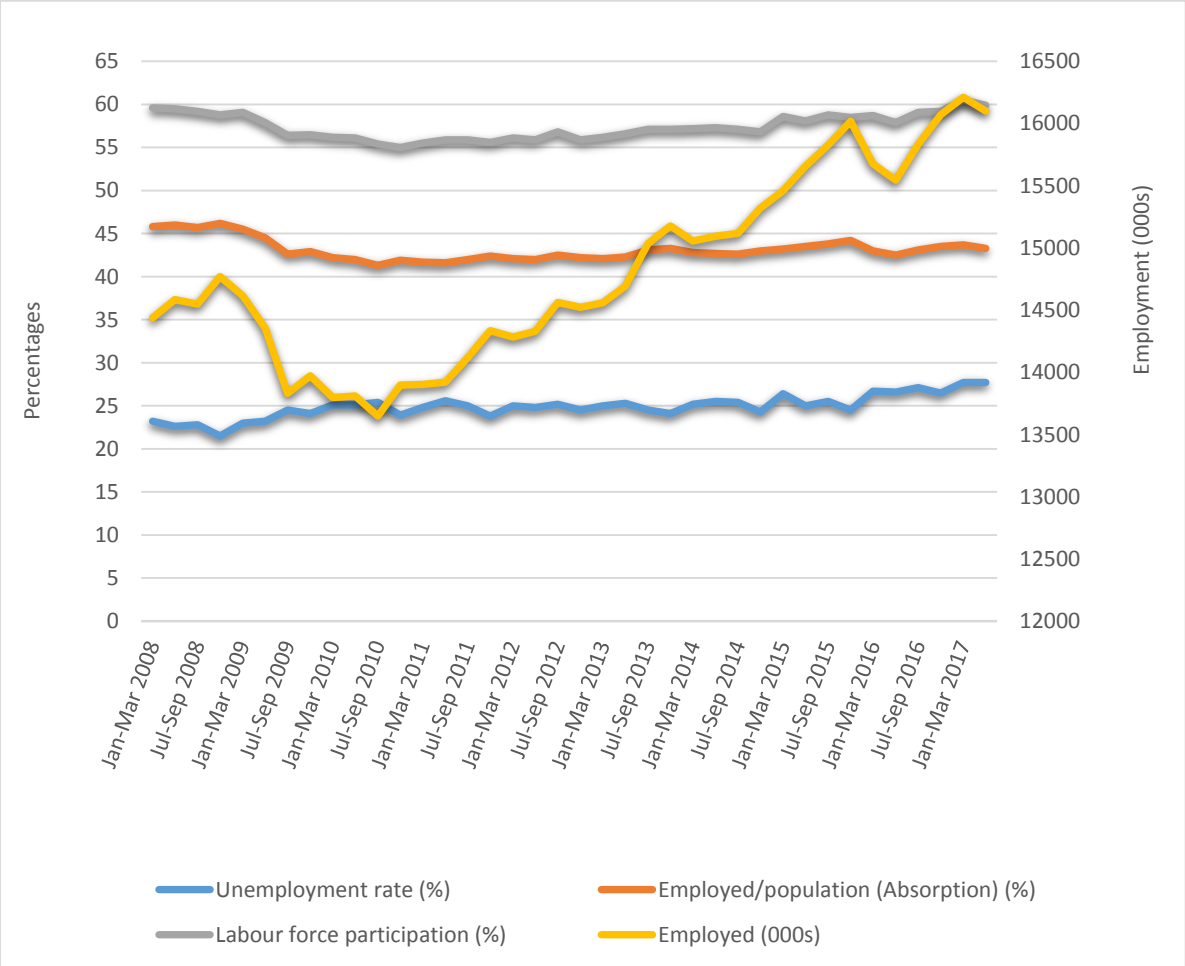

Figure 0-2: Quarterly employment trend between 2008 and 2017 (in thousands)

Source: Author's compilation (Data obtained from Statistics SA)

The Figure 3.2 exhibits employment trends in a general way. It is important to mention that fluctuation of the labour force and labour market affects all economic sectors, thus affects employment in each sector. Only five sectors are focussed on in this thesis. These sectors are mining, manufacturing, financial, construction, trade and transportation. The Table 3.1 illustrates trends in the quarterly total employment and the average in the mentioned sectors for the period of 6 years. Looking at the average contribution of each sector to the total employment during six years, trade and financial sector are the ones that contributed more to employment growth. In contrast, regardless of the utility sector, the contribution of mining, manufacturing and construction sector was disappointing.

Table 0-1: Sectoral quarterly total and average employment in the South African economic sector (in thousands): 2010 -2016

Sector	2010	2011	2012	2013	2014	2015	2016	Average
1. Mining	321	352	380	426	427	483	421	401
2. Manufacturing	1889	1909	1814	1766	1749	1738	1727	1799
3. Construction	1115	1105	1132	1204	1334	1438	1483	1259
4. Trade	3126	3198	3108	3224	3247	3280	3222	3201
5. Transport	805	839	877	961	952	900	961	899
6. Finance	1700	1846	1950	2037	2039	2273	2329	2025
Total	8956	9249	9261	9618	9748	10112	10143	9584

Source: Author's compilation (Data from Statistics SA)

Table 3.2 represents each of underlined sector's employment growth. It is essential to note that employment within the considered sectors during the period of 6 years reached its optimal growth in 2013. The worse employment situation in these sectors was experienced in 2010 where the total employment in these sectors declined by

14.6 percent. During this period, mining, construction, and financial sectors improved better than other sectors. Their growth was 4.3, 3.5 and 3.1 percent respectively. The unsatisfactory employment level in 2010 was probably due to the global economic and financial crisis. Notwithstanding, 2012 manufacturing employment growth was negative, while average employment growth in trade sector was 0.7 percent. This result explains how close these two sectors (manufacturing and trade) are interlinked.

Table 0-2: Employment growth (in percentage %) for each 4th quarter: 2010-2016

Sector	2010	2011	2012	2013	2014	2015	2016	Average
Mining	-0.4	9.9	7.9	12.1	0.2	13.1	-12.8	4.3
Manufacturing	0.1	1.1	-5	-2.7	-1	-0.6	-0.6	-1.2
Construction	-5.3	-0.9	2.4	6.4	10.8	7.8	3.1	3.5
Trade	1.5	2.3	-2.8	3.7	0.7	1	-1.8	0.7
Transport	0.4	4.3	4.6	9.5	-0.9	-5.5	6.8	2.7
Finance	-10.9	8.6	5.6	4.5	0.1	11.5	2.5	3.1
Total	-14.6	25.3	12.7	33.5	9.9	27.3	-2.8	13.1

Source: Author's compilation (Data from Statistics SA)

Additionally, the Table 3.3 displays the percentage contribution of the analysed sectors to the total employment in the South African economy. In consideration of the six sectors analysed, the total contribution towards total employment is 63.9 percent. Albeit the Table 3.2 above indicating that employment in trade sector was almost stagnant within the six years of analysis, the Table 3.3 shows that the higher average contribution toward total employment comes from the trade sector; with its contribution of 21.3 percent. Mining and transport sector are the ones with low contribution as their average contribution was 2.7 percent from mining and 6 percent from the transport sector. Considering yearly contribution, there were no significant changes as the total contribution varied between 64.6 and 63.1, percent which account for 1.5 percent.

Table 0-3: Sectoral contribution to total employment (%)

Industry	2010	2011	2012	203	2014	2015	2016	Average
Mining	2.3	2.5	2.6	2.8	2.8	3	2.6	2.7
Manufacturing	13.6	13.3	12.5	11.6	11.4	10.9	10.7	12
Construction	8.0	7.7	7.8	7.9	8.7	9	9.2	8.4
Trade	22.5	22.3	21.4	21.2	21.2	20.5	20.1	21.3
Transport	5.8	5.9	6	6.3	6.2	5.6	6	6
Finance	12.2	12.9	13.4	13.4	13.3	14.2	14.5	13.5
Total	64.4	64.6	63.7	63.2	63.6	63.2	63.1	63.9

Source: Author's compilation (Data from Statistics SA)

3.4.2 Domestic investment spending (GFCF)

One of the South African government duties is to increase the level of economic growth, reduce unemployment and eradicate poverty and inequality. The gross fixed capital formation growth remains one of the various and important tools that can help in achieving these objectives. However, the gross fixed capital formation is a process that depends on other macroeconomic activities. To raise capital formation, there must be the presence of saving to be invested and the presence of financial institutions to channel funds (Jhinghan, 2003). According to the South African Reserve (2016:1), unfortunately, due to the low confidence in the business sector and weak economic activities, the real gross fixed capital formation gradually declines within the private sector.

As it was the case in other countries, the global economic and financial crisis affected the total capital formation in the South African economy. The Figure 3.3 shows that

between 1995 and 2008, the South African total capital formation (investment spending) gradually increased from R240769 million in 1995 to R590407 million in 2008. However, after the 2008 financial and economic crisis, South African investment spending progressively declined down to million R529431in 2010. The highest level of investment spending in the South African economy between 1995 and 2016 was achieved in 2015 where it reached R639383 million yet declined to R614225million in 2016. In 2016, gross fixed capital formation declined by 6% compared to 2015 level of investment spending (Stats.SA, 2017).

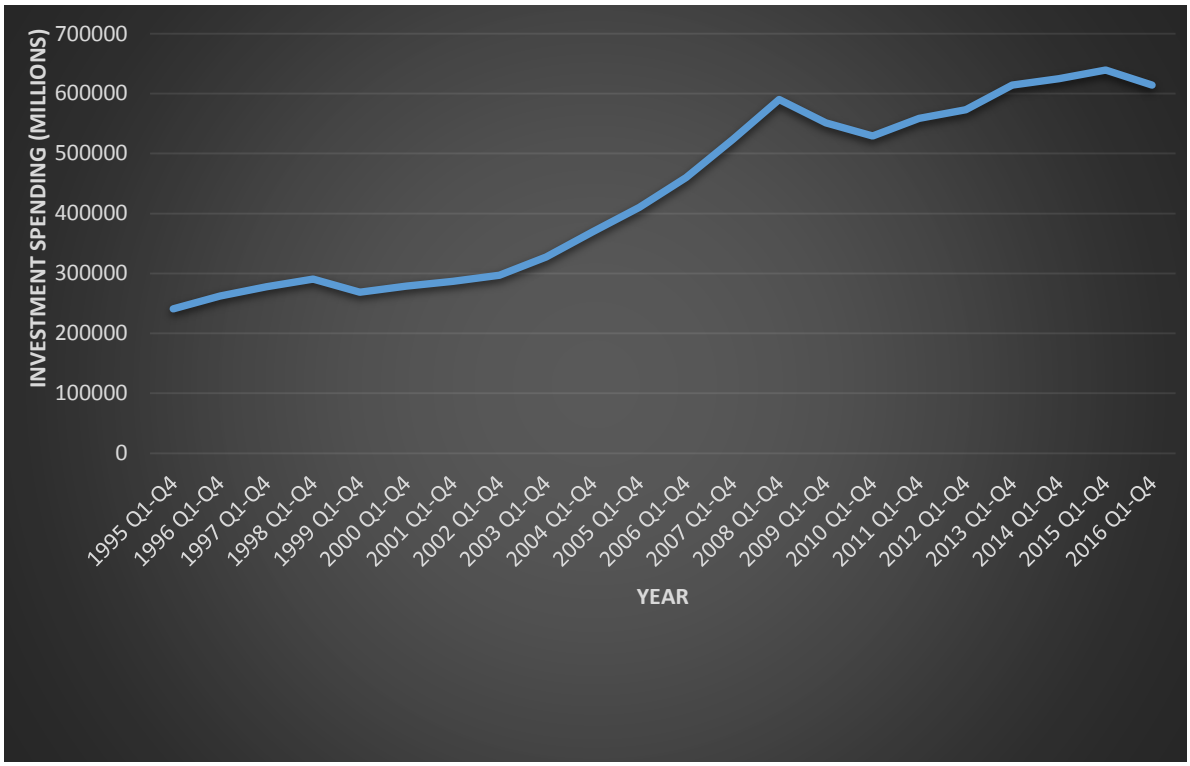

Figure 0-3: Total capital formation between 1995 and 2016 (in millions)

Source: Author's compilation (Data from the SARB, 2017)

Looking at the Figure 3.3 and 3.4, it can be observed that while investment spending gradually increased in financial, transport and construction sectors, the other two sectors (mining and manufacturing) experienced upward and downward trends between the year 1995 and 2016. As it is depicted in the Figure 3.3 and 3.4, the manufacturing sector experienced the highest fluctuation in terms of investment spending between 1995 and 2016. In 1995, investment spending in this sector was R57292 million and grew up to R109950 million in 2008. With the financial and economic crisis, the level of investment spending started to decline in 2009 where

investment spending in the manufacturing sector was R76564 million increased only by R282 million for the period of 21 years to reach the level of R76846 million in December 2016.

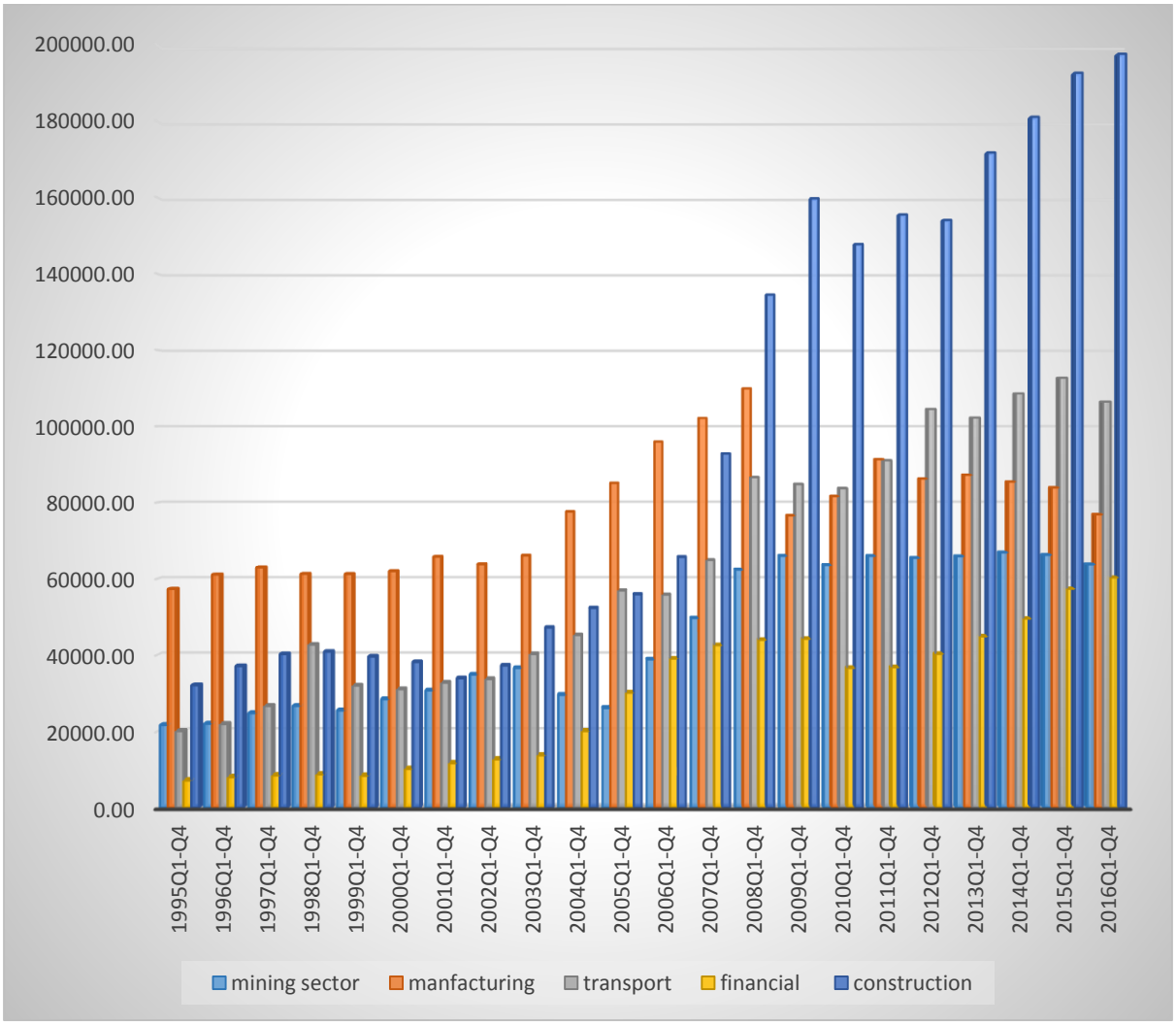

Figure 0-4: Investment spending within five economic sectors (1995 -2016)

Source: Author's compilation (Data from the SARB, 2017)

3.4.3 Correlation between employment and the real wage trends

Besides the issue of unemployment troubling the South African government and policy makers, unequal income distributions and wage volatility are current problems in the economy. A significant number of employed people is not satisfied with their earnings. This is evidenced by the frequent labour unrest experienced between 2009 and 2014. During this period, the South African labour market experienced the highest level of labour unrest in the post-apartheid economy (Burger, 2015:1). Wage inequality is one

of the key drivers that make South Africa one of the most unequal income distribution countries in the world. Despite different Acts such as Labour Relations Act (1995), the Basic Conditions of Employment Act (1997) and the Employment Equity Act (1998) introduced to eradicate the issue of wage inequality, the wage gap remains high even after more than two decades of the implementation of these Acts (Wittenber, 2015:7). The issue of wage determination does not only concern the agreement between employer and employee, it rather involves different third parties. In the South African context, besides employer and employee participation, the wage determination involves also labour union and the ministry of labour relation.

Wage determination in South Africa goes through three different stages namely, bargaining Councils, sectoral determinations and bilateral collective bargaining. The Bargaining Councils involve a bargaining, within a specific industry, between trade unions and employers in the discussion of employment terms and conditions. In some instances, the bargaining councils may appeal to the Minister of Labour to review the wage agreements. Contrary to the bargaining councils, the sectoral determinations is not a negotiation, but rather an order. It is utilised in the absence of bargaining councils to legalise employment terms and conditions and to evade employee's exploitation. Finally, a bilateral bargaining arises between a trade union and a sole employer and the agreement is only applicable to that individual employer which can be a company with various operations (Elsley & Mthethwa, 2014:13).

All these levels of wage determination affect the level of employment in both positive and negative ways. What is not surprising is that, an increase in the wage level leads to job losses and unemployment growth. Between 1997 and 2013, wage in the real medium pay increased by 2.95% and within this period the unemployment rate increased approximately by 5% (Elsley & Mthethwa, 2014; Stats.SA, 2013).

Figure 3.5 exhibits the correlation between real wage and employment trends. Between 1994 and 2009, employment level was higher than real wage. From 2010 to 2012, despite their differences in measurements, the divergence between employment level and real wage growth was insignificant. From 2013, the real wage increased at a high speed compared to job creation.

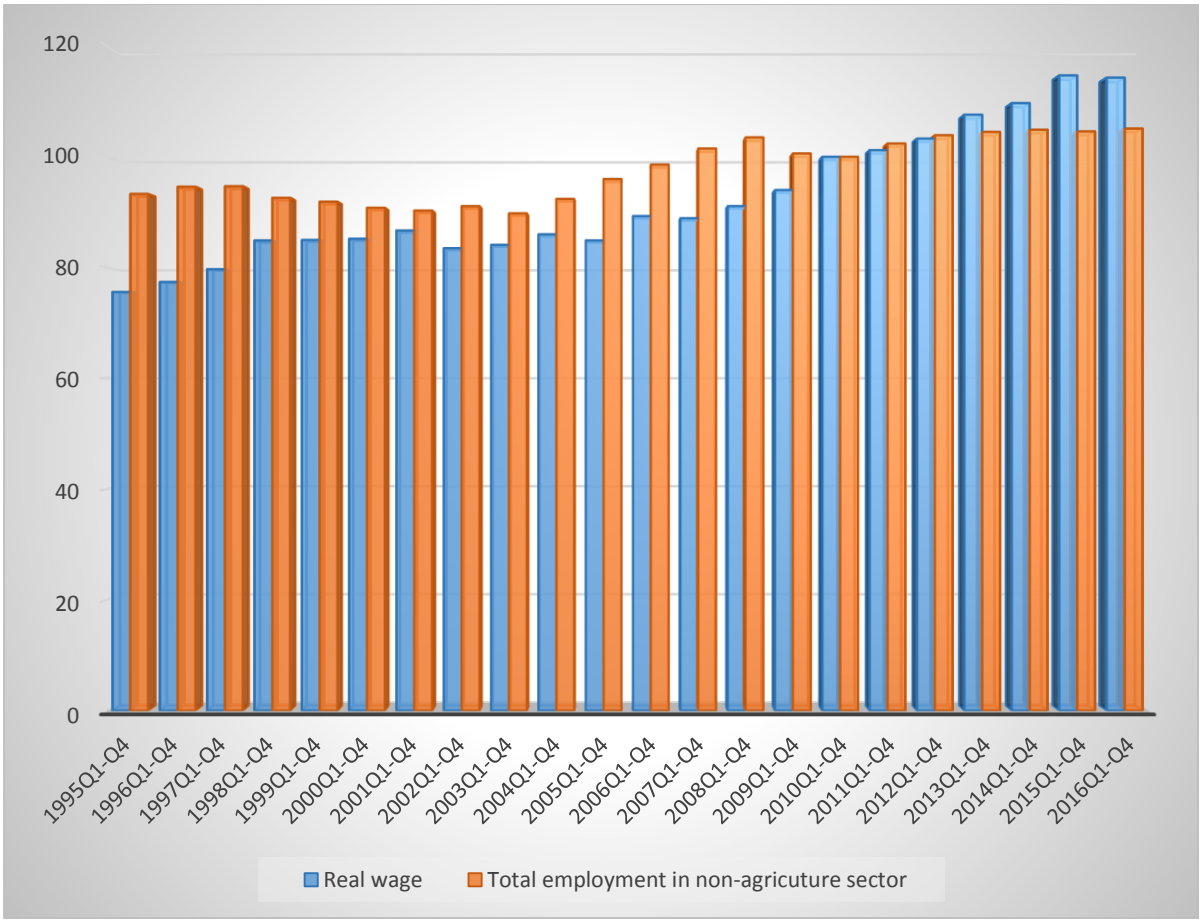

Figure 0-5: Correlation between real wage and total employment in non-agriculture sector

Source: Author's compilation (Data from SARB, 2017)

3.4.4 Productivity trends in South Africa

A well-being of any country's economy is constructed through productivity process. The greater is the country's production process; the better is the economic welfare. A high productivity does not only benefit the country but also organisations and individuals. For instance, if labour productivity increases, worker's job is secured, the industry increases its turnover and the state receives more tax revenues. Unfortunately, with the high cost of production, the South African productivity in recent decades underwent a decline in total productivity (Kruger, 2012). The study of Mosai (2012) on the South African productivity found that, besides the high cost of production, the South African economy faces several inefficiencies that rise up the cost of production and lower the long-term output. Thus, the best way to improve productivity is to obliterate those inefficiencies and improve working conditions. Having

said this, let us have a look at the trends of the South African productivity index between 1995 and 2016. Looking at the Figure 3.6, it can be seen that the total productivity in the South African non-agriculture sectors gradually increased since 1995. However, in the previous paragraph, the researcher indicated that labour productivity had been declining. Therefore, it can be concluded that the growth seen in Figure 3.5 does not come from labour intensive, but rather from capital-intensive and/or technology growth.

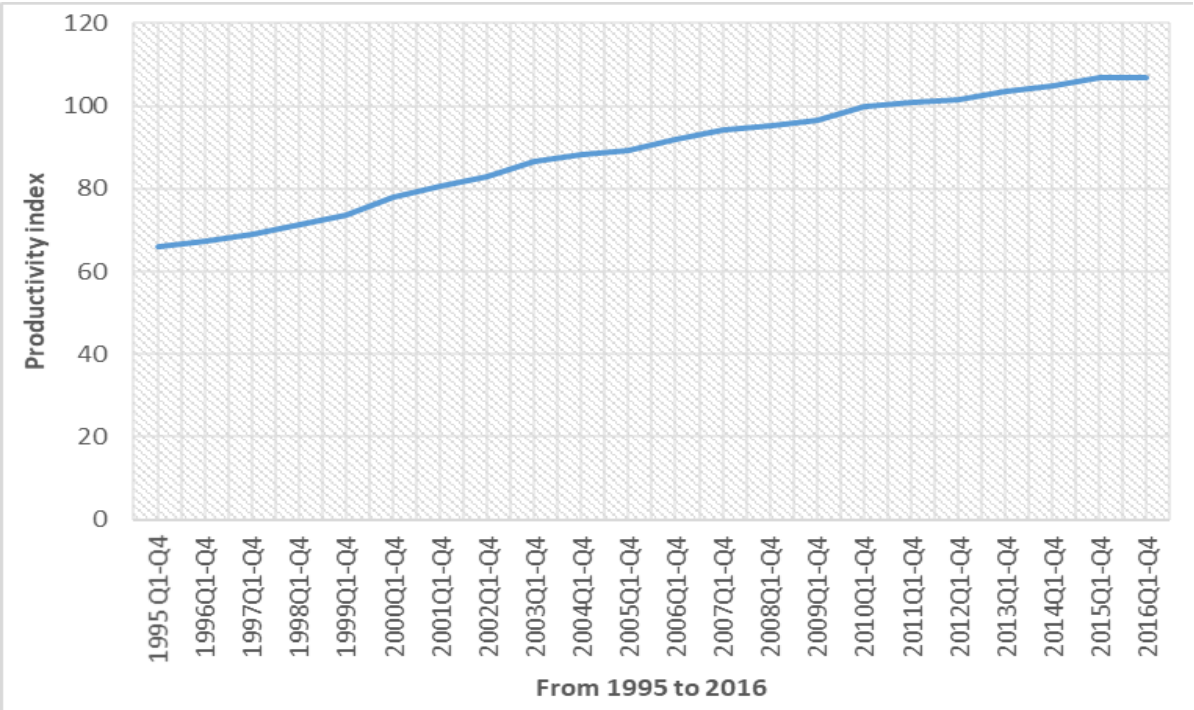

Figure 0-6: Productivity trends in non-agriculture sector (1995-2016)

Source: Author's compilation (Data from SARB, 2017)

Looking at the relationship between total productivity and the total employment in the non-agriculture sector, Figure 3.7 indicates that between 1995 and 2010, employment increased, yet the workers were not sufficiently productive to boost the level of total productivity. From 2010, total productivity was almost equal to the total employment, but yet in 2015 to 2016, the productivity increased slightly more than employment did.

Figure 0-7: Productivity and employment trends

Source: Author's compilation (Data from SARB, 2017)

After the election of 1994, the African National Congress (ANC) government was faced with a nation characterised by extreme inequality, poverty and racial discrimination. Thus, one of core aim was to rectify those social and economic disparities. Since South Africa became a democratic country, different policies were implemented. In spite of the improvement made to eradicate unemployment challenges including economic growth, unemployment kept growing up to 27.7 percent in the second quarter of 2017 (Arora & Ricci, 2006; Mahadea & Simson, 2010; Stats.SA, 2017).

Since the analysis of this thesis is founded on the South African employment and some of macroeconomic factors that have interrelationships with employment level, it is important to have an overview of the South African employment trends. According to Holland (2007: 33), a better way of understanding any country's context, is by having sufficient knowledge about that country's mixture of political, economic and social variables that impact on policy agendas and fluctuations. It would therefore, be absurd to analyse policies while lacking the knowledge about the reason and context in which they were formed. South African high unemployment is not an isolated issue; it shares

its roots with economic structures and other country's socio-political challenges (Hofmeyr, 2014:2).

In the South African context, the number of low-skilled (less educated) workers is far more than the number of skilled and high skilled workers. Unfortunately, demand for low-skilled workers decreases over time, and this low demand for less educated workers plays a major role in the South African unemployment growth (Verick, 2011:1). Besides the issue of skills, the study by Kingdon and Knight (2001:15) pointed out that the South African history and policies that discriminated and limited labour mobility especially from the rural area to towns was one of salient features that led to high unemployment growth. Furthermore, it was stated by the Industrial Development Corporation (IDC, 2013:21) that labour market rigidity, technology growth, the mismatch between available jobs and job seekers skills, and the weak correlation between wages and labour productivity form foundations of the inability of the labour market to absorb the growing labour force.

The problem of unemployment becomes severe when an unemployed person has been seeking a job for a long time and is unlikely to find one (Stats SA, 2014c). Regrettably, this is the South African case. While in the last quarter of 2014 – during financial crises, the South African labour market was having 974 000 unemployed people who had been seeking jobs for more than five years. This number increased to more than one and a half million in last quarter of 2014 (Stats.SA, 2015a). Consequently, the longer the time the unemployed person stays outside of the labour market, the lower the opportunities for him/her to get the desired employment, and the high is the possibility of staying unemployed regardless his job searching effort (Kingdon & Knight, 2001:13).

Despite the higher unemployment, South Africa like other developing countries presents a controversial nature of unemployment. In some instance, some of the unemployed people contribute to their jobless status. The prevailing circumstances in developing countries is that, enormous share of the countries' unemployment come from voluntary unemployment (Harris & Sabot, 1982). Taking into account findings of the study conducted by Kingdon and Knight (2001:3) on the nature of unemployment in South Africa, some of the South African jobless people chose to stay unemployed

searching for better jobs or waiting to join the informal employment sector. The core motivation for this decision is the real wage disparities.

3.5 ANALYSIS OF THE SOUTH AFRICAN ECONOMIC POLICIES: 1994 - 2016

Despite the seriousness of the unemployment in the South African economy, it is not a recent challenge. The unemployment rate has been gradually increasing since the post-apartheid regime and the country has been struck by obstinately low employment growth (Dias & Posel, 2007:1; Stats.SA, 2015:1). Various strategies and policies to boost employment were implemented over time, yet they are still far away from reaching the aim of reducing unemployment. Some of these strategies (policies, initiatives) are Black Economic Empowerment (BEE), Growth Employment and Redistribution (GEAR), Accelerated and Shared Growth Initiative for South Africa (ASGISA), the New Growth Path (NGP), the National Development Plan (NDP) and the Employment Tax Incentive (ETI) (Mahadea & Simson, 2010:391).

It has been more than two decades since South Africa became a democratic country. The transition from the apartheid regime to the new democratic governance faced numerous challenges such as economic transformation, unemployment, poverty and inequality eradication (Saito, 2008). Different policies formulated and implemented over these two decades aimed at improvement of access to basic social services and ensuring macroeconomic stability. To develop this point further, more initiatives were implemented with the objective of spreading economic benefits within citizens. Nevertheless, in terms of economic growth, economic stability and employment creation, the outcome of these policies and initiatives were not as much as expected. Since employment growth is almost impossible if a country's economy is unstable, the following sections provide an overview of some of the South African core national economic policies implemented over the two decades since 1994.

3.5.1 The Reconstruction and Development Programme (RDP)

One of the government policies declared just after the democratic election was the Reconstruction and Development Programme (RDP) declared in November 1994. This policy implemented by the South African government with six goals, one being to create the linkage between development and reconstruction. After having a good look at how the European countries were reconstructed after the Second World War and

the United State economy after the Great Depression, the South African government realised that the same approach can help in reconstructing economy and improving people's welfare affected by the apartheid regime (ANC, 1994).

The democratic government realised that challenges that the country was facing originated from job shortage, housing deficiency, inadequate education and failing economy. The RDP policy was implemented with the aim of addressing the racial bias that created social and economic inequalities (Cameron, 1996). However, the access to the basic needs would not be possible while people remained unemployed. Henceforth, among other objectives, the government intended to create more jobs in short and long-run especially for women and youth through the public works.

Education was to be improved and increase the level of training in order to empower the community and increase the level of income. Moreover, the RDP aimed to evade the "handouts" system when eradicating the poverty malaise, while empowering the citizens to participate into the country's production and economic growth (ANC, 1994). The theory behind the implementation of RDP was that if the government were to build modern houses for citizens, demand for different materials of construction would be increased and factories that produce those materials would hire more people, thus job creation. Notwithstanding, what was ignored by policymakers was that more of those materials were not being produced by domestic firms but by foreign companies from the countries abroad, hence a high increase in those appliances would have no effect on employment growth (Cameron, 1996).

The aspects mostly focussed by RDP were basic education improvement, rural development, economic and welfare improvement, together with how the country's resources would be distributed to the benefits of each South African citizen. Regaling welfare and social security, some of RDP's goals were achieved. For instance, disabled people, children and elderly people in need are taken care of and approximately five million of schoolchildren could be provided meals. Despite various achievements of the RDP especially in regard to the social objectives, since 1994 the issue of unemployment growth did not get satisfactory remedies, and this would be due to the fact that a wide view was conceded while formulating the RDP (Heymans, 1995:57- 61). Job creation, long-run investment and economic growth remain major

issues that South African economy is facing. It is now important to analyse if Growth, Employment and Redistribution Programme (GEAR) performed better than RDP.

3.5.2 Growth, Employment and Redistribution Programme (GEAR)

Within the same perspective of poverty reduction and employment growth, the South African government introduced another macroeconomic policy namely Growth, Employment and Redistribution Programme (GEAR). The GEAR was introduced with the aim of improving the South African trade with foreign countries (by lowering trade barriers), reduce the fiscal deficit and inflation, stabilising the exchange rate and promoting economic growth (Visser, 2004). To expand on this point, GEAR aimed to increase the economic growth up to 6 percent by the year 2000. This growth would come from export improvement and growth in fixed investment. Further, through economic redistribution and reformation of the labour market, GEAR aimed to create more jobs, thus reduce unemployment (Mathe, 2002).

The achievement of the GEAR strategies was constructed on the economic growth. Firstly, the economy had to grow followed by investment growth that would generate job opportunities. Secondly, the achievement of these mentioned objectives would allow the government to reduce its deficit. However, some of the policy changes would precede economic and employment growth. Government would contain its debt service obligations and reduce its fiscal deficit and reduce import tariffs. The government also introduced tax incentives to encourage investors to participate in labour-absorbing ventures that would allow job creation (Visser, 2004).

Notwithstanding, economic growth and employment growth and other achievements expected from the GEAR did not live up. For instance, instead of achieving economic growth of 6 percent, the economy grew by 2.7 between 1996 and 2001. While employment was expected to increase by 3 percent during this period, the country experienced unemployment growth. Instead of creating 1.3 million jobs by the year of 2000, more than one million employees lost their jobs since 1996 (Hirsch, 2005). The GEAR objective was that government investment grew by 7.1 percent, yet only 1.8 percent was experienced in government investment, while investment in the private sector declined from 6.1 percent to 0.7 in 1998 (Stats.SA, 1998). Between 1998 and 1999, spending on welfare and health decreased by 0.3 and 0.5 per cent respectively

(Stats.SA, 1999). Based on these core objectives that were not achieved, it was not easy to achieve the objective of income distribution and life improvement for impoverished and unemployed citizens. Moreover, during this period, the country experienced joblessness in public as well as in private sector. In the end, one would confirm that most of the GEAR objectives were not successful because up to 2000, economic growth, job creation and investment levels were disappointing (Hirsch, 2004; Visser, 2004).

Since the core aim of the GEAR failed, the South African government continued facing the challenge of unemployment growth and poverty eradication. The two presented strategies (RDP and GEAR) where somehow conflicting. Poverty reduction, income distribution and economic growth were not sufficient to reduce the high level of unemployment that the country was facing. Moreover, these two policies' objectives were not met. Henceforth a new strategy was needed to achieve goals set for the two-above mentioned policies.

3.5.3 Expanded Public Works Programme (EPWP)

The Expanded Public Works Programme (EPWP) was announced by the South African President Thabo Mbeki in 2003 and was launched in 2004. The short and medium-term programme, the EPWP aimed at poverty alleviation and job creation. The principal focus of the programme was to create job opportunities in infrastructure, social, environmental and non-state sectors (McCutcheon & Parkins, 2012:34). The objective of the EPWP was not limited to poverty eradication, training and job creation within the above-mentioned sectors, but also extended to the community capacity building (McCord, 2003:9). The main objectives of the EPWP were encompassed into two key components. Firstly, the EPWP uses labour-intensive approach to create new employment opportunities and secondly, the EPWP uses training and teaching new skills enabling people to find jobs after the completion of the programme (NGP, 2010). Thus, the EPWP was expected to contribute to the Millennium Development Goals achievement in the lines with the creation of millions of jobs, principally halving unemployment and poverty by 2014 (Nzimakwe, 2008:207).

Besides the provision of training for certain groups of people undergoing labour market discrimination (disabled, youth and women) and improvement of employment

opportunities, the EPWP targeted short-term jobs opportunities for nonskilled and inexperienced workers. In 2008, the EPWP created one million job opportunities (Dicks *et al*., 2011:39; South Africa, 2009). In the EPWP guideline, the wage level was also considered. A fair wage should be paid to employed people. Fair payment is important because, if the wage is lower than fair wage, workers are exploited. However, higher wage, besides being costly towards employers, it can attract workers and other sustainable initiatives (South Africa, 2012). Nonetheless, the main goal of the EPWP, which was job creation, was not fully successful. Some of the limitations faced by the EPWP were: the scare of budgetary allocations, lack of project management capacity, institutional constraints and the multiple objective fragmentations (McCord, 2003:5-23).

3.5.4 The Accelerated and Shared Growth Initiative (ASGISA)

In 2002 president Mbeki asserted that what was needed for the government to overcome current challenges was not to keep changing policies, but rather ensure that policies in place are effectively implemented and the set objectives are achieved. In this regard, the Accelerated and Shared Growth Initiative (ASGISA) was initiated with the aim of improving policy implementation and increase economic growth.

The ASGISA had to review the issue of lack of skilled and committed staff in public sector, inefficient human resources allowing for effective policies implementation, corruption and funds mismanagement, limited completion within local firms, limited investment opportunities barriers to entry into domestic markets and the deficiency in coordination between institutions (Boshoff, 2005).

The core objective of ASGISA was to have a thorough focus on poverty and unemployment reduction. The ASGISA aimed to have a significant poverty reduction by the end of 2010 and halve unemployment by the end of 2014. In order to achieve these objectives, the government decided to set a two-phase target. The first phase commenced in 2005 and ended in 2009. The target of this first phase was to improve economic growth up to an average rate of 4.5 percent. The second phase focussed on the period starting from 2010 to 2014. In this period (4 years), the target was to increase annual growth up to 6 percent of GDP (Boshoff, 2005). Increasing economic growth would help in addressing poverty and social inequalities (Chibba & Luiz,

2011:311; Maree, 2007:3). Besides the increase in GDP, the government set social objectives such as empowering labour market in promoting labour absorption and generate employment opportunities that would result in social welfare improvement.

Nonetheless, the targeted 6 percent growth in GDP was not achieved, but rather the country faced sluggishness in the distribution of income (Koma, 2013:145-146). In achieving this economic growth, ASGISA identified six major limitations or binding constraints. Those constraints are the following (The Presidency, 2006):

Volatility and level of the currency: The democratic government had improved in terms of monetary and fiscal policy, yet despite the reduction made in reducing the level of volatility; the South African currency (the Rand) remains volatile. Not only does this volatility affect the South African purchasing power, but also negatively impacts on investments and government expenditures. Consequently, it leads to the uncertainty future.

The cost, efficiency and capacity of the national logistics system: In some instances, the South African market structures together with investment and infrastructure backlogs do not stimulate competition. Moreover, challenges in logistics while moving goods and services make it more expensive than it could be in South Africa.

Shortage of suitably skilled labour amplified by the impact of apartheid spatial patterns on the cost of labour: the low growth of economy results from population settlement and a mismatch between education quality (education system) and labour market requirements. South Africa lacks sufficient and skilled workers within the labour force. Additionally, due to the long distance between presences and workplaces, labour cost increases while productivity, in some cases, decreases.

Barriers to entry, limits to competition and limited new investment opportunities: In South Africa, the economy remains quite concentrated in some sectors considered as upstream products such as paper, chemicals, iron, steel, and telecommunications. In some cases, market structure negatively affects development in the services industries, thus law and policies that counteract these factors and encourage competition need to be reinforced.

Regulatory environment and the burden on small and medium businesses: small, medium and macro businesses play an important role in GDP and employment growth. However, regulation environment such as municipality regulation and labour law to encourage growth and development of this type of business. Thus, this restrain economic and employment growth.

Deficiencies in state organisation, capacity and leadership: some weaknesses can be observed in the way government is organised. These weaknesses are revealed in policy making and implementation, economic services delivery and decision making. All these weaknesses constrain the country's growth potentials.

Given the above mentioned six limitations, ASGISA identified different goals that would help in overcoming those constraints. These six goals were (The Presidency, 2006):

Infrastructure programmes: Within infrastructure programmes, the government decided to increase investment spending on infrastructure improvement, to improve the communication infrastructure, renovate and maintain the existing public infrastructure.

Sector specific investment strategies: New strategies and policies were introduced and implemented to improve private investment. In this regard, the government recognised that various economic sectors face various challenges, thus each sector having specific problem and constraints requires specific solutions. In other words, different strategies for different sectors.

Bridge the gap with the second economy: as it was mentioned that business sector is important in the South African economy, it needs a special attention. The aim of this goal, "Bridge the gap with the second economy", is to bridge the second economy and strengthen the first economy. This will be achieved by promoting small and medium businesses through increment of the public expenditure.

Macroeconomic intervention: since the currency plays a major role in various economic activities, it important to reduce the Rand volatility and its overvaluation and ensure the efficiency of monetary and fiscal policy through inflation-targeting regime to achieve a sustainable economic growth.

Joint Initiative on Priority Skills Acquisition (JIPSA): it is a programme introduced for a period of three years to address the issue of skills shortage. As it is one of ASGISA goals, JIPSA aims to increase the level of needed skills through job identification and professionals' placement.

Public administration issues: given that new policy implementation had a cost, the existing establishments need to be diverted into new function and responsibilities to reduce or evade the cost of implementing the new policy.

Some of ASGISA achievements are that, it increased the rate of investment by 5 percent of economic growth. The annual government investment increased by over 10 percent and, in the year of 2006, and 2007, the level of consumers and government spending was improved (The Presidency, 2006). Nonetheless, ASGISA failed to impact on economic and employment growth. During the ASGISA period, the country underwent high unemployment and a decline in economic growth.

3.5.5 The Medium Term Strategic Framework (MTSF)

In 2008, the entire world experienced the financial and economic crisis. The South African government knew that this crisis would have a significant negative impact on the country's GDP. It was also known that negative economic growth, as result of the global economic crisis, would have negative implications for investment, income and revenue, real wage and employment. The South African government knew also that these implications would worsen poverty and also deepen social inequalities. Thus, entering the fourth democratic term (2009) government acknowledged that one of its major assignment was to ensure that the South African economy recovers quickly by increasing growth and development path. Henceforth the introduction of the Medium-Term Strategic Framework (MTSF) in 2009.

The MTSF determined development challenges faced by South Africa and identified priorities of the South African government within the electoral mandate for the period running from 2009 to 2014. The MTSF built on the success of previous 15 years of democracy, and it outlined the medium-term strategies that can be employed to eliminate poverty and improve economic growth and employment. It was also meant to provide planning guidelines and the allocation of resources throughout the entire government's domains. The MTSF objectives overlapped with those of the RDP,

GEAR and ASGISA. The common objectives or center of all these mentioned policies (approaches) are the improvement of economic growth and development, creation of more and decent jobs, investment in quality education and skill-development (The Presidency, 2009).

Expressly, MTSF ten priority areas that would be focutilised on for the period between 2009 and 2014 were the following (The Presidency, 2009):

First priority: Speeding up growth and create decent work opportunities: the first strategy stipulates that government has a core objective to respond promptly and effectively to macroeconomic issues. It is with the government duties to ensure growth in employment opportunities, to ensure the sustainable investment that allows industrial competitiveness and increase economic capabilities and reinforce income security.

Second priority: Programme to build economic and social infrastructure: the focussing in the second priority was investment growth. The aim was to ensure that the target growing fixed investment ratio above 25 percent of economic growth is sustained and reached between 2009 and 2014. Improving sustainable growth in investment would assist in the economic expansion, improving social infrastructure, maximising job creation and enhance the quality of public services.

Third priority: Rural development strategy linked to land reform and food security: between 10 and 15 million of South African lives in the area of extreme poverty, this strategy was implemented to improve the quality of life for people living in those areas. By improving agricultural production, the food security issue in these areas would be solved and economic potential could be exploited.

Fourth priority: Strengthen the skills and human resource base: since 1994 education occupied an important place in the national budget. However, the optimal level is not yet attained. Therefore, the aim of the fourth priority was to improve schools' management, enhance the quality of education outcome and develop a high quality of professionals' teachers.

Fifth priority: Improve the health profile of all South Africans; relating to the fifth the aim that was to improve the public health system by improving institutions and management capabilities, reducing inequalities and enhancing quality of care.

Sixth priority: Intensify the fight against crime and corruption: because corruption and crime work against economic growth and social welfare, the objective was to reinforce criminal justice system and improve citizen participation in social security.

Seventh priority: Build sustainable and caring communities: the aim was to enhance human capacities, to encourage social solidarity, to halve unemployment and poverty by 2014 and promote shared values and overall quality.

Eighth priority: Pursuing African advancements and enhanced international co-operation: the objective of this priority was to ensure the contribution of country's foreign relations within African continent and other developing countries for the growth of the economy and domestic development over the medium-term. The key focuss in this priority included the promotion of SADC and enhancement of relations in the New Partnership for Africa's Development (NEPAD).

Ninth priority Sustainable resource management and use: this priority objective was to enhance energy sources while focussing on the efficient use of renewable energy alternatives in South Africa. Additionally, energy efficient would be achieved by supporting viable food production and promoting a better water usage.

Tenth priority: Build a developmental state, improvement of public services and strengthening public institutions: the governance transformation encounters numerous challenges such as poor quality in public services, feeble planning and implementation within government institutions, deteriorating trust and confidence in public institutions. All of these are barriers to economic growth and country's improvement. The aim of the tenth priority was to reinforce the state's capacity to achieve growth and development.

3.5.6 New Growth Path

Creation of a better life for South African citizens has been the core objective of government since 1994. This objective would be achieved through enhancement of

economic growth, eradicating unemployment issue and promoting equitable income distribution. These driving forces were incorporated within formulated policies namely RDP, GEAR, ASGISA and the MTSF (Van Aardt & Van Tonder, 2011). However, as seen in previous sections, implementations of all these policies did not achieve as much as expected. South African unemployment rate keeps increasing, poverty and inequality remain far from being reduced and the economy is weakening every year. To overcome these ongoing challenges, in November 2010, the South African government introduced a new policy: The New Growth Path (NGP).

In creating the NGP, the principal objective was to increase job opportunities seconded by poverty and inequality annihilation. Thus, through NGP, five million jobs would be created by 2020. To achieve this objective, the annual economic growth rate had to alternate between 5 and 7 percent. It was expected that if this growth is achieved, the unemployment rate would decline by 15 percent (NGP, 2010). The NGP identified major economic sectors that encompass job potentiality and opportunities. Among these sectors, the following six were seen as job drivers: infrastructure development, manufacturing sectors, mining value chain, agriculture, tourism and high-level services, and the green economy (Van Aardt & Van Tonder, 2011). These sectors are those targeting labour intensive activities such as mining, construction, manufacturing, and agriculture. Moreover, these sectors can be utilised to create direct and indirect jobs. Table 3.4 below represents each job drivers and the target for job creation (NGP, 2010):

Table 0-4: Sectoral job drivers in South African economy

Job Driver 1: Infrastructure for employment and development		
	Employment goal	**Where the jobs are**
Infrastructure	250 000 Job opportunities in transport, water, energy, communication and housing infrastructure through 2015	Public works programmes, maintenance, manufacturing of inputs and government housing projects in rural areas
Job Driver 2: Improving job creation in identified economic sectorsF		
	Employment goal	**Where the jobs are**
Agricultural value chain	145 000 Job opportunities by 2020 in agro-processing	Exports of wine and fruits and in smallholder schemes in industrial products

Mining value chain	140 000 Additional direct job opportunities by 2020 and 200 000 by 2030	Enhanced platinum and coal exports and manufacturing of metal based products
Manufacturing	350 000 Job opportunities by 2020. (Also projected in IPAP 2)	Identified and discussed in IPAP 2
Tourism and high level services	275 000 Direct job opportunities by 2020	225 000 Jobs in tourism by 2015 and 50 000 jobs in business services by 2020
Job Driver 3: Potential of new economies		
	Employment goal	**Where the jobs are**
The green economy	300 000 Additional direct job opportunities by 2020 and 400 000 by 2030	In the short to medium term: Construction and in the medium to long-term: energy construction and input manufacturing
The knowledge economy	100 000 Job opportunities by 2020	Higher education, healthcare, pharmaceuticals, biotechnologies and green technologies.
The green economy	300 000 Additional direct job opportunities by 2020 and 400 000 by 2030	In the short to medium term: Construction and in the medium to long-term: energy construction and input manufacturing
The knowledge economy	100 000 Job opportunities by 2020	Higher education, healthcare, pharmaceuticals, biotechnologies and green technologies
Job Driver 4: Investing in social capital		
	Employment goal	**Where the jobs are**
The social economy	260 000 Job opportunities by 2020	Co-ops (producer, consumer and services), Community and social initiatives and social investment vehicles (community, union and religious)
The public sector	100 000 Job opportunities by 2020	Expanded Public Works Programme (EPWP) and Community Works Programme (CWP) in health, education,

		public services and social services
Job Driver 5: Spatial development		
	Employment goal	**Where the jobs are**
Rural development	Improvement in livelihoods for 500 000 households	Construction, public services, tourism and small scale agriculture
African regional development	60 000 Additional direct jobs by 2015 and 150 000 by 2020	Integrated supply chains, finance, exports, input manufacturing and transport

Source: NGP (2010)

To meet the above-mentioned targets, the NGP set several micro and macroeconomic objectives. However, the study of Van Aardt & Van Tonder (2011) revealed that, due to the economic conditions created by the government itself, those set objectives were not achieved. One of the major causes of this inability to achieve the targeted objectives was that, employers would choose to employ capital intensive rather than labour intensive to increase their production. Thus, even if economic growth rate would meet the target of 7 percent, this would not *ipso facto* lead to five million job opportunities. If capital was preferred over labour-absorption, GPD would have to grow at the rate of 10 percent to create the same number of jobs “five million” (Zarenda, 2013). The implementation of the NGP was found to be ineffective for various reasons and one of them was that the NGP does not differ from GEAR and ASGISA. These three policies faced the same limitations as their objectives are closely related (NGP, 2010:2-23.

3.5.7 The National Development Plan (NDP) (2012)

The National Planning Commission initiated the National Development Plan (NDP) a long term development plan to eradicate poverty and reduce inequality among south Africans (Zarenda, 2013:1). The NDP was created based on investigative report by the NPC (2011) which recognised the vital challenges faced by the NDP. These challenges include high number of unemployed people, exclusion of the impoverished people from development benefits, low quality of public health system, corruption, and deficient development and maintenance of infrastructure NPC (2011). The NDP articulates improvement of standard of living for all South Africans by providing equal

right to different levels of education and creating employment opportunities (Hendriks, 2013:7).

As stated by National Treasury (2015:3), the NDP establishes sustainable and inclusive economic structural changes gearing a long term social benefits. Improvement in standard of leaving underscores the provision of quality education and skills development, quality health services, clean environment, adequate nutrition, housing and water, sanitation and electricity, and reliable and safe public transport (Hendriks, 2013:5-6). Furthermore, opposed to creation of decent jobs, the NDP policy has a target of creating 11 million low quality jobs. Contrary to IPAP and the NGP that highlights the effort on reindustrialisation, the NPD focusses more on services sector and SMMEs. The criticism towards the NDP policy was that, in its frameworks discouraged workers are ignored. Additionally, it was emphasising the notion of an ongoing high inequality magnitude will extent to the year 2030 (COSATU, 2013).

3.5.8 Employment Tax Incentive (ETI)

All the above-mentioned policies and strategies did not fully reach the expected results. With the hypothesis that some employers were not able to employ a high number of employees because of higher cost of employing youth and less experienced workers. In response, the government implemented the Employment Tax Incentive (ETI) from the first January 2014 to empower employers to increase the number of employees with no adverse effect towards workers' earnings. The ETI aimed at the reduction of relative and absolute youth unemployment and thereafter stimulate demand for youth workers (National treasury, 2016). Under this policy (ETI), firms are entitled to a deduction from their due taxes, for the portion of their salary bill paid to certain groups of less skilled and youth employees. During his budget speech, the erstwhile Minister of Finance Pravin Gordhan, stated that within the first month of the ETI implementation around 56,000 beneficiaries were recorded (Gordhan, 2014) and this was a good sign that the implementation was going to improve youth employment in South Africa. Additionally, during 2014 State of Nation Address, President Zuma noted that within five months of the ETI introduction, more than 133,000 individuals benefited from the ETI (Zuma, 2014).

Notwithstanding, in 2016 Ranchhod and Finn (2016) conducted a study to investigate if the ETI was effective, in the short-run, to the reduction of youth unemployment. The study found an inverse relationship between the ETI and youth employment. Although there were different numbers of beneficiaries mentioned by the Minister of Finance and President, Ranchhod and Finn found no evidence proving that the ETI had any impact on the short-run youth unemployment. They mentioned different reasons that may have caused the inefficiency of the ETI such as time constraints, targeted firms (medium and large formal sector firms), and small or low value of incentive that may not affect firm's hiring capacity (Ranchhod & Finn, 2016:215-216).

All the analysed policies did not succeed in the reduction of the South African unemployment that is stubbornly increasing from time-to-time. Therefore, one should enquire if the implemented policies were not adequate, if it is the side effect of globalisation or if there might be any other method to curb the rate of unemployment and increase economic growth and improve employment. The subsequent section analyses the effect of globalisation on the South African labour market, especially on employment.

3.6 THE EFFECT OF GLOBALIZATION ON THE SOUTH AFRICAN LABOUR MARKET AND EMPLOYMENT

South Africa in the post-apartheid era is open and integrated into the global economy. This openness had and still has its positive effects but, on the other hand, it has its side effects on the South African economy in general and on the labour market. Jenkins (2006:650) defines globalization as an integration of markets for goods and services, labour, capital and technology. Additionally, some other economists depict the term "globalization" as an integration of goods and services markets. Economic globalization consists of, among other factors, easy spread of ideas, trading and investment barriers policy reduction, easing communication and lowering transportation cost (Frankel, 2006:1). Analysing the impact of globalization on the South African employees, Jenkins (2006) found that globalisation includes different macroeconomic determinant that in return influence labour market and employment. The labour market is not only demand and supply of labour, for it is influenced even by the factors of production, output, policies and other macroeconomic stakeholders as presented in Figure 3.8.

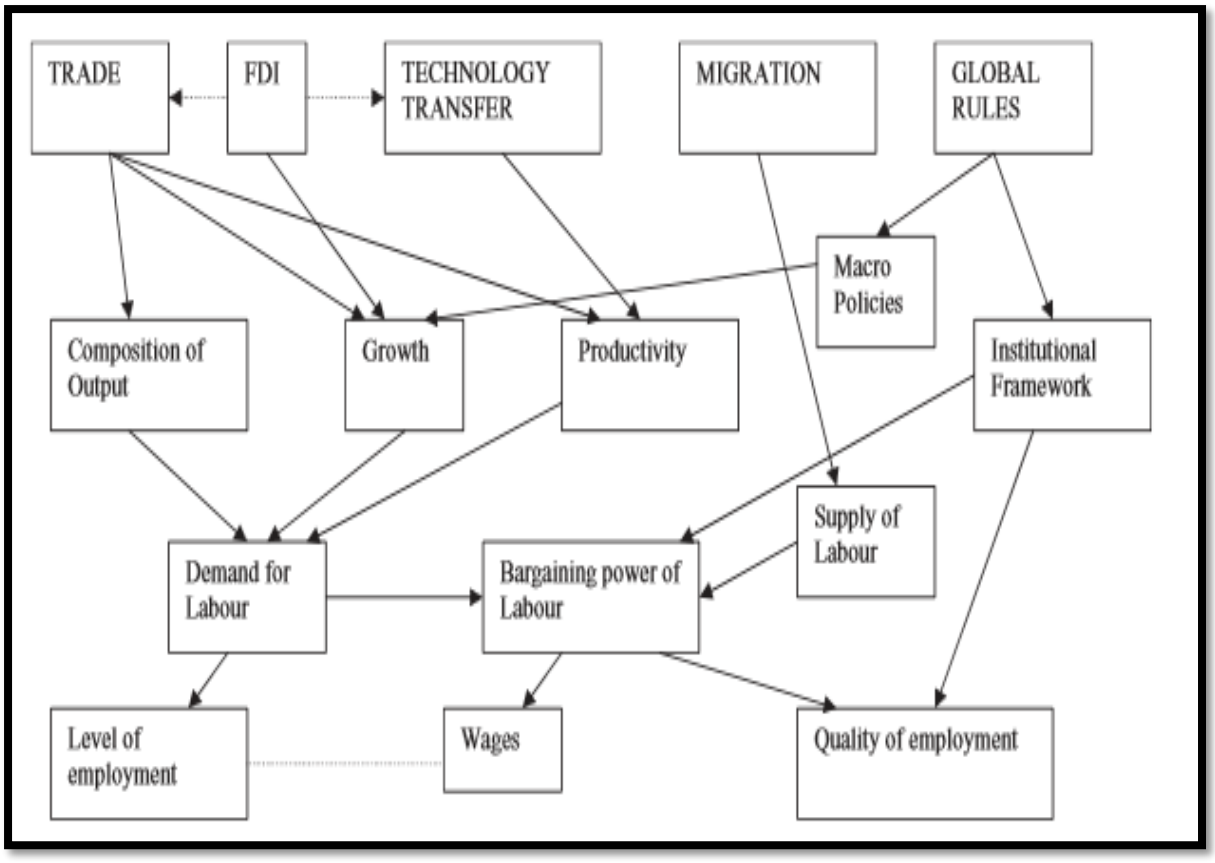

Table 0-5: A framework for analysing the impact of globalization on workers
Source: Jenkins (2006:651)

The three important key components of the South African labour market affected by globalisation are presented at the bottom of Figure 3.8. Those components are the level of employment, wages and quality of employment. If the country is open for trade, foreign investors will come into the country leading to high productivity, output and growth; and as results, more labour will be demanded. Migration also affects the labour market in the sense that more immigrants may lead to inexpensive labour and improve the quality of labour. However, with the current level of unemployment in the South African economy, immigration may not be needed. The labour market is mostly concerned with demand-supply of labour and this would be unlikely if institutions and the bargaining power are not considered (Jenkins, 2006:652).

Income growth is the main goal of globalization; each country being developed or developing aims to benefit from globalization. However, these benefits differ depending on individual firm, industry or country. All these mentioned entities (county or industries) are the niche of the labour market which operates with different

economic indicators be it micro or macroeconomics. These macroeconomic factors affect directly or indirectly individuals and households. Globalisation affects different macroeconomic variables, and employment and unemployment are some of these variables affected by globalisation. In terms of employment, globalization affects not only the number of jobs created or destroyed; it also affects job structure, job composition and employee's earnings (Di Pietro *et al.,* 2001:1-2). Since globalization allows easy relocation or transfers of economic activities of companies/ /industries to move their activities from country A to country B, this movement destroys jobs in country A while creating jobs in country B (Hatzichronoglou, 2005 13-18).

Globalization increase trade competition among industries, companies and countries. This competition involves technology growth and the may influence the job structures leading to unemployment growth within low-skilled employees. Nonetheless, it is unlikely that globalization destroys or creates jobs in all economic sectors within a country at the same time. While globalization creates jobs in manufacturing and infrastructure sectors, it might be destroying jobs in mining, agriculture or service sectors (Bhorat & Lundall, 2004:13). Besides, the negative effect of globalization towards employment, it positively affects the economic efficiency and leads to wages efficiency within countries (Di Pietro *et al.,* 2001:3).

3.7 CHAPTER SYNOPSIS

This chapter discussed labour market trends, trends in macroeconomic variables namely employment, capital formation, productivity and real wage; and different policies introduced into South African economy to reduce poverty and curb unemployment. The effect of technology growth on the South African employability was also discussed. The South African labour market face different obstacles such as low economic growth, the 2008 economic and financial crises that made it difficult to absorb all entrants into the labour market. Investment spending and labour productivity declined over time; therefore, the South African economy was unable to create sufficient jobs for existing unemployed workers and the new the entrants in labour force. The real wage also increases more than employment does. The higher level of wage discourages firms to employ more labour. Some of the industries find it easy to employ capital/technology than labour. Beside lower productivity, firms choose to

employ a small number of employees to evade employment regulations and labour union's issues.

The South African government committed to improving the South African welfare, introduced numerous policies to curb unemployment rate, reduce inequality and poverty. Among these policies are RDP, GEAR, ASGISA, MTSF, NGP, and ETI. Nonetheless, these policies did not achieve the expected results. Unemployment keeps growing and the gap between reach and poor continues to enlarge. While the wealthy become wealthier, the poor become poorer. It is important to review some of these policies to have tangible evidence on how macroeconomic policies affect employment growth in the country. Given that the relevant theories regarding the current study have been handled in the previous chapter, it is important to review empirical studies that have analysed the relationships between employment, productivity, domestic investment and real wage in different economic regions and especially in South Africa. The subsequent chapter focusses on the findings from different studies on the mentioned variables.

CHAPTER 4

REVIEW AND DISCUSSION OF EMPIRICAL LITERATURE

4.1 INTRODUCTION

The second chapter discussed the theoretical literature concerning this study. In that chapter, a relationship between employment and other macroeconomic variables namely investment spending, productivity and real wage was established and discussed. However, this type of relationship was based on assumption not on empirical facts. Grounded on tangible evidence, the current chapter aims to specify what type of relationship (positive or negative) that exists among the mentioned macroeconomic variables. It would be important to consider the effect of each variable on sectoral employment. However, because of a lack or shortage of specific empirical study focusing on each individual sector subjected to this study, a generic consideration or a broad approach will be employed in this chapter.

In the first instance, a review on the linkage between employment/ unemployment and investment spending is presented. Secondarily, the chapter discusses the empirical relationship between labour productivity and employment/unemployment. Thirdly the pragmatic mutual relationship between employment and real wage will be discussed. Fourthly, empirical studies on the South African macroeconomic relationships are discussed. The chapter ends with a concise summary and concluding remarks on the overall empirical studies reviewed.

4.2 THE EFFECT OF INVESTMENT SPENDING (GROSS FIXED CAPITAL FORMATION) ON ECONOMIC GROWTH AND EMPLOYMENT

Gross Fixed Capital Formation (GFCF) or domestic investment involves private and public investment within the domestic economy. Although numerous studies consider and focus more on the effect of the foreign direct investment on employment or job creation, few empirical studies have focussed on the effect of the domestic investment on employment growth. Likewise, those investments from abroad might come with their own costs on the local economy. For instance, in different cases, investors,

especially in developing countries might have a dominant hand not only on government but also on domestic markets. A higher level of FDI prioritises technology (which can destroy jobs), generate monopolies; and consequently, drives the domestic firms out of business (Kurtishi-Kastrati, 2013:31-33). Contrary to the mentioned negative effect of the FDI, growth in gross capital formation or rather domestic investment spending improves a country's economy without any negative alterations on domestic economic activities. In the section of theoretical analysis (see chap. 2), saving was perceived as a part of investment spending. If a household saves into the bank, money can be borrowed by firms or individual producers who can use this money for future production as capital formation. Thus, in this section, the effect of saving on employment growth is considered as a part of capital formation or investment spending. Additionally, because the government spending includes two parts namely spending on consumption and spending on investment, the latter part of government spending (government capital expenditure) is also taken as capital formation.

It is difficult if not nearly impossible for a country with lower economic growth (GDP growth) to create jobs or to increase the employment rate. It is furthermore tough for a country with low level of gross domestic investment spending to improve its employment level. Hence, even if an empirical study might not be focussing on a direct relationship between domestic investment and employment revel yet emphasizing on the link between gross fixed investment spending and economic growth is assumed that a positive relationship between investment and the level of economic growth lead to jobs growth (employment growth). Hereafter some of these studies are discussed.

Using multiple regressions on time series for the time period from 1981 to 2010, the study of Aurangzeb and Ul Haq (2012:92-100) on the impact of investment on Pakistan economic growth found that these two variables, investment and economic growth, in the long-run, exhibited a positive cointegration. This cointegration or long run relationship, other things being equal, might generate new employment into the economy. Economic growth implies income growth. Income growth stimulates spending and in Keynesian theory, spending generates employment. Another study of Ugochukwu and Chinyere (2013: 36-42.) utilised ordinal least squared (OLS) model, to analyse the impact of capital formation on the Nigerian economy. This study found that increase in capital formation was positively related to Nigerian economic growth.

Thus, gross fixed capital formation growth is a positive predictor of economic growth and employment growth. Contrary to this study, findings from another study conducted in Nigeria to determine the relationship between gross fixed capital formation, population and per capita growth, revealed a decline capital investment led to a decline in per capita growth (Adekunle & Aderemi, 2012:37- 46)

A study conducted by Habanabakize and Muzindutsi (2015:649-657) on the effect of aggregate expenditure on job creation, in the South African level economy, found that the higher is the level of investment spending results in more jobs being created. The study infers that, to alleviate the issue of unemployment that the country is currently undergoing, the level of domestic investment should be improved. The South African unemployment issue is not an isolated case it rather experiences similar difficulties like some other developing countries. Henceforth Habanabakize and Muzindutsi's study was supported by the Ferrer (2010:7-15) findings. Ferrer findings stated that one of the various solutions to the issue of unemployment in developing countries would be to increase the level of domestic investment allowing the labour market to absorb new entrants into the labour market.

Iocovoiu (2012)'s study focussed on the correlation between gross capital investment and unemployment in Romania and found a linear relationship between employment and capital formation. Iocovoiu's findings suggested that a decline in the gross capital formation leads to the unemployment growth. The result and conclusion of his study makes sense because generally any variable or influence that affects the total economic activities should *ipso facto* affect the level of employment too. Yet it is not always the case that each economic activity impact on the level of employment. Analysing the relationship between gross fixed capital formation (GFCF), money supply and economic activities in Algeria; Malawi (2005)'s study found a strong and positive relationship between GFCF and economic activities. Nonetheless, that growth in capital formation could not significantly impact employment growth.

The study conducted by Verma *et al.* (2007:8-22) applied the Vector Autoregressive (VAR) model on a time series data starting from 1960 to 2003 to determine relationships between capital formation, saving and output in the Iranian economy. This study revealed that though capital formation could have an effect on short-run

output, its long-run effect was vacillating. The same dilemma was found also by Ferrer (2010). In his study, he found that capital formation is an indicator of economic growth and employment.

Nonetheless, capital formation is utilised in production based on technology, and some new jobs are created while others are being destroyed. This happens because new technology increases productivity and thereafter a country's economy grows with a positive effect on employment. This is because new workers will be needed to use this technology. However, more other employees especially less skilled will lose their current jobs since they are inadequate with technology use.

Although some economists take capital formation as a simple component of capital spending, other consider the capital formation to be an important factor of employment growth (Munnell, 1992:189-198). Gross capital formation growth is important towards employment growth in both developed and developing countries. Analysing the determinant of the GDP growth in the sub-Saharan countries, he found that physical capital formation, instead of foreign direct investment, is one solution to the low GDP level and high unemployment in sub-Sahara (Ndambiri *et al.,* 2012:21).

The aforementioned studies stressed on indirect positive relationship between employment and capital formation through economic growth or rather gross domestic product (GDP). However, a direct and positive relationship also exists between the gross fixed capital formation and employment growth. Heintz (2000:1-62) in his study on the relationship between investment spending in the USA manufacturing sector and employment found a bidirectional positive relationship between employment and capital formation.

A close relationship exists between capital formation, employment and the real wage. The presence of capital in the economy allows job creation. The return or wages from these jobs can be utilised to invest for future production or to commence self-employment. In both cases, the aggregate employment is positively affected. In addition to Heintz's study mentioned in the previous paragraph, Psaltopoulos *et al.* (2011) study also found that, in the European Union countries, the countries with high rate of investment spending enjoy employment growth, while those with lower capital formation undergo unemployment growth. These results were not isolated cases

because the same results were found by Michelitsch and Shi (2013:14) in their studies analysing the effect of manufacturing employment among 100 countries. Findings of their study proved that more jobs can be created by enhancing the level of investment spending. Furthermore, one of the recent studies conducted in Sir Lanka revealed that not only capital formation increases the number of jobs created but also can be utilised to improve working conditions (Byiers *et al.,* 2015).

Considering the effects of new firms in jobs creation, the study of Adelino *et al.* (2014:25) revealed that solution to the unemployment issue can be reached by improving the quantity of aggregate expenditure allocated toward investment spending. This is because new firms bring innovation into the economy and they can solve the problem of job-skills mismatch.

Manufacturing is one of the economic sectors that generate more employment. The study of Dinh *et al.,* (2012:46) concluded that in Sub-Saharan countries the lack of employment growth results from the low level of investment spending. Thus, if countries would increase their domestic investment spending, the challenge of unemployment would somehow be eradicated. Unfortunately, most developing countries, because of the low level of investment spending, produce less quantity of their domestic needs and import more of those goods and services. Consequently, most of the domestic natural resources are sold abroad (to be manufactured) at a low price and come back at a higher price. Henceforth more jobs are created in the developed countries than in developing ones. In this regard, the study of Makgetla (2014:3) stated that enhancing the level of domestic investment should be the solution to the South African chronical high rate of unemployment. Besides being employment engine, investment spending was found by the study of Atkinson & Stiglitz (2015:49) as a backup of firms' competitiveness and job loss rescuer after the economic recession. Nonetheless, in some instances, mismanagement of investment spending can result in unemployment or have no effect at all on the labour market improvement. Investment spending might create employment in one sector while destroying jobs in other sectors. Investment spending utilised to purchase new technology, increases productivity while declining the level of labour demand (Maisonnave *et al.,* 2013:19; Nicholson & Noonan, 2014:14; Rotman, 2013).

Another empirical study by Lach (2010b:33-50) investigated a mutual dependence between the gross capital formation and the economic growth in Poland. This study applied non-linear causality test and bootstrap method, on data ranging between 2002 and 2008. The findings of the study were that a significant long-run relationship exists between the two economic variables under investigation. The same study found that improvement in gross capital formation would lead not only to GDP growth, but also to the level of employment. This study concluded that capital formation being one of the sources of economic growth and employment is never sufficient; it has to be improved from time-to-time.

Ncanywa and Makhenyane (2016:270–279) utilised the Johannsen cointegration and error correction approaches to investigate whether the capital formation can have an impact on economic growth in the South African economy within the period of 1960 to 2014. The results of the study revealed that, not only does the capital formation positively affect economic growth in the short-run, but also the higher level of capital formation will generate long-run economic growth. The findings of the study suggested not only a long-run relationship, but both long-run and short-run relationship between capital formation and economic growth. It is not only in the South African economy where gross fixed capital formation plays an indispensable role. Using a reduced vector autoregressive model and applying causality test, Malawi (2005) tested the impact of gross fixed capital formation on economic activities in Nigeria between 1971 and 2003. The result was that a positive causal relationship exists between the gross fixed capital formation and the level of economic activities.

Imran *et al*. (2013) utilised also Johannsen cointegration approach to examine the impact of gross fixed capital formation on employment in Pakistan economy between 1977 and 2010. Findings of this study revealed that a positive relationship exists between gross fixed capital formation and employment. They found that 1 percent increase in gross capital formation yields 0.08 percentage growth in Pakistan employment. Another study in Pakistan was conducted by Ali (2015: 21-30) to investigate the impact of gross fixed capital formation on economic growth. The study analysed annual time series starting from 1981 to 2014. The model employed was the vector error correction and Johansen cointegration to determine the short and long-run relationship between the two economic variables and to detect how significant the

GFCF is towards economic growth. The findings of the study exhibited that the growth in gross fixed capital formation plays a major role in the Pakistan economic growth. It was also found that if 1 percent increases in the level of GFCF would lead to 60 percent points increases in economic growth. Thus the GFCF formation was found to be a significant predictor of economic growth in Pakistan and indirectly the source of job creation.

The study conducted by Aktar *et al.* (2008:69-76) using Johannsen integration approach tested the effect of the total fixed investment on employment level in Turkey for the period running between 1987 and 2007. The study found that the total fixed investment impact negatively on employment. They found a positive relationship between unemployment and total domestic fixed investment.

Based on those empirical studies analysed in this section, the gross fixed capital formation (investment spending) plays a crucial role in developing as well as developed countries' economic growth. Therefore, its level has either a direct or indirect effect on employment growth. Despite a positive relationship between economic growth and employment growth, as it was indicated by some of above-mentioned studies, (Mkhize (2016:1-30) found that the sectoral employment growth in South Africa have an inverse relationship between economic growth and employment growth in the long-run.

4.3 LINKAGE BETWEEN REAL WAGE, MINIMUM WAGE AND EMPLOYMENT/ UNEMPLOYMENT

Different studies were conducted to investigate the relationship between employment/ unemployment and wages. This section focusses on some of those studies conducted in different countries using different econometric models. Findings of these studies are quite different depending on the economic sector, county or region in which the study was conducted. Some of these studies concluded that wages positively or negatively affect the level of employment whilst others found no relationship between employment and the wages rate.

The study of Dibooglu and Enders (2001: 495-515) aiming to determine the responsiveness of real wage to changes in unemployment level in the USA and

Canadian economies after the year 1973 using Johansen cointegration and the error correction the findings indicated that the effect of wages towards unemployment diverges from country to country. The outcome of this study (conducted in the USA and Canada) shows that in one country a positive relationship exists between employment and real wage whilst it is negative in another country.

Jacobson *et al.* (1996:69-96) analysed the short and long-run relationship between unemployment and the real wage in Swedish economy. The Vector error correction (VAR) model was utilised to detect that relationship. This study focussed on the 100 quarterly observations that is, from 1965 to 1990. Not only did the findings reveal a week short-run relationship, but there was also less evidence of the long-run relationship between real wage and unemployment rate in the Swedish economy.

The study noted that the real wage may fluctuate in the short-run and not in long-run because of the trade union influence. In this study, it was found that employment real wage and the labour markets are driven by the technology level.

The Classical and the Keynesian theories diverge especially when it comes to the effect of real wage fluctuation and employment relationships. The former theory argues that lower wage facilitates employment growth, while the latter stated that employment growth depends not only on wage rate but on various factors. In general, the Keynesian theory suggests that the money wages cut would not be a solution to the unemployment challenge. Amendola *et al* (2001: 654-674) conducted a study to determine the relationship between wage flexibility and unemployment. The finding confirmed the Keynesian hypothesis, suggesting that wage cut, or wages flexibility does not necessarily lead to the economic equilibrium (full employment equilibrium) – considering labour market behaviour as goods and services markets.

Although the traditional theory states that, an inverse relationship exists between employment level and wages, the study of Lucifora and Origo (1999:1-19) in the Italian economy, found no evidence of wages oscillations on employment level. This result was found using data of non-agricultural employment in private sector for the period of 1979-1993 and the generalized least squares (GLS) was employed for analysis. This relationship between real wage and employment level was also tested by some other scholars. Analysing the hypothesis of short-run real wage reduction to upturn

employment level, Adudu and Ojonye, (2015:179-188) conducted a study in the Nigerian economy using time series data from 1990 – 2009 and the application of Granger – causality cointegration to test the long-run and short-run. The findings of the study confirmed a long-run relationship between real wage and employment level. Nonetheless, the hypothesis suggesting that reduction in minimum wages reduces unemployment or rather increases employment level was rejected. Contrary, the minimum wage increases when the levels of employment fall and it falls when the level of employment increase. The results of this study were consistent with findings of Apergis and Theodosiou (2008: 40-50) and Belzil (2000: 183–203) in which the same inverse relationship between employment was found.

The level of employment/ unemployment and wage rate depends also on the labour market factors such the size of labour force and labour demand and supply. In this regard, Lehrman and Schmidt (1999:1-98) conducted a study analysing how the labour market is affected by trends such as economic, demographic and social trend in the United States of America. Findings of the study revealed that, albeit different theories and empirical studies prone to a significant effect of wages on the level of employment, found insignificant relationship between wages and employment. In the United States, the level of employment is not determined by wage rate, but by education level and economic expansion. While education provides required skills and knowledge required by different employers, economic growth generates job opportunities even for lower-skilled workers. Thus, employment growth and education are two remedies to eradicate unemployment issues.

Although he previously stated an inverse relationship, Seputiene (2011: 277- 285) conducted a study to determine the differentiation between unemployment, salaries and wages in the European Union countries. He utilised time series analysis on data from 2000 to 2010. He found contradicting results. In one group of the EURO countries he found a negative relationship between employment and wages and in other group he found a linear relationship; unemployment and wages were growing together.

The financial crises affected countries economy and changes in the economy did not leave employment in steady state. In this context, Bakker (2015:1-60) supported by the International Monetary Fund conducted a study to investigate the role played by

real wage on employment and unemployment after the 2008 financial crises. The study utilised different econometric approaches including ordinal least squire regression (OLS). This study employed a sample of 14 European countries for the period of 1970 – 2014. One of this study's motivation was to test the unemployment and the real wage relationship presented in the Okun's Law and Philips curve. The study found that effect of real wage on employment caused economic depression varying from country to country. For instance, after the great recession, employment decreased by 14 percent in Spain while declining by 6 percent in German. This study revealed that unemployment growth in some countries was resulting from demand shortfalls while the real wage rate was growing fast. In other words, the real wage increases raise aggregate demand, which induces investment spending, increases productivity and in turn real wages. On the other hand, some countries after the 2007 financial crisis, wages were adjusted coming after the slowdown in economy. The study found that between 2007 and 2014 employment increased by 1 percent in the United Kingdom and decline by 8 percent in Spain. Difference in employment growth between these two countries was caused by the difference in real wage. In Spain where employment dropped down by 8 percent, real wage rate increased by 12 percent whereas it declined by 3 percent in the United Kingdom resulting 1 percent employment growth.

4.4 THE RELATIONSHIP BETWEEN PRODUCTIVITY AND EMPLOYMENT/ UNEMPLOYMENT

Analysing the relationship between employment and productivity in developing countries, Kim *et al.* (2010:514-522) utilised the evidence of Korean economy. In this study, they applied the vector autoregressive (VAR) model on time series data from 1985Q1– 2003Q4 period. The result from the study revealed that, in the short-run, productivity enhances the technology level, thus reduces the number of hours applied or worked by labour. Nonetheless, the study found that in the medium and long-run, the technology shocks can positively affect the number of hours worked by the employees. These scholars asserted that their study findings resemble the other findings from studies conducted in some of developed countries, suggesting an inverse relationship between productivity and employment.

Taking manufacturing sector as the benchmark, Wheeler (2007:175-201) analysed the mutual effect between job flow and productivity growth. With the use of panel data with sample from 1958 to 1996 period, vector autoregressive was utilised to test the long-run relationship among variables across the country within manufacturing sector industries in the USA. The results from the analysis pointed out that a negative relationship exists between job flow and productivity growth. When a higher number of workers is employed, productivity level shrinks and the growth in productivity leads to job destruction.

In order to answer the question if the level of unemployment has an effect on the labour productivity growth, Bräuninger and Pannenberg (2002: 105-120) conducted a study on 13 countries of OECD using panel data from 1960 to 1990. The study utilised GMM-estimator and found that, in line with the employment, general and growth theory, unemployment growth led to a lower level of productivity in the long-run.

Benigno *et al.* (2015:698-709) aiming to ensure whether what is being said about the relationship between unemployment and productivity (a theory suggestion that not only a higher level of unemployment causes in the long-run, the lower level of productivity also cause the changes and volatility in productivity) conducted a study using two types of data: times series data to analyse the effect of unemployment to the long-run productivity in the USA economy and panel data to test the two assumption on the international economy. The econometric approach utilised was linear regression model applied on data of 1980 to 2000. The finding provided evidence that changes in productivity level results from high unemployment levels in both the USA and international economies.

In order to analyse if there is the trade-off between productivity and employment within developed and developing economies, Junankar (2013:1-41) utilised averaged data over various time periods. The analysed data was combined into two. The first group compiled time series starting from 1950 to 1989 and the second group was from 1990-2010. The econometric technic employed for this panel data was the generalized method of Moment (GMM), the fixed effect and the system dynamic panel estimation. The findings of the study revealed that a negative relationship exists between

productivity and employment growth. Thus, the study confirmed the presence of trade-off between employment and productivity.

4.5 LINKAGE BETWEEN WAGES, PRODUCTIVITY AND EMPLOYMENT/ UNEMPLOYMENT

The relationship between labour productivity has been and is still a concern not only for economists but also for policymakers, employers and employees. The study of Bester and Petrakis (2003:52-69) analysed the relationship between productivity and wages using panel data. The study aimed to review how innovation and technology growth affect labour productivity and wage growth. This study found that since firms in the market compete to maximize profits, they have to increase the labour cost which results in high innovation and labour productivity. Thus, a linear relationship was found between firm's labour wages and productivity growth. Additionally, the study found that not only wages determine firm's productivity, but it is also a determinant of industry's employment level.

Analysing the effect of wages on Germany's corporatist economy data of the period between 1960 and 1998, Fuess and Millea (2006: 397-409) tested the relationship between labour payment (wages) and productivity before and after the unification of Germany; that is to say before and after 1990. This study found that wage rate affects the labour productivity. However, the wage effect on productivity depends also on the labour union behaviour. Before 1990 the cointegration between wage and labour productivity was insignificant. The 1990 new channel turned wages to become a labour productivity predictor. Nonetheless, a positive effect of pay or wages on labour productivity should not be generalised because in some instance it differs from one type of employment to the other. Thus, in Germany, wage growth was found to have no effect on manual employees' productivity.

This study was preceded by another study conducted by the same authors to determine the interrelationship between pay and productivity in Austria. The study found that a hike in the Austrian manufacturing employees led to labour productivity growth (Fuess & Millea, 2001). Similarly, the study conducted by Aslam (1983:284-299) on Pakistan manufacturing sector focussing on twenty-four industries using panel data analysis for the period ranging between 1964-1977, analysed the impact of

wages growth on labour productivity and found interrelationship between the two economic variables.

Using the cointegration and Granger causality test, Kumar *et al*. (2012: 2945-2954) employed time series data within a period of 42 years (from 965 to 2007) to determine the cointegration between employment real wage and inflation in the Australian economy. The analysis outcome revealed that, although the level of inflation might cause labour productivity limitation, the real wage growth leads to productivity increase. If 1 percent increases in Australian manufacturing sector, increase in labour productivity will fluctuate between 0.5 and 0.8 percent. Besides, the cointegration test results, the Granger causality test confirmed a bi-directional causality between productivity and the real wage in the short-run. The study also employed GETS, FMOLS and ARDL model to compare obtained results. The outcome confirmed the results previously obtained using other methods.

Doubting on the traditional or common knowledge suggestion on positive relationship between real wage and labour productivity, Maiti and Marjit (2009) conducted a study to test if the mentioned theory is applicable in the Indian economy within formal as well as informal sectors. Applying a simple regression, OLS and GLS panel models on data from 1989 to 2000, they found that a mutual effect exists between real wage and productivity differs from formal to informal jobs. Although wage increment in the formal sector may affect the level of labour productivity, it is not a clear-cut. However, when wage rate increases in the informal firms, the productivity level increased *ipso facto*. Thus, within informal industries, lower wage rate works as productivity barrier. Since productivity plays a key role in the economic growth, lower wages lead to lower productivity and result to the poor economy and poor country.

Nonetheless, there is a trade-off between wages increment and the technology growth. The difference between the high wages in informal industries is caused by lower technology, in formal industries to reduce the labour cost they prefer to hire more technology. Thus, wage increment does not necessarily impact productivity level.

Another study was conducted by (Tamasauskiene & Stankaityte, 2013:24-35) in Lithuania to analyse the linkage between wages and productivity by economic sector and regions. The panel data was utilised for the period starting from 2005 – 2010. The

analysis showed that the relationship between the two variables differs from one economic sector to the other from one region to the other. However, the general findings were that dissimilarities were higher in wages than in labour productivities. Since high real wage implies higher labour cost, the increment in labour results in low labour demand. Therefore, with the fear of becoming jobless, the existing workers prefer to increase their productivity. This explains why the study outcome showed that in different regions and different economic sector wages growth preceded the productivity growth.

Employing the TAR unit root and TAR cointegration, Bildirici and Alp (2008: 93-110) analysed the relationship between the wages and productivity. Their study was conducted on Turkey economy using data of 1990 – 2007. The study focussed only on the registered workers to evade deviation that would lead to inaccuracy of analysis. Thus, wages and productivity involved in the study came only from legal and registered workers. Testing if a linear relationship exists between wage and productivity, the study found that only a nonlinear long-run relationship exists between the two underlined variables. That is to say, two cointegration equations were found. Both cointegrations confirmed a long-run relationship between wage and productivity.

Another study was conducted by Yildirim (2015: 85-103) in the Turkey economy to analyse the relationship between the association among wages, labour productivity and inflation. To achieve this objective, the author employed the cointegration and Granger causality tests. The period under the study was 1988:q1 to 2012:q2. Although the study found a longing-run relationship between wages and productivity, it was found that productivity impact more on wages than way wages affect productivity. Productivity was also found to be more elastic in response to the change in inflation rate. Moreover, no causal relationship was found between real wage and productivity in the Turkish manufacturing industry. The author argued that the absence of causality might be due to the high rate of unemployment.

Analysing wages and productivity effect in the Mexican economy, the study conducted by Lopez-Acevedo (2003:1-36) conducted interviews with an employee from 1993 and 1999. In these interviews, 7619 from 575 firms were interviewed and in 1999; 6259 employees from 722 firms were also interviewed.

These workers were grouped into 2 categories, one from the supply sides and the other from the demand side. The finding showed that growth in productivity and wages does not come from any of these two variables; rather wages and productivity are determined by the level of education and training. Moreover, wages and productivity in Mexican economy depend on regions or locations. Wages and productivity are positively correlated, yet productivity is more influential than wage rate.

The relationship between wage and productivity in the Euro-area countries was also analysed by Mora *et al.* (2005:2001-2008). Using data from 1981 to 2001 and applying panel cointegration model, the authors aimed to determine whether there is a simultaneous convergence between productivity and wages. The study found no simultaneous growth between wages and labour productivity. Depending on the individual country, it is possible that within the same economy real wage increases whilst productivity declines.

Analysing the effect of wage inequality on productivity in 34 OECD countries, the study of Policardo *et al.* (2018:1-23) utilised a sample size from 1995 through 2007. The study also employed: panel Granger causality and Arellano – Bond GMM estimator for dynamic panel data models to determine the relationship between the two economic variables. The findings revealed that wage inequality negatively affects the level of productivity within countries underlined. Authors backed this result by arguing that the lower level of real wage make workers to think that wages they are receiving are unfair, henceforth, no need to supply more effort for low remuneration.

Nonetheless, the study of Cohn *et al* (2008: 1-22) using a survey and analysing outcome trough descriptive statistics, revealed that though wages increase might also increase labour effort thus the productivity, it is not always a clear-cut result. Workers who believed to be underpaid respond positively when wage has increased. In other words, wage growth leads to effort enhancement. In this study of Cohn *et al* (2008), if wage increases by 10 percent, worker effort or productivity increases by 5.5. This shows a strong significant relationship between wages and labour effort. Notwithstanding, if workers believe that they are getting a fair wage, rising wages has no significant effect on labour or workers' effort.

A similar study to the one of Policardo *et al (2018)* was conducted by Liu (2002:449-476) to determine whether wage inequality affect productivity level in South Korea and Taiwan. This study utilised two samples; one from 1979 to 1996 for Taiwan economy and the other from 1993 to 1996 for the South Korean economy.

A linear regression model was utilised to determine and compare the effect of wages inequality on labour productivity in both countries. Analogous to the two previous studies, these results confirmed that unfair wage or rather deprivation wages curbs labour productivity. Additionally, this study found no significant evidence that efficient wages make workers become more productive.

Hægeland and Jakob Klette (1999: 231-259) conducted a study to investigate if high wage is the only real cause of productivity growth or also if gender, education and experience might play their part in productivity growth. This study utilised a survey on a set of manufactures industries in the Norway economy. The period under the study was 7 years that is, from 1986 to 1993. The findings of the study revealed that men are more productive than women and this difference in gender productivity was due to the fact that men were receiving a higher wage premium compared to women. Beside the disparities in wages and productivity caused by gender, the study showed that works with high education were likely to be more productive than the less educated. Furthermore, findings indicated that productivity also might depend on workers experience. Workers whose experience lies between 8 and 15 years were found to more productive than others. Nonetheless, workers whose work experience exceeded 15 years were also found to be less productive.

With the use of Granger causality and Engle-Granger cointegration, Aslan *et al.* (2009:179-185) employed time series data for the 1963-2007 period to scrutinise the dynamic of productivity and real wage in Turkey's private and public sectors. Despite a long-term divergence between public and private wages due to the short-term shocks, the study found a significant long-run relationship between labour productivity and real wage. In addition, the results from Granger causality analysis indicated that a unidirectional relationship exists between labour productivity and wages. That is to say that in the short-run productivity causes changes in the real wage. Nonetheless, a bidirectional causal relationship was found between both variables (productivity and

real wage) in private sector. The conclusion of the study was that, in public sector wages remain constant and were not affected by technology changes.

A study conducted by Narayan and Smyth (2009: 1285-1291) to analyse the relationship between inflation, real wage and productivity in G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States). Panel data over the period from 1960 to 2004 was utilised and the FMOLS estimation was employed to determine the long-run relationship among variables. The findings of the study revealed that real wage and productivity were positively and statistically significant. Taking Canada as an example, 1 percent increase in real wage lead to 0.4, and 1.4 percent productivity growth in each individual country and to 0.6 percent for the entire panel.

Applying the vector autoregressive together with, error correction models and Granger causality, a study of Dritsakis (2007: 133-145) analysed interrelationship between productivity, wages and unemployment in the Greek economy. Using time series data for the period of 1960q1 -2000q4, Johannsen test for cointegration was applied. The findings revealed that a strong causal relationship exists between wages, unemployment and productivity. Consequently, this study confirmed the general theory suggesting that the higher the level of real wage, the more the quantity of goods and services produced. Furthermore, the more expensive is the labour demand; the low is the number of workers hired.

In his study, Nikulin (2015:31-40) analysed the mutual effect between wages, productivity and unemployment infive new European Union countries namely Estonia, Hungary, Slovak, Czech Republic and Slovenia, taking Poland as the benchmark. The study utilised panel data with a sample period starting from 2002 and ending in 2013. Analysing that relationship, the study applied the random coefficient model. The findings were that growth proportionality between productivity and wages depends on the individual country's economy. In some of these countries, the level of productivity was higher than wages, while in others the results proved otherwise. Additionally, ratios between employment and wages were found to be weakly significant. The study found also that 2/3 of job losses in Spain was caused by high wage rate.

The study conducted in the United Kingdom by Hall (2014: 408-432) using time series and regional data, both analyses proved that a mutual effect exists between the level of unemployment and the real wage rate. High level of unemployment causes the level of real wage to fall while high wage generates job loss, thus causing unemployment. The study found that in most cases, economic crises or depression results from the excess of these two macroeconomic indicators. Thus, neither a higher real wage nor high unemployment can favour job creation. Unemployment and real wage are not independent because in some instance, they are determined by the level of productivity. Analysing the tripartite relationship between employment-wages-productivity in the Malaysian economy, Abdullah (2008: 249-262) applied a VAR model on quarterly data from 1992: q1 to 2005: q3 to determine short and long-run among these variables. The study found the existence of long-run relationship among underlined variables. Nonetheless, contrary to the general theory suggesting that an inverse relationship exists between real wage and employment, the outcome of this study found a positive relationship between employment and real wage. The efficiency wage theory suggesting that workers' performance depends on the value of their earning was supported by this study's findings.

Another study conducted in the Malaysian economy found a long-run relationship between employment, productivity and real wage. The multivariate and error-correction approaches were utilised on annual series starting from 1970 to 2005 to analyse the cointegration effect within the wage-unemployment-productivity nexus in the Malaysian economy. The outcome of the study revealed a presence of a long-run relationship between real wage and productivity level, yet unemployment was found to be dichotomized from the long-run equilibrium between productivity and real wage. Additionally, the elasticity of labour productivity towards real wage alternation was found to be higher compared to real wage elasticity towards changes in productivity. In other words, labour productivity plays a major role in Malaysian real wage oscillation (Goh & Wong, 2010: 145-156).

Besides the effect of the real wage, the change in the minimum wage has also an impact on the rate of employment. Another study was conducted in the USA by Addison *et al.* (2009: 397-408) focussing on the effect of the minimum wages on the USA retail-trade sector. Authors utilised a panel data for the time frame running from

1990 to 2005. The study did not examine all industries in the retail sector, but the focus was on some of the sub-sectors that were paying low-wages. Contrary to other studies, the findings of this study proved that by increasing the minimum wages in the analysed industries, the level of employment increased too. However, this effect of minimum wages on employment, besides being positive, varied depending on locations and it was not consistent. This positive relationship between minimum wage growth and employment in the retail sector stipulate that minimum wage growth increases the purchasing power of the existing workers and thereafter increases workers demand for goods and services. Increase in demand for goods and services generally lead to labour demand. Henceforth, new workers are hired. This study result was supported by the outcome of the study conducted by the same authors (Addison *et al,* 2012: 412–435), analysing the effect on the minimum wages on the labour market within restaurant and bar sector.

4.6 LINKAGE BETWEEN MINIMUM WAGE AND EMPLOYMENT/ UNEMPLOYMENT

Although the minimum wage will not be considered in this thesis, it is important to review some studies that empirically analysed its impact on employment/unemployment. Minimum wage policy being an ambiguous policy regarding jobs creation or job destruction, it has become a current hotly debated topic between economists and policymakers. The dilemma of the relationship between minimum wages and employment rate resides in the fact that empirical studies conducted on this topic provided different results. This is possible, firstly because data and methodology utilised in the study may affect findings and secondarily, because the effect of minimum wages depends on respective country's labour market dynamism.

Analysing the effect of minimum wage together with subminimum wages on youth employment in the United States, Neumark and Wascher (1992:55-81) utilised panel data of 50 states starting from 1973 to 1989 and found that between 1 and 2 percent of employed teenagers lost their jobs due to 10 percent escalation of minimum wages. These authors conduct another study using the same data and the same sample size to determine the linkage between minimum wages, youth employment and school (Neumark & Wascher, 2005:199 – 206), their findings revealed that minimum wage

has inverse relationship towards school enrolment yet has a positive effect on those teens whether employed or still at school. These two authors being avid to determine whether the previous negative effect on employment is consistent, they conducted another study to review other studies on the relationship between minimum wages and employment in the United States or other countries. That study concluded that a high level of minimum wages causes unemployment for least-skilled workers (Neumark & Wascher, 2015: 1-182). The negative effect of minimum wages on a specific type of labour or workers was also found in the study of Meer and West (2013:1-50), using panel data of non-agriculture employment data starting from1977 to 2011. They found an increase in the minimum wages to be stumbling block towards job creation and that the most affect group of people remains young employees as well as firms with a high low-wage worker.

In the United States, another study was conducted by Dube *et al.* (2010:945-964) to detect the effect on minimum wages in the united states on restaurant and other low-wage industries. The studies focussed on the period between 19990 and 2006. The OLS method was utilised and findings of the study revealed that, even though the minimum wage policy is implemented aiming to increase income for low-earning workers, the reality proves otherwise. Since minimum wages increases the level of unemployment, the total income does not increase because joblessness (those who lose jobs because of minimum wages growth) affects even those who are still working. Notwithstanding, the effect of minimum wages should not be generalised because the magnitude of this effect varies depending on the number of hours worked and places (locations).

Sabia (2009:75-97) conducted a study to determine how employment level was affected by the level of minimum wages. His study focussed on the retail trade in the USA economy. Monthly data was utilised for the time ranging between January 1979 and December 2004. Though it was not more influential, yet inverse relationship was found between employment and the hike of minimum wages. It was found that a 10 percent increases in the level of minim wages led to employment in the retail trade to fall by 1.1 percent. The study found also that the increment of minimum wage affects more teenagers (less experienced) than experienced people. Consequently, 10 percent increases in the minimum wages results in teenagers' employment to a

decline between 3.4 and 3.8 percent. This explains how youth unemployment is elastic to changes in minimum wage.

Although the above-mentioned studies infer that introduction or implementation of the minimum wage results in the unemployment growth, Neumark and Wascher's (1995, 2000) studies failed to find a negative relationship between minimum wages and the employment growth. Similarly, the study of Card & Krueger (1994) on the effect of minimum wage growth on employment in California found that increase in minimum wages affect only employees' earning leaving employment level constant.

4.7 LINKAGE BETWEEN EMPLOYMENT AND REAL WAGE AND PRODUCTIVITY IN THE SOUTH AFRICAN ECONOMY

In the south African context, different views are presented relating to the effect of real wages towards employment growth. The first group of thinkers argued that wage increment does not affected total employment because the latter depend on many factors. The other group asserted that wage increment reduces the firing ability, thus, negatively affect employment (Fields, 2000:3). Kingdon and Knight (1999:1-31) analysed the relationship between the wage rate and the unemployment rate. Using results from a survey conducted by the South African Living Standards Survey on 8848 households throughout 360 clusters, they found that the effect of unemployment on wages differ from urban places to rural areas. While unemployment growth can influence workers' payment in urban areas, the study found that a 10 percent increase in the unemployment rate would cause the wage rate to decline by 0.8 percent. There was no significant effect found between unemployment and wages in rural areas. The contradicting results between rural and urban areas result in labour mobility. Labour supply is higher in urban areas than in rural areas because of people moving from rural to urban places.

Another study was conducted by Gibson and Van Seventer (2000:512-546) who analysed the interrelationship between real wage, employment and macroeconomic policies within eight economic sectors namely; agriculture, mining, food, textiles, manufacturing, utilities, construction, and services. The study utilised the computable general equilibrium (CGE) model and found that although wage increase might result in a reduction of employment, this effect is not automatic. The extent to which real

wage growth affects employment level in the South African economy depends on how implemented economic policies react to the inflation dynamisms. It was found that increased wages can also serve as one of many solutions altering the income distribution issue in the South African economy.

Wakeford (2004b) conducted a study to analyse the relationship between real wage, productivity and employment in the South African manufacturing sector. The study utilised data ranging between 1970 and 2002. The econometric approaches utilised to test the long-run and short-run relationship was VAR and VECM models. The long-run relationship was found between real wage and productivity in the manufacturing sector, yet productivity was found to be more flexible than real wage. Nevertheless, the study found uneven growth between productivity and employment growth and the plausible explanation was that productivity growth might be the result of technology growth, and not labour growth and labour productivity increase.

In 2012, Klein (2012:1-27) conducted a study to discover the cause of higher rate and dynamism of unemployment in various South African economic sectors during financial crises using panel data of 1996-2009. The study found that the rapid real wage growth in some economic sectors, to be the cause of job destruction and barrier to job creation. The study found also the impact of real wage growth to be more serious in formal employment than in informal. When real wage increases, more jobs are lost in the formal sector and those laid-off workers might go for informal employment. Thus, real wage increment creates a substitution between informal and formal employment, for the former becomes relatively less costly compared to the latter. The study also analysed the linkage between wages and productivity and found a strong and positive relationship between the two globally, while in the South African economy a weak relationship was found. This study concluded that, in the South African context, beside productivity, some other factors influence real wage growth.

4.7.1 Correlation between real wage and minimum wages on employment growth

In 2016, Erero (2016:1-22) conducted a study analysing what should be the effects of the South African national minimum wage on the economy especially on economic growth, employment and welfare. Moreover, the study aimed to determine if the

national minimum wage policy was beneficial or not. He applied the computable general equilibrium (CGE) on the social accounting matrix (SAM). The findings of the study revealed that implementation of national minimum wages does not favour macroeconomic variables. It reduces the level of economic growth and leads to a decline of employment level and welfare. Thus, the minimum wage generates job losses. In support of this finding, statistical analysis revealed that when the national minimum wage was set at R3000 throughout all the South African economic sector, the real gross domestic product (GDP) level dwindled by 1.9 percent.

4.7.2 Labour productivity, real wage and employment relationship

Labour productivity increase can be as a result of technology growth or increment in labour price (wages) to stimulate workers. If productivity growth results from technology, employment level may remain unchanged or even decline. However, if productivity growth is increased because of wage increment, the employment rate will negatively be affected. Analysing how capital stock may affect employment and how productivity may affect the level of unemployment in South Africa, the study of Rowthorn (1995:26-39) revealed that the level of productivity has a great impact on reducing the unemployment rate. Increase in productivity level offset the income that would be lost if productivity was low, and as income increases job opportunity increases too.

Analysing 48 of the South African economic sectors, Fedderke and Mariotti (2002: 853) found that “where the real wage is less closely linked to real labour productivity, the growth in employment also tends to be lower. Additionally, they found that when real wage grows faster than productivity, employment declines - from which may be inferred that unemployment rises. Another result of Fedderke and Mariotti’s (2002:850) analysis is that for all the sectors with a strong improvement in real labour productivity, there is a strong improvement in the real per labour remuneration, suggesting that productivity drives wages.

Contrary those mentioned findings and the general theory stipulates that real wage is driven by productivity however this is not the case of the south African economy. The empirical evidence indicated that, in south Africa, real wage rate is driven by other factors than labour productivity (Morton & Blair, 2012). Looking at these contradicting

findings, it was important to conduct this study to determine what is the current relationship between real wage, labour productivity and employment in south Africa. chapter six provided the clarification on this dilemma.

4.8 CHAPTER SYNOPSIS

In this chapter, the researcher attempted to review various empirical studies considered to be of value regarding the study. Instead of following the chronological order, different studies were presented based on their correlation. The reviewed empirical studies reached different conclusions with regards to the analysed economic variables. Some of these empirical studies supported a positive relationship among economic variables while others found a negative relationship.

Investment spending was found to be the most significant on employment growth. Countries with a low level of spending are more likely to experience a high level of unemployment. Investment spending supports economic growth and the latter is the engine of job creation or employment growth. Nonetheless, if an enormous portion of investment spending is spent on production based on technology that investment will lead to high productivity and job destruction. This implies that the relationship between productivity and employment growth depends first on the factors of production employed and secondly on the relationship between productivity and wages. If labour intensive is employed for production, high wage can lead either to high productivity or low productivity. Most of the reviewed studies revealed that lower wage results in lower productivity. Workers are less motivated when they feel that the wage received is incompatible to what they are required to produce. Chapter 6 of this study will provide empirical result on the variables reviewed in this chapter. However, it is important to show how those empirical results will be achieved. Thus chapter 5 focusses on the research methodology of the study

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CHAPTER 5

RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

A country's employment conditions and performance result from various macroeconomic variables. The previous three chapters, that is, chapter two, three and four presented pertinent interrelationships among the economic variables under consideration in this study. Chapter two provided the theoretical relationship between employment, real wage, investment spending, and productivity. In chapter three, different empirical studies were analysed and relationships among variables were established by means of different econometric procedures employed by different scholars. Additionally, in chapter four, this study analysed the macroeconomic trends and various policies employed to overcome the issue of inequality, poverty, and unemployment in the South African economy. Nonetheless, those studies did not reach the same conclusion for some of them found a negative relationship while other others identified the positive relationships between employment and other variables. One of the reasons for reaching opposing results was due to the data and method utilised in each individual study. While some of these studies (chapter four section 4.2 to 4.5) focutilised on industrial surveys and panel data, others employed time series. The methods utilised were either ordinal least squares (OLS), the vector autoregressive (VAR) or the autoregressive distributed lags (ARDL) in their different forms.

The choice of any of these econometric approaches through recent studies was based on the power of each model to produce non-spurious results. As stated by Granger & Yoon (2002), whenever variables are cointegrated, employed series are said to possess a hidden cointegration, where this hidden cointegration is also known as a nonlinear cointegration. The hidden cointegration affects the error correction model of the study. While analysing ECM, it is important to consider positive and negative effect of independent variable on the dependent variables. That is what Granger and Yoon (2002) call "crouching error correction models". All the reviewed empirical studies analysed the relationship between employment, investment spending, labour

productivity, and real wage considered variables to have a symmetric or linear relationship. This study considered an additional element, an asymmetric relationship among variables, ignored by previous studies. Thus, two recent models (ARDL and NARDL) based on their robustness and complementarity, were utilised and their results are discussed and compared.

This chapter is divided into three sections. The first section presents times series utilised and explains reasons why the researcher chose the variables and the underlined economic sectors. The second section discusses the methodology employed in this study. Given that this study focusses on interaction or interrelationship among variables, the standard ARDL model is discussed together with linear and nonlinear ARDL. The unit root and stationarity test results determine the appropriate model for analysis. This section addresses, builds and specifies the employed models. Furthermore, it justifies the choice of models and approaches employed in the study. The third section provides a concise summary of the entire chapter followed by a conclusion.

In line with analysed empirical studies to determine the interconnection between employment and other macroeconomic variables, VAR model was predominantly utilised because of its strengths in forecasting and describing the dynamic behaviour of economic time series. Besides its strengths for data description and forecasting, VAR model is also useful for policy purpose (Zivot & Wang, 2006:383). In the current study, VAR model was discussed for Toda Yamamoto Granger non-causality. Given, its flexibility in terms of data analysis, a literature of the autoregressive distributed lags (ARDL) was included in this chapter. Hence, the standard ARDL and nonlinear (NARDL) models are outlined in detail. This detailed discussion includes advantages and disadvantages of each model. Notwithstanding, the models' discussion is preceded by data source, data description, and measurements.

5.2 DATA DESCRIPTION, METHODOLOGY AND MODEL SPECIFICATION

5.2.1 Data acquisition and description

This study is grounded on quarterly time series data for South Africa covering the period from 1995Q1 to 2017Q4. The series starting date is the first quarter of 1995 because before 1994 the South African economy was under international economic

sanctions and during 1994 new government policies were not yet fully implemented (Laverty, 2007:2). Therefore, using data of pre-1995 could probably, lead to spurious results. The availability of data also played its role in choosing 2017 as the closing date of the analysed data. The study focuses on data with the time frame running from 1995 to 2017.

Thus, 88 quarterly observations for each variable are analysed. The motivation behind the choice was that South African economic policies before and after the apartheid regime are completely different. Additionally, the South African economy before the democratic regime was under economic embargo (Nesbitt, 200:6-17). Series were obtained from the South African Reserve Bank (SARB) website (SARB, 2018). Variables under consideration include job creation or employment (EMP) in six different economic sectors namely construction, finance, manufacturing, mining, trade and transport. Based on its availability, the study utilised sectoral employment index. Other variables included in the study were investment spending (INVES), labour productivity (PROD) and real wage rate (LWAGE). In order to determine the elasticity of employment as a result of other mentioned macroeconomic variables, the data utilised in this study was transformed into a natural logarithm. Thereafter, a simple model in double log is presented as follow: [LEMP = *f* (LECONS, LEFI, LEMAN, LEMIN, LETRED, LETRAN), LINVES, LPROD and LRWAGE].

Where LEMP denotes the natural logarithm of total employment in non-agricultural sector, LECONS is the natural logarithm employment in construction sector, LEFI symbolises the natural logarithm employment in financial sector, LEMAN represents the natural logarithm employment in manufacturing sector, LEMIN denotes the natural logarithm employment in mining sector, LETRED represents the natural logarithm employment in trade sector and, LETRAN is the natural logarithm employment in transport sector.

5.2.2 Description and measurement of independent variables (LINVES, LPROD, LRWAGE)

Since the aim of the study is to analyse the interrelation among variables, each variable is treated as dependent and independent concomitantly. Nonetheless, the study considered investment spending, labour productivity and real wages as core

independent variables. Each of these three macroeconomic variables is briefly discussed below:

5.2.2.1 Investment spending (real gross fixed capital formation)

In the South African context, investment spending also known as gross fixed-capital formation impacts more on economic changes especially in regard to job creation (National Treasury, 2018: 17-18). As stated by Mohr *at el. (*2015:322), the real gross capital-formation remains the origin of most of the South African economic activities, implying that negative shocks within investment spending results in high unemployment rate. The total of investment spending or the real gross fixed-capital formation comprises of the general government investment, private business enterprises and public corporation's investment. As a function of income, investment spending is measured in billions of Rand (SARB, 2015).

5.2.2.2 Labour productivity

Labour productivity differs from employee's productivity. While labour productivity refers to how much time is employed to produce a given output, the employee's productivity refers to the ratio of total output over the number of employees utilised to produce that output (SABPP, 2016:4). Despite different ways of measuring labour productivity, the general measure consists of a ratio between output and time utilised by labour to produce that output. The same measurement is utilised in the current study. The South African labour productivity has been increasing since 1994, but this growth was accompanied with real wage growth resulting in high unemployment rate (Klein, 2012; Rankin, 2016). According to the South African Reserve Bank (2018), labour productivity growth in 2016 was lower compared to that experienced in 2015. Nonetheless, in the year 2017, the labour productivity increased from 0.5% in 2016 to 1.2% in 2017. Thus, it was important to analyse whether these fluctuations in labour productivity had an impact on high unemployment rate in South Africa.

5.2.2.3 Real wage/ Earnings

According to Kingdon and Knight, (1999:13) and Altman (2005) high real wage is one of significant causes of consistent growing level of unemployment in South Africa. The determinants of real wage, in the South African economy, include unemployment level,

labour productivity, labour unions, legislated minimum wage and number of strikes (Altman, 2006; Wakeford, 2004:112). In the Wakeford (2004) view, a correlation exists between, unemployment, productivity and wages. He argues that, since 1990, these three mentioned economic variables have concurrently increased. The real wage is established as a proxy for South Africa's remuneration per worker. It is measured as an index at current price in non-agricultural sectors (SARB, 2018). The real wage utilised in this study is deflated by producer price index as labour earnings and cost of labour production. It was acquired from the South African Reserve Bank for the period between 1995 and 2017.

5.2.3 A concise description of economic sectors and employment growth (dependent variable)

To emphasize the South African employment elasticity towards fluctuations of investment spending, labour productivity, and real wage; the study focutilised on six of the key private sectors namely construction, finance, manufacturing, mining, trade (retail and wholesale) and transport. The choice of these sectors was based on the important role they play towards economic growth, job creation, and the economic welfare. It is a combination of some of the primary, secondary and tertiary sector such as mining, manufacturing, and transport respectively. Despite their fluctuation over time, all the chosen sectors increased their contribution towards economic growth in the third and last quarter of 2016 (SARB, 2017:5-9). Figure 5.1 represents the contribution of the major sector towards the South African economy in 2016. As it is displayed in Figure 5.1, more than 60 percent of the South African economy in 2016 was covered by sectors that are analysed in this study.

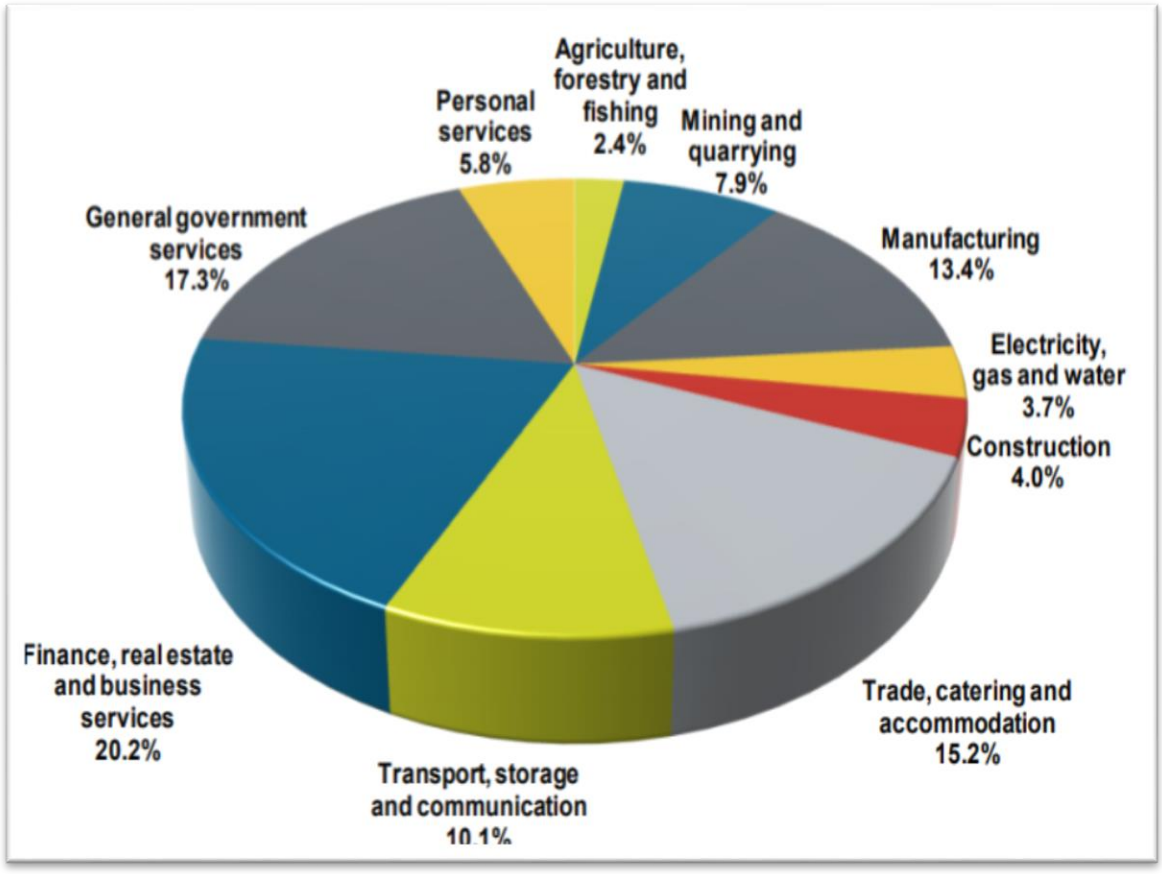

Figure 0-1: Sectoral composition of the South African economy in 2016

Source: IDC (2016)

5.2.3.1 Sectoral job growth between 1996 and 2017

Considering six sectors selected for the current study, Table 5.1 exhibits trends in job (employment) growth. Considering this growth pre and post 2008 financial crisis, one can perceive that employment in all sectors was affected by the crisis. Despite the growth, compared to others, employment in the transport sector was the most affected by the 2008 financial crisis. To the contrary, since 2011 employment in the trade sector experienced a growth except in 2017 where more than 6 percent of jobs in this sector was lost.

Considering the average number of jobs created or destroyed between 1995 and 2017, on average, four sectors namely construction, trade, transport and financial sector experience a growth. In the remaining two sectors, that is mining and manufacturing, more jobs were destroyed than created. Among the sectors that have a positive job growth on the average, transport and financial sectors created more job

than other sectors. The average of job created was 2.91and 2.85 percent for transport and financial sector respectively. On the other hand, more jobs were destroyed in mining and manufacturing sectors. The average of job growth in these sectors was -1.84 and -0.74 percent for mining and manufacturing respectively. In terms of fluctuation, job creation is more unstable in mining sector and less fluctuating in the construction sector as depicted by standard deviation in Table 5.1. The standard deviation of employment growth in mining sector is 10.96 against 3.79 in construction sector.

Table 0-1: Sectoral employment index growth between 1995 and 2017

Date	Mining	Manufacturing	Construction	Trade	Transport	Financial
1996	-0.06	-4.9	1.34	-0.63	1.51	0.95
1997	-0.61	-3.12	-0.58	0.03	0.95	1.13
1998	-1.06	-15.99	5.4	-2.29	1.3	0.11
1999	-1.46	-5.91	2.91	-2.53	3.1	0.4
2000	-1.91	-4.07	-5.52	-0.32	1.63	0.71
2001	-4.77	-2.23	0.27	-1.74	-4.81	-0.46
2002	15.15	1	-3.22	1.64	2.21	0.7
2003	-13.97	4.46	-6.04	10.66	11.9	10.25
2004	-5.89	5.44	2.37	2.72	7.32	4.56
2005	-8.66	-1.06	7.31	15.43	9.71	5.38
2006	17.2	2.74	1.84	10.36	2.28	-0.7
2007	-11.64	8.44	4.84	6.47	5.75	5.4
2008	-25.68	4.76	9.19	5.76	14.32	22.59
2009	-12.3	-5.18	-2.11	-6.12	-1.23	-0.02

2010	-6.91	1.48	0.6	-5.1	-4	-2.47
2011	-3.18	2.78	4.09	4.53	2.9	0.96
2012	8.09	2.18	2.83	5.56	3.29	5.39
2013	6.28	-2.75	0.28	3.62	2.35	5.84
2014	-5.2	-3.15	1.34	8.31	2.5	-0.95
2015	25.38	-2.29	4.65	4.26	3.03	6.83
2016	-0.65	-4.5	1.57	3.26	-0.14	-3.66
2017	-8.6	5.63	-3.65	-6.12	-1.96	-0.24
Sum	-40.45	-16.24	29.71	57.76	63.91	62.7
count (n)	22	22	22	22	22	22
Mean	-1.84	-0.74	1.35	2.63	2.91	2.85
STD	10.96	5.24	3.79	5.52	4.54	5.44

***Source**:* Author's compilation (data from SARB, 2017)

Construction: The construction industry is one of the major and significant sectors that contribute to the South African economic growth in general and employment in a specific way. During the period of 13 years, which is from 1995 to 2008, the construction sector created the largest number of jobs in comparison to the other South African economic sectors (Mkhize, 2016:15). It further contributes 3.9 percent of the total gross domestic product (GDP) with also a significant impact on the gross national product (GNP) (PwC, 2016:3). Crampton (2016) asserts that the recent report of the statistics South Africa revealed that the construction sector plays a remarkable role in the labour market and employs more than 1.4 million people. Among this employment, more than 44000 jobs were created in 2016. Thus, it necessary to analyse how this employment from construction sector is affected by macroeconomic variables such as investment spending, labour productivity, and real wage. The construction sector creates temporary and durable jobs. A job created during

construction continues during maintenance and renovation. Additionally, the construction sector is able to employ skilled and less skilled workers. A job created by construction sector is measured using index scales in terms of indexes (SARB, 2015). In the view of Muthethwa (2013:10), the job opportunities index is a tool utilised in the measurement of the number of new jobs available throughout South Africa. During the period of four recent years (2013 to 2017), employment in the construction sector increased by 19.6 percent (Bhorat & Rooney, 2017:4). As it is depicted by Figure 5.2, employment in the construction sector did not perform well over the period under analysis. Out of 24 years, a positive growth was experienced only in two years. A great number of jobs were lost in 2009 after the 2008 financial crisis and since then the sector never recovered the job lost.

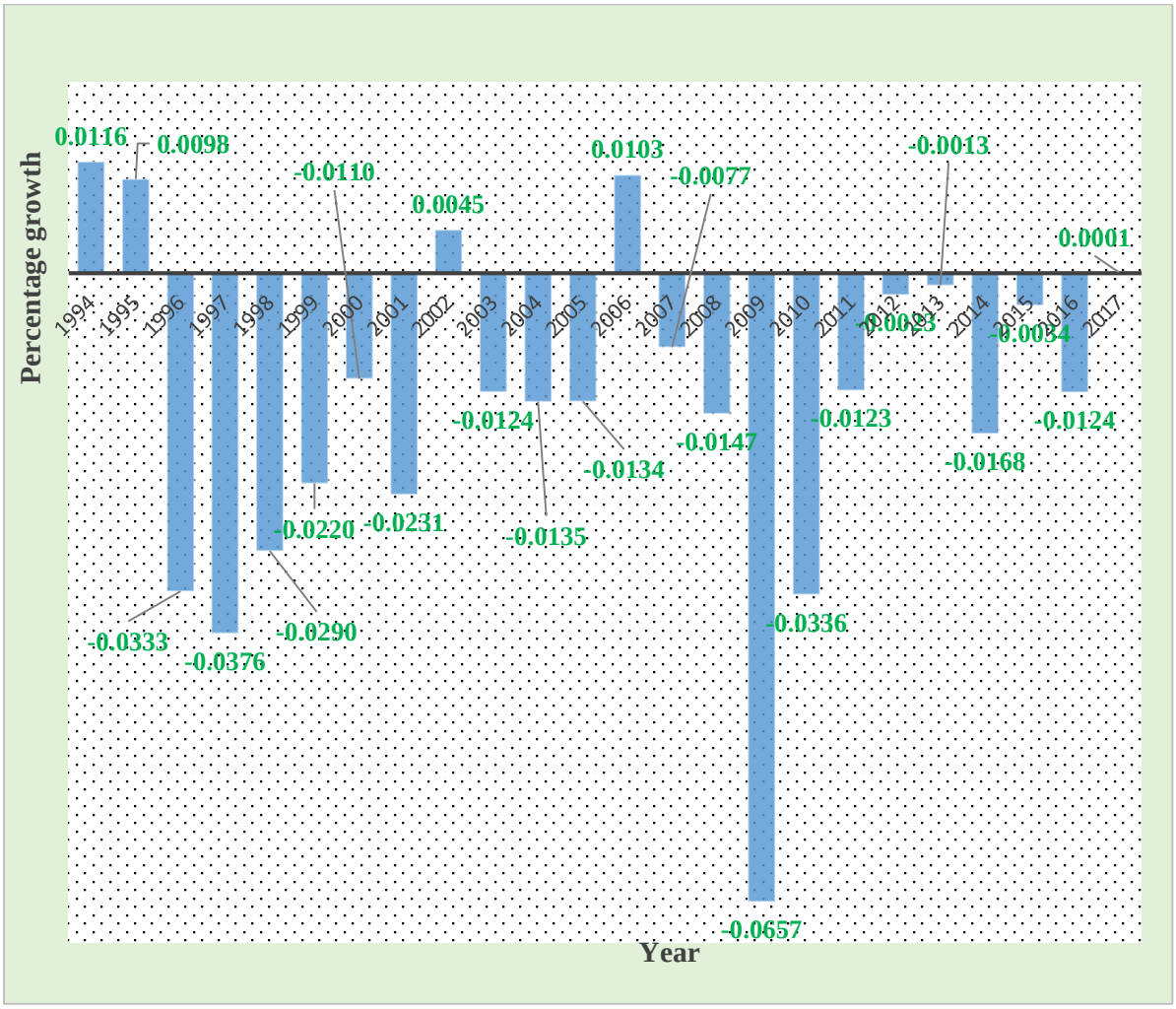

Figure 0-2: Employment index growth in the construction sector

Source: Author's compilation (data from SARB, 2017)

Financial sector: The South African financial sector comprises finance, real estate, and business services. The South African Reserve Bank, financial institutions, and other commercial banks are also counted as the financial sector's components (SARB, 2012). In regard to the current study, the data and focus are based on financial institutions. The financial sector is one of the most contributors to the South African economy. Its wellbeing affects the life of each South African citizen. Regardless, the technology that can destroy some of the labour employment, financial sector creates more employment especially trough business services. In addition to the direct jobs created by banks and other financial institutions, the financial sector, indirectly creates jobs through its credit extension to small and medium enterprises, enabling the building of vital infrastructure, economic growth and sustainable development (National Treasury, 2011:1- 62).

As it is the case in constructions sectors, the number of jobs created in the financial sector is calculated in terms of the index from the total employment. Considering employment growth from 1994 to 2017 one can perceive that the South African financial sector experienced the highest employment growth in 1996 where job creation increased by 9 percent. The worst scenario was experienced in 2003 were approximately 7 percent of jobs in the financial sector were lost. It can also be observed that since the 2008 financial crisis, the South African financial sector never recovered the jobs destroyed in 2009. In 2009, about 4 percent of the existing jobs were lost and the highest growth experienced since then was 3 percent achieved which was in 2011.

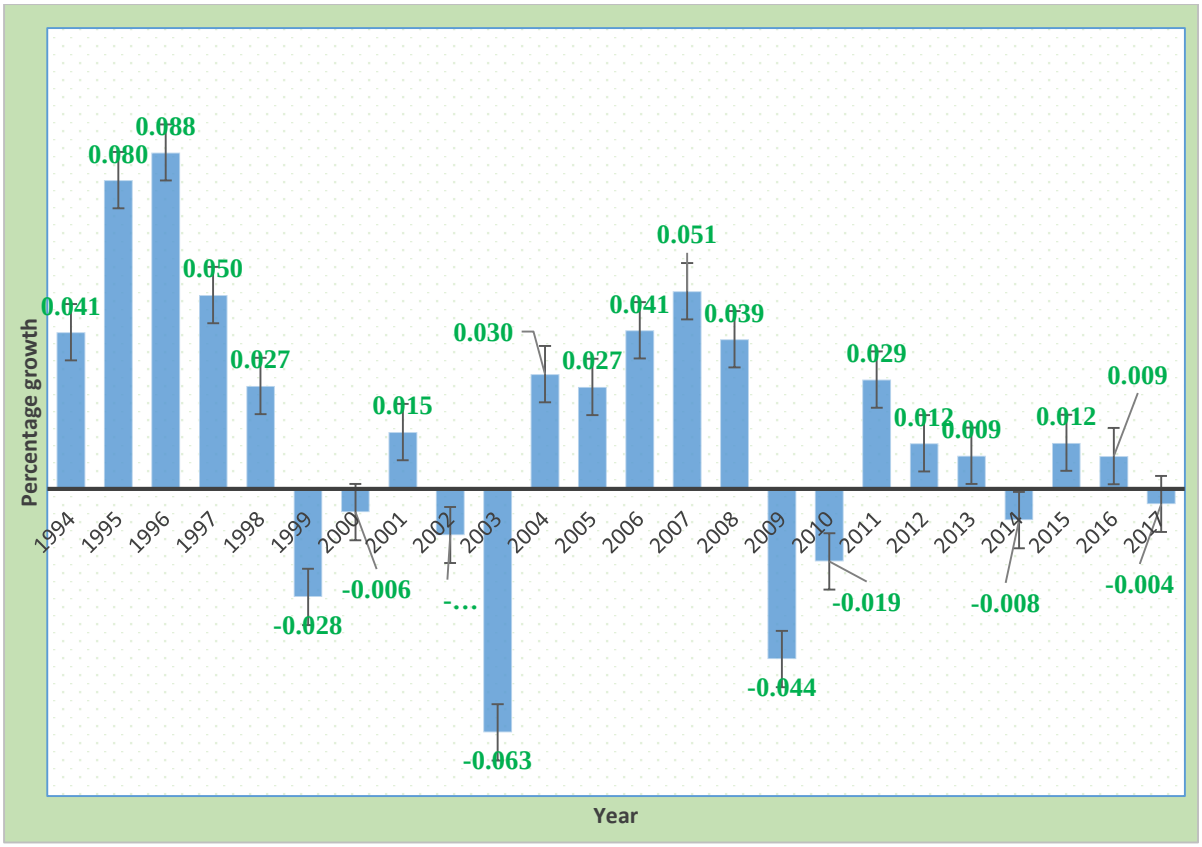

Figure 0-3: Employment in the financial sector

Source: author's compilation (data from SARB, 2018)

Manufacturing: the role of the manufacturing sector on employment growth is indispensable. A job created in this sector affect employment in other economic sectors such as agriculture, construction, and mining sectors because these sectors contributes to the manufacturing inputs (Nguyen, 2015:15-16). Additionally, this sector is able to create jobs within the informal sector and formal for both skilled and unskilled works (Fukase, 2013: 323). The manufacturing sector plays a pivotal role in the South African economy and job creation. In regard to the contribution towards employment growth, manufacturing is divided into nine subsectors namely food, beverages and tobacco; textiles, clothing and leather; wood and paper; publishing and printing; petroleum products, chemicals, rubber and plastic; other non-metallic mineral products; metals, metal products, machinery and equipment; electrical machinery and apparatus; transport equipment; and finally furniture and other manufacturing products (Bhorat & Rooney, 2017:2-6). This sector is one of economic sectors that are important in accomplishing the NDP goals. The South African manufacturing sector, given the unfavourable business condition, volatility in the exchange rate and market

liberalisation has in recent decades, faced the unsatisfactory growth (Bhorat & Rooney, 2017:2-12; Rodrik, 2006:3-26). The contribution of this sector towards employment growth declined by 3 percent between 2001 and 2014, that is from 14.7 in 2001 to 11.3 in 2014 (Bhorat & Rooney, 2017:4). Additionally, Statistics South Africa asserted that between 2008 and 2014 more than 331 000 jobs were shaded in the manufacturing sector (Bhorat & Rooney, 2017:8). This was the largest number of job losses when considering job loss into the different sectors of the South African economy. Nonetheless, considering the average contribution between 2010 and 2016, the manufacturing sector contributed approximately 12.7 percent towards the total employment (see section 4 in chapter 4). Jobs are created in the manufacturing sector through the production of finished and semi-finished products. Figure 5.4 displays employment growth or job creation in the manufacturing sector. As it can be perceived, between1994 and 2017, this sector experienced a growth only in 1994, 1995 and 2006. More jobs were lost after the financial crisis in 2009. Since then, the sector never recovered. As it is displayed in Figure 5.4, regarding the job growth since 1995, the South African manufacturing sector experienced issues except in 2006. Nonetheless, though at a slow pace, jobs lost in 2009 are being recovered progressively. Perhaps what is missing beyond the description is an attempt to explain the trends. For example, the SA manufacturing sector needs modernisation and new technologies to produce at the level of competitiveness that other BRICS and non-BRICS countries at its level of development and complexity are operating

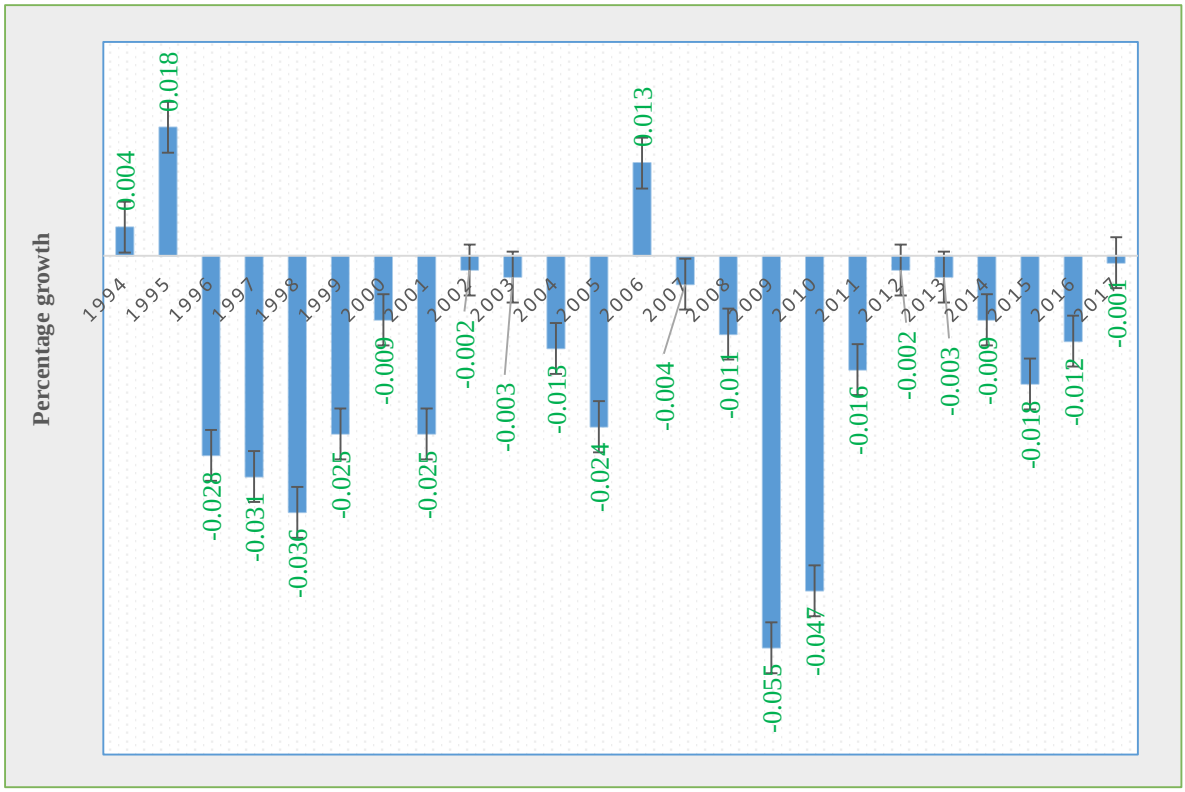

Figure 0-4: Employment growth in the manufacturing sector

Source: author's compilation (data from SARB, 2018)

Mining: Albeit fluctuations experienced by the South African mining sector over time, its contribution to the total employment, over seven years was 4.3 percent. This result is an indication that, after the 2008 global economic crisis and Marikana incident, the mining sector is recovering in creating direct and indirect jobs. One direct job created in mining sector leads to two more indirect jobs (Mining Indaba, 2017). The role of the mining sector in the South African economy is mostly based on its contribution to the country's trade. This sector exports more than manufacturing do. Thus, not only the mining sector can create more jobs it also influences job creation in other sectors and the value of the domestic currency (Rand value) (PWC, 2015). The mining industry comprises two major's groups.

The first group comprises gold, platinum group metals (PGMs), diamonds and silver; and base minerals. The second group encompasses of chrome, copper, iron ore, lead concentrate, manganese, nickel, zinc, coal, other non-metallic, and miscellaneous (Chamber of Mine (CM), 2016:3-4). Not only does the mining sector impact on

employment growth, it also contributes towards economic growth. Despite a decline of 4.7 percent compared to its contribution in 2015, the mining sector contributed by 3.7 percent towards the South African GDP in 2016 (C M, 2016:3). Thus, the mining sector can create direct and indirect employment. Indexes are also utilised to determine employment growth in this sector. The Figure 5.5 exhibits employment growth in the mining sector. This sector experienced a negative growth between 1994 and 2001. It also experienced a high loss of jobs, that is, 16 percent in 1998 and high growth of 8 percent in 2007. As in other sectors, employment in the mining sector was affected by the 2008 financial crisis which led to job loss in 2009. In addition to the financial crisis, the mining sector was affected by Marikana incident in 2012 causing job destruction up to 2017, where the sector started recovering (Harvey, 2014).

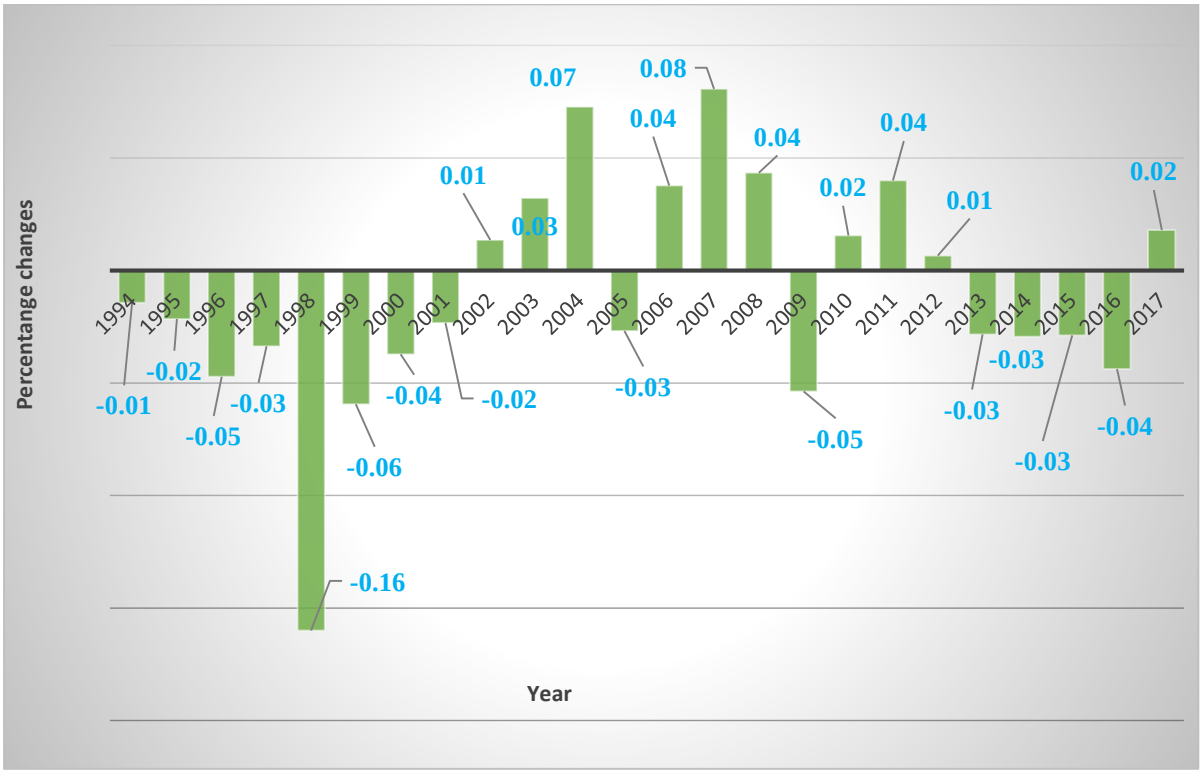

Figure 0-5: Employment growth in the mining sector

Source: Author's compilation (data from SARB, 2017)

Trade: for the current study, the trade sector comprises wholesale and retail trades. This sector was selected on the basis that it is one of the low import-penetration sectors and therefore important for employment growth (Ngandu, 2009:119-120). Trading industry is related to the country's openness and it involves imports, exports and exchange rate. Country's political stability and its relations towards the rest of the

world influence state of its trading sector (Fenira, 2015: 470; Gaalya, 2017:691; Squalli & Wilson, 2011:1745). The state of the trading sector impacts more on employment fluctuations. A growth in the country's trade results in job creation, while negatives chocks in trading sector cause the economic job shading. This explains why after 2008 financial crises the South African economy experienced a serious job loss and a quick contraction in production (Kganyago, 2012). From 2001 to 2014, employment in the trade sector grew by 17.5 percent (Bhorat & Rooney, 2017:4). In 2015 out of 8.99 million jobs amounted to the non-agriculture sector, 1.89 million people were employed by the trade sector (IDC, 2016:8). The Figure 5.6 indicates that employment in the trade sector, despite fluctuations, has been doing well between 1994 and 2017 compared to other sectors. Job losses were experienced only in 1994, 2003 and 2009; while the highest growth of 11 percent was experienced in a 1999. Comparatively, many jobs were lost as a result of the 2008 financial crisis. The year 2008 and 2014 were years of slow growth in job creation.

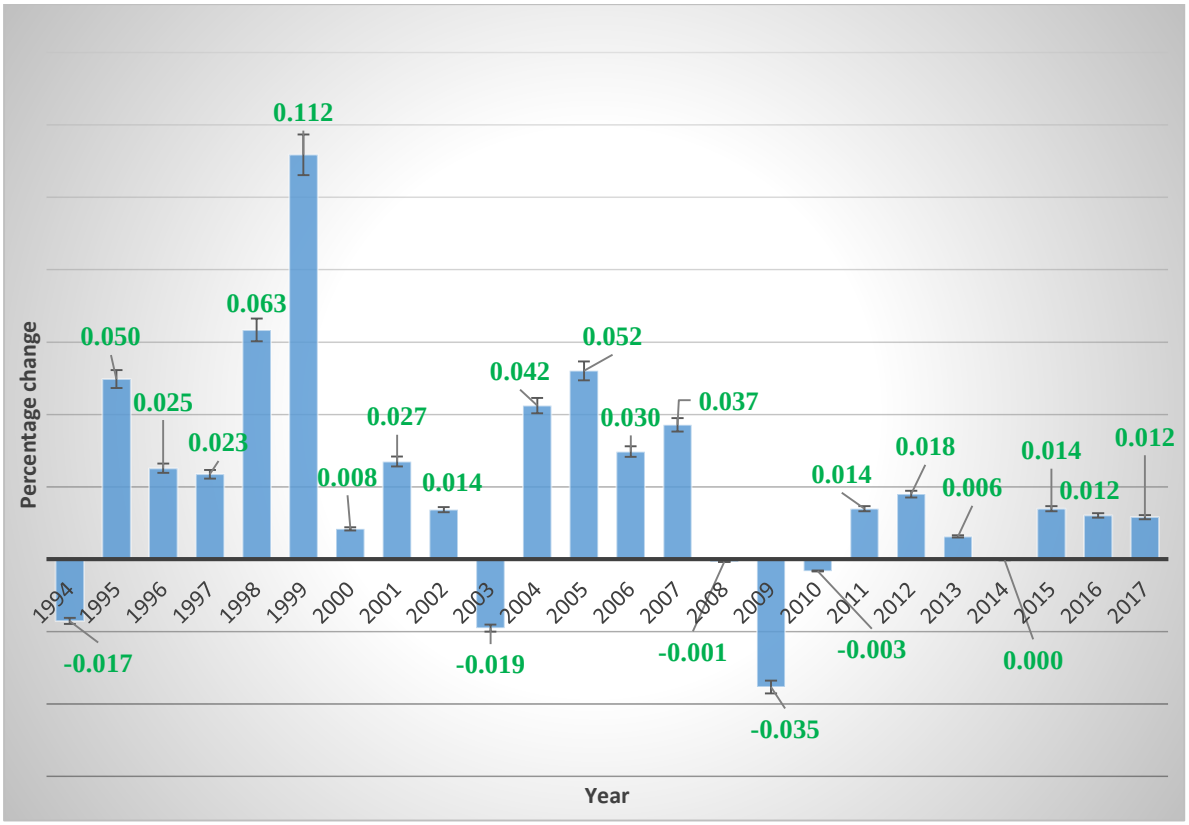

Figure 0-6: Employment growth in the trade sector

Source: Author's compilation (data from SARB, 2017)

Transport: The South African transport sector encompasses seven sub-sectors namely; railway transport, other land transport (Road), sea and coastal water transport, air transport, supporting and auxiliary transport activities, activities of travel agencies, postal and related courier activities, and telecommunication. Each of these sub-sectors can assist in creating jobs. Besides direct employment created within the transport sector, this sector is also able to create indirect jobs within different private sectors (Low Carbon Frameworks, 2017:2-5).

Since 1994, the transport sector had been importantly contributing to the South African GDP and employment growth (Du Plessis & Smit, 2007:4). Within a period of six years from 2001 and 2017, employment increased by 10.4 percent (Bhorat & Rooney, 2017:4). Jobs created and recorded in the transport, only in 2016 was above 61 000. This exhibit how important is the transport sector towards employment growth. Yet, as shown in Figure 5.7, the created jobs in 2016 was recovering job lost in 2015. Unlike other sector employment, transport sector created more jobs in 2010 than jobs lost during the 2008 financial crisis. This growth is, probably, a result of the South African 2010 world cup.

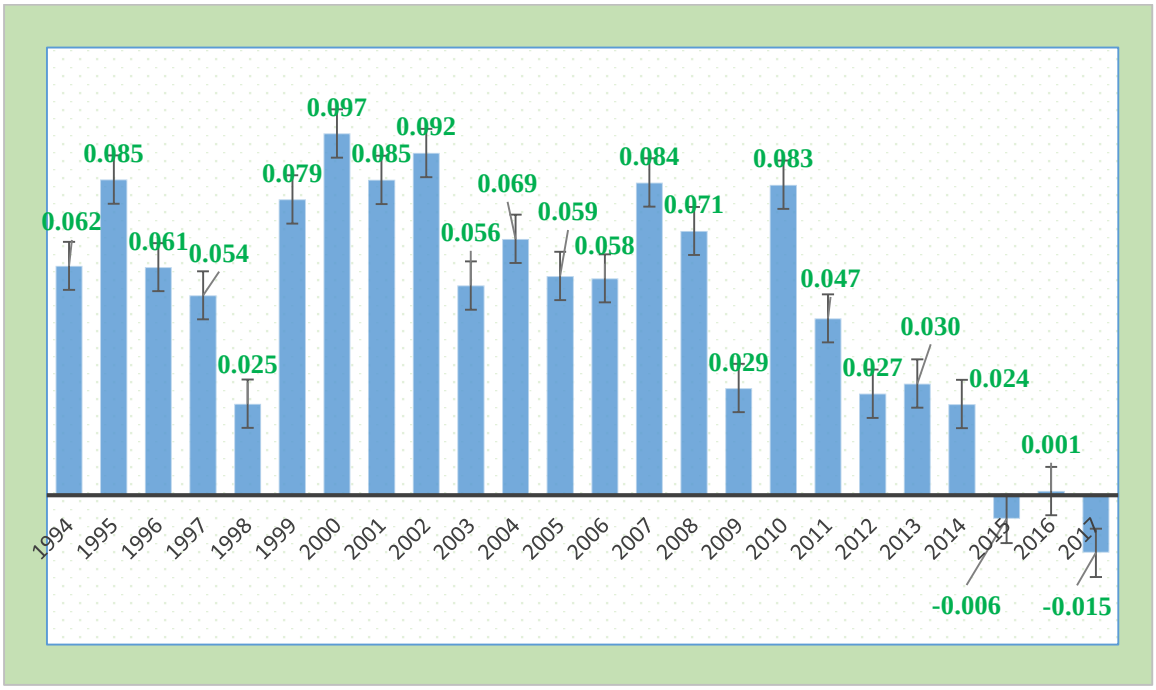

Figure 0-7: Employment index growth in the transport sector

Source: Author's compilation (data from SARB, 2017)

It was recorded that in 2016 the overall remuneration increased by approximately 5.9 percent, and this might be one of the causes for job destruction with the same period. Likewise, during this period the South African economy experienced a decline in investment spending. Albeit a slight employment growth experienced by the South African labour market in 2016, liken to 2015, labour productivity, in the same year 2016, significantly declined (IDC, 2017:8-11). Having identified and described the variables to be measured, methodology and econometric models' specification are discussed next.

5.3 METHODOLOGY AND ECONOMETRIC MODELS SPECIFICATION

Within the economic field, especially in econometric field, different approaches can be employed while analysing relationships and cointegration among variables. However, each of these approaches can be more or less effective depending on various factors such as the nature of data, type of relationship analysed, the sample size and the software employed. In regard to some of the models or approaches, the use of the ordinal least of a squire (OLS) is criticized to generate inaccurate results, which in some instance, lead to false conclusions and recommendations (Mina, 2011:202-218). To evade these erroneous conclusions, scholars include in their econometric analysis some other strong, sophisticated and robust approaches. Among those models are the Vector Autoregressive (VAR), the Autoregressive Distributed Lags (ARDL) and the Nonlinear Autoregressive Distributed Lags (NARDL) models. It significant to note that these models also have their limitations as it will be discussed further. Even so, VAR model is also effective only if applied on variables with same order of integration and require enormous sample size (Engle & Granger, 1987).

Using appropriate vigorous econometrics techniques allows analysts to reach accurate findings and evade some econometrics issues such as autocorrelation, multicollinearity, heteroscedasticity and data unit root (Arodoye & Iyoha, 2014:127-129). To investigate the interaction or inter-relationship between employment, real wage, productivity, and investment spending in the South African economy, the two above mentioned econometric approaches (ARDL, NARDL) were selected and discussed for this study. The choice of these two models was based on their econometric strengths and the nature of series under consideration (mixture of integration order), and only ARDL in its two forms (linear and nonlinear) is applied.

The motivation of this choice was to test if both models can generate analogous results since each model has its particular strengths and weaknesses. Moreover, the utilisation of the NARDL comes to support the standard ARDL. While the former generalised the relationship between the dependent and independent variable, the latter considers both components of independent variable either positive or negative.

In the view of Enders (2004:294-352), before any further econometric analysis, it is better to ensure that the data under consideration is transformed to stationarity irrespective to whether the focus is short or long-run relationships. Based on this statement, in this study, non-stationarity or unit root test and stationary tests precede other procedures.

5.3.1 Unit root and stationarity tests

In time series, the validity of the analysis depends on the type of variables employed. To ensure that the obtained result from regression analysis is accurate, the utilised variable should be stationary otherwise spurious results are obtained (Brooks, 2014:354). Besides the accuracy of the result, the stationarity test is utilised to determine the correct model to include in the study (Enders, 2008). This test also allows the researcher to determine the level (order) of integration. Thus, it indicates whether variables are integrated into levels or after being differentiated. Cheremza and Deadman (1992:128) represent the integration level as follow:

$X_t \approx$ I (d) where d indicates the integration order and (X_t) denotes a series.

The order of integration denotes the number of unit roots in series. In other words, it refers to the number of differentiating operations required for a variable to become stationary. Therefore if d = 0, a series (X_t) is integrated of order zero, noted as I(0) and it is stationary in levels. However, if d ≥ 1, a series (X_t) is integrated of order one or higher, noted as I(1) or I(2), or higher and it not stationary in levels.

In the econometric field, numerous techniques can be employed to test for a unit root. Brooks (2014:362-3365) and Gujarati (2009:754-759) mention Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) as the most common and useful unit root tests. The popularity of these approaches is, in essence, due to their nature and simplicity of use (Johansen, 1988: 231–254). The ADF is preferable

to DF. The ADF addresses the weakness of DF such as considering that the variable *Y* follows an AR (p) instead of AR (1). The unit root test under the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tend to produce similar results. These two types of test are criticised to be less powerful and more sensitive to the sample size. They lead to a spurious or poor decision if they are applied to a small sample size (Brooks, 2014:362-3365; Gujarati, 2009:754-759).

Brooks (2014:365) suggested that, in order to overcome the issue of uncertainty from ADF and PP tests, the obtained result from these two tests has to be compared to the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) stationarity test. Thus, KPSS stationality test can be utilised as a confirmatory test to the ADF and PP results (Deb, 2004:210). In the same regards, this study employs all the three (ADF, PP & KPSS) approaches to ensure that the accurate results are obtained.

5.3.1.1 Unit root test: The Augmented Dickey-Fuller (ADF)

The estimation of the ADF test can be represented as follow:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \rho Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-1+i} + e_t \text{ , t = 1, …, n} \quad (5.14)$$

Where Y_t represents the variable to be tested, α_1 represents the intercept and *t* denotes the time trend. As recommended by Dickey and Fuller (1979:427-431), the null hypothesis is represented as follows:

H_0: ρ = 0 → Y series has a unit root

It is important to mention that the decision to reject or fail to reject does not depend on the critical values of *t* statistic, it rather depends on the ADF critical values. Therefore, the null hypothesis of non-stationary is rejected if the absolute value of the estimated parameter is greater than the ADF critical values.

Generally, the Augmented Dickey-Fuller (ADF) suggests three different approaches that can be employed to test the presence or absence of unit roots within a series. The first is a test for a unit root, the second is a test for a unit root with a drift and the last, not the least, is a test for a unit root with drift and deterministic time trend (Sun & Xu, 2010:7-9).

Test for a unit root

$\Delta y_t = \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + u_t$ ……5.15)

Test for a unit root with drift

$\Delta y_t = \beta_0 + \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + u_t$…… (5.16)

Unit root with drift and deterministic time trend

$\Delta y_t = \beta_0 + \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + \beta_1 t + u_t$…….... (5.17)

Where y_t represents the series at time t, and $\Delta y_t = y_t - y_{t-1}$. β_0 denotes the drift term and the u_t error term. The null and alternative hypotheses are represented as follows:

H_0: $\varphi* = 0 \rightarrow$ the series contains unit root (is not stationary)

H_1: $\varphi* < 0 \rightarrow$ the series does not contain unit root (is stationary)

In conducting the ADF test the lag length plays a significant role. While too many lags are more likely to reduce the power of the test (causing the loss of degrees of freedom), few lags may lead to the rejection of a true null hypothesis (Torres-Reyna, 2013; Wiley, 2000). Given the implication of lag selection on regressed results, section 5.3.1.3 after the discussion of stationarity and causality tests focuses on the lag selection and lag length criteria.

5.3.1.2 Stationary Test: Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test

According to McCarthy (2015:5), one of the ADF and PP unit roots that depends on the sample size (it is less credible when applied on a large sample and overpowered on a small sample) and it is also weak when making a choice on open optimum number of lags. To overcome the ADF challenges Kwiatkowski, Phillips, Schmidt, and Shin (1992) suggested an alternative test in which, under the null hypothesis, the series y_t is presumed to be stationary. This test is commonly known as stationarity test. In the stationarity test, the residual of using the OLS regression of the series y_t on the exogenous forms the basis of the test. In other words, the KPSS test is a similar test to Lagrange Multiplier (LM) test. In spite of the ADF and PP results that can be influenced by the data sample size, the outcome of the KPSS test is independent

whether applied on small or large sample size (McCarthy, 2015:5). The estimation of the KPSS test can be expressed as follows:

$y_t = \delta_0 + \delta_{1t} + u_t$ ..... (5.18)

$u_t = u_t - 1 + \varepsilon t \sim iid\ (0, \sigma_e^2)$ ..... (5.19)

Where δ_0 denotes a constant, t stands for time trend, and u_t denotes the white noise errors. In the KPSS tests the null hypothesis suggests that the variance of the white noise errors is zero. The following is the representation of the null and alternative hypotheses for the KPSS test.

$H_0 : \sigma_e^2 = 0$

$H_1 : \sigma_e^2 \neq 0$

The null hypothesis in KPS the S test suggests that the series y_t is stationary, noted as I (0). The alternative hypothesis suggests that the series y_t contains a unit root, noted as I (1). As one can see, hypotheses in the KPSS oppose the ADF and PP hypotheses. In this regard, Brooks (2008:331) groups these hypotheses as follows:

ADF/PP	KPSS
$H_0 : y_t \sim$ I (1)	$H_0 : y_t \sim$ I (0)
$H_0 : y_t \sim$ I (0)	$H_0 : y_t \sim$ I (1)

These representations result in four possible outcomes:

ADF/PP		KPSS
Reject H_0	and	Fail to reject H_0
Fail to reject H_0	and	Reject H_0
Reject H_0	and	Reject H_0
Fail to reject H_0	and	Fail to reject H_0

Looking at hypotheses above, the conclusion is considered to be robust if results from the test fall under outcomes 1or 2. In this case, both tests reach a similar conclusion, stationary or non-stationary respectively. The last two outcomes (3 & 4) imply conflicting result (Brooks (2008:331). As mentioned earlier, to ensure sound results, this study compares outcomes from both ADF/PP and KPSS. The choice of the correct model for the analysis depends on the unit root/stationarity tests. Therefore, the estimated model is selected based on the following assumptions/statements:

If all variables are stationary, VAR model is estimated

If a mixture of stationary and non-stationary is found within variables, ARDL model is estimated

If all variables are non-stationary, a cointegration test is performed to determine whether a long-run relationship exists between these variables (Brooks, 2002:388). In the absence of cointegration among variables, the VAR model is differentiated. Notwithstanding, if a cointegration is found among non-stationary variables, the error correction is captured using the vector error collection model (VECM). In case of the ARDL model is applied in the study, the error correction model (ECM) is estimated. In this study, the error correction model procedure is followed.

5.3.1.3 Structural breaks unit root test

While analysing time series, it is important to consider structural changes. In the course of the business cycle, structural changes may occur many times as a result of various causes. Changes within the institutional arrangement, regime shifts, policy changes and economic crises are some of the multiple causes of structural changes. If structural changes exist within variables and yet are ignored during the analysis, the null hypothesis of non-stationary may fail to be rejected while series are not stationary (Leybourne & Newbold, 2003:1121). Likewise, if the ADF, PP, and KPSS are the only tests applied on series with structural breaks, the spurious result may be obtained (Perron, 1989:13). Thus, it is important to conduct a structural break unit root test. Peron (1988) suggests the existence of two different forms of structural breaks. The first form of structural breaks is called “single know breakpoints and single unknown breakpoint”. The second form is known as “multiple breakpoints” (Perron, 1989 and 1997). These two forms of structural breaks can either be endogenous or exogenous.

Henceforth, numerous techniques can be applied to detect and test both form of structural breaks (Byrne & Perman, 2006). In Perron structural unit root test, the null hypothesis suggests the presence of unit root within the series. He proved that previously many variables with trend were considered non-stationary while they are stationary. The model B produced by Perron (1989) assists in determining the effect of exogenous shocks on the elasticity of the observed variables. This is the unit root test applied on single common and known breakpoint. The following were the tested hypotheses:

$H_0 : y_t = u_1 + y_{t-1} + (\mu_2 - u_1)\, DU_t + e_t$ ..... (5.20)

$H_A : y_t = u + \beta_1 t + (\beta_2 - \beta_1)\, DT_t + e_t$ ..... (5.21)

Where y_t represents a given series; β_1, β_2 and μ_1 , μ_2 are changes in parameter during the break period (TB). In the current study, the following breakpoints unit root was conducted and compared to other tests (ADF, PP and KPSS) to evade biased results:

The first is called “clash model” testing break within series in level (with intercept)

$x_t = \alpha_0 + \alpha_1 DU_t + \mathrm{d}(DTB)_t + \beta t + \rho x_{t-1} + \sum_{i=i}^{p} \theta_i \, \Delta x_{t-i} + u_t$ ..... (5.22)

The second is a “changing growth model” allowing testing a one-time break within a slope

$x_t = \alpha_0 + \delta_1 DT_t * + \beta t + \rho x_{t-1} + \sum_{i=i}^{p} \theta_i \, \Delta x_{t-i} + u_t$ ..... (5.23)

The third test combines the first and the second. It allows detecting time change in both intercept and slope of series.

$x_t = \alpha_0 + \alpha_1 DU_t + \mathrm{d}(DTB)_t + \delta_1 DT_t + \beta t + \rho x_{t-1} + \sum_{i=i}^{p} \theta_i \, \Delta x_{t-i} + u_t$ ..... (5.24)

Where DU_t denotes a change in the level; DU_t = 1 if (t > TB) and 0 otherwise. DT_t (as well as $DT_t *$) denotes change in the slope of trend function $DT_t *$ = t- TB (or else $DT_t *$ = t if t > TB) and is zero otherwise. The depicted approaches (equations 5.22 – 5.24) to determine the presence of breaks within series as suggested by Peron (1989) were criticized by Zivot and Andrews (1992) arguing that for unknown structural breaks

Perron (1989) overestimates the evidence against the non-stationarity hypothesis. Nonetheless, they agree with Perron in testing three alternatives of breaks unit root namely change in level, change in trend and change in both intercept and trend. The advantage of Zivot and Andrews (1992) approach is that they consider broken trends within time series and consider break point as endogenous. They assert that the potentiality of structural breaks within time series does necessary implies that these breaks exist.

Since both approaches (Perron, Zevot and Andrews) have advantages, this study applies both methods to determine the presence of unit root and a structural break in the series under consideration. Considering the Zivot and Andrews (1992) model, the following hypotheses are tested:

H_0 : $y_t = \mu + y_{t-1} + e_t$

H_A : comprise of following models:

Model 1 $y_t = \hat{\mu}^A + \hat{\theta}^A DU_t(\hat{T}_b) + \hat{\beta}^A t + \hat{\alpha}^A y_{t-1} + \sum_{j=1}^{k} \hat{C}_j^A \Delta y_{t-j} + \hat{e}_t$.....(5.25)

Model 2 $y_t = \hat{\mu}^B + \hat{\beta}^B t + \hat{\gamma}^B DT_t(\hat{T}_b) + \hat{\alpha}^B y_{t-1} + \sum_{j=1}^{k} \hat{C}_j^A \Delta y_{t-j} + \hat{e}_t$..... (5.26)

Model 3 $y_t = \hat{\mu}^C + \hat{\theta}^C DU_t(\hat{T}_b) + \hat{\beta}^C t + \hat{\gamma}^C DT_t(\hat{T}_b) + \hat{\alpha}^C y_{t-1} + \sum_{j=1}^{k} \hat{C}_j^C \Delta y_{t-j} + \hat{e}_t$.....(5.27)

The alternative hypothesis comprises of three models that was the case in the Perron (1989) approach. The first model allows determining the one-time change in levels. The second model tests the stationarity of series around a broken trend. The third model combines model 1 and 2 and test change in levels together with the change of a broken trend.

The current study prioritised the outcome of the third model. In the equation 5.25 to 5.27, DU_t and DT_t represents dummy variables that capture a shift within the intercept and time trend occurring in time TB respectively. In the alternative hypothesis, the series y_t is I (0) with only one structure break and TB is the date of the break, and:

$DU_t = \begin{cases} 1 \text{ if } t > TB \\ 0 \text{ if } t \leq TB \end{cases}$ and $DT_t \begin{cases} t - TB \text{ if } t > TB \\ 0 \text{ if } t \leq TB \end{cases}$

The null hypothesis is rejected if α is statistically significant at 5 percent. In other words the timing region to be $0.05T \leq TB \leq 0.95$.

5.3.2 Toda Yamamoto (T-Y) approach to Granger non-causality Test

The Toda-Yamamoto Granger non-causality test is a procedure produced by Toda and Yamamoto (1995) to determine a causal or a Granger non-causality among variables under study. The T-Y test differs from the Granger causality in considering or adding extra lags on those considered while testing the order of integration. Additionally, the T-Y test applies the Block Exogeneity Wald test which is utilised to test the relationship among variables regardless of their integration order (Hacker & Hatemi, 2006; Lach, 2010a:171; Mehrara, 2014:5). Lach (2010b:168) argues that, due to its underlying nonstandard asymptotic properties and lag sensitivity, the standard Wald test leads to spurious results when applied on I (1) variable and consequently is not a proper method to use in testing causality effects. Contrary to the standard Granger causality test that may consider variables at I (1), the T-Y approach fits the standard VAR model and considers variables in the levels. Consequently, the T-Y approach reduces risks associated with variables' order of integration (Ahmed, 2015:41).

The T-Y approach analyses a VAR model considering the order of lags ($k + d_{max}$). Where *d* denotes the potential maximum number of lags within integration order excluding the true lag order which is denoted by *k*. In conducting the Granger causality test, the VAR model is estimated, and an extra lag is added *k+1,* … up to the maximum number of lags *k+d*. Using this approach, the T-Y suggests that the standard asymptotic theory can assist in testing the restrictions underscoring linear and nonlinear properties.

While conducting T – Y test, it is imperative to first determine the lag length (*k*) and thereafter determine the variables order of integration (*d*) with maximum number of lag (d_{max}) in the model (Awokuse, 2003:130). The T – Y test for causality fits with the ARDL model for both approaches do not require a pre-test for unit roots (Zachariadis, 2006:12-13). Similar to Jebli and Youssef (2015) and Vaona (2012), Toda and Yamamoto (1995) augmented Granger non-causality test is utilised to determine the

causal relationship among the variables. Based on VAR model the T – Y is estimated as follows:

$$\Delta LEMP_t = \alpha_0 + \sum_{i=1}^{K} \beta_i \, \Delta LEMP_{t-i} + \sum_{J=K+1}^{K+d_{max}} \beta_i \, \Delta LEMP_{t-i} + \sum_{i=1}^{K} \delta_i \, \Delta LINVES_{t-i} + \sum_{J=K+1}^{K+d_{max}} \delta_i \, \Delta LINVES_{t-i} + \sum_{i=1}^{K} \sigma_i \Delta LPROD_{t-i} + \sum_{J=K+1}^{k+d_{max}} \sigma_i \Delta LPROD_{t-i} + \sum_{i=1}^{K} \gamma_i \, \Delta LWAGE_{t-i} + \sum_{J=K+1}^{k+d_{max}} \gamma_i \, \Delta LWAGE_{t-i} + \varepsilon_t \quad \text{.....5.27)}$$

$$\Delta LINVES_t = \alpha_0 + \sum_{i=1}^{K} \beta_i \, \Delta LINVES_{t-i} + \sum_{J=K+1}^{K+d_{max}} \beta_i \, \Delta LINVES_{t-i} + \sum_{i=1}^{K} \delta_i \, \Delta LEMP_{t-i} + \sum_{J=K+1}^{K+d_{max}} \delta_i \, \Delta LEMP_{t-i} + \sum_{i=1}^{K} \sigma_i \Delta LPROD_{t-i} + \sum_{J=K+1}^{k+d_{max}} \sigma_i \Delta LPROD_{t-i} + \sum_{i=1}^{K} \gamma_i \, \Delta LWAGE_{t-i} + \sum_{J=K+1}^{k+d_{max}} \gamma_i \, \Delta LWAGE_{t-i} + \varepsilon_t \quad \text{..... (5.28)}$$

$$\Delta LPROD_t = \alpha_0 + \sum_{i=1}^{K} \beta_i \, \Delta LPROD_{t-i} + \sum_{J=K+1}^{K+d_{max}} \beta_i \, \Delta LPROD_{t-i} + \sum_{i=1}^{K} \delta_i \, \Delta LINVES_{t-i} + \sum_{J=K+1}^{K+d_{max}} \delta_i \, \Delta LINVES_{t-i} + \sum_{i=1}^{K} \sigma_i \Delta LEMP_{t-i} + \sum_{J=K+1}^{k+d_{max}} \sigma_i \Delta LEMP_{t-i} + \sum_{i=1}^{K} \gamma_i \, \Delta LWAGE_{t-i} + \sum_{J=K+1}^{k+d_{max}} \gamma_i \, \Delta LWAGE_{t-i} + \varepsilon_t \quad \text{..... (5.29)}$$

$$\Delta LRWAGE_t = \alpha_0 + \sum_{i=1}^{K} \beta_i \, \Delta LRWAGE_{t-i} + \sum_{J=K+1}^{K+d_{max}} \beta_i \, \Delta \mathrm{LRWAGE}_{t-i} + \sum_{i=1}^{K} \delta_i \, \Delta LINVES_{t-i} + \sum_{J=K+1}^{K+d_{max}} \delta_i \, \Delta LINVES_{t-i} + \sum_{i=1}^{K} \sigma_i \Delta LPROD_{t-i} + \sum_{J=K+1}^{k+d_{max}} \sigma_i \Delta LPROD_{t-i} + \sum_{i=1}^{K} \gamma_i \, \Delta LEMP_{t-i} + \sum_{J=K+1}^{k+d_{max}} \gamma_i \, \Delta LEMP_{t-i} + \varepsilon_t \quad \text{..... (5.30)}$$

Where: $LEMP$ denotes employment in the indicated individual sector. This equation 5.27 was also estimated for each of sector's employment. Additionally, α_0, β_i, δ_i, σ_i and γ_i represent parameters and residuals in the estimated model where d_{max} is the maximum potential number of lag in the model, *k* denotes the optimal lag and finally the e_t represent the error term. Considering the causal relationships between each two variables X and Y the test is conducted as follows:

$\varphi_{2i} \neq 0$ *and* $\varphi_{1i} = 0$: suggesting that Y lead X or lag X,

$\delta_{1i} \neq 0$ *and* $\delta_{2i} = 0$: indicating that X lead Y or lag Y,

$\varphi_{2i} = 0$ *and* $\delta_{1i} = 0$: indicating that Y and X are independent,

$\varphi_{2i} \neq 0$ *and* $\delta_{1i} \neq 0$: suggesting an interaction and a bidirectional relationship between Y and X series, the dependent and independent variable respectively.

It was aforementioned that the maximum and optimum number of lags selected is indispensable to determine the outcome. It is, therefore, necessary that the lag selection precedes the T – Y Granger non-causality tests.

5.3.3 The autoregressive distributed lag (ARDL) model or standard ARDL

The VAR model, to be stationary, requires series to have the same order of integration. Additionally, the VAR model tests the reciprocal or mutual relationship between variables. Thus, if the number of utilised variables equals the number of analysed equations in the study, all variables are considered to be endogenous. Nonetheless, it is possible that one variable affects the other without reciprocal effect. In other words, one variable can be endogenous while others are all treated as exogenous. For this reason and many others, Pesaran and Shin (1998) and Pesaran *et al.* (2001) develop and revised a new model that can overcome the weaknesses of the VAR model. This model focuses on a single equation. Similar (ARDL model) single equation is estimated for each equation under the study.

The standard linear ARDL cointegration model noted as ARDL (p,q) with two variable Y_t and X_t introduced by Pesaran and Shin (1999) and revised by Pesaran *et al.(*2001) is represented in the following form:

$$\Delta y_t = \alpha_0 + \rho y_{t-1} + \theta x_{t-1} + \gamma z_t + \varphi_0 + \sum_{j-1}^{p-1} \alpha_j \Delta y_{t-j} + \sum_{j-0}^{q-1} \varphi \pi_j \Delta x_{t-j} + u_t \quad \text{.....(5.31)}$$

Where z_t denotes a vector of deterministic vector (seasonal, trends and other exogenous factors, with fixed lags); and u_t represents an *iid* stochastic process. Under the null hypothesis (i.e., the absence of cointegration between Y_t and X_t), the lagged coefficient of the variables Y_t and X_t in Equation (31) are jointly equal to zero (ρ = θ = 0). Pesaran *et al*. (2001) suggest that the no cointegration assumption can be tested either by the use of a modified F-test or else by the use of a Wald test (in case of violation of certain classical assumptions). The test results are judged based on two critical bounds (lower and upper). If the value of the modified F-test statistics exceeds the value of the upper bound, the null hypothesis is rejected in the favour of the alternative hypothesis, meaning that there is sufficient evidence that a long-run relationship exists between variables Y_t and X_t. However, if the value of the modified F-test is smaller than lower bound, the null hypothesis is not rejected.

Finally, the test is inconclusive if the calculated F-value lies between the lower and upper bound. One of numerous benefits of the ARDL is that besides being more flexible it evades the “pre-test bias”, meaning the specification of the long-run model is based only on the fact that variables are integrated of the first order (Pesaran *et al.,* 2001; Romilly *et al.,* 2001). Since there is no certain evidence that a linear relationship exists between the dependent and independent variables, it is necessary to analyse that relationship using a nonlinear model.

Many advantages are attributed to the ARDL model. Contrary to the alternative traditional models, such as Johansen’s test for cointegration (Johansen, 1991), Granger/Engle test (Engle & Granger 1987) and VAR; the ARDL model can be utilised to relationships for variables that are either I (0) or I (1) as well as for a mixture of I (0) and I (1). Nonetheless, ARDL is not efficient for nonstationary to be integrated into the second order I (2) (Adom *et al.,* 2012; Dube & Zhou, 2013:203; Duasa, 2007). Unlike vector autoregressive and other conventional cointegration techniques that use a large sample to ascertain accurate result, the bound test for cointegration or ARDL results are not affected by the sample size (Dritsakis, 2011:12; Guan *et al*., 2015:393;). Furthermore, using the ARDL model, short-run and long-run are estimated simultaneously (Hamuda *et al.,* 2013:62). However, as mentioned earlier, the ARDL model is ineffective on variables that are integrated at the second difference, I (2), if the I (2), variables are utilised the ARDL reaches unreliable outcome (Ouattara, 2004).

Due to the mentioned advantages of ARDL model, this study applied the ARDL model to assess the short and long-run between series under consideration. Moreover, since variables might have an asymmetric relationship, the estimation of linear ARDL is followed by the nonlinear (NARDL) analysis.

5.4 MODEL SPECIFICATION FOR STANDARD OR LINEAR ARDL

When assessing potential relationships between two or more series, the researcher frequently postulates a model. In accordance with the equation 5.20, Y denotes the dependent variable and X is a vector of Y (independent variable) and *f* denotes a function.

$$Y=f(X) \quad \text{(5.32)}$$

The model (ARDL) introduced by Pesaran *et al.* (2001) captures relationships in *f(X).* This is a simple version of the ARDL model. If two variables are considered, the model ARDL (1, 1) is estimated as follows:

$$y_t = \alpha_0 + \beta_1 y_{t-1} + \delta_0 x_t + x_{t-1} + u_t \quad \text{..... (5.33)}$$

Where u_t denotes random error term. If variables cointegrate the error term model is derived from equation 5.34 as follows:

Let $x_t = x_{t-1} + \Delta x_t$ and $y_t = y_{t-1} + \Delta y_t$. Putting into equation 5.34 it yields the following results:

$$\Delta y_t = \alpha_0 - (1-\beta_1)\, y_{t-1} + \delta_0 \Delta x_t + (\delta_0 + \delta_1)\, x_{t-1} + u_t \quad \text{..... (5.34)}$$

The error correction is obtained by rearranging the above equation:

$$\Delta y_t = \delta_0 \Delta x_t - (1-\beta_1)\left[y_{t-1} - \frac{\alpha_0}{1-\beta_1} - \frac{(\delta_0 + \delta_1)}{1-\delta_1} x_{t-1}\right] + u_t \quad \text{..... (5.35)}$$

In the equation 5.35, the error correction is in the corner brackets, whilst $\frac{\alpha_0}{1-\beta_1}$ and $\frac{(\delta_0 + \delta_1)}{1-\delta_1}$ are the long-run coefficients. As it is presented above, the ARDL model is performed into stages or steps. The first stage focuses on cointegration or the long-run analysis following the bound testing approach suggested by Pesaran and Shin (1989) and Pesaran *et al.* (2001). The second stage depends on the first stage results. In other words, the second stage is performed if a cointegration was found in the first stage. This stage, the error correction model is estimated to illustrate the short-run dynamics (Adamu, 2014:23).

Applying the ARDL to the current study to test the relationship between sectoral employment, investment spending, productivity and real wage in the different economic sector; the estimation is expressed as follows:

$$\Delta LEMP_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \Delta LEMP_{t-j} + \sum_{j=0}^{k} \gamma_j \Delta LINVES_{t-j} + \sum_{j=0}^{k} \delta_j \Delta LPROD_{t-j} + \sum_{j=0}^{k} \lambda_j \Delta LWAGE_{t-j} + \varphi_1 LEMP_{t-1} + \varphi_2 LINVES_{t-1} + \varphi_3 LLPROD_{t-1} + \varphi_4 LWAGE_{t-1} + e_t e_t \ldots\ldots \quad \text{..... (5.36)}$$

Or else (in presence of structural breaks):

$$\Delta LEMP_t=\alpha_0+\sum_{j=1}^{k}\beta_j\Delta LEMP_{t-j}+\sum_{j=0}^{k}\gamma_j\Delta LINVES_{t-j}+\sum_{j=0}^{k}\delta_j\,\Delta LPROD_{t-j}+$$
$$\sum_{j=0}^{k}\lambda_j\Delta LWAGE_{t-j}+\varphi_1 LEMP_{t-1}+\varphi_2 LINVES_{t-1}+\varphi_3 LLPROD_{t-1}+\varphi_4 LWAGE_{t-1}+\varphi_5 T$$
$$+\varphi_6 D+e_t \quad \text{..... (5.37)}$$

Where $LEMP$ denotes the natural logarithm of employment (EMP), $LINVES$ is the natural logarithm of investment spending($LINVES$), $PROD$ represents the natural logarithm of labour productivity($PROD$), and $LWAGE$ symbolises the real wage ($WAGE$).The coefficients, β_j, γ_j, δ_j, and λ_j represent short-run changes of the model. Long-run coefficients are represented byφ_1, φ_2, φ_3, φ_4 , φ_5, φ_6 while α_0 and e_t denote the constant and the error terms, respectively. If breaks are included into the model dummy (D_{is}) variables will be created: $D = 1$ and 0 otherwise. Within the model that does not includes breaks φ_5 = φ_6 = 0. The equation 5.37 is applied firstly to each sector under consideration when testing the effect of investment spending, labour productivity and real wage on employment. Secondly, to evade a repetition, the same equation is applied when analysing the effect of changes in one sector's employment towards other sectors' employment. Thirdly, since the aim of the study is to analyse the interaction among variables, the equation 5.38 and equation 5.39 (if break considered) are also applied on the analysis of the interrelationship between investment spending, labour productivity and real wage. Thus, the procedure utilised to analyse the effect of changes in one variable to other variables, is applied to each variable under the study.

To test the cointegration, the following hypotheses are set:

H_0: for no cointegration:φ_1= φ_2 = φ_3= φ_4= 0

H_1: for cointegration: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq 0$

The bound test for cointegration or F-test is utilised to determine where the null hypothesis of no cointegration is rejected or not. Using this test, the estimated F-statistics is compared to the critical value of Pesaran *et al*. (2001) table. If the computed F-value is greater than the upper bound in critical values, then the null hypothesis is rejected. If the computed F-value is below the lower critical value, the study fails to reject the null hypothesis. Failure to reject the null hypothesis implies the absence of cointegration among variables.

The presence of cointegration among variables suggests a long-run relationship among variables. In case the calculated F-value falls between the lower and the upper bound of critical values unless further information is provided, the test result remains inconclusive (Atif *et al*., 2010:30-37; Dube & Zhou, 2013). If a cointegration or long-run relationship exists between employment, investment spending, labour productivity and the real wage, the null hypothesis is rejected. The rejection of the null hypothesis implies that in the long-run all these variables (investment spending, productivity and, real wage) affect employment level. Consequently, the estimation of the error correction model (ECM) is a necessity. From the ARDL model estimated in the Equation 5.37, the following ECM is derived:

$$\Delta LEMP_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \Delta LEMP_{t-j} + \sum_{j=0}^{k} \gamma_j \Delta LINVES_{t-j} + \sum_{j=0}^{k} \delta_j \Delta LPROD_{t-j} + \sum_{j=0}^{k} \lambda_j \Delta LWAGE_{t-j} + \vartheta ECT_{t-1} + e_t \quad (5.38)$$

Where ECT is the error correction term that measures speed of adjustment towards long-run equilibrium and the ϑ is the error term coefficient. In case the series under consideration contains structural changes (breaks), the ECM is estimated as follows:

$$\Delta LEMP_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \Delta lEMP_{t-j} + \sum_{j=0}^{k} \gamma_j \Delta LINVES_{t-j} + \sum_{j=0}^{k} \delta_j \Delta LPROD_{t-j} + \sum_{j=0}^{k} \lambda_j \Delta LWAGE_{t-j} + \sigma_1 T + \sigma_2 D + \vartheta ECT_{t-1} + e_t \quad (5.39)$$

As the importance of lag selection was mentioned in regard to econometric analysis, the lag selection was performed prior (automatically) to the ARDL model analysis. The number of lags (k) was selected building on the IBC comparison of six different criteria previously explained under the section of lag selection. Prior to the ECM results discussion, various diagnostic test such abnormality, autocorrelation, heteroscedasticity and parameter stability tests were performed to determine whether the model stochastic properties were met also to check out the fitness of the model (Maddala, 2001).

5.5 NONLINEAR ASYMMETRIC COINTEGRATION

Models described above are under assumption that the variables have a linear long-run relationships that is a linear cointegration. However, it is also important to consider the nonlinear aspect of variables, because a cointegration among variable is either

positive or negative. Yet, sometimes one can make a conclusion that variables do not cointegrate, while those variables cointegrate that is what is known as, a “hidden cointegration”. Thus, a possibility of cointegration nonstationary variables (Granger & Yoon, 2002:4-5). There is a possible way to find hidden information that may explain a cointegration of some components among others. While a simple cointegration can be detected using a simple regression, a hidden cointegration is determined through the error corrections (ECMs) (Granger & Yoon, 2002:4). In this study, the hidden cointegration is tested using error correction models and thereafter the size of conventional cointegration is examined through Monte Carlo simulations. The following is a representation of time series integrated of the first order with an ARIMA (p,1, q) containing a random work with a probability of having drift as suggested by Beveridge and Nelson (1981). The following is the simple bivariate representation considering random, two works without drifts:

$X_t = X_{t-1} + \varepsilon_t = X_0 + \sum_1^t \varepsilon_i$ ..... (5.40)

and

$Y_t = Y_{t-1} + \eta_t = Y_0 + \sum_1^t \eta_i$ ..... (5.41)

Where t = 1, 2, 3…, and X_0 and Y_0 represent initial values. ε_i and η_i denote white noise both with means. At this first stage it is not yet discussed whether *X* and *Y* are cointegrated or not. Defining new variables:

$\check{\varepsilon}_i$ = *max* (ε_i , *d*) and $\hat{\varepsilon}_i$ = *min* (ε_i , *d*).

Where $\varepsilon_i = \check{\varepsilon}_i + \hat{\varepsilon}_i - d$ and this *d* known as threshold. The popular or general choice would be ε_i^+ = *max* (ε_i, 0) and ε_i^- = min (ε_i, 0). The threshold must be chosen in such a way $\varepsilon_i = \hat{\varepsilon}_i$ or else ε_i = 0 because all *i* have to be excluded. Additionally, if $\varepsilon_i = \check{\varepsilon}_i$ for all small number of $i \in K$, whilst $\varepsilon_i = \hat{\varepsilon}_i$ for most of $i \in \mathbb{N}_+ - K$, it is more like using dummy variable for some of $i \in K$. From here it can be assumed that, $\sum_i^t \hat{\varepsilon}_i$, $\sum_i^t \widehat{\eta_i}$, $\sum_i^t \check{\varepsilon}_i$, and $\sum_i^t \check{\eta}_i$are all I(1). Now it is important to determine some criterion in making the choice of *d.* Although there could be more two components of interested series *X* and *Y*. Nonetheless, in simple way it possible to consider two components as follow:

$X_t = X_{t-1} + \varepsilon_t = X_0 + \sum_1^t \hat{\varepsilon}_i + \sum_1^t \check{\varepsilon}_i - dt.$ ..... (5.42)

and

$Y_t = Y_{t-1} + \eta_t = Y_0 + \sum_1^t \hat{\eta}_i + \sum_1^t \check{\eta}_i - dt.$ ..... (5.43)

To be more convenient, it is important to set *d = 0,* in further equations, to ease explosion in further equations *d* = 0 is utilised and where necessary the results of *d* ≠ 0 are mentioned. Furthermore, X_0 is assumed to be a constant and $X_t = X_t^+ + X_t^-$, where $X_t^+ = \sum_1^t \varepsilon_i^+$ and $X_t^- = \sum_1^t \varepsilon_i^-$. It follows that $\Delta X_t^+ = \varepsilon_i^+$ and $\Delta X_t^- = \varepsilon_i^-$. Kipping in mind that there is no need to estimate if $\Delta X_t > 0$, $\varepsilon_i^+ = \Delta X_t$, and $\varepsilon_i^- = 0$ for instance. The following observations are noted on $\{\varepsilon_i^+ \ \varepsilon_i^-\}$ under assumption that $\varepsilon_i \sim N(0, 1)$:

First $\varepsilon_i^+ \sim d\left(\frac{1}{\sqrt{2\pi}}, \ \frac{1}{2}\frac{\pi-1}{\pi}\right)$ with $E[\varepsilon_i^+ \ \varepsilon_i^-] = 0$. *d* (. , .) denoting means=and variance of a random variable.

Secondly it is important to define $\nu_i^+ = \varepsilon_i^+ - \frac{1}{\sqrt{2\pi}}$, and then $X_t^+ = \frac{1}{\sqrt{2\pi}}t + \sum_1^t \nu_i^+$, where $\varepsilon_i^+ \sim d\left(0, \ \frac{1}{2}\frac{\pi-1}{\pi}\right)$. Thus, both X_t^+ and X_t^- are random work with drift. Like Schorderet (2001), various general expressions can be represented with no specific distribution. In regard to this study the sum of positive and negative shocks are expressed as follow: $\{\sum_1^t \varepsilon_i^+ \ \ \sum_1^t \eta_i^+\} = \{X_t^+ \ \ Y_t^+\}$ and $\{\sum_1^t \varepsilon_i^- \ \ \sum_1^t \eta_i^-\} = \{X_t^- \ \ Y_t^-\}$.

Now it is time to consider the cointegration between those nonstationary components of series *X* and series *Y*. Meaning that a hidden cointegration exist between series *X* and *Y* if their components cointegrate with each other. It will be shown that only under a specific circumstance the hidden cointegration between the two-nonstationary series (X and *Y*) implies a standard cointegration. Implicitly, for convenience, it is assumed that neither: $\{\sum_1^t \varepsilon_i^+ \ \ \sum_1^t \eta_i^+\}$ nor $\{\sum_1^t \varepsilon_i^- \ \ \sum_1^t \eta_i^-\}$ are cointegrated in the subsequent discussion.

Nonetheless, the empirical part of the study will test the presence of cointegration between the two. Firstly, let us consider the absence of cointegration between the components of data series in different four cases:

Case 1: Neither $\{\sum_1^t \varepsilon_i^+ \quad \sum_1^t \eta_i^+\}$ nor $\{\sum_1^t \varepsilon_i^- \quad \sum_1^t \eta_i^-\}$ are cointegrated. This means that series *X* and *Y* are not cointegrated and are subjected to negative and positive shocks which have their own distinct stochastic trends. The subsequent case is more interesting:

Case 2: Either $\{\sum_1^t \varepsilon_i^+ \quad \sum_1^t \eta_i^+\}$ or $\{\sum_1^t \varepsilon_i^- \quad \sum_1^t \eta_i^-\}$, are integrated, but not both. Consequently, series *X* and *Y* comprise either common negative or common positive shocks, yet not both. For instance, when summations of positive shocks cointegrate, both series X and Y are subjected to mutual positive shocks. Nevertheless, the summation of common negative components do not cointegrate due to, for example, diverse degrees of downward rigidity in series *X* and *Y.* Albeit the absence of cointegration between *X* and *Y*, they contain more structure than those available in preceding case1. In case the study is interested in determining only the long-run relationships or cointegration between series under consideration, *X* and *Y* for instance, the information on hidden cointegration will be treated as irrelevant or rather less useful.

Case 3: Both $\{\sum_1^t \varepsilon_i^+ \quad \sum_1^t \eta_i^+\}$ and $\{\sum_1^t \varepsilon_i^- \quad \sum_1^t \eta_i^-\}$ are cointegrated, yet with different cointegrating vectors. Similar to the first case, series *X* and *Y* are not cointegrated, yet they possess common negative and positive shocks. In addition, these common shocks do not integrate. Therefore, to ensure a cointegration between the two series (*X* and *Y*), an additional condition is required.

Case 4: Both $\{\sum_1^t \varepsilon_i^+ \quad \sum_1^t \eta_i^+\}$ and $\{\sum_1^t \varepsilon_i^- \quad \sum_1^t \eta_i^-\}$ are integrated with similar cointegrating vectors. In this case, the negative and positive shocks are cointegrated with the identical cointegrating vectors. Thus, they have one common shock. This common stochastic trend between *X* and *Y* is the key driver or responsible for the long run dynamic between series *X* and *Y*. The case 4 illustrates the cointegration between *X* and *Y*.

The discussion above establishes how important cointegration analysis is, and a different approach that can be utilised depending on the type of cointegration needed. Two or more series, to be cointegrated, need to have common nonstationary components that are cointegrated with the same cointegrating vectors (Granger &Yoon, 2002:10). The case 1 to 3 abovementioned displays when series *X* and *Y* are

not cointegrated yet with a different degree of no-cointegration. The case 4 is the one with cointegration and it is the one applied, on the ARDL models, in the current study.

5.5.1 The Nonlinear Autoregressive Distributed Lag Model (NARDL)

Nonlinearity in the macroeconomic variable is not a new topic. Keynes (1936:314) highlighted an often tendency of violent substitution between upward and downward movement in macroeconomic variables over the business cycle. Although in most cases, while conducting econometric and modelling analysis, scholars use a generalised estimation that linear relationships among variables under consideration. It was proven by Shin *et al.* (2014) that a positive and negative relationship exists among variables. Therefore, the generalisation of linear relationships might lead to biased results. Despite that the normal ARDL is recognized to be a significant model to analyse the effect or a linear relationship among variables, the nonlinear ARDL (NARDL) is the most convenient model that enables the analysis of non-linearity, non-stationary and, more importantly, it assists in detecting asymmetric effects in both short and long-run (Fousekis *et al.,* 2016:500)

The Nonlinear Autoregressive Distributed Lag Model (NARDL) is employed in this study to explore the effect of the independent variable on the dependent variable taking into account the structural changes over the short and long-term periods. Because of its significance and flexibility, the NARDL have been applied by different scholars on macrocosmic and financial variables (Delatte & Lopez-Villavicencio, 2012; Greenwood-Nimmo *et al.,* 2013; Nguyen & Shin, 2010; Van Treeck, 2008).

Studies reviewed in the empirical literature, generally employed the OLS, VAR, VECM, Granger causality and the standard ARDL approach. None of them employed the NARDL to determine the relationships between employment, investment spending, labour productivity and real wage. Yet, as depicted in section 5.1 and 5.4, the presence of cointegration between variables suggests the existence of hidden cointegration that deserves attention in analysing long-run relationship among variables. Thus, these studies assumed a symmetric (linear relationship) between employment and the other macroeconomic variables. Yet, it is not always the case that variables are symmetric because economic policy undertaken during the economic business cycle cause perturbations within economic variables' relationship. In the standard ARDL, the

combination of regressors is assumed to be linear, meaning the symmetric adjustment in both the short and long-run (Fousekis *et al.,* 2016:500). To ensure the accurate results, recently Shin *et al*. (2014) introduced the nonlinear ARDL (NARDL) in which the variable X_t is divided into its partial sums (negative and positive). The advantage of the NARDL over the standard ARDL is that it considers positive and negative shocks to the dependent variable. The following is the representation provided by Shin *et al*. (2014):

$x_t = x_0 + x_t^+ + x_t^-$ ..... (5.44)

$x_t^+ = \sum_{j=1}^{t} \Delta x_j^+ = \sum_{j=1}^{t} \max(\Delta x_j, 0)$ and $x_t^- = \sum_{j=1}^{t} \Delta x_j^- = \sum_{j=1}^{t} \min(\Delta x_j, 0)$ ..... (5.45)

Thereafter, the asymmetric cointegration equilibrium is expressed as follow:

$y_t = \beta^+ x_t^+ + \beta^- x_t^- + u_t$ ..... (5.46)

Where β^- and β^+ denote asymmetric long-run, parameters associated with negative and positive fluctuations in x_t respectively. Shin *et al*. (2014) suggest that a combination of the Equation 5.44 with the standard ARDL (p,q) model represented in Equation 5.33, results in NARDL(p,q) model expressed as:

$\Delta y_t = \alpha_0 + \rho y_{t-1} + \theta^+ x_{t-1}^+ + \theta^- x_{t-1}^- + \sum_{j-1}^{p-1} \alpha_j \Delta y_{t-j} + \sum_{j-0}^{q-1} (\eta_j^+ \Delta x_{t-j}^+ + \eta_j^- \Delta x_{t-j}^-) + u_t$ ..... (5.47)

Where $\theta^+ = -\rho/\beta^+$ and $\theta^- = -\rho/\beta^-$

The implementation of the NARDL model into empirical results comprises four steps. The first step is to estimate the Equation 5.45 using the standard OLS. The second step is to verify whether an asymmetric cointegration exists between the levels of the series y_t , x_t^+, and x_t^- . Following the Shin *et al*. (2014) approach, the null hypothesis suggesting the absence of cointegration ($\rho = \theta^+ = \theta^- = 0$ can be estimated using the computes F-test suggested by Peseran *et al*. (2001). The third step is to conduct a test for short and long-run symmetry. On one hand, in testing the long run symmetry, the appropriate null hypothesis is formulated as: $\beta^+ = \beta^-$ (i.e. $-\theta^+/\rho = -\theta^-/\rho$) and it is test using the standard Wald test.

On the other hand, in testing short-run symmetry, the appropriate null hypothesis can take two forms. The first form (strong form) is the pairwise symmetry necessitating $\eta_j^+ = \eta_j^-$ for all j = 1, …, q-1). The second form (weak form) is additive symmetry requiring $\sum_{j-0}^{q-1} \eta_j^+ = \sum_{j-0}^{q-1} \eta_j^-$. Both two hypotheses are also tested using the standard Wald test. If an asymmetry exists either in long-run, short-run or in both, the fourth step encompasses dynamic multipliers (positive and negative) in acquaintances with unit changes in x_t^+ and x_t^-. The following is the approach to calculate those changes:

$m_h^+ = \sum_{j=0}^{h} \frac{\partial y_{t+j}}{\partial x_t^+} = \sum_{j=0}^{h} \lambda_j^+$ and $m_h^- = \sum_{j-0}^{h} \frac{\partial y_{t+j}}{\partial x_t^-} = \sum_{j=0}^{h} \lambda_j^-$ with h = 0, 1, 2, …, for x_t^+ and x_t^- respectively …….…. (5.48)

It is important to note that for h → ∞, then $m_h^+ \to \beta^+$ and $m_h^- \to \beta^-$. Portraying and analysing the way of equilibrium adjustment and/or the duration the equilibrium resulting in positive or negative changes in the independent variable. Thus, m_h^+ and m_h^- provides necessary information to the short and long-run patterns of asymmetry.

5.6 EMPIRICAL MODEL

To ensure better results, the study analysed a linear and nonlinear relationship between sectoral employment and the independent variables (investment spending, productivity and real wage).

Following Shin *et al.* (2014) and considering the Equation 1 in which the series X represents independent variables. The study decomposed the underlined independent variables' fluctuations into positive and negative partial sums. The following is the estimated approach:

$LINVES_t^+ = \sum_{j-1}^{t} \Delta LINVES_t^+ = \sum_j^t \max(\Delta LINVES_j, 0)$

$LINVES_t^- = \sum_{j-1}^{t} \Delta LINVES_t^- = \sum_j^t \min(\Delta LINVES_j, 0)$

$LPROD_t^+ = \sum_{j-1}^{t} \Delta LPROD_t^+ = \sum_j^t \max(\Delta LPROD_j, 0)$

$LPROD_t^- = \sum_{j-1}^{t} \Delta LPROD_t^- = \sum_j^t \min(\Delta LPROD_j, 0)$ …….... (5.49)

$LWAGE_t^+ = \sum_{j-1}^{t} \Delta LWAGE_t^+ = \sum_j^t \max(\Delta LWAGE_j, 0)$

$LWAGE_t^- = \sum_{j-1}^{t} \Delta LWAGE_t^- = \sum_j^t \min(\Delta LWAGE_j, 0)$

The independent variables were decomposed into two partial sums. Each of these partial sums indicates that the variable comprises positive (increases) and negative (decreases) effects. These decompositions are supported by Granger *et al*. (2002) who states that two cointegrated series with their positive and negative components possess a hidden cointegration. In this cointegration, a linear cointegration is a case of a simple case of a nonlinear cointegration. Integrating Equation 5.48 with partial sums (NARDL introduced by Shin *et al*., 2014) on the Equation 5.40 introduced by Pesaran *et al.* (2001), assists in using the bound test and enables to estimate the impact of investment spending, productivity and real wage using the following equation 5.50:

$$\Delta LEMP_t = \gamma_0 + \sum_{j=1}^{k} \gamma_{1j} \Delta LEMP_{t-j} + \sum_{j=0}^{k} \gamma_{2j} \Delta LINVES_{t-j}^{+} + \sum_{j=0}^{k} \gamma_{3j} \Delta LINVES_{t-j}^{-} + \sum_{j=0}^{k} \Delta\gamma_{4j} LPROD_{t-j}^{+} + \sum_{j=0}^{k} \gamma_{5j} \Delta LPROD_{t-j}^{-} + \sum_{j=o}^{k} \lambda_{6j} \Delta LWAGE_{t-j}^{+} + \sum_{j=0}^{k} \gamma_{7j} \Delta LWAGE_{t-j}^{-} + \varphi_1 LEMP_{t-1} + \varphi_2 LINVES_{t-1}^{+} + \varphi_3 LINVES_{t-1}^{-} + \varphi_4 LPROD_{t-1}^{+} + \varphi_5 LPROD_{t-1}^{-} + \varphi_6 LWAGE_{t-1}^{+} \varphi_7 LWAGE_{t-1}^{-} + e_t \quad (5.50)$$

The equation 5.50 displays a nonlinear model which able to capture all effects (positive and negative) of investment spending, productivity and real wage on sectoral employment variations. Assumptions, procedure and estimation of nonlinear equation 5.49 are similar to the linear or standard ARDL expressed earlier in the Equation 5.37. The use of modified F-test and bound testing method enables to determine cointegration or long-run relationships between *LEMP,* $LINVES^{+}$, $LINVES^{-}$, $LPROD^{+}$, $LPROD^{-}$, $LWAGE^{+}$, and $LWAGE^{-}$.

The use of both linear ARDL and NARDL approaches assists in detecting the existing linear and nonlinear relationships among variables. In other words, these models allow the estimation of symmetric and asymmetric effects. This enables also the determination of statically impact (positive and negative) of independent variables on dependent variables. Additionally, the short-run statistical effects of independent on the dependent variable are determined using partial sum components. For instance, $\sum_{j=0}^{k} \hat{\gamma}_{2j} \neq \sum_{j=0}^{k} \hat{\gamma}_{3j}$ implies that investment spending impacts on sectoral employment are asymmetric in the long-run. Precisely, $\hat{\gamma}_{2j} \neq \hat{\gamma}_{3j}$ suggests asymmetric effect of investment spending on employment in the quarter, j_{th}. Inversely, a symmetric impact of investment spending on employment exists, if $\hat{\gamma}_{2j} = \hat{\gamma}_{3j}$. Although, this study

generally ponders sectoral employment as dependent variable and investment spending, labour productivity and real wage; since the focus is to analyse the interaction among variables, in the analysis section each variable is considered to be both dependent and independent.

5.7 CHAPTER SYNOPSIS

The focus of this chapter was to provide and discuss the data source, data selection and econometric techniques designed for the analysis. The source of data to be analysed in chapter six is the South African Reserve Banks and quarterly time series acquired. Data consists of sectoral employment tougher with labour productivity, investment spending and real wage. The choice of economic sectors was based on the role played by these sectors into the South African economy. To evade the effect of the economic embargo imposed on the apartheid government, the period for this study's data starts from 1995 ending in 2017. The study did consider the year 1994 as an economic transition year between apartheid era and the democratic governance.

The discussion on methodology provided the literature and procedure undertaken in applying two econometric models namely the linear/symmetric (standard) Autoregressive Distributed Lag (ARDL) model and the nonlinear/asymmetric Autoregressive Distributed Lag (NARDL) model. Since each econometric model possesses its own strengths and flaws, the two models were selected to compare whether they generate the same results or not. Each model to be performed requires other econometric steps and procedures. Henceforth, some of procedures such as unit root lag selection, Granger causality, and diagnostic tests were also discussed in this chapter. Both models and their techniques are applied in the subsequent chapter focusing on the empirical estimations. The central goal of chapter six is the regression analysis, presentation of results and discussion.

CHAPTER 6

EMPIRICAL FINDINGS AND DISCUSSION

6.1 INTRODUCTION

In the previous chapter, the methods and approaches to be utilised in the analysis were discussed. Chapter five represented the source and sample of the macroeconomic series to be analysed in this chapter. Additionally, the choice and the usefulness of standard ARDL and NARDL models were illustrated and, given the quality of series and the other considerations, the standard ARDL and NARDL were justified to be the veracious models for this study's analysis. The present chapter focusses on the estimation and analysis of long, short-run and causal relationships among variables under consideration. The analysis starts with preliminary analysis such as graphical and correlation analysis. The order of integration is determined using different unit root approaches. After conducting the unit root and stationarity tests, the long and short-run are analysed.

Since the linear standard (linear) ARDL analysis leads to general conclusion and nonlinear ARDL provides positive and negative relationship among variables, a linear and nonlinear relationship among variables is estimated using the standard ARDL and NARDL models. In other words, the long-run and short-run relationships are analysed using linear and nonlinear ARDL. The application of these two models assists in determining how change in one variable affects the other variables behaviours. After each analysis of long-run relationships, a diagnostic test is performed to ensure the reliability of findings. Additionally, the short-run relationship is analysed using the Error Correction Model (ECM) and the short-run results are reported together with error correction terms. The error correction model is performed to determine whether the employed models come back to the equilibrium after short-run shocks or if the model is explosive.

Additionally, after the linear regression among variables, the Toda-Yamamoto test for non-Granger causality is utilised to determine the causal relationships among variables. The T-Y test comes after the standard ARDL analysis for both to consider

a linearity of variables under consideration. Furthermore, dynamic multipliers asymmetries were analysed to determine which independent variable is more effective towards sectoral employment. All interpretation in this study was made under the assumption "*ceteris paribus*". Lastly, the chapter ends with a concise summary of findings.

6.2 PRELIMINARY ANALYSIS

6.2.1 Graphical analysis

While conducting econometric tests, it is important to include graphical analysis of series. Graphical analysis assists in explaining series movement as well as identifying feasible model deficiencies within series. Deficiencies are more likely to be observed in form of inhomogeneous variances, structural breaks and outliers (Lütkepohl & Krätzig, 2004:40). The identified deficiencies and others are more likely to impact on model findings and may also impede the regression outcome. It is therefore, indispensable to identify series distortions before econometric model analysis. The graphical analysis is also a simple method to determine whether variables are stationary or non-stationary. Any given time, time series is stationary if its variance and mean are constant over time. However, the mean and variance can oscillate over time. The mean and variance can increase (upward trend) or decrease (downward trend) over time (Holm, 2006:16). This justifies the importance of graphical analysis before any other econometric analysis.

As displayed in Figure 6.1 and Figure 6.2, variables under the study exhibit both upward and downward trends. Thus, employment in manufacturing and mining sectors generally experienced downward trends whilst the rest of variables mostly underwent upward trends. Thus, all of these variables experienced economic fluctuations between 1995 and 2017. While independent variables (labour productivity, investment spending and real wage) have an ongoing upward trend, the dependent variables (sectoral employment) keeps shrinking. Meaning that the independent variables were sufficient to change employment or affect the labour market. Nonetheless, despite praises attributed to the graphical analysis, it also has its own shortcomings. Instead of being a confirmatory test, it is rather an indicator test. Therefore, a post graphical test such as unit root test and stationary test are important. Correlation test is also

considered as confirmatory test of graphical test outcome. This justifies why after the result of graphical analysis represented in Graph 6.1 and 6.2, the correlation analysis, unit root and stationarity tests were also performed.

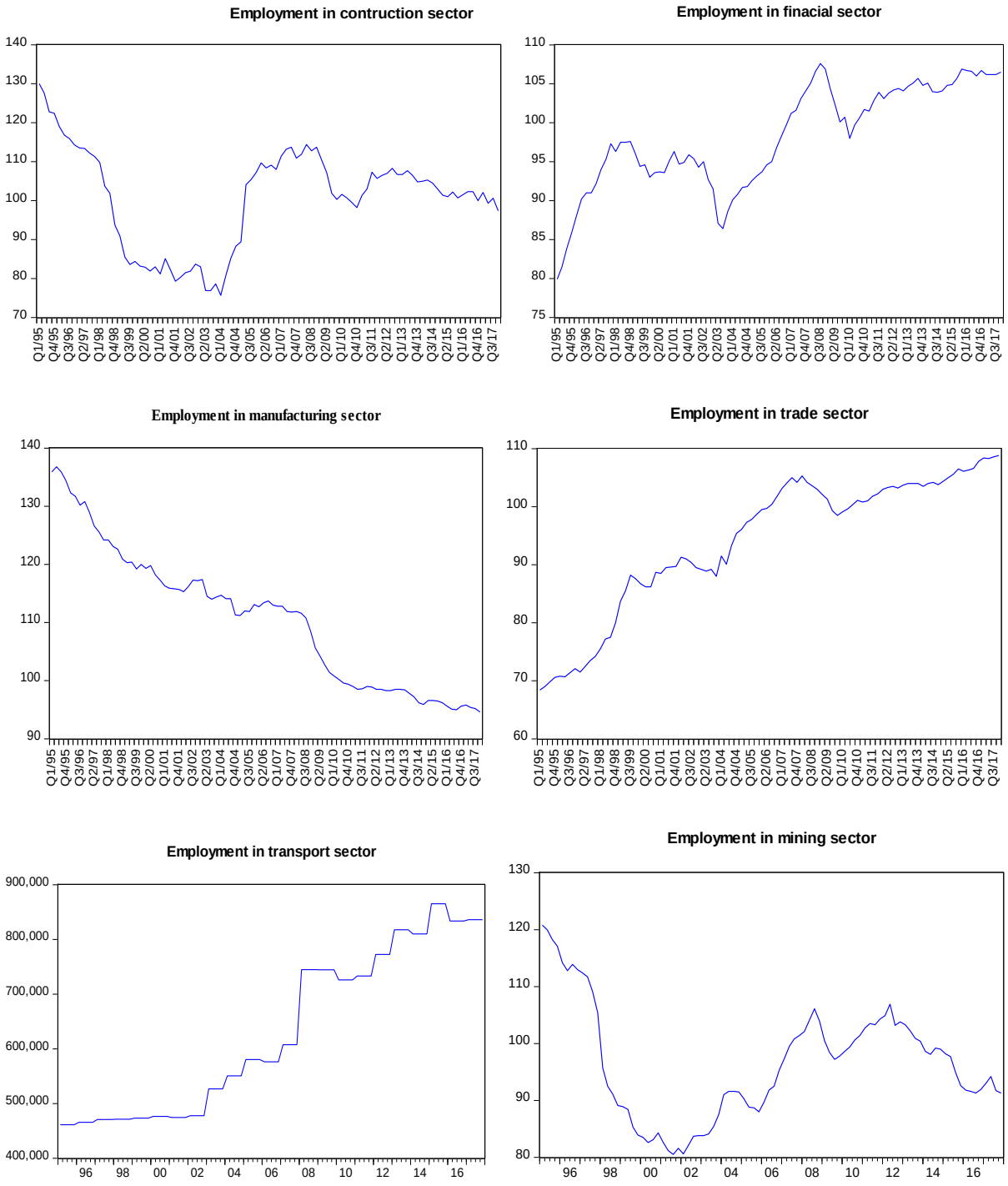

Figure 0-1: Graphical representation of sectoral employment (dependent variables)

Source: Author's compilation (data from SARB, 2017)

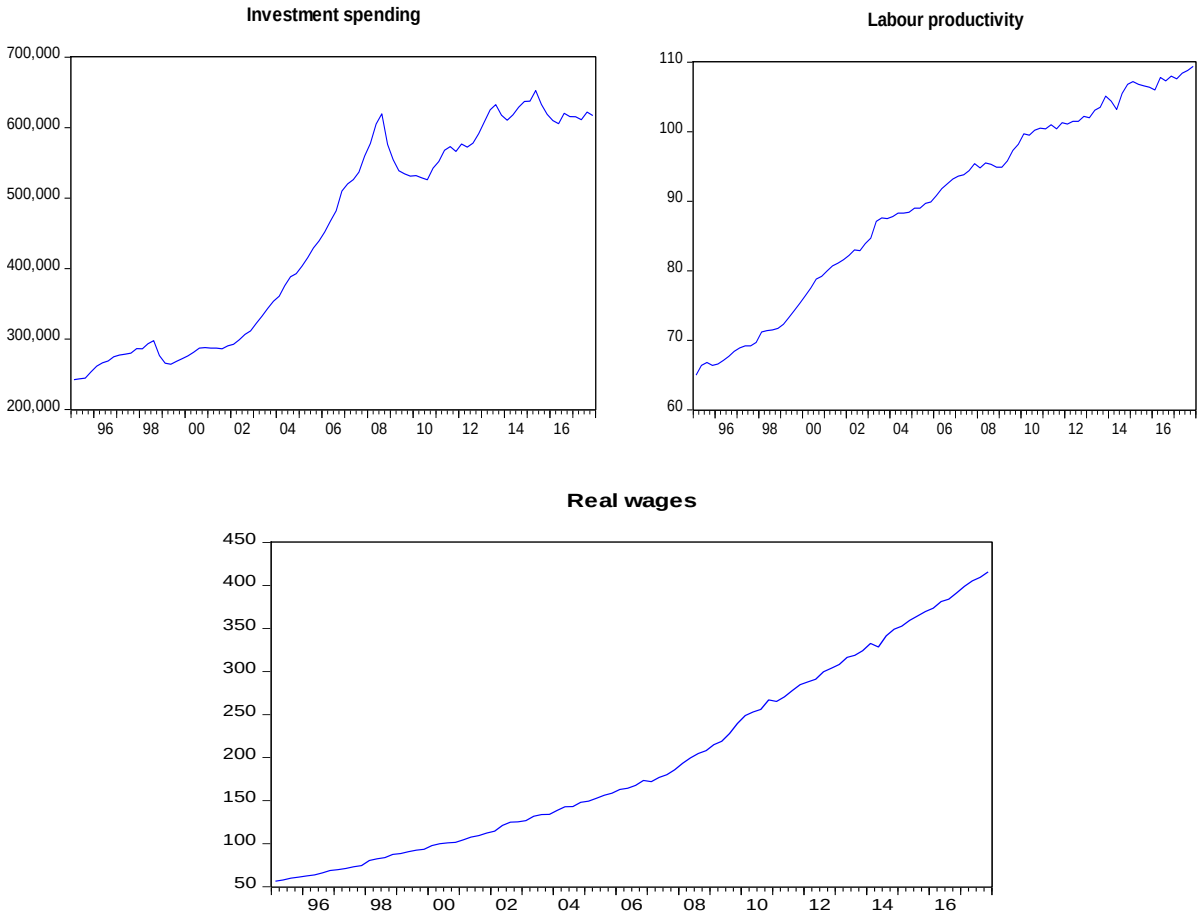

Figure 0-2: Graphical representation of investment, productivity and real wage (independent variables)

Source: Author's compilation (data from SARB, 2017)

6.2.2 Correlation analysis

The correlation coefficient, *r*, is a statistical summary that depicts the extent to which two variables *X* and *Y* relates to the other. Its value varies between + 1 and -1. The closer is the value of r to + 1, the high the variables are positively related and the value close to – 1 suggests a close negative relationship between the two variables (Simon & Goes, 2013). Alternatively stated, as displayed in Figure 6.3, the further away from zero is the *r* the greater is the positive or negative relationship between variables (Asuero *et al.,* 2006:47).

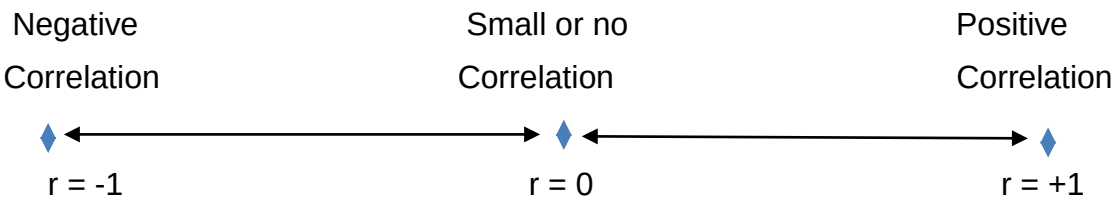

Figure 0-3: Correlation graph

Source: Author's compilation (data from SARB, 2017)

Table 6.1 displays the correlation in transport sectors. Their correlation coefficients are 0.2822; 0.8521; 0.7038 and 0.7662 respectively. However, the correlation coefficient between investment spending and employment in manufacturing sector is -0.6097, suggesting a significant negative correlation between the two variables. Additionally, the correlation coefficient between investment spending and employment in manufacturing sector is not statistically significant. In other words, the results indicate the absence of correlation between employment in mining sector and investment spending in the South African economy. Analysis between sectoral investment, investment spending, labour productivity and real wage, the results suggest that investment spending is associated with a statistically significant and positive correlation with employment within the analysed five sectors namely construction, financial, mining, trade and transport.

Considering the correlation between labour productivity and sectoral employment, a significant and positive correlation exists between employment in financial, mining, trade and transport sector. Their correlation coefficients are 0.8003; 0.6598; 0.7301; 0.5536 in financial, mining, trade and transport sector, respectively; while negative correlations of -0.7634 in manufacturing and 0.100 in mining sector exists between employment in these two sectors and labour productivity. The correlation results displayed in Table 6-4 revealed the absence of correlation between labour productivity and employment in construction sector.

Comparatively, no correlation was found between employment in construction and the mining sectors and the real wage. Nonetheless, positive correlations of 0.8385 in financial, 0.7260 in trade and 0.7621 in transport exist between these sectors and the real wage. This result shows that real wage is highly correlated to employment in these sectors. The correlation results also suggest negative correlations of -0.7847 in manufacturing and -0.0412 mining sectors with real wage. Comparing the correlation

coefficients between dependent variables (sectoral employment) and independent variables (investment spending, labour productivity and the real wage); findings disclosed investment spending to be the only independent variable correlated with employment in construction sector, while the real wage correlate with all sectors' employment with the exception of employment in construction sector. Likewise, the correlation within sectoral employment, as presented in Table 6-4, suggest that employment in transport sector correlates with employment in all other fives sectors under consideration

Table 0-1*: *Correlation coefficients

	LECONS	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN	LINVES	LPROD	LWAGE
LECONS	1.0000 -----								
LEFIN	0.2026 (0.0527*)	1.0000 -----							
LEMAN	0.0129 (0.9022)	-0.8286 (0.0000***)	1.0000 -----						
LEMIN	0.8566 (0.0000***)	0.0156 (0.8825)	0.0755 (0.3651)	1.0000 -----					
LETRAD	-0.0680 (0.5194)	0.8067 (0.0000***)	-0.8987 (0.0000***)	-0.2428 (0.0197**)	1.0000 -----				
LETRAN	0.2696 (0.0093***)	0.8353 (0.0000***)	-0.7346 (0.0000)	0.1832 (0.0803*)	0.8430 (0.0000)	1.0000 -----			
LINVES	0.2822 (0.0064***)	0.8521 (0.0000***)	-0.6097 (0.0000***)	0.14749 (0.1606)	0.7038 (0.0000***)	0.7662 (0.0000***)	1.0000 -----		
LPROD	0.0111 (0.6157)	0.8003 (0.0000***)	-0.7634 (0.0000***)	-0.1000 (0.3426)	0.6598 (0.0000***)	0.7301 (0.0000***)	0.5536 (0.0000***)	1.0000 -----	
LWAGE	0.0679 (0.5199)	0.8385 (0.0000***)	-0.7847 (0.0000***)	-0.0412 (0.6963)	0.7260 (0.0000***)	0.7621 (0.0000***)	0.7549 (0.0000***)	0.7863 (0.0000***)	1.0000 -----

, **, * Significant at 10%, 5% and 1% level respectively, p-values ( )*

Source: Author's calculations (data from SARB, 2018)

6.3 ECONOMETRIC APPROACHES AND MODELS APPLICATION

The previous section provided the statistical analysis of the relationships among variables. In the subsequent section (section 6.3) various econometrics are applied on the time series. These econometric tools are firstly utilised to determine the state of variables (stationary or nonstationary) and secondly to provide long-run, short-run and causality between variables.

6.3.1 Unit root and stationary tests

The unit root test is the first step undertaken as a part of regression analysis to examine properties of variables (times series) in this study. Although the ARDL model is applicable on any type of time series irrespective of their order of integration, it was important to conduct a unit and stationarity test to ensure that none of variables was I (2). The unit root test was performed using the Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) unit root tests and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) stationarity test. Additionally, the structural break unit root test was conducted. The various tests were applied to the study with the aim of reducing weaknesses that may be associated with any of each individual test such as being affected by the data sample size and the presence of structural break within tested data.

As mentioned before, each of these unit root and stationarity tests has its potencies and deficiencies. Consequently, the use of various tests, as suggested by the literature, is one of ways to overcome each individual test's weaknesses (Costantini & Sen, 2016). Table 6.2 displays the unit root tests results for each variable under analysis. The result indicates that some variables were stationary at level while others became stationary after being differentiated once. In other words, series under the study are of mixture of I (0) and I (1). Both unit tests, ADF and PP reach the same conclusion; they first reject the null hypothesis suggesting the presence of unit within variables (LPROD and LETRAD) at level, and for the rest of variable the null hypothesis is rejected after the first difference.

***Table 0-2*: Results of ADF and PP Unit root test**

Variable	Model specification	Levels		1st difference		Integration order
		ADF	PP	ADF	PP	
LECONS	Intercept	0.1411	0.2000	0.0006*	0.0000*	I~ (1)
	Intercept & trend	0.2999	0.4475	0.0000*	0.0000*	I~ (1)
LFIN	Intercept	0.1037	0.0540	0.0000*	0.0009*	I~ (1)
	Intercept &trend	0.0730	0.0798	0.0000*	0.0000*	I~ (1)
LINVES	Intercept	0.7160	0.6114	0.0001*	0.0001*	I~ (1)
	Intercept & trend	0.8921	0.9466	0.0004*	0.0004*	I~ (1)
LEMAN	Intercept	0.3928	0.4722	0.0000*	0.0000*	I~ (1)
	Intercept & trend	0.1737	0.5356	0.0000*	0.0000*	I~ (1)
LEMIN	Intercept	0.1385	0.1784	0.0000*	0.0000*	I~ (1)
	Intercept & trend	0.3344	0.4414	0.0003*	0.0000*	I~ (1)
LPROD	Intercept	0.0393*	0.0259*	…….	……	I~ (0)
	Intercept & trend	0.9519	0.9684	0.0000*	0.0000*	I~ (1)
LETRAD	Intercept	0.0339*	0.0105*	…….	……	I~ (0)
	Intercept & trend	0.7906	0.7294	0.0000*	0.0000*	I~ (1)
LETRAN	Intercept	0.8985	0.9054	0.0000*	0.0000*	I~ (1)
	Intercept & trend	0.4159	0.4277	0.0000*	0.0000*	I~ (1)
LWAGE	Intercept	0.1416	0.0525	0.0000*	0.0000*	I~ (1)
	Intercept & trend	0.9006	0.9427	0.0000*	0.0000*	I~ (1)

*Notes: * Indicates the rejection of the null hypothesis at the 5 percent level of significance*
Source: Author's compilation (data from SARB, 2017)

The utilised tests (ADF and PP) are more potent if the utilised variables do not contain structural break, otherwise they may produce biased results (Glynn *et al.,* 2007:5). Thus, the power of these two tests is limited to a certain type of data. To ensure the accuracy of the obtained results from the alluded test, it was necessary to perform stationarity test using KPSS in order to confirm the ADF and PP outcome. If the

stationary test was different from the unit root test, the former results would be preferred over the later.

Fortunately, the outcome of stationary test confirmed the ADF and PP unit root tests result suggesting that the set of variables under consideration has different order of integration. Otherwise, as stated, a mixture of I (0) and I (1) was obtained. As a confirmatory test, the KPSS result confirmed that some variables are stationary at level while others become stationary after the first difference. Although ADF, PP and KPPS reached the same conclusion that series under the study are a mixture of I (0) and I (1), series that are I (0) with ADF and PP are not the same in KPSS test. This difference among both results might be the result of how each of the test is serious in regard to the structural breaks. As, it was suggested in the methodology chapter, in the presence of ADF, PP and KPSS tests, the conclusion is made in the favour of KPSS results. The KPSS results are exhibited in Table 6.3 below:

Table 0-3: Results of the KPSS stationarity test

Variables	Model specification	Levels	1st difference	Order of integration
LECONS	Intercept	0.170117	----------	I~ (0)
	Intercept and trend	0.150169*	----------	I~ (0)
LFIN	Intercept	0.985612*	0.171873	I~ (1)
	Intercept and trend	0.066234	----------	I~ (0)
LINVES	Intercept	1.180069*	0.230534	I~ (1)
	Intercept and trend	0.157150*	0.127291	I~ (1)
LEMAN	Intercept	1.205258*	0.176930	I~ (1)
	Intercept and trend	0.082112	0.076092	I~ (1)
LEMIN	Intercept	0.168630	0.313172	I~ (1)
	Intercept and trend	0.170696*	0.194113*	I~ (1)
LPROD	Intercept	1.203527*	0.675285*	I~ (1)
	Intercept and trend	0.301872*	0.068096	I~ (1)
LETRAD	Intercept	1.086062*	0.398067	I~ (1)
	Intercept and trend	0.263232*	0.056559	I~ (1)

LETRAN	Intercept	1.199896	0.115417	I~ (0)
	Intercept and trend	0.189390	0.095949	I~ (0)
LWAGE	Intercept	1.241375*	0.584950*	I~ (0)
	Intercept and trend	0.188506*	0.076261	I~ (1)

*Notes: (a) critical value is 0.463 with intercept only. With intercept and trends critical value is 0.1460, (b) * variable is stationary at 5% level of significance*

Source: Author's compilation (data from SARB, 2017)

Although the abovementioned tests (ADF, PP & KPSS) indicated that variables are integrated of different order: I (0) and I (1), the I (0) and I (1) variables were not similar in both tests. Consequently, it was necessary to perform the break point unit root to detect whether variables contain structural break or not. The necessity of this test is to ensure that variables with structural breaks or rather instability in parameters are considered and adjusted in order to allow a credible analysis, accurate conclusion and recommendation of the study, and helpful policy implications (Davis *et al.,* 2006: 223). Under multiple breakpoints test, construction, mining and wage series were found to have 4 structural breaks; investment spending and trade series had 3 structural breaks. The financial sector had 2 structural breaks, while labour productivity had 5 breakpoints.

Since all variables had different number of breaks, the common breaks for the model were tested. The result was that the model contains two structural breaks. The first starting in the second quarter of 1999 and ending in the second quarter of 2005; the second break started in third quarter of 2008 and ended in the first quarter of 2013. While the first break may be due to the real wage and employment situation (Burger & Yu, 2006), the second break was probably as the consequence of the 2008 global financial crises. Dummy variables were created for the period of breaks. Two values, 0 and 1 were utilised for dummy variables. The value 1 denoted the presence of structural break and 0 otherwise. During the empirical analysis, these dummy variables were found to be insignificant to affect the study's findings. Thus, they were eliminated from the model. Inclusion or omission of insignificant dummy variables makes no difference to the regression outcome (Gujarati, 1970). Landau (1983) supports the idea of dropping insignificant variables from the regression analysis.

6.3.2 Breakpoint unit roots tests

As mentioned above, the series under the study encountered shocks that created structural breaks. Making decision that variables are stationary on the basis of tests results that ignored structural breaks (ADF, PP, and KPSS) should lead to spurious regression. Thus, it was important to conduct a breakpoint unit root to ensure whether obtained result from previous unit root and stationarity tests were accurate or not.

The break unit root test results are presented in Table 6-4. These results confirm the outcome from ADF, PP and KPSS stipulating that variables under the study are made of a mixture of I (0) and I (1), meaning that ARDL model can be employed as none of the variables is I (2). In comparison of unit root, stationarity and breakpoint unit root tests, the KPSS and breakpoint unit root result reached similar result. The results highlight the effect of economic structural changes on variables under consideration.

Table 0-4*: *Breakpoint unit root results

Variables	Model specification	Level		1st difference		Integration order
		T-value	P-value	T-value	P-value	
LECON	Intercept	4.443	0.01**	……	……	*I*~ (0)
	Intercept & trend	-4.589	0.01	……	……	*I*~ (0)
LEFIN	Intercept	-4.443	0.0427**	……	……	*I*~ (0)
	Intercept & trend	-4.589	0.1832	-4.589	< 0.01*	*I*~ (1)
LINVES	Intercept	-4.443	0.4493	-4.443	< 0.01*	*I*~ (1)
	Intercept & trend	-4.589	0.8946	-4.589	< 0.01*	*I*~ (1)
LEMAN	Intercept	4.443	0.0323**	-4.443	< 0.01*	*I*~ (0)
	Intercept & trend	-4.589	0.8578	-4.859	< 0.01*	*I*~ (1)
LEMIN	Intercept	-4.443	0.6408	-4.443	< 0.01*	*I*~ (1)
	Intercept & trend	-4.589	0.6701	-4.859	< 0.01*	*I*~ (1)
LETRA	Intercept	-4.443	0.4280	-4.443	< 0.01*	*I*~ (1)
	Intercept & trend	-4.589	0.7546	-4.859	< 0.01*	*I*~ (1)
LPROD	Intercept	-4.443	0.3323	-4.443	< 0.01*	I(1)
	Intercept & trend	-4.589	0.7733	-4.859	< 0.01*	*I*~ (1)

LETRAN	Intercept	-4.443	0.0345**	……	……	I~ (0)
	Intercept &trend	-4.859	0.082*	……	……	I~ (0)
LWAGE	Intercept	-4.443	0.0663	-4.443	< 0.01*	I~ (1)
	Intercept &trend	-4.589	0.9834	-4.859	< 0.01*	I~ (1)

*Notes: (a) * rejection of the null hypothesis at 1 percent level of significance, (b) ** rejection of the null hypothesis at 5 percent level of significance*

Source: Author's compilation (data from SARB, 2017)

Having determined the stationarity and order of integration for variables under consideration, subsequent step was to provide a brief explanation on lag length criteria and lag length selection. Thereafter, the following section focutilised on the core objective of the study which is to determine short and long-run interrelationship between sectoral employment, investment spending, productivity, and real wage. The analysis starts with the linear or standard ARDL followed by nonlinear ARDL.

6.3.3 Optimal lag lengths and model selection in ARDL and NARDL

Once it is known that the data under consideration is stationary, the subsequent step is to determine the optimum number of lags. The aim of the optimum lags selection in to evade the issue of non-normal and autocorrelation within the normal standard error term. Moreover, in the presence of long-run relationship among variables, the optimum number of lags assists while conducting the vector error correction model (Marseet, 2015:126-127). Six lag length criteria can be employed while selecting the optimum number of lags to be included into the model. These criteria are Log likelihood (LR) test statistic; Final prediction error (FPE); Akaike information criterion (AIC); Schwarz information criterion (SIC); and the Hannan-Quinn information criterion (HQIC). Each of these criteria has its strengths and weakness.

Among these six criteria, the AIC is the most popular and most utilised, yet SIC is more preferable for its rigours and strictness features (Neath & Cavanaugh, 1997:559). According to Narayan (2009) and Pesaran (1997), in determining the maximum and optimum number of lags within the ARDL model, quarterly data should use four lags whilst two lags are better for annually data. In consideration of current study that employs quarterly data, four lags were selected as maximum for both dependent and

independent variables. Four lags where applied to five information criteria to determine the best model. Since the best criteria is the one that minimises information, the Schwarz information criterion was found to be the best for current study as it minimises information for all models[1].

As suggested in Table 6.5, the ARDL (1, 1, 1, 0) is the model suggested by SIC in determining the cointegration between employment in construction, investment spending, labour productivity and real wage. In similar way, the SIC-based suggested the ARDL (1, 0, 1, 0) as the best model to determine the long-run relationship between employment in the financial sector, investment spending, labour productivity and real wage. Also, the ARDL (1, 1, 0, 0) was selected using SIC as the optimal model to do analyses in the cointegration between employment in manufacturing sector, investment spending, labour productivity and real wage.

The ARDL (2, 0, 0, 0) was selected to investigate the long-term relationship between employment in mining, investment spending, labour productivity and real wage. While both SIC and HQC selected the ARDL (3,1,0,0) to be best model that can be utilised to determine the long-run relation between employment in trade, investment spending, labour productivity and real wage; AIC, SIC and HQC criteria agreed on the ARDL(1,0,0,0) as the optimal model to assist in determining cointegration between employment in transport, investment spending, labour productivity and real wage. As shown in Tables 6.5, the SIC was also the best criteria to determine the best model utilised to test long-run relationship between investment spending, labour productivity and real wage.

[1] When applying the ARDL model, Eviews 10 has a power to select different number of lags in the model, thus each variable can possess its own number of lags selected automatically. Nonetheless, instead of six criteria, it provides three criteria and adds the Adjusted R-squared as model selection method (as displayed in Table 6.5).
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Table 0-5: Model selection

Equation	AIC	SIC *	HQC	R2	Best choice
$LECONS_t$ (Eq. 27a)	ARDL(4,1,1,0)	ARDL(1,1,1,0)	ARDL(4,1,1,0)	ARDL(4,1.1,4)	SIC
$LEFIN_t$ (Eq. 27b)	ARDL(2,2,1,0)	ARDL(1,0,1,0)	ARDL(1,2,1,0)	ARDL(3,2,4,0)	SIC
$LEMAN_t$ (Eq. 27c)	ARDL(3,1,1,4)	ARDL(1,1,0,0)	ARDL(1,2,0,0)	ARDL(3,2,1,4)	SIC
$LEMIN_t$(Eq. 27d)	ARDL(2,1,0,0)	ARDL(2,0,0,0)	ARDL(2,1,0,0)	ARDL(3,1,3,0)	SIC
$LETRAD_t$ (Eq. 27e)	ARDL(4,1,1,0)	ARDL(3,1,0,0)	ARDL(3,1,0,0)	ARDL(4,1,1,4)	SIC
$LETRANS_t$ $(Eq.27f)$	ARDL(1,0,0,0)	ARDL(1,0,0,0)	ARDL(1,0,0,0)	ARDL(1,0,1,0)	SIC
$LINVES_t$ (Eq. 28)	ARDL(2,0,0)	ARDL(2,0,0)	ARDL(2,0,0)	ARDL(2,4,4)	SIC
$LPROD_t$ (Eq. 29)	ARDL(4,1,1)	ARDL(1,0,1)	ARDL(1,0,1)	ARDL(1,4,4)	SIC
$LRWAGE_t$ (Eq. 30)	ARDL(3,1,4)	ARDL(1,1,0)	ARDL(1,1,0)	ARDL(4,1,4)	SIC

*Note: * denote the criteria that minimises the information criteria*

Source: Author's compilation (data from SARB, 2017)

6.4 ESTIMATION AND DISCUSSION OF SYMMETRIC RELATIONSHIPS

The estimation of long-run and short-run relationship was achieved using the standard ARDL to detect a linear relationship and the NARDL to determine the nonlinear relationship among variables. The linear model provides better results when analysing linear relationship between the dependent and independent variables. Yet, this model is more likely to lead to spurious results if applied on time series containing some noise and complexity. This gives potent the application of a nonlinear model as means of overcoming the issue of noise and complexity within series (Enke, 2005; Ho *et al.,* 2002). Henceforth, the application of both ARDL and NARDL appeared appropriate for this study's empirical analysis.

The analysis is divided into two sections. The first section (section 6.4) is based on the linear relationship and the subsequent section (section 6.5) focusses on the nonlinear relationship.

6.4.1 Analysis of long-run relationships among variables

In order to conclude whether a linear long-run or short-run relationship exists between investment spending, labour productivity, real wage and sectoral employment, the standard ARDL model was employed. Since the analysis is based on interaction among variables, each variable is treated as dependent and independent simultaneously. In other words, the number of variables equals the number of models analysed. Under the standard ARDL model application, the null hypotheses suggesting the absence of long-run relationships among variables were rejected because the value of the computed F-statistics was greater than the upper bound critical values from Pesaran *et al.* (2001) Table. This implies that the utilised variables, in the long-run, are cointegrated. The results for long-run relationships or cointegration are presented in Table 6.6.

As displayed in the Table 6.6, in the long-run investment spending (domestic investment), positively impact on employment in all sectors under analysis except in manufacturing sector. A 10 percent increase in investment spending level causes employment to growth by 5.25404 percent in construction sector, 3.2032 percent in financial sector, 0.14531in manufacturing sector, 4. 17534 percent in mining sector, and 0.5389 percent in transport sector. This contribution of investment spending towards sectoral employment, as it is justified by Figures in Table 6.6, is not equally shared. Construction, mining and transport sector are the most affected sectors. Thus, growth in domestic investment creates more jobs in these sectors compared to jobs created in financial and manufacturing sectors. Despite a positive relationship that exists between investment spending and job growth in above mentioned sectors, an inverse relationship exists between investment spending and employment in trade sector. If investment spending increases by 10 percent, employment in trade sector declines by 0.22144 percent.

Contrary to domestic investment that create job in five out of six sectors, the result presented in Table 6-5 suggests that labour productivity creates jobs in three sectors while destroying jobs in the other three sectors. Increase in labour productivity creates long-run employment in mining, manufacturing and transport sector. If 10 percent were to increase in labour productivity, employment would have increased by 1.13653, 1.60371 and 7.199 percent in manufacturing, mining and trade sector respectively.

Trade sector is the one that mostly benefits from growth in labour productivity. Nonetheless, this 10 percent of growth in labour productivity would cause 1.4824 percent job loss in construction sector, 1.3195 job loss in financial sector, and 0.661 job loss in transport sector.

The real wage was the last independent variable analysed in relation to long-term changes within sectoral employment. Similar to the effect of labour productivity towards sectoral employment's fluctuations, real wages create employment in three sectors and destroys jobs in the other three sectors. On one hand, if real wage increases by 10 percent, employment in construction sector increases by 0.81233, whilst employment increases by 1.72332 percent in financial sector and 3.623 percent in the transport sector respectively. On the other hand, 10 percent increase in real wage causes employment to decline by 2.0945 percent in manufacturing, 3.09676 in mining sector and 2.5157 percent in trade sector.

Analysing the long-run relationships between dependent variables (sectoral employment) and the independent variables (investment spending, labour productivity and real wage); it is important to note that the main variable that influence a positive change in sectoral employment remains investment spending. The other two variables (labour productivity and real wage) can also influence job growth while destroying employment within other economic sectors. This finding is supported by economic theory and empirical findings. For instance, in the Keynesian theory, employment growth depends not only on the demand side but also on the level on country investment. If the high amount of resource is allocated for future production (investment spending), the level of employment is more likely to grow (Keynes, 1937:221).

Similarly, Munnell (1992:191) argues that growth of investment as one of four components of aggregate expenditure impact more on job creation. In other words, one of the strategies that can assist in creating more jobs within the economy is to improve the level of domestic investment (Dinh *et al.,* 2012:46). Furthermore, investment spending plays an important role to recover job lost during economic crises (Atkinson & Stiglitz, 2015). Economic theories in regard to the relationship between investment spending and employment growth are backed by empirical results. Several of previous studies conducted to determine whether investment spending possesses

a significant effect on job growth found that as more is invested in the domestic economy more job opportunities are created. Furthermore, besides jobs created through investment spending, the later assists in sustaining existing jobs (Byiers *et al.*, 2015; Iacovoiu, 2012; Michelitsch & Shi, 2013; Psaltopoulos *et al.*, 2011).

In regard to the inverse relationship between productivity, real wage and employment, some theories and empirical findings suggest that other factors not included in the model such as technology growth positively affect labour productivity while destroying hire opportunities (Rotman, 2013). Hence, increase in job loss due to productivity growth is not an isolated case for South Africa. However, productivity may destroy job in one sector while creating jobs in other sectors (Casey, 2004). With regard to real wage, under the perfect competition, real wage and productivity play an important role in hiring and firing. A real wage below labour productivity encourages firms to hire or employ more labour while a real wage above labour productivity induces firms to lay off workers. Hence, efficient real wage and labour productivity implies employment equilibrium (Van Biesebroeck, 2015; Cahuc *et al.,* 2014).

Labour productivity growth creates jobs in manufacturing, mining and trade sectors while destroying jobs in construction, financial and transport sectors. With regard to the real wage, the study findings are supported by theory and empirical studies. Jerger and Michaelis (2003) hiking in real wage results in low employment or job destruction. Nonetheless, the effect of real wage on employment depends on individual sector. While in some sectors the real wage growth leads to job growth, workers lose their employment due to real wage increase. In the South African case, the low level of employment within different sector does not only result from increase in real wage, but also from population growth. Between 2008 and 2013, for instance, over 15 million jobs were created yet employment ration never moved from where it was during the 2008 financial crisis (Makgetla, 2014:4).

It was also imperative to ensure that the obtained results were trustworthy or accurate. The reliability of variables was established through the diagnostic tests. Lagrange multiplier test (LM test) was utilised to detect whether variables are serially correlated or not, while the heteroscedasticity was tested using ARCH text. The null hypothesis for all these tests suggest that better results are obtained only if the probability value is greater than the critical value which is, under the current study, 5 percent. The

outcome of these tests together with Durbin-Watson indicates that the measured variables were not serially correlated and were also homoscedastic. The normality test was not included in the study because it has no strong effect on the regression outcome when utilised on a large sample size (Ghasemi & Zahediasl, 2012: 486-489).

Table 0-6: Long run relationships

	LECONS	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN
LINVES	0.525404	0.32032	0.014531	0.417534	-0.022144	0.5389
LPROD	-0.14824	-0.13195	0.113653	0.160371	0.7199	-0.0661
LWAGE	0.081233	0.172332	-0.20945	-0.309676	-0.25157	0.3623
C	1.836920	4.66773	5.081503	-0.472104	-0.57566	0.2869
Bound test (F-value)	4.2104**	4.79100***	4.61170**	6.64038 **	5.9126**	4.362***
Diagnostic tests and model robustness						
LM test	0.4115	0.2032	0.5775	0.9738	0.86562	LETRAN
Durbin-Watson	2.107808	2.026285	1.972774	1.995848	1.99774	0.539***

*Note: ***, **, and * indicates a rejection of null hypothesis coefficient at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2017)

6.4.2 Error correction model and short-run analysis

The presence of cointegration among variables requires the regression of the Error Correction Model (ECM) and the error correction term (ECT) that determines the model's speed of adjustment. The error correction is the convenient approach utilised to determine the correction from disequilibrium of the previous time period towards the expected long-run equilibrium (Asteriou & Hall, 2007:310 -311; Brooks, 2014:376). However, it is imperative that the error correction term be significant and negative, in order to achieve the expected adjustment (Mukhtar & Rasheed, 2010:54).

The error correction term of the error correction model plays, therefore, a role of "equilibrating" errors that may occur within the model. That is, the error correction term modifies shocks or deviations of models employed by the study. The significance of all these ECM coefficients associated with the negative sign are indication of the long-run relationships among variables and suggests that any deviation or shock from equilibrium caused by the previous quarter's shocks converges back to the equilibrium

in the long-run for all models (Gujarati & Porter, 2009:231-232). The regression results of the short-run and error correction terms are displayed in Table 6-6.

For the LECONS, the error correction term is - 0.239360, thus it is negative and significant as expected. This means that almost 24 percent of shocks in the previous quarter in the relationship are corrected in approximately the next 4 quarters (1/0.239360) for the economy to fix all deviations. For the LEFIN model, error correction term is 0.117135 also negative and significant. The LEFIN model will need almost 9 quarters (1/ 0.117135) to adjust all disturbances. Following similar approach, the ECM analysis provided 0.169952; - 0.032970 and - 0.12867 as error terms of LEMAN, LEMIN, LETRAD and LETRAN respectively. All of these error terms are also negative and significant at 1 percent level. While the ECT of LEMAN is -0.169952, the ECT of LEMIN is - 0.032970. That is, 17 percent and 3 percent of variations are fixed in LEMAN and LEMIN respectively each quarter.

Furthermore, these two error terms suggest that it takes six quarters (1/0.169952) in LEMAN and thirty quarters (2.5 years) in LEMIN (1/0.032970) to fix all disturbances. The last two ECTs are - 0.12867 and - 0.287340 for LETRAD and LETRAN respectively. Consequently, 13 percent and 29 percent of shocks in the model are adjusted in LETRAD and LETRAN respectively and the LETRAD requires eight quarters (1/0.12867) to adjust deviations while LETRAD model needs only three quarters to regain its long-run equilibrium after disturbances.

Considering the error term values for all 6 models, one can observe that model disturbances are quickly adjusted towards long-run equilibrium in transport sector while a slow adjustment is experienced in mining sector. The slow speed of adjustment in mining sector and high speed of adjustment in transport sector result from the disparities in their ECT and sector's size. Williams (2015) asserts that high error terms and variances are expected from large firms compared to small firms. Consequently, it takes more time to adjust deviations in large sector than small sector.

Results of the ECM presented in Table 6.7 are combined with the short-run relationship results. In the short-run, changes in one sector's employment are more likely to be the result of changes in investment spending, labour productivity, and real wage as well as previous employment within the same sectors. Similar to long-run

results, investment spending plays a critical role in start term sectoral employment. In the short-run, investment spending has as significant effects on jobs dynamic in construction, financial, mining, manufacturing, and trade sector. Fluctuation in real wage has a short-run impact only on the manufacturing sector. Labour productivity has a short-run inverse relationship with employment in construction, mining and manufacturing sector's employment. Analogous to labour productivity, real wage influences short-term employment changes within the three-mentioned sector. However, unlike labour productivity that causes job loss in financial and manufacturing sector, growth in real wage creates short-term employment in financial and manufacturing sector.

Table 0-7: Linear ARDL short run relationships and the ECM regression

	LECONS	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN
D(LECONS(-1))	0.08208	----------	----------	----------	----------	----------
D(LECONS(-2))	0.18373**	----------	----------	----------	----------	----------
D(LECONS(-3))	0.23252**	----------	----------	----------	----------	----------
D(LEFIN(-1))	0.12898	----------	----------	----------	----------	----------
D(LEMAN(-1))	----------	----------	0.18937**	----------	----------	----------
D(LEMAN(-2))	----------	----------	0.24434**	----------	----------	----------
D(LEMIN(-1))	----------	----------	----------	0.329***	----------	----------
D(LETRAD(-1))	----------	----------	----------	----------	0.14366	----------
D(LETRAD(-2))	----------	----------	----------	----------	0.38280	----------
D(LETRAD(-3))	----------	----------	----------	----------	0.16091	----------
D(LINVES)	0.47177***	0.0953*	0.07542**	0.201***	-0.1311**	0.18434
D(LINVES(-1))	----------	0.1087*	----------	----------	----------	----------
D(LPROD)	-0.3270***	0.702***	-0.20575**	0.13480	-0.05415	-0.71453
D(LWAGE)	-0.03094**	0.004***	0.03373**	-0.10415	-0.01382	0.19175
D(LWAGE(-1))	----------	----------	0.02034	----------	----------	----------
D(LWAGE(-2))	----------	----------	-0.01222	----------	----------	----------
D(LWAGE(-3))	----------	----------	-0.1752***	----------	----------	----------
CointEq(-1)	-0.23936	-0.11713	-0.16995	-0.03297	-0.12867	-0.28734
ECM (P-value)	0.0001***	0.000***	0.0001***	0.001***	0.000***	0.000***

*Note: ***, **, and * indicate coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2017).

6.4.3 Estimation of linear long-run interaction among sectoral employment

Though the level of sectoral employment can be influenced by external factors such as the level of investment spending, labour productivity and real wage; it is possible that changes of employment in one sector affects employment in the other sectors. Therefore, it was important to determine the interaction of employment within sector under the study. The outcome of long and short-run relationship among the analysed six sectoral employment is displayed in Table 6.8 and 6.10. As shown in Table 6.8, employment growth in construction sector has a major impact on job creation in other four sectors namely; financial, manufacturing, mining, and trade. The transport sector is the only one negatively affected by employment growth in construction sector. Considering the magnitude of jobs created in these four sectors through employment growth in construction sector, trade and mining sector create more when compared to financial and manufacturing. If employment in construction sector increases by 10 percent, employment in other sector increase their employment by 2.657percent in financial sector, 3.055 in manufacturing sector, 4.002 in mining sector and 4.791 in trade sector. Not only does employment growth in construction section positively influence other sector employment, this sector is positively influenced by job created in other sectors. With the exception of financial sector, employment growth within other sector in the system increases job opportunities in construction sector. This power of job creation in many other sectors is not held by construction sector alone. Employment growth in trade sector also leads to job growth in four other sectors. Due to 10 percent increase in trade employment, construction sector's employment grows by 3.079 percent, employment in financial sect increase by 3.621 percent, jobs grow by 2.278 percent in mining sector and 2.695 percent is job growth in transport sector.

Contrary to the power of construction and trade sectors to create jobs in other four sectors, employment in financial sector has a positive influence only on two sectors namely trade and transport. If employment in financial sector increases by 10 percent, jobs increase by 3.696 in trade and 5.161percent in transport sector. Employment growth in financial sector causes job loss in construction, mining and manufacturing sectors. Likewise, employment growth in manufacturing and transport sectors causes job creation only in two sectors namely construction and mining sectors. While construction and mining sector's employment increases by 2.715 percent and 3.736

percent respectively as a response to 10 percent of job growth in manufacturing sector; employment in construction and mining grows by 0.267 and 3.581 percent respectively as result of 10 percent increase in construction employment. The rest of sectors in the model experience job loss due to employment growth in manufacturing and transport sector.

Employment growth in mining sector leads to job creation in construction, financial and transport sectors. Among these three sectors, financial sector creates more jobs than construction and transport. The responsiveness to 10 percent of job growth in mining sector is 0.954 percent job growth in construction sector, 4.789 percent job growth in financial sector, and 2.889 job created in transport sector. Comparing the effects of sectoral employment growth, employment in construction, trade and mining sector is more significant to influence other sectors' employment.

The obtained results from regression analysis justified the interconnectivity among sectoral employment. Employment in some sectors has either a positive or negative impact towards other sectors employment. For instance, mining and construction sector are able to employ workers with low or without experience. Therefore, due to working condition such as environment or wage levels, employees might shift from one sector to the other. This does not necessarily imply that employment in one sector destroys jobs in other sectors. It rather means that there is easy movement of workers between the two sectors. On the other hand, since construction sector can use products that come from mining, if there is construction of more new buildings and infrastructures or maintenance of the existing ones, more of mining products (materials) are demanded. As results, more jobs are created in both sectors. All these activities require the assistance of trade, transport and finance. As such, due to high demand, jobs are also created in these mentioned sectors because high demand leads to high supply and high supply requires more labour (Keynes, 1936). Despite its internal issues, the mining sector still have the ability to create jobs in other sectors such as construction, financial and transport. These results are in line with Maia (2013) findings asserting that the mining sector needed other products from other sectors to carry on its activities. In so doing it creates jobs within those sectors.

An inverse long run relationship between employment in manufacturing and trade sector denotes with other scholars' findings (Ferreira *et al.*, 2010; Menezes-Filho &

Muendler 2011; Wacziarg & Wallack, 2004) that proved a declining of low-skilled employment in manufacturing sector due to an ongoing completion affect also the level of employment in trade sector.

Table 0-8: The symmetric long run relationships of sectoral employment

	LECONS	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN
LECONS	----------	0.2657	0.3055	0.4002	0.4791	-0.3450
LEFIN	-0.4281	----------	-0.2435	-0.2608	0.3696	0.5161
LEMAN	0.2715	-0.2210	----------	0.3736	-0.2248	-0.4506
LEMIN	0.0954	0.4789	-0.2678	----------	-0.4692	0.2889
LETRAD	0.3079	0.3621	-0.1059	0.2278	----------	0.2695
LETRAN	0.0267	-0.1883	-0.3210	0.3581	-0.6938	----------
Constant	-1.441	3.1280	10.3655	4.2655	21.1444	0.061682
Bound test (F-value)	6.7284	6.8835	10.6055	3.9847	4.84333	5.387181

Source: Author's compilation (data from SARB, 2017)

6.4.4 Residual diagnostic tests

Residual diagnostic tests were utilised in the study to determine whether the empirical findings of the study do not violate the classical linear model assumptions. The outcome of econometric analysis is accurate if the employed models meet the prerequisite of the stochastic properties. These properties include heteroscedasticity, autocorrelation and parameter stability (Takaendesa, 2006:100). Based on the results presented in Table 6.9 and Figure 6.4, it is noted that the models utilised for analysis passed all the diagnostic tests. The probability value for serial correlation and heteroscedasticity is greater than critical value at 5 percent significant level.

The serial correlation is supported by Durbin-Watson value which must be around two for the model to be free of autocorrelation. It is also important to conduct the Cumulative Sum of Recursive Residuals (CUSUM) tests to establish whether the models' parameters are stable or not (Lee & Strazicich, 2004). As displayed in Figure 6.4, the CUSUM test plots suggest the stability of employed model. The Plots remain within critical bounds at 5 percent significance level. The outcome from diagnostic tests reveals that employed models present robust analysis of long-run and short-run estimations amongst sectoral employment.

Table 0-9: Diagnostic test results

	LM Test	Durbin-Watson	ARCH test
	No serial correlation	No serial correlation	No heteroscedasticity
LECONS	0.4691	1.9652	0.9914
LEFIN	0.2005	2.0347	0.4721
LEMAN	0.5958	2.0054	0.3126
LEMIN	0.7862	2.0016	0.6652
LETRAD	0.1542	2.1996	0.0603
LETRAN	0.7920	2.0052	0.7626

Source: Author's compilation (data from SARB, 2017)

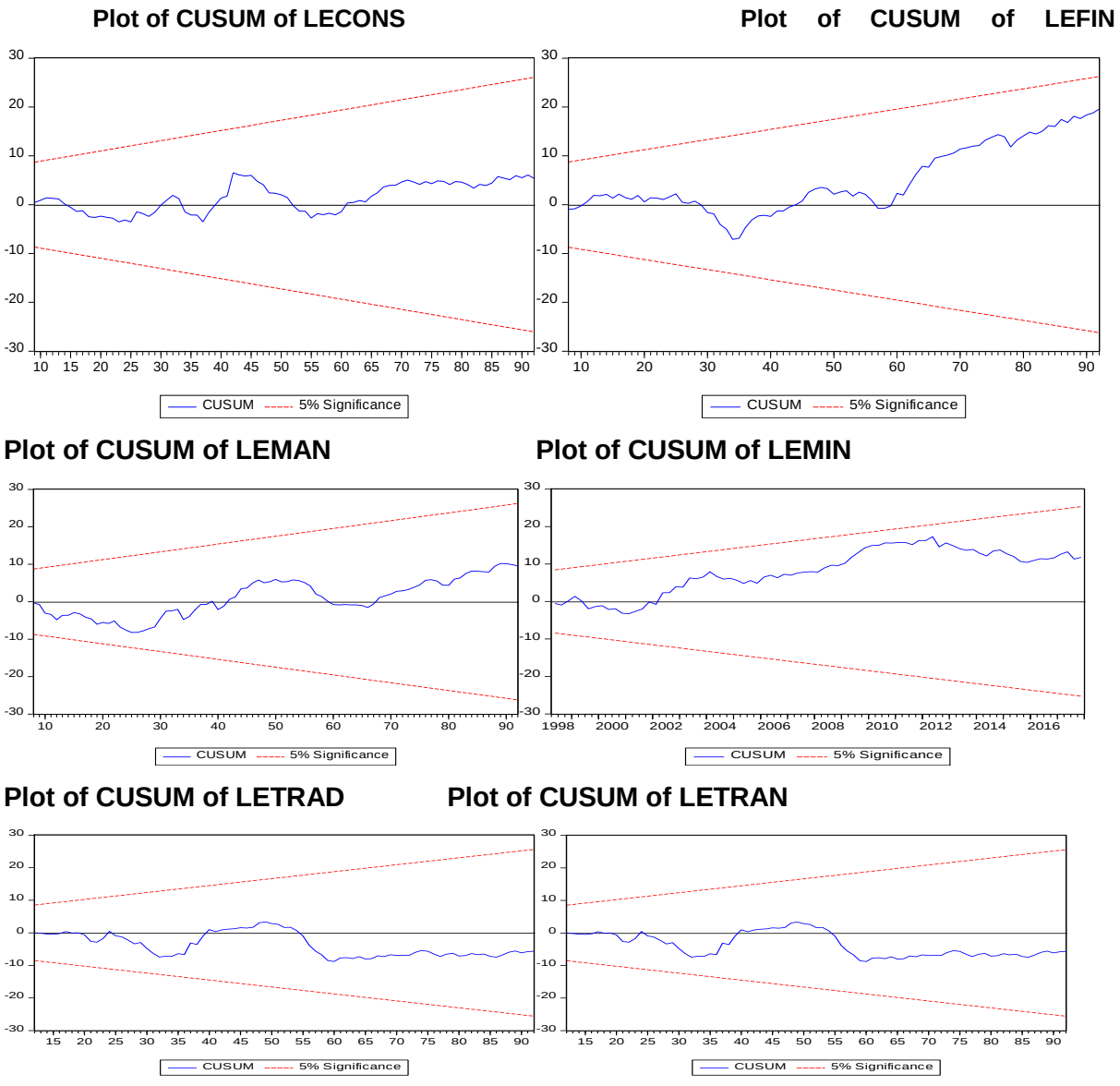


Figure 0-4: Plots of CUSUM in the long run of all the models

6.4.5 The ECM and linear short run dynamics between sectors

The presence of the cointegration among variables under consideration requires, *ipso facto*, the estimation of error correction model (ECM). The error term should be negative and significant to indicate that shocks in the system will come back to the equilibrium in the long-run. As expected, the error terms (-0.180527, -0.096285, -0.243, -0.032, -0.058, and -0.280) for all six models employed in this analysis are negative and significant at 1 percent level.

Considering the error term value for each sector, the speed of adjustment differs from one sector to the other. Shocks or disturbances are quickly adjusted in transport and manufacturing sectors; while a slow adjustment is observed in mining and trade sector respectively. This might be due to the size and flexibility of industries within the sector. In the short-run, employment in construction sector is affected by changes in financial and manufacturing employment. This implies that construction sector's activity depends of on the performance of other sectors. For instance, the need of facilities growth in manufacturing sector involves construction sector. Manufacturing employment has a high effect on other sectors employment in the short-run, for changes in manufacturing employment cause changes in construction, financial, mining and transport employments. Manufacturing sector creates short-term employment in other sectors because it can fire short-term employees and those employees might need different services from other sectors.

Thus, the later are also able to create short-term employment. Further, short-run employment in manufacturing sector is affected by changes in construction, financial, trade and transport sectors' employment. Mining and trade are the only sectors that are not affected by changes in other sectors' employment. Nonetheless, the current state of employment in mining sector depends on the lagged level in the same sector. In other words, short-term employment in manufacturing sector depends on employment mining sector. It is therefore justifiable why declining employment growth is being experiencing within the South African mining sector. The short-run relationships and error correction terms of sectors employment are displayed in Table 6.10.

Table 0-10: A linear short run relationships of sectoral employment

	LECONS	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN
D(LECONS)	--------	0.035118	0.075***	-0.085	0.03198	-0.150
D(LECONS(-1))	--------	--------	-0.027	0.110*	--------	--------
D(LECONS(-2))	--------	--------	-0.037*	--------	--------	--------
D(LECONS(-3))	--------	--------	-0.046**	--------	--------	--------
D(LEFIN)	0.094	--------	0.021	0.177	0.11795	0.086
D(LEFIN(-1))	0.514**	--------	0.146**	-0.319**	--------	--------
D(LEFIN(-2))	0.289	--------	--------	--------	--------	--------
D(LEFIN(-3))	0.583***	--------	--------	--------		--------
D(LEMAN)	0.869***	0.3033**	--------	0.036**	-0.10083	0.584*
D(LEMIN)	-0.230	0.09940	0.009		0.01029	0.020
LEMIN(-1)	--------	--------	--------	1.313***	--------	--------
LEMIN(-2)	--------	--------	--------	-0.376***	--------	--------
D(LETRAD)	0.068	0.157926	-0.131**	0.077	--------	0.289
D(LETRAD(-1))	--------	--------	0.002	--------	--------	--------
D(LETRAD(-2))	--------	--------	0.124**	--------	--------	--------
D(LETRAN)	-0.082	-0.00745	0.069***	0.022	0.05083	--------
D(LETRAN(-1))	--------	--------	0.087***	--------	--------	--------
D(LETRAN(-2))	--------	--------	0.0867***	--------	--------	--------
D(LETRAN(-3))	--------	--------	0.044*	--------	--------	--------
CointEq(-1)	-0.18052	-0.09628	-0.243	-0.032	-0.058	-0.280
ECM (P-value)	0.000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000

*Note: ***, **, and * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2018)

6.4.6 Estimation of linear relationships between investment spending, labour productivity and real wage

6.4.6.1 Long-run linear relationships and diagnostic checking

Since the aim of the study is to analyse the interaction among variables under consideration, it is pertinent to investigate the linear relationship among independent variables. The regression results that show how these variables affect one another are reported in Table 6.11 for the long-run interaction and in Table 6.12 for the short-run

relationships. All the null hypotheses suggesting the absence of cointegration among variables are rejected because the computed F- statistics are greater than the upper bound critical values. Therefore, in concordance with other studies (Katovich & Maia, 2018; Sharpe *et al.,* 2008), the current result attests the presence of a long-run relationships between investments spending, labour productivity and real wage.

Investment spending positively influences changes in both labour productivity and the real wage. A 10 percent increase in investment spending leads to 2.59519 and 4.86277 percent growth in labour productivity and real wage respectively. These coefficients suggest that investment spending impact more on wage than productivity. In other words, if investment spending grows, workers get paid more than their productivity has increased. Similar to the effect of investment spending, labour productivity affects positively, both investment spending and real wage. While investment spending increases by 3.61900 percent because of 10 percent increases in labour productivity, real wage grows by 3.15809 percent if labour productivity increase by 10 percent.

Despite the positive responsiveness of the real wage when investment spending and labour productivity increase, investment spending respond negatively when real wage increases. A 10 percent increases in real wage causes investment spending to decline by 3.93143 percent. This result confirms the theoretical view of the relationship between real wage and labour productivity. Under normal circumstances, a better earning (good wage) stimulates labour productivity (Cahuc *et al,* 2014). In relation to this theory, findings in Table 6.11 depict a positive long-run relationship between real wage and investment spending. If the real wage increases by 10 percent, labour responds by increasing their productivity by 2.03947 percent.

The accuracy of the above mentioned findings was tested using LM test for serial correlation and ARCH for heteroscedasticity. The null hypothesis for these two tests suggests the presence of serial correlation and heteroscedasticity within series under consideration. As represented in Table 6.11, none of the null hypotheses was rejected. Under LM test, failure to reject the null hypothesis means the absence of serial correlation. Consequently, variables utilised in the model are homoscedastic and free of serial correlation. The outcome of diagnostic test is shown in Table 6.11 below.

Table 0-11: A linear long run relationship between LINVES, LPROD and LWAGE

	LINVES	LPROD	LWAGE
LINVES	----------	0.259519	0.486277
LPROD	0.361900	----------	0.315809
LWAGE	-0.393143	0.203947*	----------
Diagnostic tests and model robustness			
LM test	0.9393	0.9956	0.1287
Durbin-Watson	1.985846	1.944848	1.995805
ARCH	0.4821	0.9374	0.9303
Critical value at 5%	Lower bound: 2.72 & upper bound 3.83		
Bound test (F-value)	4.607719**	3.063798 **	4.953027**

*Note: ** indicates coefficient with a p-value significance at 5% level*

Source: Author's compilation (data from SARB, 2018)

6.4.6.2 The ECM and the short-run relationships

The analysis of the ECM is imperative as it allows determining whether shocks within the model are adjusted in the long-run or not. In the case of this study, the error terms are negative and significant as expected; meaning that short-run changes in these models are adjusted in the long-run. Looking at the results in Table 6.12, the speed of adjustment in labour productivity model is slow compared to investment and real wage models. Approximately 5 percent of shocks in real wage and labour productivity models is adjusted, whilst only about 2 percent of disturbances in investment spending is fixed each quarter. In other words, it takes more time to adjust changes that occur in investment spending level to come back to long-run equilibrium compared to time required to adjust changes in labour productivity and real wage.

Considering the short-run results, the current level of investment spending is subjected to the lagged value of investment spending. The labour productivity and real wage have no short-term effect on investment spending. This result suggests that labour productivity takes time to impact on investment and real wage. Additionally, the real wage is not significant to influence investment spending level. This means that the wage received in the short-run is mostly spent on the daily life necessities and other activities rather than investment for future productions.

Nonetheless, short-run increase in the investment spending causes a decline in real wage. A 10 percent increase in investment spending leads to 0.21915percent decline real wage. This is a small effect; thus, it requires time for investment spending to influence real wage. Likewise, the lagged value of real wage can also have a negative effect on the current real wage. Contrary to investment and the lagged real wage that negatively influence real wage in the short-run, labour productivity has a positive and significant impact on short-run real wage. If productivity increases by 10 percent, the real wage should grow by 0.83713 percent.

Table 0-12: A linear short-run relationships LINVES, LPROD and LWAGE

	LINVES	LPROD	LWAGE
LINVES	0.456381***	0.002392	-0.021915
D(LINVES(-3))	----------	----------	-0.178756**
D(LPROD)	0.057200	----------	0.0583713***
LWAGE	-0.005800	0.170001**	----------
D(LWAGE(-1))	----------	----------	-0.176369*
D(LWAGE(-2))	----------	----------	-0.186957*
CointEq(-1)	-0.046631	-0.024392	-0.046921
ECM (P-value)	0.0027***	0.0255**	0.0000**

*Note: *** significance at 1% level; ** significance at 5% level and * significance at 10% level*

Source: Author's compilation (data from SARB, 2018)

6.4.6.3 Toda-Yamamoto Granger Non-Causality Test

In the above sections, the Autoregressive Distributed Lag (ARDL) model was utilised to determine the presence or absence of long and shortrun relationships between sectoral employment, investment spending, labour productivity and real wage. In this case, sectoral employment was considered as dependent of investment spending, labour productivity and real wage. In the second case, the analysis was based only on interrelationship among sectoral employment where each employment sector was analysed, firstly the dependent and thereafter as independent variables. The third case analysed the interrelationship between what was previously considered as independent. Those variables are investment spending, labour productivity and real

wage. The ARDL approach utilised in these three cases did not provide the causal relationship or rather the direction of causality among variables.

The study, as discussed in section 5.3.1.2 of the methodology chapter, found that the Toda-Yamamoto causality test as the appropriate approach to determine the causal relationship among variables. Results presented in Table 6.13 depicted the outcome from the Toda-Yamamoto causality test.

Table 0-13: Toda-Yamamoto Granger non-causality results

	LECON	LEFIN	LEMAN	LEMIN	LETRAD	LETRAN	LINVES	LPROD	LWAGE
LECONS	……	0.2732	0.2880	0.6988	0.2266	0.0025***	0.7202	0.6717	0.5630
LEFIN	0.1179	……	0.1836	0.4526	0.0020***	0.3834	0.3004	0.0018***	0.9474
LEMAN	0.3325	0.5782	……	0.6511	0.0004***	0.1469	0.0182**	0.9576	0.7807
LEMIN	0.7422	0.4260	0.5455	……	0.0289	0.1599	0.0172**	0.0400**	0.0474**
LETRAD	0.6766	0.1265	0.6283	0.7327	……	0.0278**	0.0239**	0.7282	0.1143
LETRAN	0.1784	0.5728	0.3693	0.3611	0.2874	……	0.8178	0.1726	0.8308
LINVES	0.6970	0.1920	0.5751	0.7533	0.0037***	0.0342**	……..	0.6288	0.2911
LPROD	0.4746	0.3054	0.0835*	0.8229	0.1373	0.3502	0.0671*	……..	0.3250
LRWAGE	0.2162	0.0259**	0.4855	0.4426	0.0123**	0.0141**	0.6450	0.1489	……

*Note: ***, **, and * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2018)

In the application of Toda-Yamamoto Granger non-causality approach, the study tested the null hypothesis of non-causal relationship against the alternative that stipulated the presence of causal relationship between two variables. Based on the results in Table 6-13, the result indicates that none of variables in the system can cause short-term changes towards the employment within construction and mining sector. Similarly, employment in the transport sector does not cause changes to any of the analysed variables.

However, considering employment in financial sector, the real wage is the only variable that causes fluctuations in financial sector's employment. Additionally, real wage is also a short-run predictor for employment changes in trade and transport sector. In other words, a unidirectional causal relationship exists between real wage and employment in financial, trade and transport sector. Employment in transport sector can also be caused by employment in trade sector. The result in Table 6.13 indicates a single bidirectional causal relationship that exists between employment in trade sector and investment spending. While employment in mining sector can cause short term oscillations within domestic investment and employment in trade sector, employment in mining sector can be utilised to predict changes in labour productivity, real wage and investment spending. Changes in investment spending are not only caused by employment in mining and manufacturing, but also by employment in trade sector and labour productivity. Briefly, in the short-run, the real wage is the only variable, among independent variables, that can cause changes in more than two variables in the model.

6.5 THE ASYMMETRIC RELATIONSHIPS BETWEEN SECTORAL EMPLOYMENT, INVESTMENT SPENDING, LABOUR PRODUCTIVITY, REAL WAGE

The previous section 6.4 provided the estimation of a linear long-run relationship between sectoral employment, investment spending, labour productivity and real wage. However, in some cases relationships exist among economic and financial variables that are not linear. In some case, a nonlinear or asymmetric relationship is found among economic variables. Additionally, the linear analysis oversees the integration patterns by providing the overall effect of the independent on the dependent variable. In so doing, the hidden integration parameters are ignored while performing the ECM (Granger and Yoon, 2002). Furthermore, the assumption of

linearity among economic and financial series does not always hold and instead of being linear, economic decisions are asymmetric or nonlinear. Therefore, a nonlinear analysis yields better results compare to linear models (Barão, 2008:42).

The outcome of nonlinear analysis assists in determining the two-sided effect of independent variable on the dependent variable. Growth in real wage, for instance, does not only have a negative effect towards job creation it can also assist in creating new jobs (Adudu & Ojonye, 2015; Scarth & Myatt, 1980). However, if the positive effect is small than negative, the former effect is offset by the later, yet it is important to note that both effect exists. In this regard, it was considered pertinent to scrutinise whether variables under the study, despite the linear relationship estimated in the section (6.4), possess some nonlinear relationships. The importance of the nonlinear estimation is that if a linear analysis is applied to variables that have a nonlinear relationship the estimated results are judged to be spurious and this might result is erroneous conclusion and unfitting policy suggestions (Enders, 2014).

In this section (6.5), the NARDL approach is applied to analyse both long and short-run asymmetric within the relationships between sectoral employment and the independent variables (investment spending, labour productivity and real wage). In case, these two models (ARDL and NARDL) provide different outcome, the NARDL findings are preferred over the ARDL results because the linear model is more restrictive compared to nonlinear (Frost, 2017).

6.5.1 Analysis of asymmetric long-run relationships

Firstly, the presence of cointegration is investigated and the results in Table 6.14 indicate the existence of a long-run relationship among variables. To this end, the null hypothesis, suggesting that variables do not cointegrate, for each model, was rejected in favour of the alternative. In other words, all calculated F-statistics were found to be greater than the upper bound critical values from Pasarn *et al.* (2001) table. Consequently, the NARDL confirmed the cointegration or long-run relationship between underpinned variables as found from the linear ARDL regression. Although the general conclusion, the existence of long-run relationship among variables is substantiated by both linear and nonlinear ARDL, the magnitude of the effect from one variable towards other differs. With this heterogeneity of findings, the results from

NARDL prevail for they consider series noise and complexities. In so doing, the NARDL provides trustworthy results (Enke, 2005; Ho *et al.,* 2002).

Analysing the effect of investment spending, labour productivity on sectoral employment, Table 6.10 portrays long-run coefficients. As displayed in the table, positive changes or shocks in investment spending levels have a significant positive effect on employment in construction, financial, mining and transport sector. If investment spending increases by 10 percent, employment in construction sector increases about 8 percent. Similarly, investment spending has almost the same effect on employment in financial sector, because in this sector employment grows with 8 percent as a response to 10 percent increase in investment spending. The difference between the effect of investment spending on employment in construction and financial sector is the significant levels. Shocks of investment spending are more significant to influence employment in financial sector than they are for employment financial sector. The confidence level is 99 percent in construction sector and 90 percent in financial sector. The power of investment spending towards employment growth within different sector is not the uniqueness of the South African economy. Some other scholars' have found that a high level of investment spending leads to low level of unemployment rate and thus, increases employment level (Byiers *et al.*, 2015; Iacovoiu, 2012; Michelitsch & Shi, 2013; Psaltopoulos *et al.*, 2011).

Additionally, employment in transport sector increases approximately by 6 percent when investment spending is raised up by 10 percent. Both negative and positive changes of investment spending possess a significant effect towards employment in mining sector. On one hand, if investment spending increases by 10 percent, employment in mining sector increases approximately by 4 percent. Surprisingly, on the other hand, approximately 15 percent increases in mining employment as response to 10 percent declines in investment spending. Thus, investment spending has a high magnitude effect on employment in mining sector than positive effect. In this case, one can conclude that foreign direct investment creates more employment in mining sector than domestic investment. Therefore, if a negative correlation exists between domestic and foreign investment, a decline in domestic investment will give more opportunity to foreign investors. In so doing, more jobs will be created.

Changes in labour productivity are significant only for employment in financial sector where negative changes dominate positive changes. Thus, 10 percent increase in productivity causes employment in financial sector to decline by 1 percent.

However, if labour productivity declines by 10 percent, the response of employment in financial section is to increase by 2.2 percent. Analysing the effect of the real wage on sectoral employment, the results in Table 6.12, portray that negative changes in the real wage do not affect any sector's employment. In contrast, if the real wage increases by 10 percent, employment level will decline by 6 percent in construction sector and 3 percent in mining sector respectively. Taking into account the asymmetric effect of independent variables namely investment spending, labour productivity and real wage, on sectoral employment, one can conclude that employment in manufacturing and trade sectors are not affected by the mentioned independent variables. This does not necessarily imply the absence of impact of the independent variables on independent variables; it rather infers that influences of independent variables may be there only for a short-term.

Table 0-14: Cointegration between sectoral employment, investment, productivity and real wage

	LECONS	LEFIN	LNEMAN	LEMIN	LETRADE	LETRAN
LINVES+	0.0285***	0.829763*	0.538288	0.40414**	-0.221863	0.6445***
LINVES−	0.088761	-0.343942	0.152074	0.14599**	0.419631	0.1795
LPROD+	0.750228	-0.1344***	0.272515	0.209261	-0.378777	-0.810441
LPROD−	0.470925	0.219021**	-0.348484	0.340287	1.098883	-0.157653
LWAGE+	-0.605***	-0.001090	-0.220012	-0.2803**	0.140626	0.207775
LWAGE−	-0.22173	-0.331692	-0.736114	-0.45596	0.096650	-0.714497
Bound test: F- results	6.4782***	11.6578***	6.45187***	3.299115*	5.151924***	5.81903***

Note: *, **, * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively**

Source: Author's compilation (data from SARB, 2018)

6.5.2 Diagnostic tests and model robustness

It was imperative to conduct a diagnostic test to be certain that the regression results are genuine. In this case, the Breusch-Godfrey Lagrange multiplier or rather LM test

is utilised to determine whether variables are serially correlated or not. This test is also supported by Durbin-Watson statistic to evade the doubt about LM test results. Additionally, the autoregressive conditional heteroscedasticity (ARCH) test is also conducted to investigate whether variables are homoscedastic or heteroscedastic. The outcome of these mentioned tests is depicted in Table 6-15. Based on the same results, one can, without hesitation, conclude that the estimated models are free of serial correlation and variables are homoscedastic. Consequently, the results from regression analysis are trustworthy.

Table 0-15: Diagnostic tests and model robustness

	LM Test	Durbin-Watson	ARCH test
	No serial correlation	No serial correlation	No heteroscedasticity
LECONS	0.6206	1.955445	0.7550
LEFIN	0.6683	1.990417	0.4066
LEMAN	0.3774	2.310691	0.2975
LEMIN	0.8659	1.993878	0.9790
LETRAD	0.1542	1.964423	0.0603
LETRAN	0.7287	1.955412	0.1588

Source: Author's compilation (data from SARB, 2018)

6.5.3 Error correction model and short-run relationships analysis

Since the long-run relationship among variables is analysed in previous section, it is necessary to investigate what happens to the dependent variables as result in changes of independent variables. It is also significant, through the ECM analysis, to determine whether short run shocks or disequilibrium in the model are adjusted in the long-run. In the short-run, positive changes of investment spending are not significant; meaning that they have no significant effects of sectoral employment. However, its negative changes have a positive effect on employment construction, financial and manufacturing sector; and negative effects on employment in trade sector.

In the short-run, increases in labour productivity have a negative effect on employment construction, financial and trade sector; whilst increase in labour productivity leads to job growth in mining sector. A decline in labour productivity increases employment in the financial sector and causes job decline in transport sector. The real wage

variations impact on employment in two sectors. Increase in short-term real wage results in joblessness in construction and financial sector, while a decline in real wage results in employment growth within financial sector.

Disequilibrium or shocks in each of six models is adjusted in the long-run. This is justified by the fact that each error term is negative and significant. All six error terms, as displayed in Table 6-16, are significant with 99 percent level of confidence. In other words, their probability value of being incorrect is less than 1 percent. Considering the speed of adjustment towards long-run equilibrium, employment changes within the transport sector is quickly adjusted compared to other sectors; while employment changes in mining sector is slowly adjusted compared to other sector under the study. The ECM results, in Table 6.16, for nonlinear model confirm the ECM results, in Table 6.17 for linear model.

Table 0-16: ECM and short run relationships

	LECONS	LEFIN	LNEMAN	LEMIN	LETRADE	LETRAN
D(LINVES^{+})	0.179113	0.085765	0.018305	0.139507	-0.06035	0.228317
D(LINVES^{-})	0.7516***	0.3354***	0.202824***	0.267873	-0.1435*	0.147650
D(LPROD^{+})[2]	-1.2092**	-1.1344***	-0.145321	0.304979***	-0.3758*	-0.40650
D(LPROD^{-})	-0.21902	1.219021**	0.088007	0.108851	0.288996	-2.9082**
D(LWAGE^{+})	-0.4323*	-0.17535**	0.049444	-0.074495	-0.02721	0.179886
D(LWAGE^{-})	-0.85642	1.6620***	0.401697	-0.386604	-0.16628	-0.15903
ECM	-0.16129	-0.085892	-0.063501	-0.056293	-0.10690	-0.31151
ECM (prob.)	0.0000***	0.0000***	0.0000***	0.0021***	0.0006***	0.0000***

Note: ***, **, * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively.

Source: Author's compilation (data from SARB, 2018)

6.5.4 Analysis of asymmetric relationships among sectoral employment

Employment in the analysed sectors does not only depend on investment spending, labour productivity and real wage. Changes in one sector's employment may also have repercussions on other sectors' employment level. This section analyses the

[2] Productivity effect on employment in mining sector is inconclusive because the computed F- value lies between the lower and upper critical values. Therefore, without further information no inference can be made

asymmetric relationships within sector's employment for the long-run and short-run implications. In other words, the section analyses asymmetric relationships of inter-sectors' employment.

6.5.4.1 Long run asymmetric relationships and diagnostic tests

To ensure that cointegration or long-run relationships exist between sectoral employment levels, the computed F-statistics were compared to the Pesaran *et al.* (2001) critical values. Findings revealed that the computed F-value was found to be greater than the upper bound critical value at 5 percent level for each sectoral employment model (LNECONS, LNEFIN, LNEMAN, LNEMIN, LNETRAD and LETRAN). Thus, the null hypothesis of no cointegration, for each model, was rejected in favour of the alternative. Consequently, similar to the linear ARDL findings, variables under consideration are cointegrated. The estimated long-run results: long-run coefficients together with diagnostic test results are presented in Table 6.17.

Considering one sector's employment effects towards other sectors' employment level, the results reported in Table 6.17 indicate that positive changes in construction sector's employment leads to job growth in manufacturing and trade sector while a long-run negative shocks on employment in the construction sector causes a decline of employment in financial, manufacturing, trade and transport sectors' employment. From these finding, one can conclude that negative changes in construction sector are more influential compared to positive changes. When construction employment grows, its fluctuation impact on two sectors, while its decline affects four out of five sectors analysed.

Additionally, the magnitude of negative effects dominate over the positive asymmetric effects. These findings oppose to CIBD (2015) report asserting that construction industry creates indirect job within other sectors through the use of materials and services from those sectors. The ideas behind this study findings, should relate to the impotent of the South African construction sector or the use of more imported and services. Nonetheless, Chitiga *et al.* (2016:9) argued that growth of construction sector should impact more on other sector since, for instance, a construction of road or bridge should reduce the transportation cost of input and output in other sectors. Thus, reducing logistics cost and the cost of production.

Secondly, the effect of positive and negative changes in financial sector towards other sectors' employment was analysed. The study found that, out of five sectors considered, four are affected by positive changes of employment in financial sector while negative changes affect only to sectors. When the level of employment increase by 10 percent in financial sector, trade and transport sector increases their employment by 7.1531 and 9.19104 percent respectively. However, this employment growth in financial sector leads also to job loss in manufacturing sector for a 10 percent increase in former causes 3.10475 decline in the later. Besides, job losses in financial sector cause a job cuts in the trade sector. Almost 7 percent of jobs are lost in trade sector as a result of 10 percent job decline in financial sector. Contrary to the two sectors (construction and manufacturing) that impact positively and negatively, positive changes in manufacturing sector impact only on the long-run employment in the transport sector. Negative changes in manufacturing employment have no significant effect on other sectors employment.

Considering the responsiveness of other sectors' employments towards positive and negative variations of employment in mining sector, the result in Table 6.14 suggests that positive and negative changes affect employment in two different sectors. While a 10 percent increase in mining employment results in 0.531percent growth in transport employment and 4.7631percent decline in trade sector, a 10 percent decline in mining employment lead to a 6.316 percent growth in construction sector and a 6.398 decline in trade sector. Therefore, any change in mining employment has a negative impact on the trade sector.

The positive and negative fluctuations of employment in trade sector impact also on employment in other sectors. If employment in the trade sector increases by 10 percent, employment in financial and manufacturing sector will grow by 3.841 and 1.006 percent respectively as a response to the rise of employment in trade sector. However, the result in Table 6.14, indicate that negative changes in trade sector positively influence growth in financial and manufacturing employment. The financial and manufacturing employment increases by 3.798 and 6.168 percent respectively as a response to a 10 percent decline in trade sector's employment. Additionally, 10 percent declines in trade employment causes employment in the construction sector

do decline by 5.47 percent; meaning that a linear relationship exists between employment in trade and construction sectors.

While a positive change in transport sector's employment causes a decline in manufacturing sector's employment, it also leads to employment growth in trade sector. A 10 percent increase in transport sector's employment leads to 3.149 increase in trade sector's employment and at the same time cause employment in manufacturing sector to decline by 4.036 percent. Furthermore, a decline in transport employment causes a high employment growth in trade sector. If 10 percent decline in transport employment, trade sector's employment increases by 8.701 percent.

Analysing the responsiveness of one sector's employment towards fluctuation on employment in other sector, as reported in Table 6.14, one can conclude that a decline of employment level in one sector does not necessarilly imply unemployment growth. A person might leave his/her current employment in one sector and immediately find employment in other sector. In other words, during the economic cycle, people might switch their employers or their employment sector due to their skills growth, technology implication, and wage differentiation and employees satisfaction. On the other hand, growth of employment in one sector does not necessary means the total level (national) of employment has grown because these new employees might be coming from other sector. Therefore, a conclusion on whether the total national employment has increased should consider positive and negative changes in different economic sectors.

The accuracy of the above interpreted findings was established through the diagnostic tests. The outcome of diagnostic tests is also presented in Table 6.17. Durbin-Watson and the LM test result indicate that the employed variables were free of serial correlation, while the ARCH test for heteroscedasticity revealed that variables were homoscedastic.

Table 0-17: Long run coefficients and diagnostic tests

	LNECONS	LNEFIN	LNEMAN	LNEMIN	LNETRAD	LETRAN
LECONS^{+}	----------	-0.0590	0.1812*	1.0464	0.3589***	0.0279
LECONS^{-}	----------	0.7271***	0.3015***	-0.1179	-0.4038***	-0.0892**
LEFIN^{+}	-1.0054	----------	-0.3105*	-0.7059	0.7153**	0.2191**
LEFIN^{-}	-0.2617*	----------	-0.1094	-1.9240	-0.6602**	-0.5016
LEMAN^{+}	3.7546	-0.9261	----------	0.6336	1.1248	0.2372***
LEMAN^{-}	0.2943	-0.1228	----------	0.7104	-0.4164	0.1043
LEMIN^{+}	0.7975	0.7111	-0.0970	----------	-0.47631**	0.0531***
LEMIN^{-}	0.6316**	0.3441	-0.1605	----------	-0.6398***	0.0565
LETRAD^{+}	0.3441	0.3841**	0.1006***	0.0321	----------	0.5733
LETRAD^{-}	-0.547***	0.3798***	0.6168***	-0.4221	----------	-0.8865
LETRAN^{+}	-0.0747	-0.27400	-0.4036***	0.1740	0.3149***	----------
LETRAN^{-}	-0.7953	-1.6878	-0.5635	0.0456	0.8701***	----------
LM test	0.4691	0.3745	0.7728	0.3274	0.5417	0.1438
DW	1.9997	1.9472	1.9706	1.9719	1.9292	2.0571
ARCH	0.9911	0.4858	0.3501	0.1758	0.1919	0.7476
F-value	5.3396***	6.3850***	10.70090***	3.3397**	4.8291***	3.5729**

*Note: *** indicates significance at 1% level; ** significance at 5% level and * significance at 10% level; D-W: symbolises Durbin-Watson*

Source: Author's compilation (data from SARB, 2018)

6.5.4.2 Short-run asymmetric relationships and Error correction models

Since the previous section provided the asymmetric relationship among sectoral employment, it is imperative to investigate the responsiveness of employment in one sector due to short-run changes of employment in other sectors. The regression of the short-run analysis is exhibited in Table 6-18.

Positive changes (that is growth), of short-run employment in construction sector impacts only on two sectors namely mining sector and trade sector. Even though a weak significance effect (significant at 10 % level) exist between employment growth in construction and mining sector, 10 percent increase in construction's employment causes mining employment to decline by 1.273. Nonetheless, this same growth of employment in construction sector results in 1.346 increase in trade sector's

employment. Taking into account the negative changes in construction sector, that is job losses in this sector, possess a negative and positive impact on some of other sectors' employment. Employment in financial and manufacturing sector increases by 1.977 and 0.940 as a response to 10 percent decreases of employment in construction sector. On the other hand, if employment in construction sector shrinkages by 10 percent, causes trade sector to lose 1.48 (or 2.919 with 3 lags) percent of its jobs.

In the short-run, positive changes in financial sector's employment leads to employment growth only in mining sector. In the latter sector, employment increases by 5.935 as a reflexion of 10 percent employment increase in financial sector. The positive effect of employment growth in other sector does not only come from positive change in financial employment because even a decline of employment level in this sector can create jobs in other economic sectors. In this regard, 5.914 and 3.523 percent is the employment growth in construction and trade sectors respectively, as a result to 10 percent decline in financial employment. As mentioned before, if job decline in one sector leads to job growth in other sector, this could mean that employees are altering their employment sectors.

Employment growth in manufacturing sector encompasses both positive and negative effect on some of other economic sectors. While employment in construction and transport sector increases by 4.998 and 4.118 percent respectively because of 10 percent increase in manufacturing employment, almost 10 percent of employment in trade sector declines following a 10 percent increase in manufacturing employment. Similar to positive changes, negative changes in manufacturing sector's employment can also have both positive and negative impact towards other sector employment. If employment in manufacturing declines by 10 percent, employment in financial and trade increases by 5.087 and 3.847; whilst it also decreases by 3.750 in trade sector.

The effect of short-run employment growth in mining sector has a significant positive impact on employment in trade sector while it causes employment to decline in construction, manufacturing and transport sector. Comparing the responsiveness of other sector employment to the positive changes in mining sector, these sectors are more negatively affected than positively affected. Similarly, to the positive changes, negative changes or decline of employment in mining sector causes positive and negative changes into other sectors' employment. Nonetheless, the magnitude of

positive changes in mining sector's employment is stronger than the negative changes power.

Although the positive short-term employment in trade sector has no significant effect on the other sector employment, negative changes impact on other sectors' employment. A decline of 10 percent of employment in trade sector results in 7.1155 and 4.613 percent of employment growth in construction and financial sector respectively; while it causes a decline of 5.736 percent of employment in manufacturing.

The transport sector's employment effects towards other sectors' employment was analysed. In contrast to other sectors that might increase their level of employment while causing other sectors to lose their jobs, positive changes in transport sector's employment leads to employment growth in other sector. The level of employment in the manufacturing and trade sector increases by 4.28 and 1.4895 percent respectively as a result of 10 percent increase in transport sector employment. A 10 percent decline in transport sector's employment is followed by 8.943 decrease of employment in construction sector and 4.419 percent growth in trade sector's employment.

Looking at the short-run interrelationships among sectoral employment, the trade sector is the most affected sector in comparison to the other sectors. That is, employment in trade sector depended on other sectors employment. Finally, considering the error correction terms and their probabilities, the conclusion is that all of the ECM are negative and significant as anticipated. In other words, short-run deviations or shocks in each sector's employment model, are fixed and adjusted toward the equilibrium in the long run. The speed of adjustment is quicker in trade and transport sectors and very slow in the mining sector.

Table 0-18: Short run coefficients and the error correction terms

	LNECONS	LNEFIN	LNEMAN	LNEMIN	LNETRAD	LETRAN
D(LECONS^{+})	--------	-0.0622	0.0376	-0.1273*	0.1346***	-0.1309
D(LECONS^{-})	--------	0.197***	0.0940***	-0.0463	-0.148**	-0.2332
D(LECONS^{-} (-1))	--------	--------	----------	--------	-0.0135	----------
D(LECONS^{-} (-2))	--------	--------	----------	--------	-0.0857	----------
D(LECONS^{-} (-3))	--------	--------	----------	--------	-0.2919***	----------
D(LEFIN^{+})	-0.0677	--------	-0.0247	0.5935***	0.1775	0.2965
D(LEFIN^{-})	0.4100	--------	0.1661**	-0.0464	-0.1130	-0.1450
D(LEFIN^{-} (-1))	0.8914**	--------	----------	----------	0.3523**	----------
D(LEFIN^{-} (-2))	--------	--------	----------	----------	0.5609***	----------
D(LEMAN^{+})	0.4998**	-0.3805		0.8103	-0.392241	0.4118**
D(LEMAN^{+} (-1))	--------	--------	----------	----------	-0.3930***	----------
D(LEMAN^{+} (-2))	--------	--------	----------	----------	-0.9747**	----------
D(LEMAN^{-})	0.4935	0.508***		0.1674	-0.0011	0.4597
D(LEMAN^{-} (-1))	--------	--------	----------	--------	0.3847**	----------
D(LEMAN^{-} (-2))	--------	--------	----------	--------	-0.3750**	----------
D(LEMIN^{+})	-0.858***	0.1811	0.0367	--------	0.3947***	-0.0463
D(LEMIN^{+} (-1))	--------	--------	0.0892	--------	0.1240	-1.3104***
D(LEMIN^{+} (-2))	--------	--------	0.0809	--------	0.2333	-1.2893***
D(LEMIN^{+} (-3))	--------	--------	-0.3247***	--------	0.6598***	----------
D(LEMIN^{-})	0.0301	0.0460	-0.0278	--------	-0.0708	-0.0615
D(LEMIN^{-} (-1))	--------	--------	----------	--------	0.0992	0.2160
D(LEMIN^{-} (-2))	--------	--------	----------	--------	0.24446**	----------
D(LEMIN^{-} (-3))	--------	--------	----------	--------	-0.2404***	----------
D(LETRAD^{+})	0.0593	0.1333	0.0167	0.0321	----------	-0.0504
D(LETRAD^{-})	-0.2584	0.4613*	0.0802	-0.4221	----------	-0.0603
D(LETRAD^{-} (-1))	0.7115**	----------	-0.5736***	----------	----------	----------
D(LETRAN^{+})	-0.1183	-0.0231	0.0428*	0.0108	0.14895***	----------
D(LETRAN^{+}(-1))	--------	--------	0.0592**	----------	----------	----------
D(LETRAN^{+}(-2))	--------	--------	0.0575**	----------	----------	----------
D(LETRAN^{-})	-0.8943*	0.1067	-0.0021	0.0028	0.4419**	----------
D(LETRAN^{-} (-1))	-0.0510**	--------	----------	----------	----------	----------
CointEq(-1)	-0.1635	-0.1059	-0.197712	-0.0320	-0.4337	-0.2796
ECM (P-value)	0.000***	0.000***	0.0000***	0.0000***	0.0000***	0.0000***

*Note: ***, **, * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2018)

6.5.5 Estimation of Asymmetric relationships between investment spending, labour productivity and real wage

6.5.5.1 Estimation of long-run relationships

The relationships between dependent (sectoral employment) and independent variables were analysed in sections 6.4 and 6.5. It is noteworthy to analyse the asymmetric relationships among the dependent variables. Analysing the interrelationships between investment spending, labour productivity and real wage, each variable was considered first to be dependent and thereafter becomes independent. Thus, three models were developed. Testing the Wald test for all these three variables, it was found that the calculated F- statistics for investment spending falls between lower and upper bound values while the computed F-statics for labour productivity is smaller than lower bound critical values. Consequently, the labour productivity model has no long-run relationship with investment spending and real wage whilst investment spending model is inconclusive. Nonetheless, the F-statistics in real wage model is 24.27254 greater than upper bound critical value of 3.67 at 5 percent level.

Based on these findings, it is only necessary to interpret the effect of real wage on investment spending and labour productivity. The estimated result infers that changes in real wage have no significant long run effects on investment spending. However, if real wage increases by 10 percent, labour productivity increases by 4.39460. The result in Table 6-15 suggests also that 3.72434 percent increases in labour productivity as a response to 10 percent decline in real wage. The residuals diagnostic tests were conducted to ascertain that the above interpretation was not based on spurious data. The outcome from these diagnostic tests is reported in Table 6.19. The conclusion from these tests suggests that variables employed in this model have no serial correlation among themselves and they are not heteroscedastic but rather homoscedastic.

Table 0-19: Estimation of long run relationships among independent variables

	LINVES	LPROD	LWAGE
LPROD+	5.967910	----------	----------
LPROD⁻	8.484813	----------	----------
LINVES⁺	----------	-0.959364	0.670019***
LINVES⁻	----------	-1.052706	-0.726263*
LWAGE⁺	-2.009640	0.439460***	----------
LWAGE⁻	-12.468812	0.372434**	----------
Diagnostic tests and model robustness			
LM test	0.1548	0.9986	0.2100
Durbin-Watson	2.004339	1.952404	1.948326
ARCH	0.7719	0.6521	0.7652
Critical value at 5%	Lower bound: 2.79 Upper bound 3.67	Lower bound: 2.79 Upper bound 3.67	Lower bound: 2.79 Upper bound 3.67
Bound test (F-value)	2.965670	2.059546	24.27254***

*Note: ***, **, and * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2018)

Since the other two models, namely the model analysing the effect of investment spending on real wage and labour productivity together with the model analysing the impact of labour productivity on investment spending and real wage have no cointegration, it is unnecessary to test for error correction model for these two models. However, the subsequent section will analyse the asymmetric short-run effect of labour productivity and investment spending towards real wage. Asymmetric short-run relationship between real wage, investment spending and labour productivity

Looking at the short-run results presented in Table 6.20, it can be noted that in the short-run investment spending depends only on its lagged value. While the labour productivity significantly impacts on real wage, the later has no short-run relationship neither with investment spending nor real wage. The results make sense because it is not easy to invest or increase productivity in short-run as result of changes in real wage. Nevertheless, the real wage can be increased in the short-run as a stimulus or motivation to workers.

The ECM in the three models (LINVES, LPROD and LWAGE) meets the expectation. The ECM coefficients are negative and significant. Meaning that after short-run disturbance, each model comes to the equilibrium. Considering the ECM coefficients, the speed of adjustment is quicker in real wage model compared to other two, while it takes more time for investment model to come back to the long-run equilibrium aftershocks in the system.

Table 0-20: Short run relationships among independent variables

	LINVES	LPROD	LWAGE
D(LINVES+)	----------	-0.007281	-0.007071
D(LINVES(-1))	0.405487**	----------	----------
D(LINVES−)	----------	0.051874	-0.085982
D(LPROD^{+})	0.321728	----------	0.814654***
D(LPROD^{+} (-1))	----------	----------	-0.686115**
D(LPROD^{-})	-0.593154	----------	-0.078433
D(LWAGE^{+})	-0.049407	0.166266***	----------
D(LWAGE^{-})	-0.620884	0.689026*	----------
Coint Eq(-1) coefficients	-0.031092	-0.063302	-0.082069
ECM (P-value)	0.0017***	0.0004***	0.0000***

*Note: ***, **, * indicates coefficient with a p-value significance at 1%; 5% and 10% respectively*

Source: Author's compilation (data from SARB, 2018)

Looking at the both models, standard ARDL and NARDL, it is noted that despite their agreement on the presence of long-run relationship among variables, they provide distinct findings. In the view of Hatemi (2012) it is indispensable to consider the asymmetric effects between the dependent and independent variables for they influence labour and financial markets. In this regard, the extension of the ARDL model (Benigno, 2016), the NARDL results were chosen over the standard ARDL. Besides, NARDL regression considers structural changes during economic cycle. The linear analysis expects a constant impact of independent variables on the dependent variable. It also suggests a constant speed of adjacent towards the long-run equilibrium.

The linear model is judged to be more restrictive as it suggests that an economic variable undergoes the same shocks during the recession as in peak phase of

business cycle. Consequently, the linear model does not capture the asymmetric feature that occurs over the business cycle (Bayramoglu &Yildirim, 2017:175; Koop *et al.,* 1996:120). These assumptions of linearity among variables are not always valid within economic time series. Economic theory states that there is no such a thing as assuming that a regular and constant relationship exists among economic variables (Morley & Piger, 2004). In linear relationships, the coefficient of independent variables is assumed constant over time (Barnett, *et al.,* 2000:80). To include the positive and negative variations of explanatory variables and their effects on the dependent variable, it appeared necessary to apply both linear and nonlinear ARDL on the current study. The use of dynamic multiplier asymmetries allows the determination of positive and negative effect of the explanatory variables on the dependent variables.

6.5.6 Dynamic multipliers with long-run and short-run asymmetries

Using NARDL, the study applied the multiple dynamic adjustments to analyse the combination of long-run and short-run effects and the magnitude of the effect of independent variables (investment spending, labour productivity and real wage) on the dependent variables (sectoral employment). This analysis was achieved by plotting the dynamic cumulative multiplies. Following the Schwarz Information Criterion, estimation of empirical dynamic multiplies is one of the fitted components of NARDL model (Shahbaz, 2018: 23-23).

The results from the dynamic multipliers are presented throughout Figures 6.5 to 6.10. The green line and dashed black line represents positive and negative capturing adjustment of sectoral employment to positive and negative shocks in investment spending, labour productivity and real wage. The asymmetric curve represented by continuous red line designates the difference between positive and negative change associated with the dynamic multiplies. The lower and upper bound level of confidence of asymmetry at 95 percent is denoted by the dotted red line.

6.5.6.1 Dynamic Multipliers with LR and SR Asymmetries in construction sector

Looking at results in Figure 6.5, the overall conclusion should be that, investment spending, labour productivity and real wage contribute to the employment variation within construction sector. Findings show that, from the initial point, the impact of positive change stemming from investment spending possesses a dominant effect on

employment compared to negative shocks in investment spending. Similar results, as displayed in Figure 6.5, were found between labour productivity and employment in construction sector. The effect of positive changes in labour productivity on construction employment dominates negative changes. In other words, growth in investment spending and labour productivity allow the construction sector to increase employment level.

These results are in line with other studies' findings (Fouladi, 2010; Saks, 2008) suggesting that investment spending and productivity growth within construction sector generate both direct and indirect jobs. Contrary to investment spending and labour productivity, negative effects of real wage on employment in construction sector dominate over positive effect. Increase in real wage results in job destruction in construction sector. Klein (2012) findings revealed also that an inverse relationship exists between real wage growth, productivity and employment. Real wage growth reduces employment and outplaces productivity.

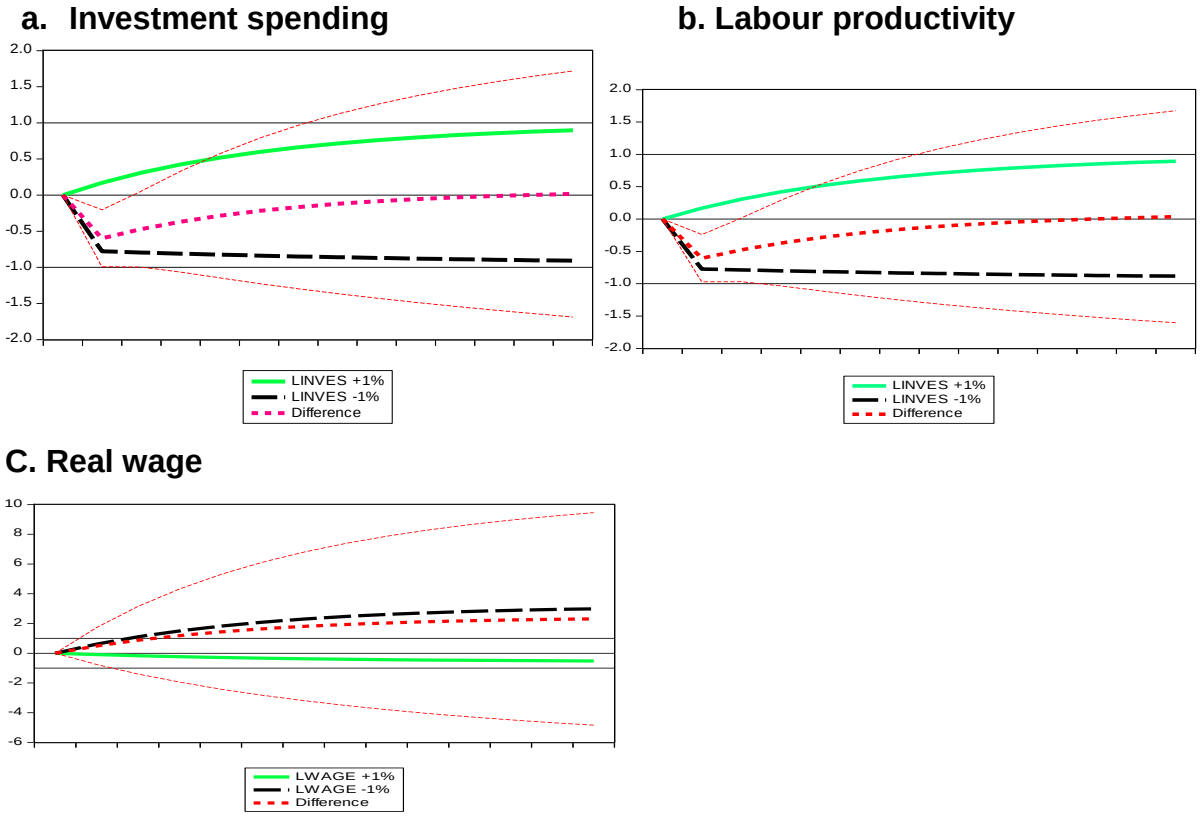


Figure 0-5: Dynamic Multipliers with LR and SR Asymmetries in construction sector

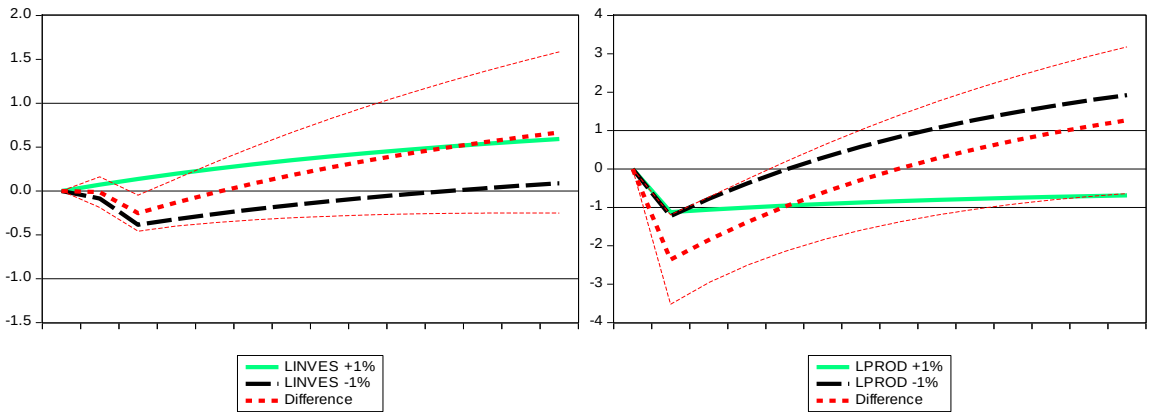
Source: Author's compilation (data from SARB, 2018)

6.5.6.2 Dynamic Multipliers with LR and SR Asymmetries in financial sector

Taking into consideration the dynamic multipliers of the effect of independent variables (investment spending, labour productivity and real wage) as displayed in Figure 6.6, it can be noticed that from the starting point in 1995 up to 2017 the effect of positive shocks on employment in financial sector dominated over the negative effects. This indicates that an increase in domestic investment over the analysed time positively impacted on job growth in financial sector. Yet, despite that the positive effect of investment spending on employment in financial sector remains dominant, the negative effect increased with a high speed compared to the positive effect growth as the continuous black line lies above the green line shows. In this same sector, negative effect of labour productivity and real wage dominated positive effects. Thus, labour productivity and real wage increase at the expenses of employment in financial sector.

These results are in line with Archer (2008) and West (2015) who suggest that the productivity growth experienced in the South African financial sector does not result from labour intensive, but rather from capital intensive and technology growth. Using more and advanced technology increases sector's productivity while reducing job opportunities for labour market. Additionally, the financial sector is one of those employing highly skilled workers, thus paying high wage compared to other sectors. Employing more labour implies increasing the cost of production. Therefore, labour productivity growth and technology change can lead to low employment in the financial sector (Lindley & McIntosh, 2017).

a. Investment spending **b. Labour productivity**



C. Real wage

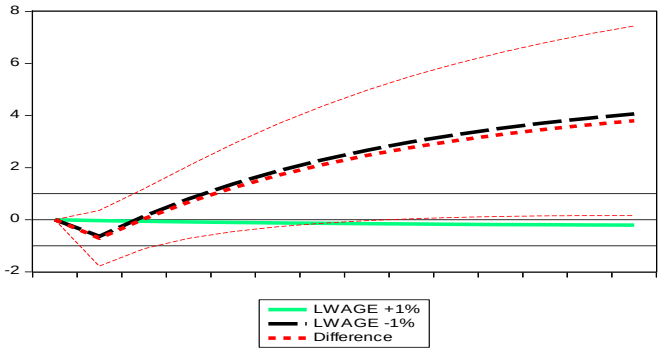


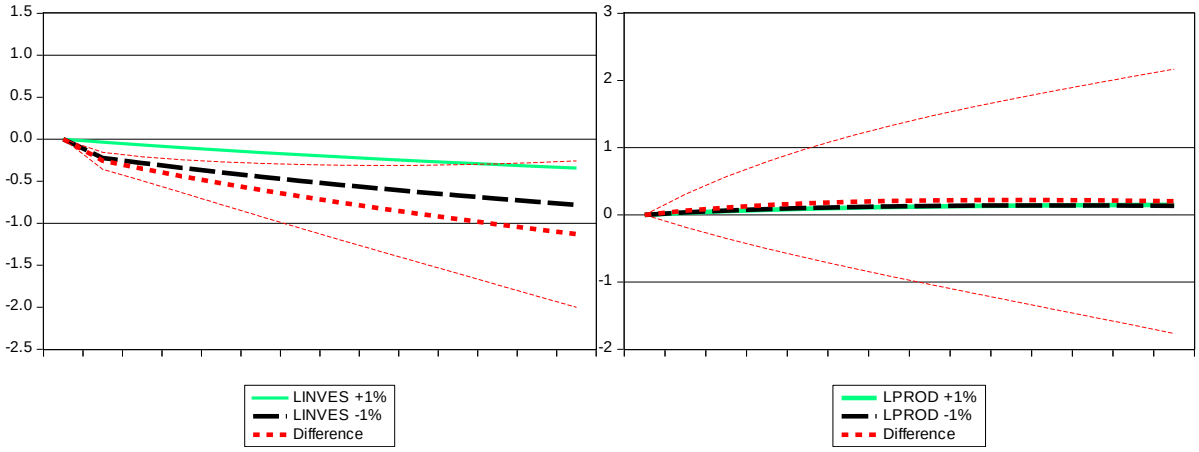
Figure 0-6: Dynamic Multipliers with LR and SR Asymmetries in financial sector

Source: Author's compilation (data from SARB, 2018)

6.5.6.3 Dynamic Multipliers with LR and SR Asymmetries in manufacturing sector

The result in Figure 6.7 displays the dynamic multipliers of the effect of investment spending, labour productivity and real wage in manufacturing sector. The positive effect of investment spending is dominant over the negative effect. Increase of domestic investment over time can assist in reducing the growing level of unemployment in South Africa especially in manufacturing sector. The negative and positive dynamic effects of labour productivity on employment level in manufacturing sector are indistinct. The green, black line and red line in Figure 6-6 merge one another. In other words, increases or decline in labour productivity have no significant effect on employment in manufacturing sector. Results in Figure 6.7 also indicate that while investment spending affect positively employment in manufacturing sector and labour productivity has no significant effect, real wage impact negatively on employment in manufacturing sector. In other words, more investment assist in employing more labour while production based technology growth makes labour producitivity to be insignificant (Bhaduri & Marglin, 1990; Stehrer, & Ward, 2012). Increase in real wage restrains firms' ability to employ more labour. Consequently, the real wage increase is accompanied with a high rate of unemployment this result is supported by the Keynesian theory of employment (Keynes, 1936) and empirical finding of Gregg and Machin (2014)'s study.

a. Investment spending **b. Labour productivity**



C. Real wage

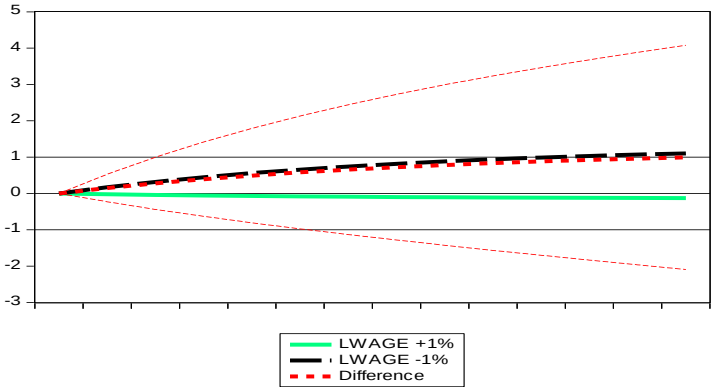


Figure 0-7: Dynamic Multipliers with LR and SR Asymmetries in financial sector

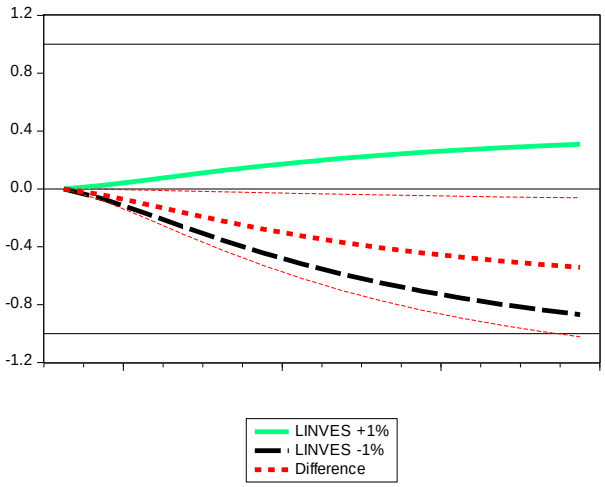
Source: Author's compilation (data from SARB, 2018)

6.5.6.4 Dynamic Multipliers with LR and SR Asymmetries in mining sector

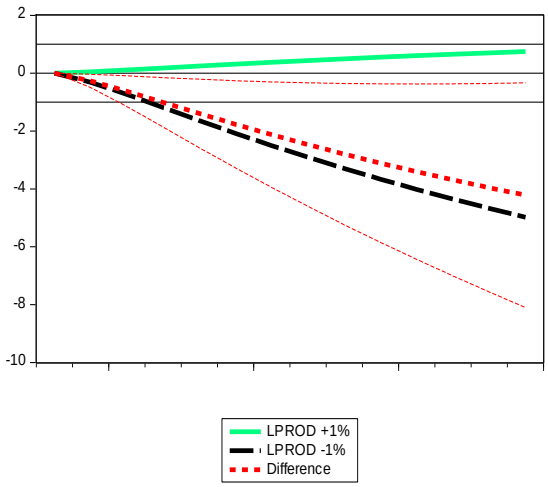
As it is the case in construction sector, investment spending and labour productivity positive effects dominate the negative effects on employment in mining sector. That is, if investment spending and labour productivity growth, employment in this sector will follow the same trend. A transitive behaviour is experienced between investment spending, labour productivity and employment in mining sector (CM, 2017). Mining is the sector with a power to employ both low skilled and high skilled workers.

The earnings for high skilled worker are high whilst the low skilled workers earn low wages (Itkin, 2007). Putting both remunerations together, the average cost per labour in mining sector is fair and it allows the sector to employ more workers as long as they are productive. Increase in mining production leads to investment growth and GDP which in return assist in creating new employment opportunities. However, if real wage increases, some of employed workers will lose their jobs. Consequently, an inverse relationship exists between real wage and employment in mining sector. The Figure 6.8 below portrays the asymmetric relationship between mining employment, labour productivity investment spending and real wages.

a. Investment spending



b. Labour productivity



C. Real wage

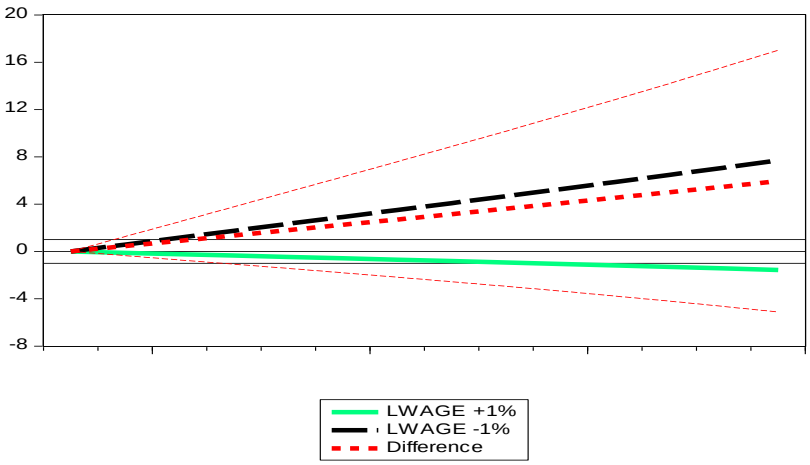


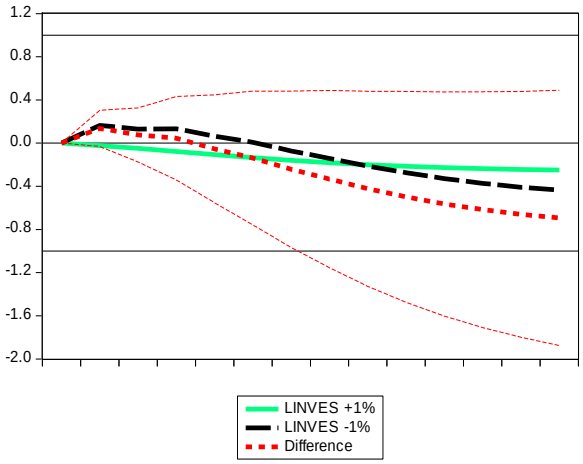
Figure 0-8: Dynamic Multipliers with LR and SR Asymmetries in mining sector

Source: Author's compilation (data from SARB, 2018)

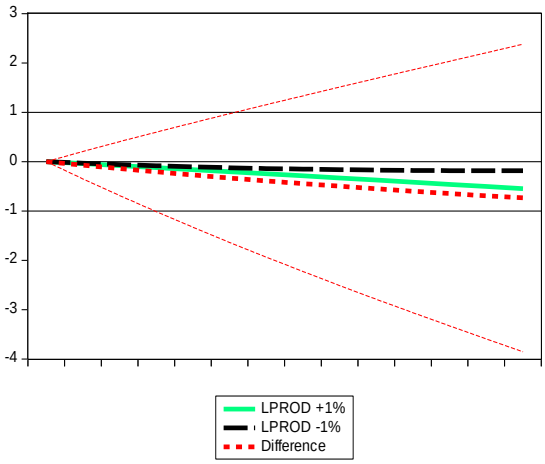
6.5.6.5 Dynamic Multipliers with LR and SR Asymmetries in trade sector

Dynamic multipliers asymmetric effects of investment spending and labour productivity in trade sector differ from sectors previously analysed. Results in Figure 6.9 suggest that from the starting point in 1995 up to the third quarter of 2016, negative effect of investment spending on employment in trade sector dominated the positive effect. Nonetheless, from the first quarter of 2017, positive effect was dominant, but unable to have a positive impact on employment. Looking at labour productivity in this sector, a negative effect dominates over positive effect and grows over time. Therefore, both negative and positive effect of labour productivity leads to job loss in trade sector. In this sector, negative effect of real wage can result in job destruction and the positive effect has a null impact on employment, that is, insignificant.

a. Investment spending



b. Labour productivity



C. Real wage

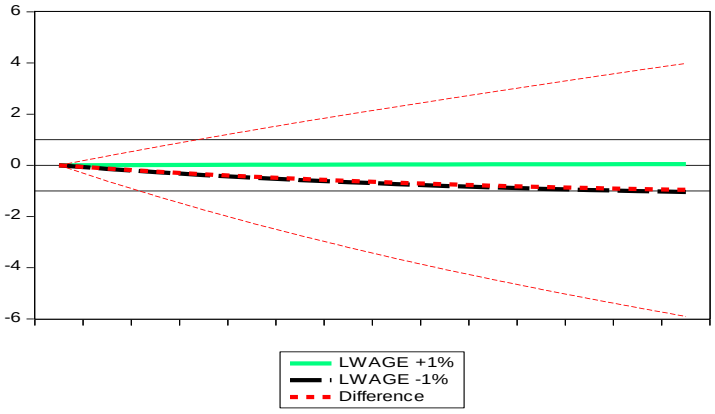


Figure 0-9: Dynamic Multipliers with LR and SR Asymmetries in trade sector

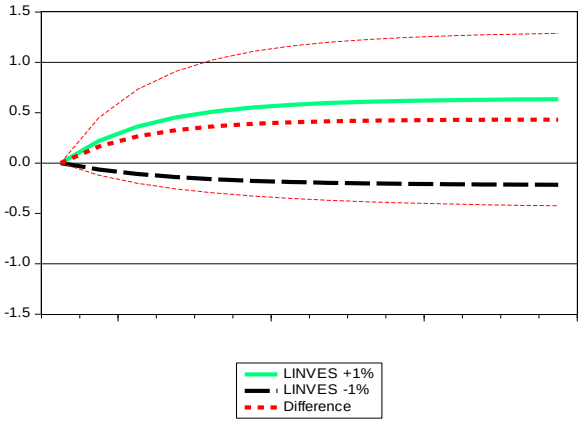
Source: Author's compilation (data from SARB, 2018)

6.5.6.6 Dynamic Multipliers with LR and SR Asymmetries in transport sector

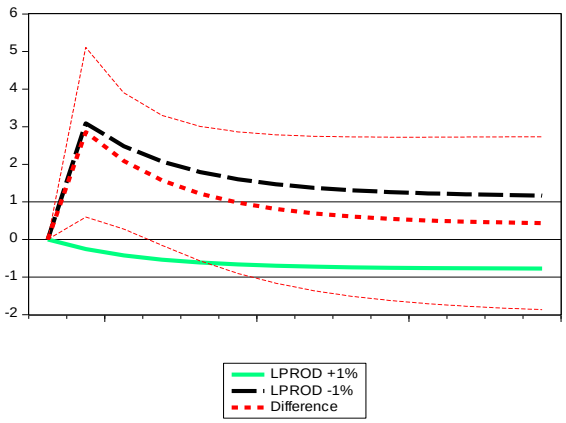
The final analysis of Dynamic Multipliers of the asymmetric effect in this study focuses on employment in transport sector. In this sector, only investment spending has a positive dominant effect. In both labour productivity and real wage, negative effects are dominating over positive effects. The trade-off between employment and these two economic variables (labour productivity and real wage) was also found in the study of Junankar (2013).

Increase in labour productivity and real wage push employers to reduce the number of workers. Alternatively stated, growth in investment spending enables job creation whilst escalation of labour productivity and real wage induce unemployment within the transport sector. In Figure 6.10, the green line lies above the black line only for investment spending and it falls below for labour productivity and real wage.

a. Investment spending



b. Labour productivity



C. Real wage

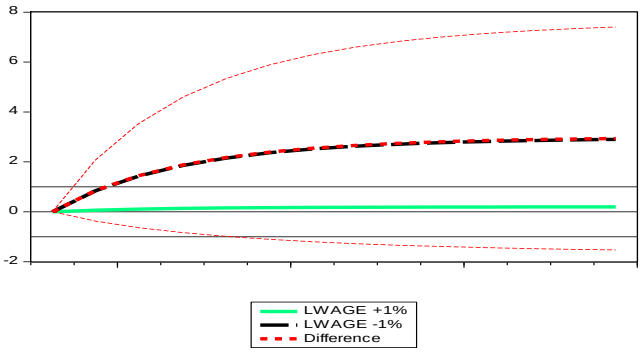


Figure 0-10: Dynamic Multipliers with LR and SR Asymmetries in mining sector

Source: Author's compilation (data from SARB, 2018)

6.6 CHAPTER SYNOPSIS

Through the data analysis and discussion, the chapter has made a contribution to the literature on the relationship between sectoral employment, real wage, labour productivity and investment spending. The chapter started with the analysis of variables using various statistical and econometric methods. Using different approach to test unit roots and determine stationarity of variables, a mixture of order of integration was identified. In other words, some of series under the study were found to be stationary at level *I (0)* whilst others were stationary after first difference *I (1).* Variables being a mixture of *I (0)* and *I (1)*, the standard ARDL and NARDL models were employed to determine linear and nonlinear long-run and short-run relationships among variables. The findings, based on linear and nonlinear ARDL approaches, suggest that in many cases investment spending has a positive long-run relationship with sectoral employment. The labour productivity and real wage do not have a strong significant effect on changes in sectoral employment. Nonetheless, within few sectors namely construction and mining, positive shocks in labour productivity generates job growth.

Taking into account the asymmetric effect of independent variables namely investment spending, labour productivity and real wage on sectoral employment, it was concluded that employment in manufacturing and trade sectors are not affected by the three mentioned independent variables. This does not necessarily imply the absence of relationship between dependent variables and independent variables; it simply infers a deficiency of influential power of independent towards alterations within the dependent variables. Nonetheless, negative changes in construction sector's employment are more likely to influence other sectors' employment compared to its positive changes. When construction employment grows, its fluctuations impact on other two sectors, while its decline affects four out of five sectors analysed.

Analysing the responsiveness on one sector's employment towards fluctuation on employment in other sectors, the findings revealed that a decline of employment level in one sector does not necessarily imply unemployment growth. A person might leave his/her current employment in one sector and immediately find employment in other sectors. In other words, during the economic or business cycle people might switch their employers or their employment sector due to their skills, wage and employee

satisfaction. Furthermore, growth of employment in one sector does not necessary means that the total level of employment has grown because these new employees might be coming from other sectors. Therefore, a conclusion on whether the total national employment has increased should consider positive and negative changes in different economic sectors.

Looking at the short-run interrelationships among sectoral employment, the trade sector is the most affected by changes in other sectors' employment. While a decline of employment in construction sector cause job loss in other sector, employment growth in financial sector leads to job growth in other sectors. The overall finding was that, employment in each economic sector reacts differently to shocks in investment spending, labour productivity and real wage. More particularly, under dynamic multipliers asymmetries, positive shocks in investment spending impacts employment in most of economic sectors, positive changes in labour productivity creates jobs in few sectors and finally real wage growth negatively impact on sectoral employment.

Increase in one sector's employment might mean that people are leaving their employment in other sector coming to this one, probably because of its working conditions. On other hand, losing employment in one sector might mean increasing employment in the other sector. If other sectors respond negatively towards positive changes in one sector, this could mean that this sector takes away other sectors employees.

CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

Unemployment in South Africa, as discussed in chapter 3 and 4, and signposted in the data, is a serious economic challenge which requires attention. The current study scrutinized the effects of investment spending, labour productivity and real wage on employment in six of the major economic sectors in South Africa. The primary, as well as secondary objectives underlined throughout theoretical and empirical objectives, provided the direction for the study analysis. The sample period of the data employed was from the South African Reserve Bank from the period 1995 Q1 to 2017 Q4. To achieve the set objectives, the study employed various statistical tests and econometric models comprising of descriptive statistics, graphical representations, correlation analysis, unit root tests, symmetric and asymmetric ARDL tests for cointegration, as well as Granger causality and diagnostic tests. Accordingly, the dataset employed for the empirical analysis consisted of investment spending, labour productivity, real wage and sectoral employment within construction, financial, manufacturing, mining, trade and transport sectors. Each variable was transformed into its natural logarithm form in order to analyse variables based on a common unit. This chapter draws together the summary, achievement of objectives, contribution and limitations of the study. It also presents the conclusion and recommendations, as well as the final remarks of the study. It commences with a concise summary and closes with the final remark.

7.2 SUMMARY OF THE STUDY

The study analysed the interaction between investment spending, labour productivity, real wage and sectoral employment in South Africa. The formulation of the title, objectives, and the choice of methodology, were based on the premise that South Africa is one of the countries with high levels of unemployment. It was reported that in the last quarter of 2017, the South African unemployment rate was 26.7 percent (Stats SA, 2018). Besides its high unemployment rate this during period, the country

underwent a significant amount of fluctuations in investment spending, labour productivity and real wage. The research question emanated from the narrative that different theories and empirical studies suggest: a strong relationship between employment, investment spending, labour productivity and real wage. Henceforth, the study's main empirical objectives consisted of:

(i) analysing the interactions between productivity, real wage, investment spending and sectoral employment in South Africa; (ii) determining the growth and trends of investment spending, labour productivity, real wage and sectoral employment rate; (iii) the determination of the long run and short interactions between sectoral employment, investment spending, labour productivity and real wage in the South African economy; (iv) the analysis of the responsiveness of employment in each sector based on the changes in other sectors' employment; (v) determining the causality between investment spending, productivity and real wage; (vi) the identification of the main driver of sectoral employment in South Africa between wages, productivity and investment spending; and lastly, (vii) the analysis of the multiplier effects of investment spending, labour productivity and real wage on sectoral employment.

The following was the structure of the study: The first chapter introduced subsequently elaborated upon issues leading to the study. This chapter provided the background of the study, problem statement and research questions, the study objectives, ethical consideration as well as the study structure. The chapter also provided the overall significance of the relationship between investment spending, labour productivity and employment, both globally and in South Africa.

The second chapter supplied insights on current literature by reviewing the literature in relation to the dynamism of employment, investment spending, labour productivity and real wage. The chapter distinguished different theories of employment focussing on Marxism, Classical and Keynesian theory. The discussion has shown that, despite the existence of multiple employment theories and the dynamic effects of economic indicators on employment, interconnections exist between investment spending, labour productivity, real wage and employment. Furthermore, different types of employment were discussed together with their causes and effects. The theoretical effect of investment spending and real wages on employment was also subjected to a detailed discussion.

Chapter three, investigated the trends of South Africa's macroeconomic variables and its employment policies. The chapter indicated that the South African investment spending, labour productivity, real wage and employment, has experienced a significant fluctuation between 1995 and 2017. Changes in each variable were identified to present repercussions on the performance of other variables. Despite the numerous policies presented to curb the high rate of unemployment and improve the South African economy, the discussion on the reviewed policies highlighted a small effect of those policies on South Africa's employment level.

The fourth chapter gave insights on existing empirical studies by proving a review of empirical studies, the applied methodology, and the findings obtained. It was observed, in this chapter, that most scholars employed the Ordinary Least Squares (OLS) and the Vector autoregression (VAR) model to determine the relationship between employment, investment spending, labour productivity and real wage. Contrary to those studies, the current study made use of the Autoregressive Distributed Lag (ARDL) model in its linear and nonlinear forms. In regards to the connectivity between investments spending, labour productivity, real wage and sectoral employment, three distinct opinions emerged from the reviewed literature. Firstly, a number of reviewed empirical studies supported the existence of positive relationship between investment spending, labour productivity, real wage and employment. Secondly, some studies suggested the presence of negative relationships between investment spending, labour productivity, real wage and sectoral employment, while the third set of empirical literature refuted the existence of any relationship among these variables. In the literature, it was broadly acknowledged that an increase in investment spending can improve employment and job creation.

The fifth chapter outlined the methodological framework which reviewed the VAR model, linear and nonlinear ARDL and other econometric approaches pertinent for the preceding analysis. Chapter five also presented the various steps followed in the study, respective of the analysis and estimations. To inform the reader on the variables utilised for the analysis, the chapter discussed the data set in regard to the sources as well as how and where it was obtained. The sample size and sample period were designated based on data sources and data availability. Finally, the chapter justified

the use of both linear and nonlinear ARDL modelling for cointegration as presented by Psarian *et al.* (2001) and Shin *et al.* (2014).

Chapter six provided the analysis and discussion of the estimated findings. In this regard, series under the study were subjected to preliminary tests in order to assess the features of each variable and establish any deficiencies within the distribution of the series. The results from the unit root test highlighted the use of the ARDL model for cointegration. Other different econometric approaches were employed in support of the ARDL model. The analysed theoretical and empirical research justified the assigned methods and approaches employed for estimating the set objectives. Additionally, in presenting the empirical outcome, the following sequence was embraced by the study: Cointegration test, ECM, residual diagnostic tests, T-Y test and the dynamic multiplier test. The outcome obtained from the utilised approaches and procedures empowered to make inferences and rational conclusions. Additionally, findings from analysis in chapter six assisted in providing effective responses to the research questions and in achievement of the objectives outlined in the first chapter of the study.

In chapter six, the study went further to investigate whether employment in one sector may present effects on other sectors' employment. The study therefore identified that growth in investment spending creates employment in various sectors. Labour productivity was found to have an effect on employment in some sectors and but non-significant in other sectors. With the exception of the mining sector, an increase in real wage was found to be associated with job loss in other sectors.

Another feature of the study was to analyse the interaction between the sectors' employment. Contrast to other studies that analyse the effect of other macroeconomic components on employment level, this study investigated how the growth or decline in employment in one sector affects the level of employment in other sectors. It was found that employment in construction and the financial sector affect more other sectors' employment. Although the anticipated positive linkage between labour productivity and sectoral employment was not found, findings between investments spending, real wage and employment agreed with prior expectation. Fleetingly, an interaction exists between investment spending, labour productivity and sectoral

employment. Figure 7.1 gives a summary of the linkages between the analysed variables.

Chapter eight provides the study summary and policy implications. It provides an executive summary of the entire study in a logical and concise manner. Moreover, it identifies the policy implications of the study. The impact and contribution of the study towards the existing knowledge, as pertains to the interaction between investment spending, labour productivity, real wage and sectoral employment, were also highlighted in this chapter. After the presentation of its limitation, the study pointed out the areas of further studies concerning the topic under consideration.

7.3 ACHIEVEMENT OF STUDY OBJECTIVES

The synopsis of how the study objectives, as presented in chapter one, were achieved is provided throughout the subsequent sections:

7.3.1 Primary objective

The primary objective of the study was to conduct a detailed analysis of the interactions between productivity, real wage, investment spending and sectoral employment in South Africa. Different steps satisfying pertinent theoretical and empirical objectives were undertaken in order to achieve the primary objective which was to analyse the interaction between investment spending, labour productivity, real wage and sectoral employment.

7.3.2 Theoretical objectives

The study established a useful theoretical background and literature to provide the reader an understanding of the concepts and keywords surrounding the research question and primary objectives. The analysis of relevant theories was undertaken to accomplish the set of theoretical objectives in accomplishment of the primary objective of the study. The subsequent paragraphs outline and discuss the underscored theoretical objectives and how they were achieved.

- ***To define, contextualize and classify the concept of employment and unemployment***

The achievement of this objective was realized in chapter 2 throughout section 2.2.1, section 2.22 and section 2.2.3. In these three sections employment and unemployment were defined and distinguished. In section 2.2.1, it was elucidated that job loss in one of the employment sectors does not necessary mean unemployment growth as new job opportunities do not also necessarily mean that the total number of jobs has grown. Labour movement sometimes creates a confusion between jobless growth and employment growth. If a worker leaves his job in one sector and is employed in other sector, one can think that there was job destruction in one sector and job creation in the other sector, yet this has no significant effect on employment and unemployment. Section 2.2.2 provided different definitions of the unemployment concept. The aim of employment or a job must be the generation of income in the form of wages or profits. Nonetheless, some activities might be executed with the intention of generating income yet not classified as employment because of time constraints. This explains why in section 2.23 the concept of underemployment was introduced. Underemployed is referred to a person performing an activity below his or her full capacity. Consequently, underemployment results in inadequate job opportunities and real wage. In these three sections, different arguments were provided to emphasis the difficulties in defining, measuring and classifying employment and unemployment.

- ***To depict theoretical aspects and the different types, causes, consequences and measurements of employment/unemployment***

Different types of unemployment such as cyclical, structural, frictional, and seasonal, were thoroughly discussed. Their causes and consequence to economic and social welfare were also established in chapter 2. Grounded on the different theories and groupings, the discussed types of employment in section 2.2.5 and 2.2.6, depicted two major categories of unemployment. The first category refers to those people who are not working because, in their own perception and judgement, the current wage is not sufficient. This type of unemployment is not caused by lack employment opportunities but caused by undesirable wages. The second category of unemployment encompasses those people who are able and willing to work for the existing wages yet facing the absence of employment opportunities. The first type of unemployment is perceived as voluntary unemployment while the second is involuntary

unemployment. Section 2.2.7 emphasized other forms of employment/unemployment while section 2.2.8 focutilised on the measurement of employment/unemployment. It was also depicted that workers are either employed in the formal sector or informal sectors. Those employed within the informal sector cannot enjoy the same employment benefits as those in the formal sector. Further, a person can be employed where his/her capacity or skills captivity are not fully employed. That is what is known as under employment. This objective assisted in providing details about employment/unemployment.

- ***To review three of the main theories of employment/unemployment***

Although numerous theories in economic literature explain employment and unemployment behaviour, this study focussed on three main theories, namely, Marx's economic theory, the Classical theory and the Keynesian employment theory. The Marx's theory, in section 2.3.1, explains the role played by capitalism in solving unemployment and wages issue. This theory enlightened also how firms intending both high capital and high productivity can create and destroy jobs concomitantly. Capital is utilised to develop technology that takes over labour employment. Contrary to Marx's theory, the Keynesian theory, in section 2.3.2.2, argues that the main cause of unemployment is the low level of aggregate demand for goods and services as demand creates supply and high supply requires more labour. Beside Keynesian and Marx's theory, the Classical theory emphasises how high wages obstruct productivity and employment growth. In this regard, high supply and low wages can assist in reducing unemployment rate.

- ***To define and elucidate labour market flexibility with the concepts of real wage, labour productivity and gross domestic investment spending***

From section 2.2.12.1 to 2.2.12.7, the study discussed the labour market and employment flexibility. Demand for labour depends on many factors. Labour productivity, investment spending and real wage are amongst the few factors that influence labour market dynamism. Investment spending is one of the key factors that push the private sector to demand more labour with the intention of increasing their turnover. However, this is possible if productivity is mostly labour intensive instead of technological or capital usage. In section 2.5, an eminent highpoint was the immense relationship and interdependences of the considered features amongst investment

spending, labour productivity and real wage and how employment is affected. Through spillover effects, literature and theories suggested that an interaction exists between investment spending, labour productivity, real wage employment.

- ***To review empirical studies that investigated the relationship between employment, investment spending, labour productivity, real wage and employment***

In support of the theoretical relationships outlined and discussed in chapter two. Chapter three reviewed empirical studies that focussed on the relationship between employment, investment spending, labour productivity and real wage. Upon examining various studies which were conducted during different periods of time and within different environments, it was found that, regardless of the econometric approach utilised, a close relationship exists amongst variables. In most cases, emperical evidence showed that investment spending generated employment growth, while a growth in real wages negatively impacted employment level.

- ***To discuss the macroeconomic trends and assess the effectiveness of some of the South African employment policies***

Furthermore, section 3.4 and 3.5 of the study's third chapter presented and discussed the South African macroeconomic trends and the relevant employment policies. In these sections, the labour market fluctuations were discussed and the trends of each considered variable under were scrutinized. It was perceived that changes in one of the macroeconomic variables, directly or indirectly, had an impact on other variables. The trend analysis was followed by a discussion of the selected employment policies focussing on the South Africa's post-apartheid economy. These employment policies involved strategies and measures enforced by the government towards curbing the country's high unemployment rate and the establishment of a labour-absorbing environment by means of increased economic growth. Despite the efforts invested in these policies, they were not fully efficient to offset the growing unemployment rate.

7.3.3 Empirical objectives

The study also set empirical objectives that assisted in achieving the underlined main objective. The subsequent section outlines empirical objectives and elucidates how they were achieved.

- ***To determine the growth and trends of investment spending, labour productivity, real wage and sectoral employment rate***

This objective was achieved by establishing tabulated and graphical presentations of patterns and trends of the South African employment dynamics, as well as investment spending, labour productivity and real wage. Section 3.3 of chapter three analysed the patterns of the South Africa's labour dynamics between 1995 and 2017. This analysis focussed on labour force trends, labour absorption, job growth and job loss. Additionally, the analysis was extended, in section 3.4, to other macroeconomic variables namely investment spending, labour productivity and real wage. Fluctuations in these three macroeconomic variables have a significant impact on the labour market in general as well as the employment vicissitudes. It was found that one factor that contributes towards high unemployment rate was a decline in labour productivity and investment spending accompanied by an increase in real wage.

- ***To determine the long run and short interaction between sectoral employment, investment spending, labour productivity and real wage in the South African economy***

To accomplish this objective, section 6.4 and 6.5 of chapter 6 established the long run and short run relationships between sectoral employment, investment spending, labour productivity and real wage. The study employed the standard ARDL and the Nonlinear ARDL (NARDL) models to analyse the cointegration among variables. Both models reached the same broadened conclusion that a long run and short run relationship exists among the analysed variables. Accordingly, the reaction and magnitude of the effect of each variable towards changes in other variables within the model were established. Under NARDL, positive shocks within investment spending were found to affect job creation in most of the analysed sectors. An increase or positive shocks in real wage was found to be an obstacle towards sectoral employment growth.

- ***To analyse the responsiveness of each sector's employment towards changes in other sectors' employment***

Finding presented in section 6.5.3 of chapter six suggests that job growth within the construction sector has a positive spillover effect on the manufacturing and trade sector. However, job losses were experienced in financial, manufacturing, trade and

transport sectors due to the growth of employment in the construction sector. Employment growth in the financial sector was found to be the one that causes active reaction from other sectors' employment. Four out of six sectors analysed respond to positive changes in the financial sector's employment. Employment in manufacturing sector was found to be less influential towards other sectors' employment. This ineffectiveness of manufacturing employment towards other sectors' employment is probably due to the fact that manufacturing sector employs more capital and technology than other economic sectors.

- ***To determine the interaction and causality between investment spending, productivity and real wage***

This objective was achieved in section 6.4.5.3 of chapter six. Using the Toda-Yamamoto Granger Non-Causality approach, the causal relationship among all variables considered in the study was estimated. Considering the causal relationship between investment spending, labour productivity and real wage, the result in Table 6-11, revealed that labour productivity was significant at 10 percent significance level in causing short term changes in domestic investment. Therefore, it can be concluded that these three macroeconomic variables are not good short predictors of one another.

- ***To identify the main driver of sectoral employment in South Africa between wages, productivity and investment spending***

Although all variables considered as independent series (investment spending, labour productivity and real wage) tend to cointegrate with the South African sectoral employment, they impact sectoral employment differently. In accordance to the study findings, investment spending is the key driver of employment in most of the analysed sectors. Inversely, an increase in real wage appeared to be the cause of job loss in different economic sectors. The effect of labour productivity on employment growth depends on the type of economic sector. Labour productivity growth within a sector that is labour intensive leads to job creation or employment growth. However, if labour productivity increases in a sector that focuses more on capital and technology for production, this will have no significant effect on employment growth.

- ***To analyse the investment spending, labour productivity and real wage multiplier effects towards sectoral employment***

This objective was achieved in chapter 6, section 6.5.5. Analysing positive and negative impact of investment spending labour productivity and real wage, findings revealed that, in five out of six analysed sectors, positive multiplier effects dominate over negative multiplier from investment spending towards employment. Considering the multiplier effects of labour productivity on sectoral employment, it was found that while a negative multiplier effect dominates in finance, as well as the trade and transport sectors; a positive multiplier effect is dominant in the mining sector. The real wage has a dominant negative multiplier effect on employment within all analysed sectors.

7.4 THE CONTRIBUTION OF THE STUDY TO THE EXISTING KNOWLEDGE

The study analysed the interaction between investment spending, labour productivity, real wage and sectoral employment in South Africa. The formulation of the title, objectives, and the choice of methodology of the study was based on the premise that South Africa is one of the countries with high levels of unemployment. It was reported that in the last quarter of 2017, the South African unemployment rate was 26.7 percent (Stats SA, 2018). Besides the high unemployment rate, the country underwent a significant amount of fluctuations in investment spending, labour productivity and real wage. The research question emanated from the fact that different theories and empirical studies suggested a strong relationship between employment, investment spending, labour productivity and real wage.

This study analysed the interaction between labour productivity, investment spending, real wages and sectoral employment in South Africa. By so doing, the study contributes to the analysis on pertinent issues in the South African economy. Additionally, the current study made an important and significant contribution to the reviewed theoretical as well as empirical literature. This was realised through constructive comments to the relevant theoretical and empirical literature reviewed in chapter 2, 3 and 4. Furthermore, the study focutilised on South Africa's unique country framework. In this regard, the study provided an opportunity to present a comprehensive breakdown of employment based on issues affecting the South African economy. The theoretical and empirical review highlighted in the study were crucial in

scrutinising South Africa's low levels of labour demand, declining domestic investment, fluctuating labour productivity and real wage.

The study went further to investigate whether employment in one sector may have effects on other sectors' employment. The study thereafter identified that growth in investment spending creates employment in various sectors. Labour productivity was found to have a direct effect on employment in some sectors and appeared non-significant in other sectors. However, this does not mean the absence of an impact on those sectors' employment, yet presents an indirect effect. With the exception of the mining sector, an increase in real wage was found to be associated with job loss in other sectors.

Another feature of the study was to analyse the interaction between the sectors' employments. Opposed to other reviewed studies that analyse the effect of other macroeconomic variables on employment level, this study investigated how a growth or decline of employment in one sector affect the level of employment in other sectors. It was found that employment in construction and financial sector, directly, affects more other sectors' employment. Although the expected direct positive linkage between labour productivity and sectoral employment was not found, findings between investments spending, real wage and employment met prior expectations. Fleetingly, an interaction exists between investment spending, labour productivity and sectoral employment. Figure 7.1 gives a summary of the linkages between the analysed variables.

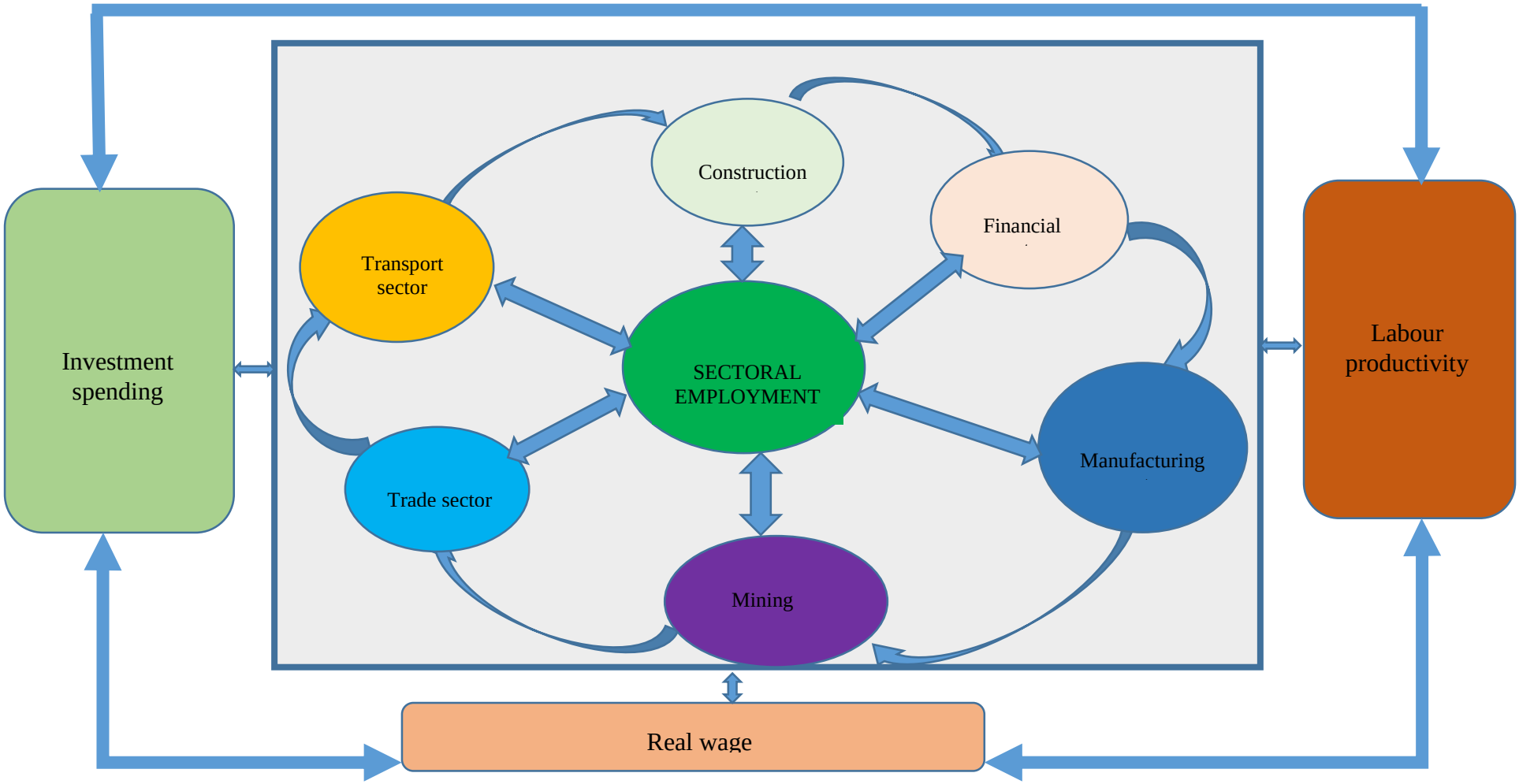


Figure 0-1: Interactions between investment spending, real wage, labour productivity and sectoral employment

Source: Author's compilation

The framework exhibited in Figure 7.1 was compiled from the analysis results as obtained in chapter 6. The framework indicates that sectoral employment is dependent on the performance of other economic variables such as investment spending, labour productivity and real wage. Additionally, the total sectoral employment relies on the performance of each economic sector's employment. Both the reviewed employment theories and empirical studies have indicated that the seriousness and magnitude of unemployment depends on other related economic indicators.

Utilising various statistical and econometric approaches and models, the study unveiled how investment spending, labour productivity and real wages affect employment in the short run and the long run. By means of analysing the relationships among these variables, the study become significantly comprehensive and inclusive. Additionally, the relationship or cointegration among analysed variables was evaluated within a rigorous framework. This is fundamental since the behaviour of variables under the study was analysed over the long run. Additionally, the study analysis elucidated how changes in one sector's employment possesses positive and negative spillovers towards employment within other sectors. In this regard, several recommendations proposed by the study will assist South Africa as well as other various developing countries on the related path to formulating investment, wages and employment policies. This further broadens possibilities for the South African policymakers and for other developing countries facing the same issue of growing unemployment rate. The suggested policies are significant to reinforce the current South African policies in addressing numerous bottlenecks that have weakened labour productivity and employment growth over the years. Although the study focussed on the South African framework, its findings and policies implications are, nevertheless, applicable to more of African and other developing countries on a related path.

7.5 POLICY IMPLICATION OF THE STUDY FINDINGS

Reviewed policies in chapter three were theoretically impeccable. However, they did not meet their targets. The implementation of theoretical and empirical findings of this study acknowledged noteworthy recommendations to boost employment trajectories within various economic sectors. In order to restrain the country's high unemployment rate, ongoing growth in real wage and improved investment spending policies centred

on employment and investment growth were formulated based on the study findings. These policies are included but not restricted to the following:

7.5.1 Establishment of special support towards construction sector

The construction sector employs skilled and non-skilled workers. It also creates continuing employment (construction of news building and infrastructure extended to maintenance of existing one). Special support is needed to increase employment in the South African construction sector as well as the mining sector. If construction sector is well performing jobs are created in mining sector.

7.5.2 Endorsement of expansionary policy in favour of output and productivity growth

High tax relevel is one of challenging that business and middle-income class are facing in south Africa. However, according to Keynesian thinking, expansionary policy would increase output in the economy because it increases the aggregate demand level. Therefore, if the government reduces taxes, individuals and businesses will use their tax savings to consume more goods and services. That increase in consumption will stoke the economy to produce more of the goods and services demanded by consumers. More demand of goods and services brings, therefore,

7.5.3 Implementation of sectoral employment strategies channelling job creation

The study pinpointed out the sectoral employment interdependency. Creation of a channel between the sectors' operation and activities can be one of the strategies to create more jobs and sustain the existing ones. Production in the mining sector should have a connection to the manufacturing operations, manufacturing to trade, trade to transport, transport to construction and vice versa. The manufacturing sector has a strong linkage to other economic sectors and to the national economy. The linkage in sectoral operation and employment can for instance work as follows: the financial sector will ease the operations in manufacturing sector while mining sector is providing raw materials; transport and trade will facilitate the distribution of manufacturing products using the construction sector's facilities. This chain will create demand and

supply for each economic sector while allowing more labour demand. Thus, job creation.

Although the issue of unemployment and policies for employment growth are seen a national concern, it is normal that an individual sector faces specific issues in regard to skills and employment requirement. Consequently, despite the consideration of policies on the national level, goals and strategies in favour of job creation should be decentralised. In other words, each sector should be given a specific attention to create durable and sustainable jobs. The issue of economic growth and employment growth could be handled using the bottom-up approach instead of the top-bottom strategy. Based on the interrelationships found throughout sectoral employment, it is important to establish a channel that links economic sectors. In this case manufacturing should be empowered to transform mining production, while both sectors create works in retail trade and the transport sector. The process will be easy if the construction sector is well-functioning and the financial sector is in good conditions. Thus, the interrelation among economic sectors will drive towards a continuous cycle of job creation.

7.5.4 Establishment of national and sectoral macroeconomic stability

One of the government's crucial contributions in achieving employment growth and job creation is to uphold the macroeconomic stability through applicable policies. The South African government needs to integrate job creation into its economic and development framework. In other words, a deliberate effort is required from the government to ensure the linkage between national and sectoral policies in regard to employment growth and job creation. Moreover, as indicated by empirical findings of this study, investment is key to job creation. Consequently, instead of spending more on households' consumption, government should spend more on public investment and encourages investment and savings culture.

7.5.5 Improvement of required workforce skills

The deficiency of a skilled workforce is detrimental to any job creation or employment strategy. Henceforth, it is imperative for South Africa to improve its formation of human capital. As suggested in the study analysis, labour productivity has a small impact on employment growth. This may suggest the insufficiency of required skills. To improve

human capital and labour productivity effects on job creation, the government needs to provide programs that could assist in developing job skills. Since in some instances, education or knowledge acquired from schools and universities mismatch with available jobs, education officials should revise the correlation between skills required at the workplaces and those provided throughout the education process. Additionally, government support towards youth employment should focus on work experience or training guarantees, work placement programmes and intensified job search assistance. The aim of any form of education and labour training has to focus on labour demand-driven.

7.5.6 Improvement of labour market flexibility and trade openness

Trade openness is one of the various strategies that are pro-employment as foreign firms will be able to enter and establish businesses into South Africa and domestic workers will have the opportunity to work abroad if their skills do not match with the domestic employment opportunities. With trade the opening policy, business information and innovation will play a crucial role in job creation. Labour mobility and job-skills matching should be taken as a backbone in solving the issue of joblessness.

7.5.7 Promotion of independence and connexion between economic and political institutions

In the current decade, it has been seen that economic, business processes and a country's political status play an interdependent role. Although an economy needs political support, it would be better if economic institutions are independent from every political decision. However, it is important to mention that globalization and openness remains a dream if political institutions are not strong. It is difficult for investors to invest or reallocate their businesses into knowing that in no time everything shall soon collapse.

7.5.8 Labour skills, productivity and technology diffusion enhancement

Technology is in some instances regarded as job annihilation. However, it is not always the case. Technology growth can assist in jobs creation. The proof is that a country with high technology experiences low levels of unemployment. In South African economy, labour productivity is not sufficient to boost the economy and create

more new jobs. Therefore, it is imperative for the South African economic authorities to identify and develop new technologies able to transform economic structure and improve the economic sector's capability to create productive jobs. The economic activities, in the South African economy, need to be more knowledge-based moving employment from low to high-skilled sectors in order to improve labour productivity and workers' income. The manner and magnitude at which new technologies are diffutilised across economic sectors, may impact productivity and job creation. Moreover, technology diffusion mechanisms may assist towards the reduction of mismatches between labour demand and labour supply caused by skills shortage and employment performance.

7.5.9 Economic growth and labour-intensive production oriented

The disequilibrium between economic growth and employment appears to be an issue in the south African economy. To ensure the benefits of growth and employment creation are more equitably distributed, any development plan needs to place the growth of labour-intensive sectors at its core.

7.5.10 Creation of labour market model

One barrier to formulating policies to eradicate the unemployment issue in South Africa is the deficiency of a guiding labour market model. It is therefore imperative to pull research findings and insights together in order to develop an overarching framework for labour market analysis in South Africa. This is the vitally priority for scholars, researchers and policy-makers in the future.

7.5.11 Establishing and implementing an effective wage policy

The world of work is centred on employment and wages. Not only do wages influence employment, they also determine the standard of living and the aggregate demand for goods and services. Real wage growth is a challenge for various firms in the South African economy. The pressure of labour union to increase wages lessens the firms' power to employ more labour. Consequently, some firms and other employers prefer to use more technology and capital intensive inputs to evade labour related issues. It is imperative for economic authorities and policymakers to establish an effective real

wage in favour of employees as well as employers. A wage that corresponds with long run productivity, improved economic growth and the social welfare.

7.6 CHALLENGES OR STUDY LIMITATIONS

It is important to highlight that it is difficult and almost impossible to find a study that is free of limitations and challenges. In this regard, the current study acknowledges the following shortcomings. Firstly, the study employed a framework of a unique country that is South Africa. There is a possibility that if panel data analysis were utilised by the study, findings would not be the same. Secondly, instead of using the general South African economy, the study selected some economic sectors. Therefore, it is important to exercise carefulness when employing the study outcome in forecasting and formulating policies fo other economic sectors. Additionally, the effect of the technology growth was not included into the model. Further studies should ensure the inclusion of the technology as control variable. Finally, employment in countries with different economic conditions can be differently affected by investment, productivity and real wage. Therefore, it would be an oversimplification to assume that the econometric approaches and models utilised in the current study will inevitably be appropriate and applicable to all other African and developing economies.

7.7 SUGGESTIONS FOR FUTURE STUDIES

Given the constraints and limitations abovementioned, further studies may consider the following aspects: firstly, the extension of the number of countries focussing on developing countries allowing the application of panel data instead of a simple time series. This could allow research to determine whether the South African sectoral employment issues are an isolated case or common to other countries. Secondly, scholars can extend the number of explanatory variables from three to probably five or more regressors because employment level does not only depend on investment spending, productivity and real wage. Better results can probably be obtained if more relevant macroeconomic variables are added as explanatory variables. Thirdly, the real number of jobs, not job index, can be utilised to verify whether the results collaborate with findings from employment indexes analysis. Lastly, behavioural and special economic theory can also be analysed in future research studies to determine how they impact employment dynamism.

7.8 FINAL REMARKS

The current study investigated the interaction between investment spending, labour productivity, real wage and sectoral employment. The study was constructed upon modern and new econometric approaches, considering linear and non-linear properties, in attempt to determine the link between sectoral employment and other mentioned macroeconomic variables. Findings suggested that one way to increase the level of employment in the South African economy would be to boost the level of investment spending and handle the issue of real wage with caution. Despite using the case of the South African economy, the author is convinced that, in various ways, findings and recommendations from the study may assist other countries with similar challenges as South Africa, in formulating policies of employment-related. Nevertheless, the study encourages more research in respect to unemployment issues, particularly the aspect that traces the causality between employment growth and other economic indicators. Additionally, the author suggests that labour unions should, firstly and for most, focus on how more jobs should be created instead of giving more attention to wage increment. An increase in real wages might push firms to use more capital and advanced technology than hiring more labour.

BIBLIOGRAPHY

Abdullah Y. S. 2008. The long run and dynamic behaviours of wages, productivity and employment in Malaysia. *Journal of Economic Studies*, *35* (3): 249-262.

Abel, A. B., Bernanke, B. S. & Croushore, D. 2014. Macroeconomics. 8th Ed. New York: Pearson.

Adamu, F. M. 2014. Trade openness and industrial performance in Nigeria: evidence from autoregressive distributed lag (ARDL) models. Çankaya (Dissertation - Masters).

Addison, J. T., Blackburn, M. L. & Cotti, C. D. 2012. The Effect of Minimum Wages on Labour Market Outcomes: County-Level Estimates from the Restaurant-and-Bar Sector. *British Journal of Industrial Relations*, 50(3): 412–435.

Addison, J. T., Blackburn, M. L. & Cotti, C. D. 2009. Do minimum wages raise employment? Evidence from the US retail-trade sector. *Labour Economics*, *16*(4): 397-408.

Adekunle, K. A. & Aderemi, A. K. 2012. Domestic Investment, Capital Formation and Population Growth in Nigeria"; *Developing Country Studies*, 2 (7): 37-46.

Adelino, M., Ma, S. & Robinson, D. T. 2014. Firm age, investment opportunities, and job creation. Duke University and NBER.

Adom, P. K., Bekoe, W. & Akoena, S. K. K. 2012. Modelling aggregate domestic electricity demand in Ghana: An autoregressive distributed lag bounds cointegration approach. *Energy Policy* 42, 530–537.

Adudu, S. A & Ojonye S. M. 2015. Employment–Real Wage Relationship and Economic Growth in Nigeria. *Journal of Economics and Sustainable Development*, 6 (2): 179 - 188.

Ahmed, S. F. 2015. Investigating the Causal Relationship between FDI and Economic Growth using Toda-Yamamoto Approach: Evidence from Bangladesh. *ELK Asia Pacific Journal of Finance and Risk Management,* 6(3):35-49.

Akerlof, G. A. & Yellen, J. L. 1990. The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, *105*(2):255-283.

Aktar, I., Ozturk, L. & Demirci, N. 2008. The Impact of FDI, Export, Economic Growth, Total Fixed Investment on Unemployment in Turkey. First International Conference on Management and Economics, Tirana, Albania, 28-29 March, Volume 2, pp. 69-76.

Alberta Labour. 2016. Self-employment: is it for me? Government of Alberta. https://alis.alberta.ca/pdf/cshop/Self-Employment.pdf Date of Access: 20 Sep. 2017.

Altman, M. 2005. A review of labour markets in South Africa: Wage trends and dynamics. HSRC: Employment and economic policy research programme. October.

Altman, M. 2006. Wage determination in South Africa: what do we know?. *Transformation: Critical Perspectives on Southern Africa*, *60*(1):58-89.

Amendola, M., Gaffard, J. L. & Saraceno, F. 2004. Wage flexibility and unemployment: the Keynesian perspective revisited. *Scottish Journal of Political Economy*, *51*(5):654-674.

ANC (African National Congress). 1994. Reconstruction and Development Programme: A policy framework. Johannesburg: Umanyano Publications.

Apergis, N. & Theodossiou. 2008. The Employment-Wage Relationship: was Keynes right after all? *American Review of Political Economy*, 6 (1):40 – 50.

Archer, S. 2008. The financial services sector and its skills development issues relevant to the South African economy. Department of Labour, S.A.

Arodoye, N. L. & Iyoha, M. A. 2014. Foreign trade-economic growth nexus: evidence from Nigeria. *CBN Journal of Applied Statistics*, 5 (1):121-138.

Arora, M. V. B. & Bhundia, M. A. 2003. Potential output and total factor productivity growth in post-apartheid South Africa. Working Paper No. 3-178. International Monetary Fund.

Arora, V. & Ricci, L. A. 2006. Unemployment and the labour market. *In* Nowak, M. & Ricci, L.A., *ed.* Post-Apartheid South Africa: the first ten years. Washington DC: IMF, DC.

Aslam, N. 1983. Level of real wage and labour productivity in the manufacturing sector of the Punjab. *The Pakistan Development Review*, 22 (4):283-299.

Aslan, M., Aslan, H. K. & Yalama, A. 2009. The dynamics of real wage and productivity in public and private sectors: An empirical investigation for 1963–2007 period in Turkey. *Investment Management and Financial Innovations*, *6*(3):179-185.

Asteriou, D. & Hall, S. 2007. Applied Econometrics: Palgrave Macmillan.

Asuero, A. G., Sayago, A. & Gonzalez, A. G. 2006. The correlation coefficient: An overview. *Critical reviews in analytical chemistry*, *36*(1):41-59.

Atif, R. M., Jadoon, A., Zaman, K., Ismail, A. & Seemab, R. 2010. Trade liberalisation, financial development and economic growth: evidence from Pakistan (1980-2009). *Journal of International Academic Research*, 10(2):30-37.

Atkinson, A. B. & J. Stiglitz. 2015. Lectures on Public Economics. New York: McGraw-Hill.

Aurangzeb, D., Ul Haq, A. 2012. Impact of Investment Activities on Economic Growth of Pakistan. *Business and Management Review,* 2(1): 92 – 100.

Awokuse, T. O. 2003. Is the export-led growth hypothesis valid for Canada? *Canadian Journal of Economics, 36(1):126-136*.

Bakke, W. E. 1933. The Unemployed Man: A Social Study, London: Nispet.

Bakker, B. B. 2015. Employment and the Great Recession: The Role of Real wage. IMF Working Papers: WP/15/229. International Monetary Fund.

Bangane, T. W. 1999. The unemployment problem in South Africa with specific reference to the Lekoa Vaal Triangle Metropolitan Area (LVTMA). The Rand Afrikaans University. (Dissertation - Masters).

Barão, S. M. M. 2008. Linear and Non-linear time series analysis: forecasting financial markets. Ciências do Trabalho (Thesis - PhD).

Barker, F. 2007. The South African labour market: theory and practice. 5th ed. Pretoria: Van Schaik. The Rand Afrikaans University. (Dissertation - Masters).

Barnett, W. A., Hendry, D. F. & Hylleberg, S. E. 2000. Nonlinear econometric modeling in time series: proceedings of the Eleventh International Symposium in Economic Theory (Vol. 11). Cambridge University Press.

Bayramoglu, A.T. & Yildirim, E. 2017. The Relationship between Energy Consumption and Economic Growth in the USA: A Non-Linear ARDL Bounds Test Approach. *Energy and Power Engineering,* 9(03):170.

Beatson, M. 1994. Labour market flexibility, Research Series 48. Moorfoot: Employment Department.

Bellante, D. 1994. Sticky wages, efficiency wages, and market processes. *The Review of Austrian Economics*, *8*(1):21-33.

Belzil, C. 2000. Job Creation and Job Destruction, Market Reallocation and wages. *Journal of Labour Economics*, 18: 183–203.

Benigno, P., Ricci, L. A. & Surico, P. 2015. Unemployment and productivity in the long run: the role of macroeconomic volatility. *Review of Economics and Statistics*, *97*(3):698-709.

Bester, H. Petrakis, E. 2003. Wages and productivity growth in a competitive industry. *Journal of Economic Theory*, 109 (1): 52-69.

Beveridge, S. & Nelson, C. R. 1981. A new approach to decomposition of economic time series into permanent and transitory components with particular attention to measurement of the business cycle, *Journal of Monetary Economics*, 7, 151-174.

Bhaduri, A., 1969. On the significance of recent controversies on capital theory: a Marxian view. *The Economic Journal*, *79*(315):532-539.

Bhaduri, A. & Marglin, S. 1990. Unemployment and the real wage: the economic basis for contesting political ideologies. *Cambridge journal of Economics,* 14(4):375-393.

Bhorat, H. & Lundall, P. 2004. Employment and labour market effects of globalization: Selected issues for policy management. Employment Analysis Unit, Employment Strategy Department, International Labour Office.

Bhorat, H. & Rooney, C. 2017. State of manufacturing in South Africa. Development Policy Research Unit, working paper 201702: University of Cape Town.

Bhorat, H., Kanbur, R. & Mayet, N. 2013. The impact of sectoral minimum wage laws on employment, wages, and hours of work in South Africa. *IZA Journal of Labor and Development*, *2*(1):1-27.

Bildirici, M. & Alp, E. A. 2008. The relationship between wages and productivity: Tar unit root and Tar cointegration approach. *International Journal of Applied Econometrics and Quantitative Studies*, *5*(1): 93-110.

Black, J., Hashimzade, N. & Myles, G. 2013. A dictionary of economics. 4th ed. Oxford: Oxford University Press.

Blinder, A. S. 2002. Keynesian Economics. The Concise Encyclopedia of Economics. http://www.econlib.org/library/Enc/KeynesianEconomics.html Date of access: 8 Sept. 2017.

Boor, M. 1980. Relationships between unemployment rates and suicide rates in eight countries, 1962–1976. *Psychological Reports*, *47*(3):1095-1101.

Borjas, G. J. 2010. Labour economics. 5th ed. Boston: McGraw-Hill.

Boshoff, H. 2008. Rethinking ASGISA and the rand exchange rate. *South African Journal of Economic and Management Sciences*, 11(1):112-120.

Brancaccio, E. & Fontana, G. 2011. The global economic crisis: New perspectives on the critique of economic theory and policy. New York: Routledge.

Bräuninger, M. & Pannenberg, M. 2002. Unemployment and productivity growth: an empirical analysis within an augmented Solow model. *Economic Modelling*, *19*(1): 105-120.

Bresnahan, T., Brynjolfsson, E. & Hitt, L. 1999. Information Technology and Recent Changes in Work Organization Increase the Demand for Skilled Labor. *The New Relationship: Human Capital in the American Corporation*.

Brooks, C. 2002. Introductory Econometrics for Finance. UK: Cambridge University Press.

Brooks, C. 2008. Introductory econometrics for finance. Cambridge university press.

Brooks, C. 2014. Introductory Econometrics for Finance. 3rd ed. UK: Cambridge University Press.

Brosnan, P. & Rea, D. 1991. An adequate minimum code: A basis for freedom, justice and efficiency in the labour market. *New Zealand Journal of Industrial Relations*, 16: 143-158.

Brosnan, P. & Wilkinson, F. 1988. A national statutory minimum wage and economic efficiency. *Contributions to Political Economy*, 7: 1-48.

Brosnan, P. 1991. Labour Market Flexibility and the Quality of Work: A Case Study of the Retail Industry. *New Zealand Journal of Industrial Relations*, 16: 13-36.

Brosnan, P. 2003. The political economy of the minimum wage. In Burchell, B., Deakin, S., Michie, J. & Rubery, J. (Eds.) Systems of Production: Markets, Organisations and Performance. London: Routledge, pp.192-212.

Brosnan, P. and Wilkinson, F. 1989. Low Pay and the Minimum Wage. Wellington: New Zealand Institute of Industrial Relations Research.

Brunner, K. & Meltzer, A. H. 1978. Theory of Employment and Unemployment. Paper presented at Konstanz Seminar 1978. Carnegie Mellon University.

Burger, P. 2015. Wages, Productivity and Labour's Declining Income Share in Post-Apartheid South Africa. *South African Journal of Economics*, *83*(2):159-173.

Burger, R. & Woolard, I. 2005. The State of the labour market in South Africa after the first decade of democracy. Centre for Social Science Research, Working Paper, no 133. Cape Town: Southern African Labour & Development Research Unit.

Burger, R. & Yu, D. 2006. Wage trends in post-apartheid South Africa: Constructing and earnings series from household survey data. Stellenbosch Economic Working Papers: 04/06.

Businesstech. 2017. Inflation and a weak economy will kill your salary increase in 2017. https://businesstech.co.za/news/finance/145799/inflation-and-a-weak-economy-will-kill-your-salary-increase-in-2017/ Date of access: 24 Oct. 2018.

Byiers, B., Kratke, F., Jayawardena, P., Rodriguez, T. L. & Wijesinha, A. 2015. Manufacturing progress? Employment creation in Sri Lanka. London: ODI development progress.

Byrne, J. P. & Perman, R., 2006. Unit roots and structural breaks: a survey of the literature. Department of Economics, Glasgow, University of Glasgow.

Card, D. & Krueger, A. 1994. Minimum wages and employment: a case study of the fast-food industry in New Jersey and Pennsylvania. *American Economic Review,* 84:772–793.

Cahuc, P; Carcillo, S & Zylberberg, A. 2014. Labor Economics. 2nd ed. Cambridge: The MIT Press.

Cameron, R. 1996. The Reconstruction and Development Programme. *Journal of Theoretical Politics*, 8(2):283-294.

Case, K. E., Fair, R. C. & Oster, S. M. 2012. Principles of Macroeconomics.10th Ed. New York, Pearson Education, Inc.

Casey, B. H. 2004. The OECD jobs strategy and the European Employment Strategy: Two views of the labour market and the welfare state. *European Journal of Industrial Relations,* 10 (3):329-352.

Chadha, B. 1994. Disequilibrium in the labour market in South Africa. IMF Working paper. Washington: International Monetary Fund.

Champernowne, D.G. 1936. Unemployment, Basic and Monetary: the classical analysis and the Keynesian. *The Review of Economic Studies*, *3*(3):201-216.

CM (Chamber of Mines of South Africa). 2016. Facts and figures 2016. file:///G:/FOR%20tomorrow/chamber-facts-figures-2016.pdf Date of access 19 Jan. 2018.

Chamber of Mine of South Africa (C M). 2017. Facts and figures 2016. file:///C:/Users/NWUUser/Downloads/chamber-facts-figures-2016.pdf Date of access 15 Oct. 2018.

Cheremza, W. & Deadman, D. 1992. New Directions in Econometric Practice: General to Specific Modelling, Cointegration and Vector Autoregression. New York: Edwards Elgar Publishing.

Chen, M. & Doane, D. 2008. Informality in South Asia: A Review, WIEGO, Cambridge, MA.

Chibba, M. & Luiz, J. M. 2011. Poverty, inequality and unemployment in South Africa: Context, issues and the way forward. *Economic Papers: A journal of applied economics and policy*, *30*(3):307-315.

Chitiga, M., Mabugu, R. & Maisonnave, H. 2016. Analysing job creation effects of scaling up infrastructure spending in South Africa. *Development Southern Africa*, 33(2):186-202.

Cohn, A., Fehr, E. & Gotte, L. 2010. Fair Wages and Effort: Evidence from a Field Experiment. CEPR working paper.

Construction Industry Development Board (CIDB). 2015. Construction monitor: employment development through partnership. http://www.cidb.org.za/publications/Documents/ Construction%20Monitor%20-%20October%202015.pdf Date of Access: 21 Feb. 20117.

COSATU (Congress of South African Trade Unions). 2013. Mangaung and the second phase of the transition. http://www.cosatu.org.za/docs/discussion/2013/analysis.pdf Date of access: 17 Sept.2018.

Costantini, M. & Sen, A. 2016. A simple testing procedure for unit root and model specification. *Computational Statistics & Data Analysis*, *102*:37-54.

Das, P., Basu, R. & Halder, A. 2017. Employment, Wage and Productivity: Analysis of Trend and Causality in Indian Manufacturing Industries. *The Journal of Industrial Statistics*, 6 (1): 41–56.

Davidson, P. 1999. Uncertainty, International Money, Employment and Theory: Volume 3: The Collected Writings of Paul Davidson. Springer. Antony Rowe LTD.

Davidson, P.1998. Post Keynesian Employment Analysis and the Macroeconomics of OECD Unemployment. *The Economic Journal*, 108 (448): 817-831.

Davis, S. J., Haltiwange, J. & Schuh, S. 1996. Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts. *Small Business Economics*, 8 (4):297-315.

De Mel, S., McKenzie, D. & Woodruff, C. 2010. Who are the Microenterprise Owners? Evidence from Sri Lanka on Tokman v. De Soto. In International Differences in Entrepreneurship: Lerner and Schoar, eds. University of Chicago Press.

Deb, S. 2004. Terms of trade and investment behaviour in Indian agriculture: A cointegration analysis. *Indian Journal of Agricultural Economics*, 59(2):209-230.

Delatte, A. L. & Lopez-Villavicencio, A. 2012. Asymmetric exchange rate pass-through: Evidence from major countries. *Journal of Macroeconomics,* 34(3):.833-844.

Delong, J. B & Olney, L. M. 2009. Macroeconomics. 2nd Ed. New York, Mc-Graw-Hill.

Di Pietro, M. A., Girsberger, E. M & Vuille, A. 2001. The Impact of Globalisation on Employment. Swiss Federal Statistical Office (FSO), Switzerland. http://ec.europa.eu/eurostat/documents/1001617/4576272/SESSION-II-DOC-4.pdf date of access: 24 Jul. 2017.

Diamond, P.A. 1981. Mobility costs, frictional unemployment and efficiency. *Journal of Political Economy,* 89(4):798-812.

Dibooglu, S. & Enders, W. 2001. Do real wage respond asymmetrically to unemployment shocks? Evidence from the US and Canada. *Journal of Macroeconomics*, *23*(4):495-515.

Dickey, D. A. & Fuller, W. A. 1979. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74, 427-431.

Dicks, R., Brockerhoff, S. & Lwanda, G. 2011. Achieving a Decent Work Agenda in South Africa: Finding synergies between public employment schemes and social security interventions within a New Growth Strategy. National Labour and Economic Development Institute*. http://www. global-labouruniversity.* Date of access: 23 Jul. 2017.

Dinh, H. T. Palmade, V. Chandra, V. & Cossar, F. 2012. Light Manufacturing in Africa: Targeted Policies to Enhance Private Investment and Create Jobs. Washington D.C:World Bank.

Doyle, E. 2005. The economic system. West Sussex: John Wiley & Sons.

Dritsakis, N. 2007. Labour productivity, wages and unemployment: An empirical investigation for Greece using causality analysis. *Asian-African Journal of Economics and Econometrics,* 7(1):133-145.

Dritsakis, N. 2011. Demand for money in Hungary: an ARDL approach. *Review of Economics and Finance*, (5). http://users.uom.gr/~drits/publications/ARDL.pdf Date of access: 08 Aug. 2018.

Du Plessis, S. & Smit, B. 2007. South Africa's growth revival after 1994. *Journal of African Economies*, *16*(5):668-704.

Duasa, J. 2007. Determinants of Malaysian trade balance: An ARDL bound testing approach. *Global Economic Review,* 36(1):89–102.

Dube, A., Lester, T. W. & Reich, M. 2010. Minimum wage effects across state borders: Estimates using contiguous counties. *The review of economics and statistics*, *92*(4):945-964.

Dube, S. & Zhou, Y. 2013. The Repo Rate Pass-Through to the Prime Rate in South Africa: Evidence from ARDL and FMLS Models. *Journal of Business Theory and Practice*, 1(2):199-213.

Dubihlela, D. 2010. Socio-economic challenges and the survival mechanisms for the female-headed households in the Bophelong Township. NWU. (Dissertation - Masters).

Dullien, S., Goodwin, N., Harris, J. M., Nelson, J. A., Roach, B. & Torras, M., 2018. *Macroeconomics in Context*. New York: Routledge.

Dwivedi, D. N. 2005. Macroeconomics: Themy and Policy. 2nd Ed. New Delhi: Tata-McGraw Hill.

Eisenberg, P. & Lazarsfeld, P. F. 1938. The psychological effects of unemployment. *Psychological bulletin*, *35*(6):358-390.

Elijah, O. A. 2007. Effects of Economic Globalisation on Employment Trend and Wages in Developing Countries: Lessons from Nigeria Experiences. In 22nd National Conference of Labour Economics, September (pp. 13-14).

Elmslie, B. & Criss, A. J. 1999. Theories of convergence and growth in the classical period: The role of science, technology and trade. *Economica*, *66*(261):135-149.

Elsley, T. & Mthethwa, G. 2014. Wage determination In South Africa Since 1994: Determined to keep wages low. South Africa: Labour Service Research.

Enders, W. 2014. Applied Econometric Time Series. Hoboken: John Wiley & Sons.

Enders, W. 2004. Applied econometric time series. 2nd ed. New York: John Wiley & Sons.

Enders, W. 2008. Applied econometric time series: John Wiley & Sons.

Engle, R. F. & Granger, C. W. J. 1987. Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55(2): 251-76.

Enke, D. & Thawornwong, S. 2005. The use of data mining and neural networks for forecasting stock market returns. *Expert Systems with Applications,* 29 (4) 927-940.

Erero, J. L. 2016. National minimum wage in South Africa: A Computable General Equilibrium Model Analysis. ERSA Working Paper (No. 650).

Farooq, S. 2011. Mismatches between education and occupation: a caste study of Pakistani graduates. http://www.pide.org.pk/psde/pdf/AGM27/Shujaat%20Farooq.pdf Date of access: 15 Aug. 2017.

Fenira, M. 2015. Trade openness and growth in developing countries: An analysis of the relationship after comparing trade indicators. *Asian Economic and Financial Review*, *5*(3):468.

Ferreira, F. H. G., Lite, P. G. & Wai-Poi, M. 2010. Trade Liberalization, Employment Flows and Wage Inequality in Brazil. Washington, DC: The World Bank. World Bank Policy Research. Working Paper 4108.

Ferrer, A. 2010. Raúl Prebisch and the dilemma of development in the globalised world. CEPAL REVIEW 101. University of Buenos Aires.

Fields, G. S. 1975. Rural-Urban Migration, Urban Unemployment and Underemployment, and Job Search Activities in LDC's. *Journal of Development Economics*, 2 (2):165-188.

Fields, G. S. 2000. The Employment Problem in South Africa. Keynote address prepared for presentation at the Trade and Industrial Policy Secretariat Forum, 18 September, Johannesburg.

Fields, G. S. 2013. Self-employment in the Developing World. Paper submitted to the High Level Panel on the Post-2015 development agenda. Cornell University and Iza.

Forstater, M. 2005. Unemployment in capitalist economies: a history of thought for thinking about policy. http://www.cfeps.org/pubs/wp-pdf/WP16-Forstater.pdf Date of access: 08 Jul. 2015.

Fouladi, M. 2010. The Impact of Government Expenditure on GDP, Employment and Private Investment a CGE Model Approach. *Iranian Economic Review*, *15*(27):53-76.

Fourie, C.V. & Burger, P. 2010. How to think and reason in macroeconomics. 3rd ed. Claremont: Juta

Fousekis, P., Katrakilidis, C. & Trachanas, E. 2016. Vertical price transmission in the US beef sector: Evidence from the nonlinear ARDL model. *Economic Modelling*, *52*:499-506.

Frankel, J. 2006. What Do Economists Mean by Globalization? Implications 31 for Monetary Policy. Kennedy School of Government. Harvard University. https://sites.hks.harvard.edu/fs/jfrankel/FRB-Globalzn&InflOct4.pdf Date of access: 24 Jul. 2017.

Freeman, R. B. 1979. Foundations of modern economic series: labour economics. 2nd ed. Edited by Eckstein, O. New Jersey: Prentice-Hall Inc.

Freeman, R. B. 2008. Labour productivity indicators: comparison of two OECD databases productivity differentials & the Balassa-Samuelson effect. OECD Statistics Directorate, Division of Structural Economic Statistics.

Freud, S. 1962. An Outline of Psycho-Analysis, New York, Norton Press.

Frost, J. 2017. How to Choose Between Linear and Nonlinear Regression. http://statisticsbyjim.com/regression/choose-linear-nonlinear-regression/ Date of access, 13 Sept. 2018.

Fullerton, A. S., Robertson, D. L. & Dixon, J. C. 2011. Reexamining the relationship between flexibility and insecurity: A multilevel study of perceived job insecurity in 27 European countries. *Research in the Sociology of Work*, 22, 9–41.

Fuess, S. M. & Millea, M. 2006. Pay and productivity in" corporatist" Germany. *Journal of Labor Research*, *27*(3): 397.

Fuess, S. M. and Millea, M. 2001. Pay and productivity in a corporatist economy: evidence from Austria. IZA Discussion Paper, (244).

Fukase, E. 2013. Export liberalization, job creation, and the skill premium: evidence from the US–Vietnam bilateral trade agreement (BTA). *World Development*, (41):317-337.

Gaalya, M. S., Edward, B. & Eria, H. 2017. Trade Openness and Tax Revenue Performance in East African Countries. *Modern Economy*, *8*(05):690 -712.

Gallin, D. 2001. Propositions on trade unions and informal employment in times of globalisation. *Antipode*, *33*(3): 531-549.

Gavin, W. T. 2013. The Mechanics behind manufacturing job losses. https://m.research.stlouisfed.org/publications/es/13/ES_20_2013-07-26.pdf Date of access: 19 Jan. 2016.

Ghasemi, A. Zahediasl, S. 2012. Normality tests for statistical analysis: a guide for non-statisticians. *International journal of endocrinology and metabolism*, *10*(2):486.

Gibson, B. & Van Seventer, D. 2000. Real wage, employment and macroeconomic policy in a structuralist model for South Africa. *Journal of African Economies*, *9*(4): 512-546.

Gill, F. 1999. The meaning of work: Lessons from sociology, psychology, and political theory. *Journal of Socio-Economics,* 28 (1999): 725–743.

Goetz, S. J., Fleming, D. A. & Rupasingha, A. 2012. The economic impacts of self-employment. *Journal of Agricultural and Applied Economics*, *44*(3): 315-321.

Goh, S. K. & Wong, K. N. 2010. Analyzing the productivity-wage-unemployment nexus in Malaysia: evidence from the macroeconomic perspective. *International Research Journal of Finance and Economics*, *53*: 145-156.

Gordhan, P. (2014). Budget Speech, February 2014. Pretoria: National Treasury.

Gordon, D. 2000. An Introduction to Economic Reasoning. Alabama: Ludwig von Mises Institute.

Gorlich, D., Stepanok, I. Al-Hussami, F. 2012. Tackling youth unemployment: background paper.https://www.global-economicsymposium.org/knowledgebase/the-global-society/tackling-youthunemployment/background-paper/tackling-youth unemployment/atdownload/file Date of access: 14Nov. 2017.

Grady, P. & Kapsalis, C. 2002. The Approach to Seasonal Employment in the Nordic Countries: A Comparison with Canada. Quebec: Human Resources Development Canada Publications Centre.

Granger, C.W. 1969. Investigating causal relations by econometric models and cross-spectral methods. Econometrica: *Journal of the Econometric Society*, 37(3):424-438.

Granger, C.W.J. & Yoon, G. 2002. Hidden cointegration. University of California, Mimeo, San Diego.

Greenwood-Nimmo, M. J., Shin, Y., Van Treeck, T. & Yu, B. 2013. The great moderation and the decoupling of monetary policy from long-term rates in the U.S. during the Great Moderation. Mimeo: University of Melbourne.

Gregg, P., Machin, S. &Fernández-Salgado, M. 2014. Real wage and unemployment in the big squeeze. *The Economic Journal*, *124*(576): 408-432.

Gronau, R. 1971. Information and frictional unemployment. *The American Economic Review*, 61(3):290-309.

Guan, X., Zhou, M. & Zhang, M. 2015. Using the ARDL-ECM approach to explore the nexus among urbanization, energy consumption, and economic growth in Jiangsu Province, China. *Emerging Markets Finance and Trade*, 51(2):391-399.

Gujarati, D. 1970. Use of dummy variables in testing for equality between sets of coefficients in two linear regressions: a note. *The American Statistician*, *24*(1):50-52.

Gujarati, D. 2011. Econometrics by example. London: Palgrave Macmillan.

Gujarati, D. N. & Porter, D. C. 2009. Basic Econometrics. 5th Ed. New York: McGraw Hill Inc.

Habanabakize, T. & Muzindutsi, P.F. 2015. Time series analysis of interaction between aggregate expenditure and job creation in South Africa. *Journal of Governance and Regulation*, 4(4): 649-657.

Hægeland, T. & Jakob Klette, T. 1999. Do higher wages reflect higher productivity? Education, gender and experience premiums in a matched plant-worker data set. In *The creation and analysis of employer-employee matched data* (pp. 231-259). Emerald Group Publishing Limited.

Hacker, R. S. & Hatemi-J, A. 2006. Tests for causality between integrated variables using asymptotic and bootstrap distributions: theory and application. *Applied Economics,* 38(13):1489-1500.

Hall, R. E. & Taylor, J. B. 2007. Macroeconomics. 5th ed. Boston: George Hoffmann.

Hamberg, D. & Schultze, C.L. 1961. Autonomous vs. Induced Investment: The Interrelatedness of Parameters in Growth Models. *The Economic Journal*, 71(281): 53-65.

Hamermesh, D.S. 1993. Labor Demand. New Jersey: Princeton University Press.

Hamuda, A.M., Šuliková, V., Gazda, V. and Horváth, D., 2013. ARDL investment model of Tunisia. *Theoretical & Applied Economics*, 20(2): 17-34.

Harris, R. & Sabot, R. 1982. Urban unemployment in LDCs: Towards a more general search model. (*In* Sabot, R. *ed.*, Migration and labour market in developing countries. Boulder, Colorado: Westview Press).

Harrison, Richard. 1976. The demoralizing experience of prolonged unemployment. *Department of Employment Gazette*, 4 (84): 339-348.

Harvey, R. 2014. Minefields of Marikana: Prospects for Forging a New Social Compact. The Governance of Africa's Resources Programme (GARP), The South African Institute of International Affairs (SAIIA).

Hatemi, J. A. 2012. Asymmetric causality tests with an application. *Empirical Economics*, 43(1): 447-456.

Hatzichronoglou, T. 2005. The Impact of Offshoring on Employment: Measurement Issues and Implications. In Organization for Economic Co-operation and Development (OECD) Workshop on the Globalisation of Production: Impacts on Employment, Productivity, and Economic Growth, November (pp. 15-16).

Hayes, 2006. The Economics of Keynes: A New Guide to The General Theory. Homerton College, University of Cambridge.

Hayes, M. 2008. The Economics of Keynes: A new guide to the General Theory. Edward Elgar Publishing.

Heintz, J., Pollin, R. & Garrett-Peltier, H. 2000. How Infrastructure Investments Support the U.S. Economy: Employment, Productivity and Growth. Political Economy Research Institute, 1-62.

Helpman, E. 2012. The mystery of economic growth. Moscow: Gaidar Institute Publishers.

Hendriks, S. 2013. South Africa's National Development Plan and New Growth Path: reflections on policy contradictions and implications for food security. *Agrekon*, 52(3):1-17.

Hermann, F.B.W. 1832. Staatswirthschaftliche Untersuchungen über Vermögen, Wirthschaft, Productivität der Arbeiter, Kapital, Preis, Gewinn, Einkommen und Verbrauch. Munich: A. Weber.

Heymans, C. 1995. A lifelong task: The RDP in perspective. *Indicator SA*, 13(1):57-64.

Hirsch, A. 2005. Seasons of hope: Economic reform under Mandela and Mbeki. South Africa: UKZN Press & IDRC.

Ho, S. L; Xie, M. & Goh, T. N. 2002. A comparative study of neural network and BoxJenkins ARIMA modeling in the time series prediction. *Computers and Industrial Engineering,* 42(2-4), 371-375.

Hodge, D.C. 2009. Growth, employment and unemployment in South Africa. *South African Journal of Economics*, 77(4):488-504.

Hofmeyr, J. 2014. Youth unemployment in South Africa: impacts on longer term political stability. Konrad-Adenauer-Stiftung, South Africa.

Holland, J. 2007. Tools for institutional, political, and social analysis of policy reform: a sourcebook for development practitioners. Washington, DC: World Bank Publications.

Holm, H. 2006. Housing Investment in Germany - an Empirical Test. D-level: Uppsala University (Thesis-Masters).

Hubbard, G. M., Garnett, A. M., Lewis, P., & O'Brien, A. P. 2013. Essentials of Economics. 4th ed. Sydney: Pearson.

Hughes, J. J. & Perlman, R. 1984. The Economics of Unemployment: A Comparative Analysis of Britain and the United States, Wheatsheaf Books LTD, Brighton.

Hussmanns, R. 2004. Measuring the informal economy: from employment in the informal sector to informal employment. Working Paper No. 53 (Geneva, ILO Policy Integration Department, Bureau of Statistics).

Iacovoiu, V. B. 2012. Impact of capital investments on unemployment in the context of economic crisis. The case of Romania. *Economic insights – trends and challenges,* 1(64):36 – 47.

Imran, M., Sial, M. H. & Zaman, B. U. 2013. Employment, Trade Openness and Capital Formation: Time Series Evidence from Pakistan. *Journal of Global and Science* Issues*,* 1(4): 37-42.

IDC (Industrial Development Corporation). 2013. South African economy: An overview of key trends since 1994. Department of Research and Information. Gauteng, Industrial Development Corporation of South Africa Limited.

IDC (Industrial Development Corporation). 2016. Economic Trends: Key trends in the South African economy. Department of Research and Information. Sandton, 2146, Gauteng, South Africa.

ILO (International Labour Organisation). 1951. Seasonal unemployment in the construction industry. Third session. Geneva: International Labour Office.

ILO (International Labour Organisation). 2005. Comparable annual employment and unemployment estimates. Geneva: International Labour Office.

ILO (International Labour Organization). 2003. Guidelines concerning a statistical definition of informal employment, endorsed by the Seventeenth International

Conference of Labour Statisticians (November-December 2003); in: Seventeenth International Conference of Labour Statisticians. Geneva: International Labour Office.

ILO (International Labour Organisation). 2014. Global employment trends. ILO, Geneva.

ILO (International Labour Organisation). 2016. Key indicators of the labour market (KILM), Ninth edition. Geneva: International Labour Office.

ILO (International Labour Organisation). 2017. World employment social outlook. Geneva: International Labour Office.

ILO (International Labour Organization). 2015. World employment and social outlook. http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_337069.pdf Date of access: 13 Feb. 2016.

ILO (International Labour Organization). 2016a. Minimum wage policy guide. International Labour Office, Geneva. http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/genericdocument/wcms_508566.pdf Date of access 15 Jul. 2017.

ILO (International Labour Organization). 2016b. World employment and social outlook: Trends 2016. Geneva: International Labour Office.

ILO. 1973 (International Labour Organisation). Resolution concerning an integrated system of wages statistics, adopted by the 12th International Conference of Labour Statisticians. Geneva: International Labour Office.

ILO. 2003. (International Labour Organisation). Statistics of employment, unemployment, underemployment: economically active population. Bureau of Statistics Policy Integration Department. Turin: International Training Centre of the ILO.

Iocovoiu, V. B. 2012. Economic Insights – Trends and Challenges. 1(6). Bucuresti: University of Ploiesti.

Itkin, D. 2007. Wage and employment patterns in the mining sector. Occupational Employment and Wages. Bulletin, 2585: Bureau of Labor Statistics.

Jacobson, T., Vedrin, A. & Warne A. 1996. Are Real wage and Unemployment Related? *Economica,* 65 (257): 69–96.

Jahoda, M. 1979. The Impact of Unemployment in the 1930s and the 1970s. *Bulletin of the British Psychological Society*, (32):309-314.

Jahoda, M. 1982. Employment and Unemployment: A Social-Psychological Analysis*.* Cambridge, MA: University of Cambridge Press.

Janoski, T., Luke, D. & Oliver, C. 2014. The causes of structural unemployment: four factors that keep people from the jobs they deserve. Cambridge: Polity Press.

Jebli, M. B., & Youssef, S. B. 2015. Economic growth, combustible renewables and waste

consumption, and CO2 emissions in North Africa. Environmental Science and Pollution

Research, 22(20):16022-16030.

Jenkins, R. 2006. Globalization and the labour market in South Africa. Journal of International Development, 18(5):649-664.

Jerger, J. & Michaelis, J. 2003. Wage hikes as supply and demand shock. *Metroeconomica*, *54*(4):434-457.

Johansen, S. 1988. Statistical analyses on cointegration vectors. *Journal of Economic Dynamics and Control,* 12:231–254.

Johansen, S. 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 59(6):1551-1580.

Jones, S. R. G. & Riddell, W.C. 1999. The measurement of unemployment: an empirical approach. *Econometrica*, 67(1):147-162.

Jorgenson, D. W. & Griliches, Z. 1967. The Explanation of Productivity Change*. Review of Economic Studies,* 34(99):249-283.

Junankar, P. N. 2013. Is There a Trade-off Between Employment and Productivity? IZA Discussion Paper, No. 7717.

Karl, E. Fair, R.C. & Sharon, M. O. 2012. Principles of Macroeconomics. 10th Ed. Boston: Pearson Education.

Kates, S. 2005. Supply creates its own demand: A Discussion of the Origins of the Phrase and of its Adequacy as an Interpretation of Say's Law of Markets. *History of Economics Review*, *41*(1):49-60.

Kates, S. 2008. A Letter from Keynes to Harlan McCracken Dated 31st August 1933: Why the 46 Standard Story on the Origins of the General Theory Needs to be Rewritten. *History of Economics Review*, (47): 39-53.

Katovich, E. S. & Maia, A. G. 2018. The relation between labor productivity and wages in Brazil. *Nova Economia*, *28*(1):7-38.

Kaufman, B. E. & Hotchkiss, J. L. 2006. The economics of the labour market. 7th ed. Ohio: Thompson Higher Education.

Keynes, J. M. 1939. Relative Movement of Real wage and Out-put. *Economic Journal,* 193, 34-51.

Keynes, J.M. 1936. The general theory of employment, interest and money. London: Macmillan.

Keynes, J.M. 1937. The General Theory of Employment. *The Quarterly Journal of Economics, 2(*51):209-223.

Keynes, J.M. 1973. The general theory of employment, interest and money. 13th ed. Cambridge: Cambridge University Press.

Kganyago, L. 2012. The impact of the Eurozone and global financial crisis on South Africa. Metier Capital Growth Fund Investor Conference (Vol. 1).

Kim, S., Lim, H. & Park, D. 2010. Productivity and Employment in a Developing Country: Some Evidence from Korea. *World Development*, *38*(4):514-522.

Kingdon, G. & Knight, J. 2001. Why high open unemployment and small informal sector in South Africa? http://www.csae.ox.ac.uk/resprogs/usam/why%20small%20informal%20sector .pdf Date of access: 20 Jan. 2017.

Kingdon, G. & Knight, J. 2004. Unemployment in South Africa: The nature of the beast. *World Development*, 32(3):391-408.

Kingdon, G. Knight, J. 1999. Unemployment and Wages in South Africa: A Spatial Approach. Working Paper No. WPS/99-12. Centre for the Study of African Economies, University of Oxford.

Kirk, D. 2011. The primary cause of structural unemployment in South Africa: poor education standards and policy. http://twentythirdfloor.co.za/2011/06/11/structuralunemployment- and-education/ Date of access: 25 Feb. 2015.

Klein, N. 2012. Real wage, labour productivity, and employment trends in South Africa: A closer look. Working Paper (No. 12-92). International Monetary Fund.

Kohler, W. & Wrona, J. 2010. Offshoring tasks, yet creating jobs? CESifo Working Paper Series No. 3019.

Koma, S.B. 2013. The trajectory of economic development policies in South Africa: the case for public policy analysis. *Administratio publica*, 21(1):142-160.

Koop, G., Pesaran, M. H. & Potter, S. M. 1996. Impulse Response Analysis in Nonlinear Multivariate Models. *Journal of Econometrics,* 74(1):119-147.

Kruger, K. 2012. Productivity in South Africa: is reward management part of the problem or part of the solution? http://www.sara.co.za/sara/file%20storage/Documents/Con2012a/ ProductivityInSA.pdf Date of access: 11 Jan. 2018.

Krugman, P & Wells, R. 2013. Macroeconomics. 3th Ed. New York, Worth Publishers.

Krugman, P. & Wells, R. 2015. Macroeconomics. 4rd Ed. New York: Worth Publishers.

Kumar, S., Webber, D. J. & Perry, G. 2012. Real wage, inflation and labour productivity in Australia. *Applied Economics*, *44*(23):2945-2954.

Kuper, A. & Kuper, J. 1996. The Social Science Encyclopaedia. 2nd ed. London: Routledge.

Kurtishi-Kastrati, S. 2013. The effects of foreign direct investments for host country's economy. *European Journal of Interdisciplinary Studies*, *5*(1): 26 -38.

Kurz, H. D. & Salvadori, N. 2003. Classical Economics and Modern Theory. Studies in Long-Period Analysis. London and New York: Routledge.

Kwiatkowski, D., Phillips, P. C., Schmidt, P. & Shin, Y. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of econometrics*, 54(1-3):159-178.

Lach, L. 2010a. Application of bootstrap methods in investigation of size of the Granger causality test for integrated VAR systems. *Managing Global Transitions,* 8(2):167-186.

Lach, Ł. 2010b. Fixed capital and long-run economic growth: evidence from Poland. *Systems Science,* 36 (4): 33-50.

Landau, D. 1983. Government expenditure and economic growth: a cross-country study. *Southern Economic Journal*, 49 (3):783 -792.

Landmann, O. 2004. Employment, productivity and output growth. *Employment Strategy Papers*, *17*, 1-61.

Laverty, A. 2007. Impact of economic and political sanctions on apartheid. The African File. http://theafi 'icanfile. Word press. Com/ucsd-2/impact-of-economic-andpolitical-sanctions-on-apartheid Date of access, 28 Mar.2018.

Lee, J. & Strazicich, M. C. 2004. Minimum LM unit root test with one structural break. *Manuscript, Department of Economics, Appalachian State University*, 1-16.

Lee-Peng, H. & Yap, S. F. 2001. The link between wages and labour productivity: An analysis of the Malaysian manufacturing industry. *Malaysian Journal of Economic Studies*, 38 (2):51-57.

Lehrman, R. & Schmidt, S. 1999 .An overview of economic, social, and demographic trends affecting the U.S. labor market. Urban Institute, Washington, working paper.

Leibbrandt, M., Levinsohn, & J. McCrary. 2010. Incomes in South Africa after the fall of apartheid. *Journal of Globalization and Development* 1(1).

Leijonhufvud, A. 1968. On Keynesian Economics and the Economics of Keynes, Oxford: Oxford University Press.

Lester, B. Y & McCain, R. A. 2001. An equity-based redefinition of underemployment and unemployment and some measurements. *Review of Social Economy*, 59 (2):133-159.

Levine, L. 2013. The increase in unemployment since 2007: is it cyclical or structural? fas.org/sgp/crs/misc/R41785.pdf Date of access: 28 Nov. 2017.

Lewis, J. 2001. Policies to promote growth and employment in South Africa. Informal Discussion Papers on aspects of the Economy of South Africa. *Washington: The World Bank Southern Africa Department*.

Leybourne, S. J. & Newbold, P. 2003. Spurious rejections by cointegration tests induced by structural breaks. *Applied Economics*, *35*(9):1117-1121.

Liem, R. &Liem, J. H. 1988. Psychological effects of unemployment on workers and their families. *Journal of Social Issues*, *44*(4):87-105.

Lindbeck, A. 2015. Unemployment: structural. *International Encyclopedia of the Social & Behavioral Sciences*, 23:738-743.

Lindley, J. |& McIntosh, S. 2017. Finance sector wage growth and the role of human capital. *Oxford Bulletin of Economics and Statistics*, *79*(4): 570-591.

Liu, E. & Wu, J. 1999. The Measurement of Unemployment and Underemployment. Research and Library Service Division Legislative council Secretariat, Hong Cong.

Liu, J. 2002. Does wage inequality affect labour productivity? Some evidence from manufacturing industries of Taiwan and South Korea. *Asia Pacific Management Review*, *7*(4): 449-475.

Longhi, S. & Taylor, M. 2013. Occupational change and mobility among employed and unemployed job seekers. *Scottish Journal of Political Economy*, *60*(1):71-100.

Lopez-Acevedo, G. 2002. Wages and Productivity in Mexican Manufacturing. Mimeographed document. Mexico: The World Bank (LCSPE).

Low Carbon Frameworks. 2017. Employment in the South African transport sector. http://tgh.co.za/wp-content/uploads/2017/10/wwf_transport_employment_brief_online.pdf Date of access: 19 Jan. 2018.

Lucifora, C. & Origo, F. 1999. Alla Ricerca Della Flessibilita: Un'Analisi della Curva dei Salari in Italia (with English summary). *Rivista Italiana degli Economisti*, 4: 3–35.

Lütkepohl, H. & Krätzig, M. 2004. Applied time series econometrics. Cambridge: Cambridge University Press.

Lyle, F., Kasongo, A., Moses, M. & Yu, D. 2015. The South African labour market, 1995-2013. ERSA Working Paper 493, Economic Research Southern Africa (ERSA).

Machin, S. 2001. The changing nature of labour demand in the new economy and skill-biased technology change. *Oxford Bulletin of Economics and Statistics*, *63*(1):753-776.

Maddala, G. S. 2001. Introduction to Econometrics, 3rd ed. London: John Wiley & Sons Ltd.

Mafiri, M.I. 2005. Socio-economic impact of unemployment. Pretoria: University of Pretoria. (Thesis - PhD).

Mahadea, D. & Simson, R. 2010. The challenge of "low employment growth" in South Africa: 1994 – 2008. *SAJEMS*, 13(4):391-406.

Maia, J. 2013. The interface between the mining and manufacturing sectors in South Africa. Department of Research and Innovation: Industrial Development Corporation.

Maisonnave, H., Mabugu, R., Chitiga, M. & Robichaud, V. 2013. Analysing Job Creation Effects of Scaling Up Infrastructure Spending in South Africa. *Cahier de recherche/Working paper,* 10(13):1-28.

Maiti, D. & Marjit, S. 2009. Informal Wage and Formal Sector Productivity: Theory and Evidences from India". Institute of Economic Growth Working Paper Series No. E/301/2009.

Makgetla, N. 2014. Manufacturing employment and equality in South Africa. TIPS: Working paper. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2588348 Date of access: 25 Sept. 2017.

Malakwane, C. T. 2013. Economic and social effects of unemployment in South Africa: prospects for the future. Tshwane: TUT. (Dissertation - Masters).

Malawi, A., 2005. The impact of gross fixed capital formation and money supply on economic activity in Algeria. Jordan: Mu'tah University.

Maloney, W. F., 2004. Informality revisited. *World development*, *32*(7):1159-1178.

Mankiw, N. G. & Taylor, M.P. 2008. Macroeconomics. European Edition. New York: Worth Publishers.

Maqbool, M .S., Sattar, T. M. A. & Bhalli, M. N. 2014. Determinants of unemployment: Empirical evidences from Pakistan. *Pakistan Economic and Social Review*, *51*(2): 191-207.

Maree, J. 1978. The dimensions and causes of unemployment and underemployment in South Africa. *South African Labour Bulletin*, *4*(4):15-50.

Marseet, K. 2015. Estimation and Forecasting of the Dynamic Relationship between Stock Prices and Exchange Rates: A Comparative Study. University of Huddersfield. (Thesis - PhD).

Marshall, A. 2015. The early economic writings of Alfred Marshall, 1867–1890. Edited and introduced by J.K. Whitaker. Volume 1. London: Palgrave Macmillan. Springer.

Marx, K. & Engels, F. 1969. Wage-labour and capital. New York: International publishers.

Marx, K. 1967. Capital: A critique of political economy. Three Volumes. New York: International Publishers.

Mathe, K. 2002. A policy study of the Growth Employment and Redistribution (GEAR) with respect to social development and adult basic education and training (ABET). Pietermaritzburg: University of Natal. (Dissertation - Masters).

Mathy, G. 2003. Cyclical unemployment becomes structural unemployment: unemployment persistence in the Great Depression and today. https://www.american.edu/cas/economics/ news/upload/12-4-Mathy-Abstract.pdf Date of access: 14 May. 2017.

Mazumdar, D. & Sarkar, S. 2008. Globalization, Labour Markets and Inequality in India. New York: International Development Research Centre.

Mazumdar, D. 2003. Trends in Employment and the Employment Elasticity in Manufacturing, 1971-92: An International Comparison. *Cambridge Journal of Economics*, 27(4): 563-582.

McCarthy, D. 2015. An Introduction to Testing for Unit Roots Using SAS®: The Case of U.S. National Health Expenditures. Department of Research and Evaluation, Kaiser Permanente.

McConnell, C.R. & Blue, S.L. 1992. Contemporary Labour Economics. 3rd Ed. New York: Mcgraw-Hill, Inc.

McConnell, C.R. & Brue, S.L. 1995. Contemporary labour economics. 4rd Ed. New York: Mcgraw-Hill, Inc.

McConnell, C.R., Brue, S.L. & Macpherson, D.A. 2009. Contemporary labour economics. 8th ed. NY: McGraw-Hill.

McCord, A. & Bhorat, H. 2003. Employment and labour market trends in South Africa. In: HSRC (Ed.), Human Resources Development Review, 2003. HSRC Press, Cape Town

McCord, A. 2003. An Overview of the Performance and Potential of Public Works Programmes in South Africa. Paper prepared for the Dpru/Tips Forum, Johannesburg, South Africa.

McCutcheon, R. & Parkins, F.T. 2012. The Expanded Public Works Programme: policy, rhetoric, reality and opportunities foregone during the expenditure of over R40 billion on infrastructure: construction and project management. *Civil Engineering Siviele Ingenieurswese*, 20(6):34-46.

McMillan, M &Harttgen, K. 2014. What Is Driving the 'African Growth Miracle'? *National Bureau of Economic Research Working Paper Series* No. 20077.

Meager, N. & Speckesser, S. 2011. Wages, productivity and employment: A review of theory and international data. Brighton: Institute for Employment Studies.

Meer, J. & West, J. 2013. Effects of the Minimum Wage on Employment Dynamics. NBER Working Paper 19262.

Mehrara, M. 2014. The nexus between Prices and Macroeconomic Variables in Iran. *World Scientific News,* 6(1):1-9.

Menezes-Filho, N. A. & Muendler, M. A. 2011. Labor reallocation in response to trade reform. National Bureau of Economic Research, No. w17372.

Meng, X. 2006. Say's Law and the Business Cycles. *Annals of Economics & Finance*, *7* (2):295-319.

Michelacci, C. & Lopez-Salido, D. 2007. Technology shocks and job flows. *The Review of Economic Studies*, *74*(4):1195-1227.

Michelitsch, R. & Shi, A. 2013. Training, technology and innovation, and job growth. Assessing private sector contributions to job creation: IFC Open Source Study. Washington DC: International Finance Corporation.

Mill, J. 1826. Elements of Political Economy. Reprinted in James Mill: Selected Economic Writings, edited by D. Winch. Chicago: University of Chicago Press.

Mill, J. S. 1844. Essays on Some Unsettled Questions in Political Economy, New York, Kelley.

Mina, B. 2011. Growth by destination (where you export matters): trade with China and growth in African countries. *African Development Review.* 23(2):202-218.

Mining Indaba. 2017. The Outlook for the South African Mining Sector. http://www.fticonsulting.com/~/media/Files/emea--files/insights/articles/mining-indaba-conference-2017.pdf Date of access, 18 Mar. 2018.

Mirko, M. 2005. The Maltese labour market and frictional unemployment. *Bank of Valletta Review*, 32:47-61.

Mkhize, N. 2012. The sectoral employment intensity of growth in South Africa. Economic Research in South Africa working paper No. 631, September.

Mkhize, N. 2016. The Sectoral Employment Intensity of Growth in South Africa. Pretoria: UNISA. (Thesis – PhD).

Mohd Noor, Z., Isa, N., Said, R. & Abd Jalil, S. 2011. The impact of foreign workers on labour productivity in Malaysian manufacturing sector. *International Journal of Economics and Management*, *5*(1):169-178.

Mohr, P. & Fourie, L. 2009. Economics for South African students. 4th ed. Pretoria: Van Schaik.

Mohr, P. 2015. Economics for South African Students. 5th ed. Pretoria: Van Schaik Publishers.

Mongiovi, G. 1990. Notes on Say's law, classical economics and the theory of effective demand. *Contributions to Political Economy*, *9*: 69-82.

Mora, T., Lòpez-Tamayo, J. & Suriñach, J. 2005. Are wages and productivity converging simultaneously in Euro-area countries? *Applied Economics*, *37*(17):2001-2008.

Morishima, M. 1973. Marx's Economics. A Dual Theory of Value and Growth. Cambridge University Press.

Morley, J. & Piger, J. 2004. The Importance of Nonlinearity in Reproducing Business Cycle Features. Working Paper 2004-0328, Federal Reserve Bank of St. Louis.

Mortensen, D. T. & Pissarides, C. A. 1998. Technological progress, job creation, and job destruction. *Review of Economic dynamics*, *1*(4): 733-753.

Morton, B. & Blair, C. 2012. An analysis of the SA labour market. http://www.hrpulse.co.za/legal/legal-opinion/228660-an-analysis-of-the-sa-labour-market Date of access: 11 Jan. 2019.

Mosai, S. 2012. Productivity trends in South Africa. http://bhtg.co.za/images/BRICS-Productivity-SA2013.pdf Date of access: 11 Jan. 2018.

Moudud, J. K. 1999. Government Spending in a Growing Economy. *The Jerome Levy Economics Institute,* (52):1-5.

Mouhammed, A. 2010. Unemployment and the Entrepreneur. *International Journal of Economics and Research*, 1(1): 55-68.

Mourdoukoutas, P. 1988. Seasonal employment, seasonal unemployment and unemployment compensation: The case of the tourist industry of the Greek islands. *American Journal of Economics and Sociology*, *47*(3), 315-329.

Mukhtar, T. & Rasheed, S. 2010. Testing a long run relationship between exports and imports: Evidence from Pakistan. *Journal of Economic Co-operation and Development*, 31(1):41-58.

Munnell, A. H. 1992. Policy watch: infrastructure investment and economic growth. *The Journal of Economic Perspectives*, *6*(4):189-198.

Muthethwa, S. M. 2013. Job opportunities and unemployment in the South African labour market, Pretoria. Department of Labour.

Narayan, P. & Smyth, R. 2009. The effect of inflation and real wage on productivity: new evidence from a panel of G7 countries. *Applied economics*, *41*(10):1285-1291.

National Treasury, 2016. Employment tax incentive descriptive report. Pretoria: National Treasury.

National Treasury. 2011. A safer financial sector to serve South Africa better. National Treasury Policy Document. Pretoria: National Treasury.

National Treasury. 2015. National Treasury strategic plan 2015/19. http://www.treasury.gov.za/publications/strategic%20plan/Strat%20Plan%202015-2019.pdf Date of access: 13 Jul. 2017.

National Treasury. 2018. Economic overview chapter: 2018 budget review chapter 2. http://www.treasury.gov.za/documents/national%20budget/2018/review/Chapter%202.pdf Date of access: 30 Oct. 2018.

Ncanywa, T. & Makhenyane, L. 2016. Can investment activities in the form of capital formation influence economic growth in South Africa? SAAPAM Limpopo Chapter 5th 270 Annual Conference Proceedings 2016.

Ndambiri, H. K., Ritho, C., Ng'ang'a, S. I., Kubowon, P. C., Mairura, F. C., Nyangweso, P. M., Muiruri, E. M., Neumark, D. & Wascher, W. 2012. Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws. *Industrial and Labor Relations Review*, 46 (1) 55-81.

Neath, A. A. & Cavanaugh, J. E. 1997. Regression and time series model selection using variants of the Schwarz information criterion. *Communications in Statistics-Theory and Methods*, *26*(3):559-580.

Nesbitt, F. N. 2004. Race for sanctions: African Americans against apartheid, 1946-1994. Indiana University Press.

Neumark, D. & Wascher, W. 1995. Minimum Wage Effects on Employment and School Enrolment. *Journal of Business & Economic Statistics*, 13 (2):199-206.

Neumark, D. & Wascher, W. 2000. Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Comment. *American Economic Review*, 90 (5) 1362-1396.

Neumark, D. & Wascher, W., 2015. The effects of minimum wages on employment. *FRBSF Economic Letter*, *2015*, p.37.

News 24. 2015. SA ranks 8th on worst unemployment rate list. http://www.news24.com/Archives/City-Press/SA-ranks-8th-on-worst-unemployment-rate-list-20150429 Date of access: 15 Feb. 2015.

Ngandu, S. N. 2009. The impact of exchange rate movements on employment: the economy-wide effect of a rand appreciation. *Development Southern Africa*, 26(1):111-129.

NGP (New Growth Path). 2010. Economic Development Department. Republic of South Africa.

Nguyen, T. K. 2015. Manufacturing exports and employment generation in Vietnam. *Southeast Asian Journal of Economics*, 3(2): 1-21

Nguyen, V. H. & Shin, Y. 2010. Asymmetric Price Impacts of Order Flow on Exchange Rate Dynamics. Mimeo: Leeds University Business School.

Nicholson, J. R. & Noonan, R. 2014. Manufacturing Since the Great Recession. Economics and Statistics Administration. U.S. Department of Commerce.

Nikulin, D. 2015. Relationship between wages, labour productivity and unemployment rate in new EU member countries. *Journal of International Studies,* 8(1):31–40.

Nitisha, B. 2016. Classical Theory of Employment. Economics discussion. http://www.economicsdiscussion.net/employment-theories/classical-theory-of-employment-with-diagram/3981 Date of access: 5 Sept. 2017.

NPC (National Planning Commission). 2011. Diagnostic Overview. Pretoria: National Planning Commission, Office of the Presidency.

Nzimakwe, T. I. 2008. Addressing unemployment and poverty through public works programmes in South Africa. *International NGO Journal*, 3(12):207-212.

OECD (Organisation for Economic Co-operation and Development). 2014. Registered unemployed and job vacancies. OECD, Paris.

OECD (Organisation for Economic Co-operation and Development). 2016a. African Economic Outlook 2016: Sustainable Cities and Structural Transformation. Paris: OECD Publishing.

OECD (Organisation for Economic Co-operation and Development). 2001. Measuring Productivity measurement of aggregate and industry-level productivity growth. http://www.oecd.org/sdd/productivity-stats/2352458.pdf Date of access, 06 Feb. 2019.

OECD (Organisation for Economic Co-operation and Development). 2016. New evidence on the role of young firms in creating jobs. http://www.oecd.org/sti/young-SME-growth-and-job-creation.pdf Date of access: 14 Mar. 2017.

Ohio. 2013. Unemployment rate methodology. http://ohiolmi.com/laus%5CURMethodology 2013.pdf Date of access: 11 Jul. 2017.

Onaran, Ö., Nikolaidi, M. & Obst, T. 2017. The role of public spending and incomes policies for investment and equality-led development in the UK. https://scholar.google.co.za/scholar?cluster=9060301912540175638&hl=en&as_sdt=0,5&as_ylo=2017 Date of access: 17 Jan. 2017.

Oosthuizen, M. 2006. The post-apartheid labour market: 1995-2004. DPRU Working Paper 06/103. Cape Town: Development Policy Research Unit: University of Cape Town.

Ouattara, B. 2004. Foreign aid and fiscal policy in Senegal. Manchester: Mimeo University of Mancheste.

Parker, J. 2010.Models of unemployment. http://www.reed.edu/economics/parker/s10/314/_book/Ch14.pdf Date of access 24 Apr. 2017.

Parkin, M., Baur, P., Bruce-Brand, j., Kholar, M., Neethling, L., Saayman, A., Schoel, V., Scholtz, D.Thompson, K. & Vander Merwe, J. 2014. Global and Southern African Perspectives Economics. 2nd Ed. Cape Town: Pearson.

Pencavel, J., Pistaferri, L. & Schivardi, F. 2006. Wages, employment, and capital in capitalist and worker-owned firms. *ILR Review*, *60*(1):23-44.

Perron, P. 1989. The great crash, the oil price shock and the unit root hypothesis. *Econometrica,* 57:1361–1401.

Perron, P. 1997. Further evidence from breaking trend functions in macroeconomic variables. *Journal of Econometrics,* 80: 355–385.

Pesaran, M. H. Shin, Y. & Smith, R.J. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3):289-326.

Pesaran, M.H. & Shin, Y. 1999. An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometric Society Monographs*, *31*:371-413.

Pessoa, J. P. & Van Reenen, J. 2013. Wage growth and productivity growth: the myth and reality of 'decoupling'. Centre for Economic Performance, LSE. http://cep.lse.ac.uk/pubs/download/cp401.pdf Date of access: 13 Nov. 2018.

Pigou, A. C. 1933. A note on imperfect competition. *The Economic Journal*, *43*(169):108-112.

Presis, K. 2014. Unemployment and neoliberal policies in Estonia: success or failure? Aalborg: Aalborg University. (Dissertation - Masters).

Policardo, L., Punzo, L. F., & Sanchez Carrera, E. J. 20018. Wage inequality and its effects on labour productivity. Discussion Paper 136 – 2018: Centro de Estudos Sobre.

Psaltopoulos, D., Skuras, D. & Thomson, K. J. 2011. Employment effects of private investment initiatives in rural areas of southern Europe: a regional SAM approach. *Agricultural Economic Review,* 12(1):50-61.

PWC. 2015. SA Mine Highlighting trends in the South African mining industry. https://www.pwc.co.za/en/assets/pdf/sa-mine-nov-2012.pdf Date of access, 27 Mar. 2018.

PWC. 2016. SA construction 4th edition: Highlighting trends in the South African construction industry. https://www.pwc.co.za/en/assets/pdf/sa-construction-2016.pdf Date of access: 08 Aug. 2018.

Ranchhod, V. & Finn, A. 2016. Estimating the Short Run Effects of South Africa's Employment Tax Incentive on Youth Employment Probabilities using A Difference-in-Differences Approach. *South African Journal of Economics*, *84*(2): 199-216.

Rankin, N. 2016. Labour productivity, factor intensity and labour costs in South African manufacturing. Research Project on Employment, Income Distribution and Inclusive Growth. *Working Paper*.

Riveros, L. & Bouton L. 1991. Efficiency wage theory, labour markets and adjustment. Working Paper Series 731, Country Economics Department, the World Bank: Washington. http://documents.worldbank.org/curated/en/822531468764133582/pdf/multi-page.pdf Date of access: 15 Jul. 2017.

Rodríguez, A. R. Sorolla, V. 2015. Classical versus Keynesian theory of unemployment. Universitat Autonoma de Barcelona. https://scholar.google.co.za/scholar?hl=en&q=Classical+versus+Keynesian+Theory+of+Unemployment%3A+An+approach+to+the+Spanish+labor+market&btnG=&as_sdt=1%2C5&as_sdtp= Date of access: 16 Aug.2017.

Rodrik, D. 2006. Understanding South Africa's Economic Puzzles. Bureau for Research and Economic Analysis of Development (BREAD), Working Paper No. 131.

Romilly, P., Song, H., & Liu, X. 2001. Car ownership and use in Britain: a comparison of the empirical results of alternative cointegration estimation methods and forecasts. *Applied Economics,* 33(4):1803–1818.

Rotman, D. 2013. How technology is destroying jobs. *Technology Review*, *16*(4):28-35.

Rowthorn, R. 1995. Capital formation and unemployment. *Oxford Review of Economic Policy*, *11*(1):26-39.

Rubery, J. 2003. Pay equity, minimum wage and equality at work. ILO: Geneva. https://www.researchgate.net/profile/Jill_Rubery/publication/254442644_Pay_equity_

minimum_wage_and_equality_at_work/links/55277d380cf2520617a71236.pdf Date of access: 15 Jul. 2017.

Sabia, J. J. 2009. The effects of minimum wage increases on retail employment and hours: New evidence from monthly CPS data. *Journal of Labor Research*, *30*(1):75-97.

SABPP. 2016:4. Productivity basics: Basics of employee communication. http://sabpp.co.za/wp-content/uploads/2017/01/sabpp-fact-sheet-february-2016.pdf Date of Access: 30 Oct. 2018.

Saito, F. 2008. Foundations for local governance: decentralization in comparative perspective. Heidelberg: Physica-Verlag.

Saks, R. E. 2008. Job creation and housing construction: Constraints on metropolitan area employment growth. *Journal of Urban Economics*, *64*(1):178-195.

Saleh, K. 1997. The measurement of gross domestic fixed capital formation in Indonesia. In document présenté à l'occasion de la conférence de l'OCDEsur le stock de capital qui s' esttenue à Canberra du (Vol. 10).

SARB, 2018. Economic and Financial Data for South Africa. http://wwwrs.resbank.co.za/webindicators/EconFinDataForSA.aspx Date of access, 21 Apr.2018.

Sari, R. 2000. A wage determination model: theory and evidence. Texas: TexasTech University (Thesis - DhD).

Say, J. B. 1821. A Treatise on Political Economy. Translated from the fourth edition of the French, London: Paternoster-Row.

Scarth, W. M. & Myatt, A. 1980. The real wage-employment relationship. *The Economic Journal*, *90*(357):85-94.

Schaufeli, W. B. 1997. Youth unemployment and mental health: some Dutch findings. *Journal of adolescence*, *20*(3):281-292.

Schokkaert, E. & Van Ootegem, L. 1990. Sen's concept of the living standard applied to the Belgian unemployed. *Recherches Économiques de Louvain/Louvain Economic Review*, *56*(3-4):429-450.

Schussler, M. 2013. Gehamer op armoede kan boomerang. Sake24. 14 October 2013. Johannesburg.

Sen, A. 1997. Inequality, Unemployment and Contemporary Europe", *International Labour Review*, 136(2): 259-271.

Sengenberger, W. 2011. Beyond the measurement of unemployment and underemployment: the case for extending and amending labour market statistics. ILO, Geneva.

Seputiene, J. 2011. The estimation of the relationship between wages and unemployment in the European Union. *International Journal of Social Sciences and Humanity Studies*, *3*(2): 277- 285.

Shahbaz, M. 2018. Current Issues in Time-Series Analysis for the Energy-Growth Nexus (EGN); Asymmetries and Nonlinearities Case Study: Pakistan. In *The Economics and Econometrics of the Energy-Growth Nexus*: 229-253.

Sharpe, A., Arsenault, J. F. & Harrison, P. 2008. The Relationship between Labour Productivity and Real Wage Growth in Canada and OECD Countries. Centre for the Study of Living Standards Research Report 2008-8.

Sherman, H. J., Meeropol, M.A & Sherman, P. 2013. Principles of Macroeconomics: Activist vs. Austerity Policies. New York: ME Sharpe.

Shin, Y., Yu, B. & Greenwood-Nimmo, M. 2014. Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In: Horrace, W.C., Sickles, R.C.(Eds.), Festschrift in honor of Peter Schmidt: Econometric methods and applications. *Springer Science and Business Media*, New York, pp. 281–314.

Simon, M. & Goes, J. 2013. Correlational research. Dissertation and scholarly research: Recipes for success. Seattle, WA: Dissertation Success.

Smith, A. 1776. An Inquiry into the Nature and Causes of the Wealth of Nations, Chicago: University of Chicago Press.

Sobel, R. S., Gwartney, J. D., Stroup, R. & Macpherson, D. A. 2006. Understanding economics. South-Western: Cengage Learning.

SARB (South African Reserve Bank). 2015. Quarterly Bulletin December 2015. Pretoria: South African Reserve Bank.

SARB (South African Reserve Bank). 2018. Quarterly Bulletin, March 2018 No. 287. Pretoria, South African Reserve Bank.

SARB South African Reserve Bank). 2017. Quarterly Bulletin December 2017. Pretoria: South African Reserve Bank.

South Africa. 2009. Department of public works. Expanded Public Works Programme five-year report 2004/05 – 2008/09: reaching the one million target. http://www.epwp.gov.za/downloads/EPWP_Five_Year_Report.pdf date access: 23 Nov. 2017.

The Presidency. 2006. ASGISA annual report. Pretoria: Office of the President.

Squalli, J. & Wilson, K. 2011. A new measure of trade openness. *The World Economy*, *34*(10):1745-1770.

Statistics Norway. 2007. Unemployment measured by survey and register data: a comparison of the two measurements. https://www.stat.fi/registerseminar/session2_pedersen_pres.pdf Date of access: 10 Jul. 2017.

Stats SA (Statistics South Africa). 2015. Quarterly labour force survey, quarter 1 of 2015. Pretoria: Government printer.

Stats SA (Statistics South Africa). 2015a. National and provincial labour market: Youth. Quarterly Labour Force Survey. Pretoria: Government printer.

Stats SA (Statistics South Africa). 2015b. Quarterly labour force survey – Quarter 4, 2014. Pretoria: Government printer.

Stats SA (Statistics South Africa). 2016a. Quarterly labour force survey, quarter 4 of 2015, Pretoria: Government printer.

Stats SA (Statistics South Africa). 2016b. Unemployment increased in the first quarter of 2016. http://www.Stats SA.gov.za/?p=728. Date of access: 07 September 2017.

Stats SA (Statistics South Africa). 2017. Statistical release: Quarterly Labour Force Survey. Pretoria: Government printer.

Stats SA. (Statistics South Africa). 2018. Quarterly Labour Force Survey. Quarter 4: 2017. Pretoria: Government printer.

Stehrer, R. & Ward, T. 2012. Sectoral employment effects of economic downturns. WIIW Research Reports, 379. Vienna: the Vienna Institute for International Economic Studies.

Stockman, C. A. 1996. Introduction to economics. Orlando: The Dryden Press.

Strauss, I. & Isaacs, G. 2016. Labour compensation growth in the South African ecocomy: assessing its impact through the labour share using the Global Policy Model. University of the Witwatersrand, Working Paper Series No. 4.

Strobl, E. & Byrne, D. 2002. Defining unemployment in developing countries: evidence from Trinidad and Tobago. *Discussion Paper,* 659. Institute for the Study of Labor, Germany.

Summers, L. H. 1981. Measuring unemployment. *Brookings Papers on Economic Activity*, 2:610-620.

Sun, Y. & Xu, Y. 2010. Dynamic linkages between China and US equity markets under two recent financial crises.

Swanepoel, D. J. & Van Zyl, J.S. 1999. Economics 2000. Cape Town: Nasou.

Sweezy, P. 1934. Professor Pigou's Theory of Unemployment. *The Journal of Political Economy*, 42 (6): 800-811.

Takaendesa, P. 2006. The Behaviour and Fundamental Determinants of the Real Exchange Rate in South. Eastern Cape Province: Africa Rhodes University. (Dissertation - Masters).

Tamasauskiene, Z. & Stankaityte, A. 2013. Evaluating of the Relationship between Wages and Labour Productivity in Lithuania: Territorial and Sectoral Approaches. *Socialiniai Tyrimai*, *1*(30):24-35.

Tcherneva, P. R. 2011. Keynes's approach to full employment: aggregate or targeted demand? Working Paper 542: Levy Economics Institute.

Teal, F. 2000. Employment and Unemployment in Sub-Saharan Africa: An Overview. University of Oxford.

Toda, H. Y. & Yamamoto, T. 1995. Statistical inference in vector autoregressions with possibly integrated processes. Journal of econometrics, 66(1):225-250.

Tokman, V. 2007. Modernizing the informal sector. UN/ DESA Working Paper no. 42. United Nations, Department of Economic and Social Affairs.

Torrens, R. 1965. An Essay on the Production of Wealth. New York: Kelley.

Torres-Reyna, O. 2013. Time series. Data and statistical services. Princeton University. http://www. Princeton. Edu/~ otorres/TS101. Pdf. Date of access: 12 Jun. 2017.

Tsoku, J. T. & Matarise, F. 2014. An Analysis of the Relationship between Remuneration (Real Wage) and Labour Productivity in South Africa. *Journal of Educational and Social Research*, *4*(6):59-68.

Tucker, I. B. 2004. Economics for today.7th Ed USA: South-Western College Publisher.

Tuerck, D. G. 2015. Macroeconomics. 1st Ed. New York, Business Expert Press.

Ugochukwu, U.S. & Chinyere, U. P. 2013. The impact of capital formation on the growth of Nigerian economy. *Research journal of finance and accounting,* 4(9):36-42.

Van Aardt, C. J., Ligthelm, A.A. & Van Tonder, J. 2011. A broad review of the New Growth Path Framework with a specific emphasis on the feasibility of its proposed targets. www.unisa.co.za/contents/faculties/ems/docs/press413.pdf Date of access: 23 Jun. 2014.

Van Biesebroeck, J. 2015. How tight is the link between wages and productivity? A survey of the literature. Conditions of Work and Employment Series No. 54. International Labor Organization.

Van Den Bogaerde, F. 1972. Elements of macro-Economics. 1st Ed. Pretoria: J.L van Schaik.

Van Treeck, T. 2008. Asymmetric income and wealth effects in a non-linear error correction model of US consumer spending. Working paper no. 6/2008, Macroeconomic Policy Institute in the Hans-Böckler Foundation, Düsseldorf.

Verick, S. 2011. Giving up job search during a recession: the impact of the global financial crisis on the South African labour market. Discussion Paper 6116. Germany Institute of the Study of Labour.

Verma, R, Wilson, E. & Pahlavani, M. 2007. The role of capital formation and saving in promoting economic growth in Iran. *Middle East Business and Economic Review*, 19(1): 8-22.

Visser, W. 2004. Shifting RDP into GEAR: The ANC Government's dilemma in providing and equitable system of social security for the 'new South Africa'. Paper presented at the *40th ITH Linzer Conference*, 17 September 2004.

Vaona, A. 2012. Granger non-causality tests between (non) renewable energy consumption and output in Italy since 1861: the (ir) relevance of structural breaks. Energy Policy, 45:226-236.

Wacziarg, R. & Wallack, J. S. 2004. Trade liberalization and intersectoral labor movements. *Journal of International Economics*, *64*(2):411-439.

Wakeford, J. 2004. The productivity–wage relationship in South Africa: an empirical investigation. *Development Southern Africa*, *21*(1):109-132.

Wakeford, J. 2004a. Productivity, Wages and Employment in South Africa's Manufacturing Sector, 1970-2002. *Development Policy Research Unit Working Paper*, *4*(85):1-31.

Wakeford, J. 2004b. The productivity–wage relationship in South Africa: an empirical investigation. *Development Southern Africa,* 21(1): 109-132.

Welker, J. 2009. Will the economy self- recorrect? http://cartoonbank.com/assets/1/122079m. gif Date of access: 16 Sep. 2017.

West, D. M. 2015. What happens if robots take the jobs? The impact of emerging technologies on employment and public policy. Centre for Technology Innovation at Brookings, Washington *DC*.

Wheeler, C.H. 2007. Job flows and productivity dynamics: Evidence from US manufacturing. *Macroeconomic Dynamics*, *11*(2):175-201.

Wiley, J. 2000. A Guide to Modern Econometrics. New York: John Wiley & Sons, Inc.

Williams, R. 2015. Heteroskedasticity. University of Notre Dame. https://www3.nd.edu/~rwilliam/ Date of access 13 Sept. 2018.

Wittenber, M. 2015. Wages in Post-apartheid South Africa. *The Journal of the Helen Suzman Foundation,* 75: 27- 32.

World Bank. 2013. Jobs, a world development report. Washington, DC. http://siteresources.worldbank.org/EXTNWDR2013/Resources/8258024132095074 7192/8260293-1322665883147/WDR_2013_Report.pdf Date of access: 31 Mar. 16.

World Bank. 2015. Recent developments in emerging and developing country labor markets.
http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015b/GlobalEconomic-Prospects-June-2015-Labor-trends-in-emerging-markets.pdf Date of access: 23 Feb. 2016.

World Bank. 2015. South Africa economic update: jobs and South Africa's changing demographics. DC: The World Bank Group.

World Bank. 2017. The Africa Competitiveness Report 2017: Addressing Africa's Demographic Dividend. Washington, DC.

Wray, L. R. & Forstater, M. 2009. Keynes and macroeconomics after 70 years: Critical assessments of The General Theory. Northampton, Edward Elgar Publishing.

Wray, L. R. 2009. The Social and Economic Importance of Full Employment. The Levy Economics Institute, Working Paper No. 560.

Yildirim, Z. 2015. Relationships among labour productivity, real wage and inflation in Turkey. *Economic Research-Ekonomska Istraživanja*, *28*(1):85-103.

Yu, D. 2008. The South African labour market, 1995-2006. Stellenbosch Economic Working Paper 05. Stellenbosch: Stellenbosch University.

Zachariadis, T. 2006. On the exploration of causal relationships between energy and the economy. Department of Economics, University of Cyprus. (Discussion Paper 05).

Zarenda, H. 2013. South Africa's National Development Plan and its implications for regional development. Stellenbosch: Tralac Trade Law Centre. (Working papaer No. D13WP01).

Zarnowitz, V. 1992. Rational Expectations and Macroeconomic. *Forecasts of Economic Research Volume.*

Zivot, E. & Andrews, D. W. K. 1992. Further evidence of the great crush, the oil price shock and the unit root hypothesis, *Journal of Business and Economic Statistics,* 10, 251-270

Zivot, E. & Wang, J. 2006. Vector autoregressive models for multivariate time series. Modelling Financial Time Series with S-PLUS, 385-429.

Zuma, J. G. 2014. State of the Nation Address, June 2014. Pretoria: The Presidency.

ANNEXURES

ANNEXURE A: BOUNDS TESTS RESULTS AND F-STATISTIC ESTIMATION

Interaction between investment, productivity, real wage and sectoral employment

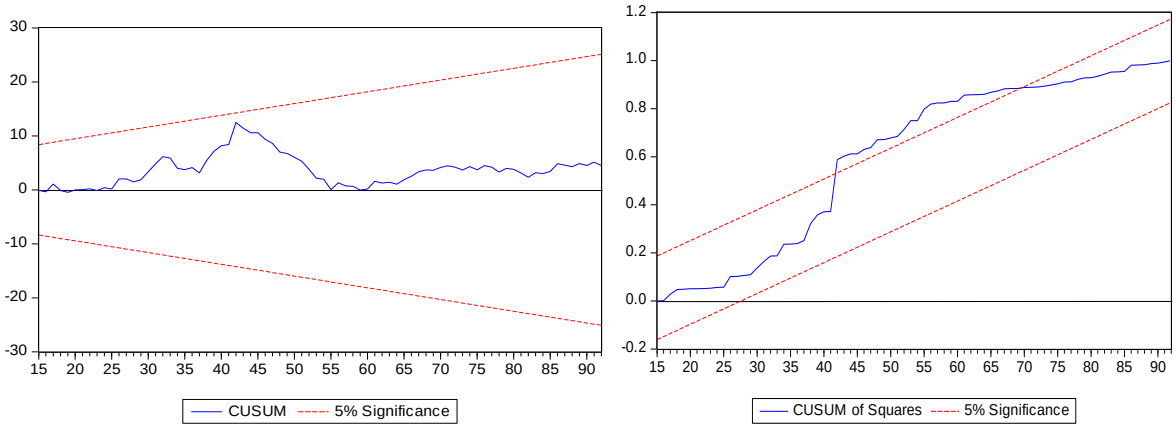
Estimated models	F-Stat	I (0) Bound	I (1) Bound	Conclusion
LECONS = *f*(LINVES, LPROD, LWAGE)	4.21043**	3.23	4.35	Cointegration
LEFIN = *f*(LINVES, LPROD, LWAGE)	4.79100**	3.23	4.35	Cointegration
LEMAN = f(LINVES, LPROD, LWAGE)	4.61170**	3.23	4.35	Cointegration
LEMIN = *f*(LINVES, LPROD, LWAGE)	6.64038 **	3.23	4.35	Cointegration
LETRAD = *f*(LINVES, LPROD, LWAGE)	5.91263**	3.23	4.35	Cointegration
LETRAN = *f*(LINVES, LPROD, LWAGE)	4.36274***	3.23	4.35	Cointegration

Cross- sectoral employment: Cointegration

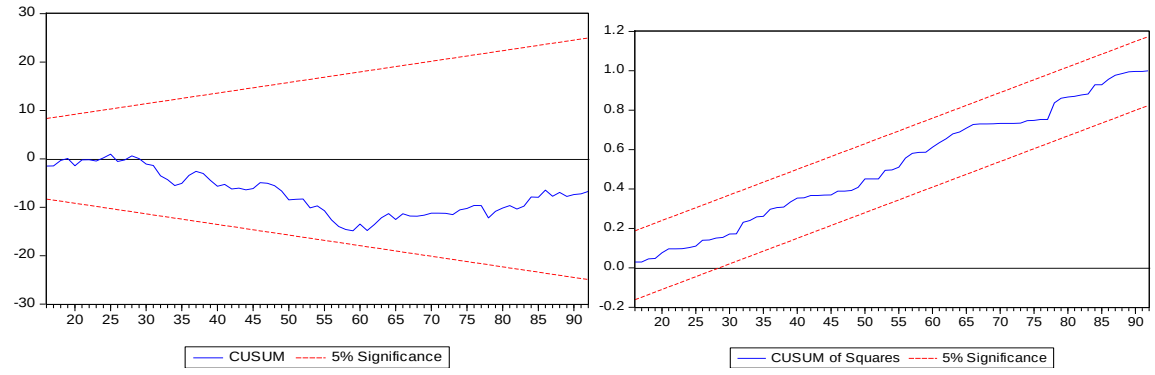
Estimated models	F-Stat	I (0) Bound	I (1) Bound	Conclusion
LECONS = *f* (LEFIN, LEMAN, LEMIN, LETRAD, LETRAN)	6.7284**	2.62	3.79	Cointegration
LEFIN = *f* (LECONS, LEMAN, LEMIN, LETRAD, LETRAN)	6.8835**	2.62	3.79	Cointegration
LEMAN = *f* (LECONS, LEFIN, LEMIN, LETRAD, LETRAN)	10.6055**	2.62	3.79	Cointegration
LEMIN = *f* (LECONS, LEFIN, LEMAN, LETRAD, LETRAN)	3.9847**	2.62	3.79	Cointegration
LETRAD = *f (LECONS, LEFIN, LEMAN, LEMIN, LETRAN)*	4.84333**	2.62	3.79	Cointegration
LETRAN = *f (LECONS, LEFIN, LEMAN, LEMIN, LETRAD)*	5.387181**	2.62	3.79	Cointegration

ANNEXURE B: INTERACTION BETWEEN INVESTMENT, PRODUCTIVITY, REAL WAGE AND SECTORAL EMPLOYMENT, STABILITY TEST RESULTS

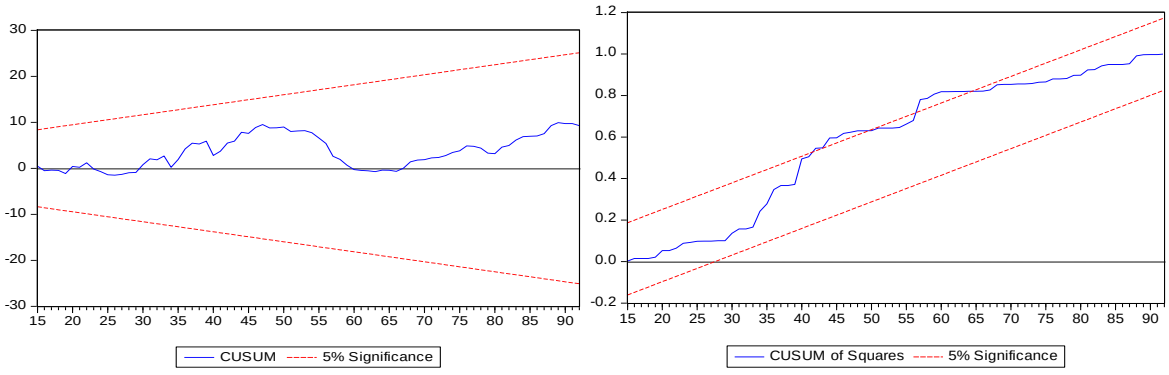
Construction sector



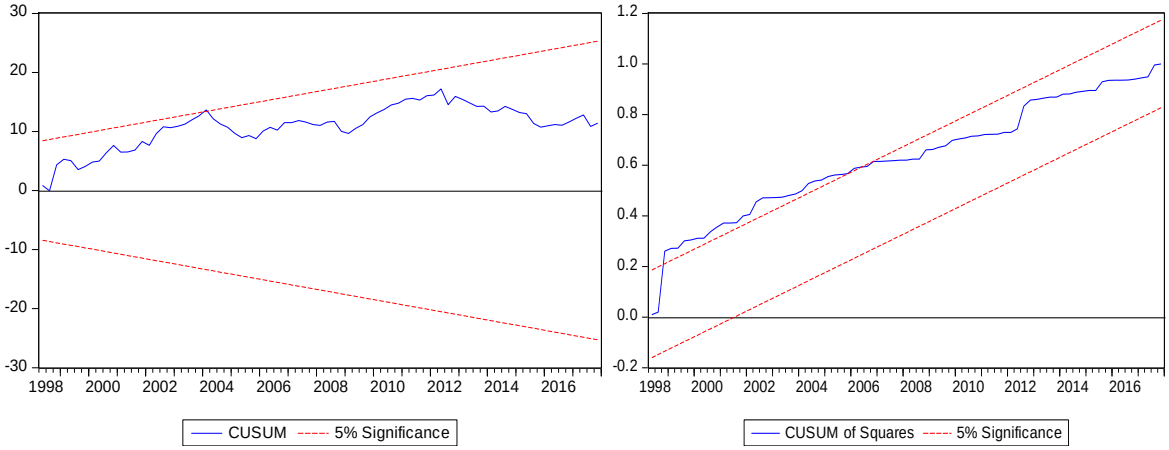
Financial sector



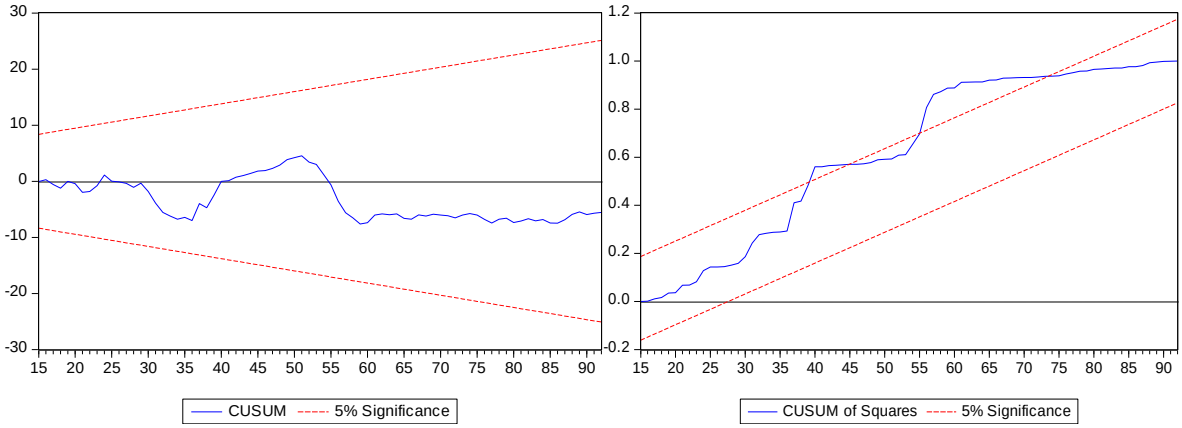
Manufacturing sector



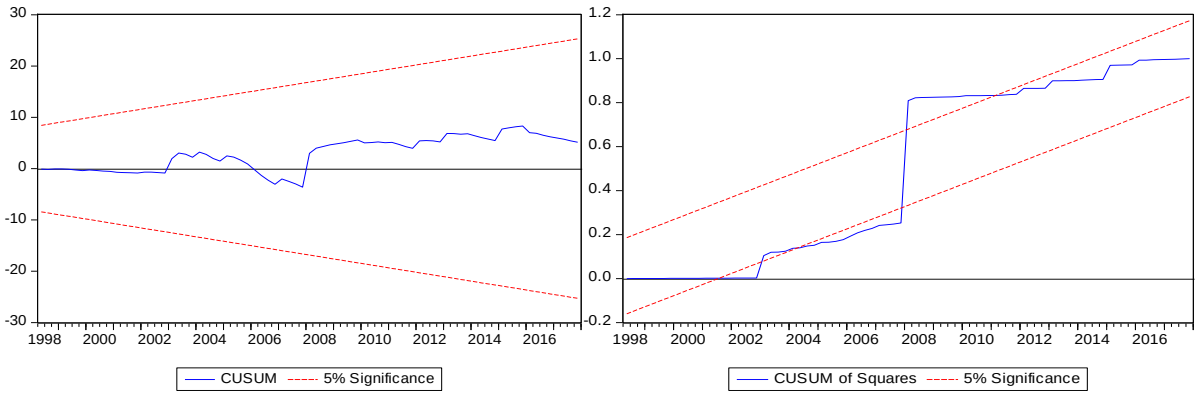
Mining sector



Trade sector



Transport sector



ANNEXURE C: LETTER FROM THE LANGUAGE EDITOR

CERTIFICATE OF EDITING

Professional EDITORS Group

To whom it may concern

This document certifies that the dissertaion whose title appears below was edited for proper English language usage, grammar, punctuation, spelling and overall style by Dr Anthony Masha who is a member of the Professional Editors' Group and whose academic qualifications appear in the footer of this document.

THESIS TITLE

TIME-SERIES ANALYSIS OF THE INTERACTIONS BETWEEN PRODUCTIVITY, REAL WAGE, INVESTMENT SPENDING AND SECTORAL EMPLOYMENT IN SOUTH AFRICA

RESEARCHER

T Habanabakize

DATE EDITED

November 2018

Editor's comment

All mistakes relating to grammar, punctuation, spelling and overall style have been corrected. The editor was not responsible for conducting a cross-referencing check. The editor was not responsible for editing the preliminary pages of this thesis. The editor was not responsible for editing the bibliography of this thesis.

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