THE SECTORAL EMPLOYMENT INTENSITY OF GROWTH IN SOUTH AFRICA: 2000-2012

By

NJABULO INNOCENT MKHIZE

Submitted in accordance with the requirements

for the degree of

DOCTOR OF LITERATURE AND PHILOSOPHY

in the subject

ECONOMICS

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROFESSOR D HODGE

Date submitted: May 2015

DECLARATION

I declare that **The Sectoral Employment Intensity of Growth in South Africa: 2000-2012** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

_____ _____

Njabulo Innocent Mkhize
PhD Scholar
Department of Economics
University of South Africa

Date

ACKNOWLEDGEMENTS

"To God our Saviour and the Father of our Lord Jesus Christ, be the glory, praise, dominion and power now and forever. Amen."

I wish to express my appreciation and thanks to my supervisor, Professor Duncan Hodge, for his constant encouragement, support, provision of direction for the study and incisive evaluation of my thesis. I am grateful to Professor F. Tarp and Dr C. Arndt of the United Nations University – World Institute for Development Economics Research (UNU-WIDER) for their guidance and constructive suggestions. I also wish to thank Professor O.A. Akanbi for our many very insightful informal discussions. Many thanks to Leanne Brown and Tony van der Watt for proof reading the draft of my thesis and for providing guidance on my English writing style and grammar.

I am very thankful to the Chair of Department in the Department of Economics, Professor J Lötter, and the management of the Department for their continuous support ever since I was offered the position of Post-graduate Student Assistant in the Department. For this I am immensely grateful.

I further wish to convey my sincere appreciation to the following institutions for sponsoring my studies and making them a success: University of South Africa (UNISA) and UNU-WIDER based in Helsinki, Finland. Their support was invaluable.

DEDICATION

Special thoughts go to my wife Aquila, whose unconditional love and tolerance has seen me through my academic career. Words are inadequate to express my full and sincere gratitude.

SUMMARY

The rate of unemployment in South Africa remains stubbornly high despite vastly improved macroeconomic fundamentals and relatively high rates of economic growth for most of the post-1994 democratic era. Employment growth was much weaker than might have been expected given the improved economic outlook. This thesis investigates how the sectoral employment intensity of output growth in the eight non-agricultural sectors of the South African economy has evolved from 2000 to 2012, with a view to identifying key growth sectors that are employment intensive. An econometric model of the demand for labour is used to estimate employment elasticities in the major Standard Industrial Classification (SIC) divisions of the economy. The results suggest that aggregate employment and economic growth diverged and that jobless growth occurred in South Africa during the period under review. South Africa has become less labour intensive and more capital intensive, reflecting a structural adjustment that has weakened the employment-growth relationship. At the sectoral level, the results suggest the presence of a long-run relationship between employment and growth in finance and business services, manufacturing, transport and the utilities sectors. In particular, the results suggest that the tertiary sector performed best in terms of the employment intensity of output growth. This reflects the changing structure of the economy and the nature of employment shifting away from the primary towards the tertiary sectors. Investment in the tertiary sector may help to foster new employment opportunities and assist in improving the overall employment intensity of output growth in South Africa.

TABLE OF CONTENTS

DECLARATION ii
ACKNOWLEDGEMENTS iii
DEDICATION iv
SUMMARY v
TABLE OF CONTENTS vi
LIST OF FIGURES viii
LIST OF TABLES ix
CHAPTER ONE
INTRODUCTION 1
1.1. THE SITUATION IN SOUTH AFRICA 2
1.2. AN OVERVIEW OF EMPLOYMENT AND GROWTH POLICIES IN SOUTH AFRICA 5
1.3. OBJECTIVES OF THE STUDY 14
1.4. METHODOLOGY AND OUTLINE OF THE STUDY 15
CHAPTER TWO
THEORETICAL BACKGROUND OF THE EMPLOYMENT AND GROWTH RELATIONSHIP 18
2.1. INTRODUCTION 18
2.2. OKUN'S LAW 18
2.2.1. The Derivation of Okun's Law 18
2.2.2. Different Interpretations Of Okun's Law 21
2.3. THE BUSINESS CYCLE THEORY 23
2.4. THE PRODUCTION FUNCTION THEORY 26
2.5. EMPLOYMENT INTENSITY OF GROWTH 37
2.5.1. The Determinants of Employment Elasticity 39
2.6. SUMMARY AND CONCLUSION 43
CHAPTER THREE
REVIEW OF EMPIRICAL STUDIES ON GROWTH AND EMPLOYMENT 44
3.1. INTRODUCTION 44
3.2. DEVELOPED ECONOMIES 45
3.3. TRANSITION ECONOMIES 52
3.4. ASIA AND THE PACIFIC 58
3.5. LATIN AMERICA AND THE CARIBBEAN 64
3.6. AFRICA AND THE MIDDLE EAST 71

3.7. EMPLOYMENT AND GROWTH AMONG THE BRICS COUNTRIES 76
3.7.1. Brazil 77
3.7.2. Russia 81
3.7.3. China 85
3.7.4. South Africa 89
3.8. SUMMARY AND CONCLUSION 96
CHAPTER FOUR
MODELLING SECTORAL EMPLOYMENT ELASTICITIES 99
4.1. INTRODUCTION 99
4.2. THE LABOUR DEMAND MODEL 99
4.3. METHODOLOGY 101
4.4. ARC ELASTICITY OF EMPLOYMENT APPROACH 101
4.5. ECONOMETRIC APPROACH 104
4.5.1. Testing for Cointegration: The Engle-Granger Methodology 109
4.6. DATA SOURCES AND DESCRIPTION 113
4.7. SUMMARY AND CONCLUSION 113
CHAPTER FIVE
EMPIRICAL EVIDENCE: RESULTS AND INTERPRETATION 114
5.1. INTRODUCTION 114
5.2. SIMPLE ARC ELASTICITY OF EMPLOYMENT, 1999-2012 114
5.3. REGRESSION RESULTS OF THE ECONOMETRIC MODELLING OF EMPLOYMENT ELASTICITIES 126
5.4. SUMMARY AND CONCLUSION 146
CHAPTER SIX
CONCLUSION AND POLICY IMPLICATIONS 148
6.1. INTRODUCTION 148
6.2. SUMMARY OF THE MAIN CONCLUSIONS 148
6.3. POLICY IMPLICATIONS 152
6.4. LIMITATIONS OF THE STUDY AND AREAS FOR FUTURE RESEARCH 154
REFERENCES 157
Appendix 1.1: A summary of empirical research on international employment intensity of growth. 173
Appendix 1.2: A summary of empirical research on domestic employment intensity of growth. 193
Appendix 2.1: Unit root test results: employment, output, wages, inflation and interest rates 198
Appendix 2.2: Estimation results of all the co-integrating equations and the summary statistics. 227
Appendix 2.3: Diagnostic tests on the error correction model. 231

LIST OF FIGURES

Figure 1.1: Private sector employment, GDP and capital labour ratio…… 4
Figure 2.1: A simple business cycle…….. 23
Figure 2.2: Isoquant graphs representing different production functions and elasticities of substitution between capital (K) and labour (L)……28
Figure 2.3: Isoquants of a CES production function……. 34
Figure 2.4: Production theoretical framework of the growth-employment linkage…….. 35
Figure 3.1: Employment by economic sector ('000s), Brazil, 1998-2008……. 79
Figure 3.2: Employment by economic sector ('000s), Russia, 1998-2008…… 84
Figure 3.3: Employment by economic sector ('000s), China, 1998-2008……. 88
Figure 5.1: Employment and value-added growth rates by sector, 2008-2010……... 122
Figure 5.2: Employment and GVA in the formal non-agricultural sector; 2000Q1-2012Q4……..130

LIST OF TABLES

Table 1.1: Summary of main economic and labour outcomes in South Africa: 2006-2011. 3
Table 3.1: Country estimates of employment elasticities: Brazil, 1999 - 2008 78
Table 3.2: Country estimates of employment elasticities: Russia, 1999 - 2008 84
Table 3.3: Country estimates of employment elasticities: China, 1999 - 2008 89
Table 4.1: Interpretation of employment elasticities..... 103
Table 5.1: Real GDP employment and employment elasticities in the non-agricultural formal sector, South Africa, 1999 - 2012..... 116
Table 5.2: Employment elasticities and growth in value added by economic sector, South Africa, 1999 – 2012..... 117
Table 5.3: Augmented Dickey-Fuller (ADF) unit root test on series..... 127
Table 5.4: Cointegration test on residuals from sectoral employment and other selected variables... 128
Table 5.5: OLS estimates of the relationship between employment and other macroeconomic variables 131
Table 5.6: Results of the error-correction model 137
Table 5.7: Short run causality tests 138
Table 5.8: Total non-agricultural employment, by sector as at 2012:04..... 139
Table 5.9: Computed employment elasticity of output growth..... 140
Table 5.10: Number of additional jobs created for a given percentage change in GDP 140
Table 5.11: Skills share of total employment by sector, 1995-2008. 142
Table 5.12: Employed, unemployed and labour force trends, 2008-2012. 143

CHAPTER ONE

INTRODUCTION

Persistently high unemployment has become a common phenomenon in many countries. A recent report by the International Monetary fund (IMF) indicated that over 200 million people throughout the world are unemployed, with youth unemployment rates reaching alarming levels in many countries. Unemployment rates remain significantly higher than the near full employment levels that prevailed until the early 1970s (ILO, 2011). The global unemployment rate is projected to remain high, at around 6 per cent, until at least 2017 (ILO, 2013). The large increases in global unemployment are due to high population and labour force growth rates in the developed economies and European Union region, as well as South-East Asia and the Pacific, South Asia, sub-Saharan Africa, Latin America, and the Caribbean. Some of this increase is also due to lags between economic changes and changes in the labour market.

The substantial rise in youth unemployment that has occurred in most countries is a major concern. According to a recent report by the International Labour Organisation (ILO) on Global Employment Trends, the labour market situation remains particularly bleak for the world's youth, whose employment prospects have deteriorated drastically in the wake of the great recession (ILO, 2013). In its report, the ILO estimated that global youth unemployment had increased by 12.6 per cent to 73.8 million in 2012, from 2011. Moreover, the rise in youth unemployment has occurred alongside the withdrawal of young people from the labour market. In 2012, there were 22.9 million fewer employed youth compared to 2007 despite a growth in the global youth population of more than 12 million, implying a significant decline in global youth labour force participation rates. The low global youth participation rates in developing countries can be partly explained by increases in the time spent in education, given the historically low attainment levels for secondary and tertiary education in these countries. However, in the developed economies and European Union region, the decline in youth participation is mainly due to discouragement and increasing numbers of youth who are neither in education nor employed or in training. The report further suggests that many youth in a number of countries risk going from being unemployed or out of the labour market to becoming unemployable.

The 2008/09 financial crisis and the global recession that followed have aggravated the problem of chronic high unemployment. Many countries continue to face the challenge of strengthening weak recoveries, while battling to increase the rate of employment creation at the same time. A renewed interest in the relationship between employment and economic growth has emerged, as employment recoveries in many countries were found to be slower than those observed after previous recessions.

There is consensus among economists that growth is an essential prerequisite (though not always sufficient) for employment creation. The emergence of the 'jobless growth' concept sought to explain the situation where output growth increases, while employment stagnates. For example, in countries such as India and Pakistan, despite GDP growth rates of more than 6 per cent per year, unemployment rates remain above 15 per cent. A number of studies have investigated the relationship between output and employment. One of the earliest studies, conducted by Madden and Tuckwell (1975), disaggregated the relationship between output and employment by sector. In their study, the authors examined sectors within Australian industry and concluded that in most of these sectors, changes in output had no relationship to changes in employment. Akçoraoğlu (2010) investigated the long-run relationship between employment and GDP, based on the Johansen co-integration and Engle-Granger co-integration methods. His study found a bi-causality between these two variables.

1.1. THE SITUATION IN SOUTH AFRICA

The general perception of employment performance in South Africa has been rather negative. The key issue in the long-standing debate about this problem is the inability of South Africa's economic growth, generally regarded as the creator of employment, to create sufficient employment opportunities for the growing labour force. The rate of unemployment remains stubbornly high, in spite of vastly improved macroeconomic fundamentals compared with the situation in the 1990s (Hodge, 2009). According to the South African Reserve Bank (SARB), as indicated in Table 1.1 below, South Africa registered positive average growth rates of 4.9 per cent between 2005 and 2008, and 1.7 per cent between 2009 and 2011. However despite these growth rates, employment has not increased significantly. During these two periods, the increase in total non-agricultural employment showed a declining trend, from 2.4 per cent in 2005-2008 to -0.6 per cent in 2009-2011.

Table 1.1: Summary of main economic and labour outcomes in South Africa: 2006-2011.

							Av. annual growth (%)	
Main variables		2005	2008	2009	2010	2011	2005-08	2009-11
Macroeconomic outcomes	GDP growth	5.3	3.6	-1.5	3.1	3.6	4.9	1.7
	Labour productivity growth rate	-1.3	1.7	1.7	4.0	1.3	-0.9	2.3
Labour market outcomes	Unemployment rate	23.8	22.7	23.7	24.7	24.7	22.5	24.4
	Total non-agricultural employment	8 960 881	9 690 312	9 436 473	9 383 523	9 520 110	2.4	-0.6
	Construction	434 291	472 672	433 690	409 065	422 786	6.3	-3.5
	Finance	1 646 872	1 907 495	1 816 214	1 776 492	1 819 960	3.1	-1.5
	Manufacturing	1 321 676	1 298 570	1 212 206	1 170 701	1 154 662	-0.2	-3.8
	Mining	449 305	535 109	511 136	573 034	594 682	4.2	3.8
	Social and personal services	3 063 641	3 327 970	3 387 844	3 387 873	3 436 898	2.4	1.1
	Trade	1 636 644	1 728 618	1 661 904	1 650 695	1 668 827	2.5	-1.1
	Transport	359 993	364 083	357 481	358 419	362 724	0.9	-0.1
	Utilities	48 459	55 794	55 997	57 245	59 572	5.3	2.2
Sector's share of total employment	Construction	4.8	4.9	4.6	4.4	4.4		
	Finance	18.4	19.7	19.2	18.9	19.1		
	Manufacturing	14.7	13.4	12.8	12.5	12.1		
	Mining	5.0	5.5	5.4	6.1	6.2		
	Social and personal services	34.2	34.3	35.9	36.1	36.1		
	Trade	18.3	17.8	17.6	17.6	17.5		
	Transport	4.0	3.8	3.8	3.8	3.8		
	Utilities	0.5	0.6	0.6	0.6	0.6		

Source: SARB (2014); World Bank: World Development Indicators (2014)

In fact, between 2009 and 2011, a modest average annual GDP growth rate of 1.7 per cent was met with a greater relative decline in employment growth, and an increase in productivity growth. During this period, total non-agricultural employment fell by 0.6 per cent, while the labour productivity rate grew by 2.3 per cent. Therefore, it is clear that productivity growth has increased at the expense of employment growth throughout much of this period. Furthermore, during the same period, unemployment rates rose from 23.7 per cent in 2009 to 24.7 per cent in 2011.

According to the National Treasury (2011), only two out of five persons of working age (41 per cent) currently have a job, compared with 65 per cent in Brazil, 71 per cent in China, and 55 per cent in India. It is further asserted that in order to match the emerging markets average of 56 per cent, South Africa would need to employ approximately 18 million people, which would be 5 million or more than a third more than are currently employed.

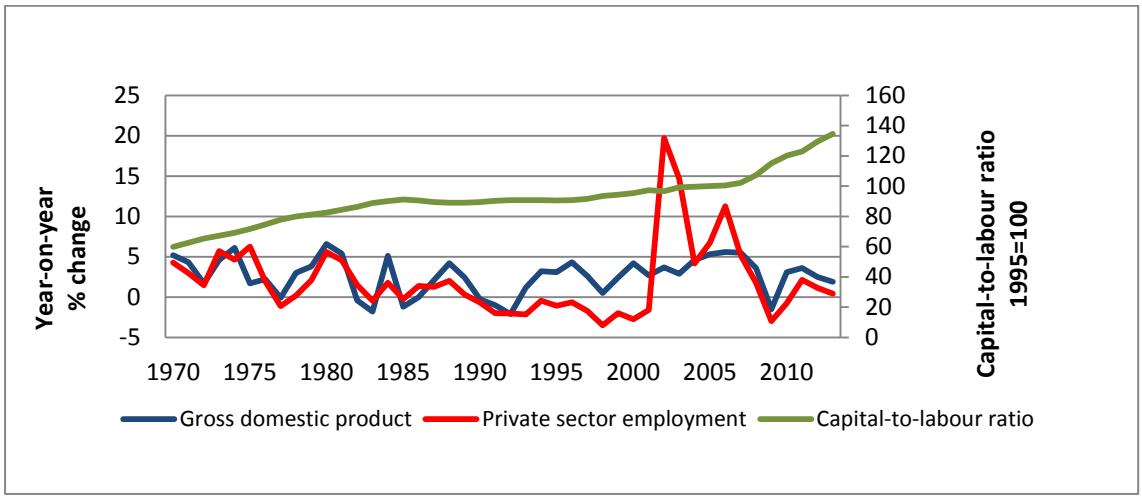
Figure 1.1 below shows the relationship between gross domestic product (GDP) and employment. During the 1970s and 1980s, GDP growth and private sector employment were highly correlated. However, according to a report by the SARB (2001), structural shifts such as an increasing capital intensity of production in the early 1990s led to the deterioration of

this relationship. During this period the unemployment rate began to steadily increase in each successive year, with the most rapid increase occurring in the mid and late 1990s. The average labour force absorption capacity declined from 79.6 per cent during the 1973-1977 period to zero during the 1990-1995 period (Loots, 1998). The rates of job creation started to rise more slowly than economic growth during economic expansion periods and fell more rapidly during recessions (Samson *et al.,* 2001).

Furthermore, the average productivity of labour increased in the early 2000s, largely due to increases in the capital-labour ratio. The relatively flat trend of the capital-to-labour ratio in the early 1990s can be associated with a weak correlation between employment and growth, whereas its upward trend in the 2000s signifies the substitution of capital for labour (Samson *et al.,* 2001). During this period, employment growth had become less responsive to economic growth. In an effort to stem the contraction of the labour market, government launched an Expanded Public Works Programme in the mid-2000s, which was aimed at creating jobs and providing training opportunities through investment in physical infrastructure. The impact of this initiative is illustrated in Figure 1.1 by the once-off sharp increases during this period.

An ILO study conducted by Hayter *et al.* (1999) indicated that some of the causes of increasing capital intensity in developing countries included trade liberalisation, which shifts production in favour of capital-intensive sectors and away from more labour-intensive sectors. According to a study by Burger (2015), the increase use of labour-using technology since 1994 has not only weakened labour's bargaining power in South Africa but have contributed a declining share of labour in total income. This reaffirms the view of Nattrass (1998) that since South Africa embarked on trade liberalisation in the 1990s, exports have become relatively less labour-intensive and more capital-intensive. This suggests that South Africa has increasingly specialised in more capital-intensive products, marking a structural adjustment that has led to a weakening employment-growth relationship.

Figure 1.1: Private sector employment, GDP and capital labour ratio



Source: SARB (2014); QUANTEC (2014).

Mahadea (2012) reaffirmed that with the exception of the year 2008, the ratio of employment growth to GDP growth has been far less than one, indicating South Africa's weak job creation performance for most years between 2002 and 2010. According to Mahadea and Simson (2010), although the economy has registered positive economic growth over the past 15 years since the demise of apartheid in 1994, the formal sector in South Africa has been unable to provide adequate employment for labour. Consequently, it is widely acknowledged that the South African economy has experienced 'jobless growth' for most of the post-apartheid era.

1.2. AN OVERVIEW OF EMPLOYMENT AND GROWTH POLICIES IN SOUTH AFRICA

One of the critical challenges facing South Africa today is the absence of sustained economic growth and employment creation, both of which are essential in reducing poverty and improving living conditions. After several years of the post-apartheid era, the growth and employment performance of the South African economy show a continuous deterioration that has been occurring for decades. Economic growth fell from an average of around 6 per cent in the 1960s to less than 1 per cent in the 1980s and early 1990s. Although it recovered during the mid-1990s, this recovery was short-lived and weak, as it peaked at only around 4 per cent in 1996. Between the late 1990s and early 2000s, GDP growth remained weak,

averaging 2.7 per cent. After it peaked at 5.6 per cent in 2006, it deteriorated further, averaging only 1.9 per cent between 2009 and 2013.

Throughout this period, the capacity of the South African economy to create jobs declined dramatically. The number of new entrants who obtained formal employment in the labour market decreased significantly, particularly among unskilled and semi-skilled workers (Lewis, 2001). Between the early 1980s and late 1990s, the level of formal sector employment in these two groups declined almost every year, resulting in a total loss of 1.3 million jobs. According to Natrrass (1998), the job crisis in South Africa stems from comparatively weak long-term growth. This trend differs from international patterns, which supports the view that labour-demanding growth is best pursued through stable growth-oriented macroeconomic policies and a competitive labour market. This implies that macroeconomic and labour market policies must be aligned with each other. A report by the United Nations Conference on Trade and Development (UNCTD) indicated that supportive monetary, financial and fiscal policies are required to achieve strong growth that provides the additional employment opportunities required to absorb excess labour (UNCTD, 2012). The report further argued that the task of monetary, financial and fiscal policies to support employment growth can be helped by the additional use of income policies enabling the gradual expansion of domestic growth.

In 1994 the new democratic government adopted the Reconstruction and Development Programme (RDP) as the centrepiece of its economic policy. This programme outlined a comprehensive plan to reduce poverty and inequality, emphasising economic growth, as well as efforts to improve service delivery and human resource development for the previously disadvantaged groups. Despite widespread support of the RDP goals, the new government faced other problems, including high inflation, exchange rate volatility, declining GDP growth, and a large fiscal deficit. In view of these challenges and growing concerns over its commitment to sound macroeconomic policies, the government introduced the Growth, Employment and Redistribution (GEAR) policy framework in 1996 in order to restore confidence in and enhance the credibility of the government. The key elements of the GEAR framework are described in Box 1.1 below. It soon became clear that the some of the GEAR targets were highly optimistic, and it was therefore unrealistic to expect a turnaround within five years. In the short run, GEAR's conservative monetary and fiscal policies translated into low growth and fewer jobs. In 1996 the private sector lost 95 000 jobs, while government

made employment gains of 40 000 jobs (Grawitzky, 1999). In the late 1990s employment levels continued to deteriorate, with the number of job losses in the formal non-agricultural sector rising sharply. For instance, according to employment statistics released by Statistics South Africa in September 1999, the formal non-agricultural sector shed 55 239 jobs between March and June 1999, with the public service accounting for the largest number of job losses due to a decline in jobs within the provinces. It was during this period that capital intensity began to increase in most sectors, due to the growing demand for semi-skilled and highly skilled professionals as technology started replacing unskilled and low-skilled workers (Fraser, 1999). Other exogenous factors that were blamed for poor output growth and low employment generation included the sharp decline in commodity prices in 1997, the 1997/98 Asian and emerging market currency crisis, and the South African Reserve Bank's policy of high interest rates (Gows and Roy, 1997).

Box 1.1: The Growth, Employment and Redistribution (GEAR) Framework

Recognising the critical need to rebuild and restructure the economy, government set out the GEAR framework as an integrated economic strategy to confront the challenges of meeting basic needs, developing human resources, increasing participation in the democratic institutions of civil society and implementing the Reconstruction and Development Programme in all its facets. The plan proposed a growth rate of 6 per cent per annum and an additional 400 000 new jobs created per annum by the year 2000. The plan envisaged a sustained growth path that required transformation towards a competitive outward-oriented economy.

The core elements of the GEAR framework as described in the government publication included:

- A renewed focus on budget reform to strengthen the redistributive thrust of expenditure.
- A faster fiscal deficit reduction programme to contain debt service obligations, counter inflation and free resources for investment.
- An exchange rate policy to keep the real effective rate stable at a competitive level.
- Consistent monetary policy to prevent a resurgence of inflation.
- A further step in the gradual relaxation of exchange controls.
- A reduction in tariffs to contain input prices and facilitate industrial restructuring, compensating partially for the exchange rate depreciation.
- Tax incentives to stimulate new investment in competitive and labour absorbing projects.
- Speeding up the restructuring of state assets to optimise investment resources.
- An expansionary infrastructure programme to address service deficiencies and backlogs.
- An appropriately structured flexibility within the collective bargaining system.
- A strengthened levy system to fund training on a scale commensurate with needs.
- An expansion of trade and investment flows in Southern Africa.
- A commitment to the implementation of stable and coordinated policies.

Source: Department of Finance (1996).

The Diagnostic Report of the National Planning Commission, released in June 2011, highlighted some of the South African economy's shortcomings since 1994. The report asserted that although some progress had been made in terms of reducing poverty, not enough progress was made in terms of reducing inequality. It further articulated that millions of South Africans were still unemployed, particularly the youth, and that many working households lived close to the poverty line. The current National Development Plan (NDP) policy framework proposes a number of initiatives that South Africa can adopt through partnerships between government, labour and the business sector in order to promote large-scale job creation and growth (see Box 1.2 below).

Box 1.2: The National Development Plan

The plan envisages an economy that is more inclusive, more dynamic, and in which the fruits of growth are shared more equitably. It proposes to increase growth and employment through the following:

- Raise exports, focusing on those areas where South Africa already has the endowments and a competitive advantage such as mining, construction, mid-skill manufacturing, agriculture and agro-processing, tourism and business services.
- Increase the size and the effectiveness of the innovation system, and ensure closer alignment with companies that operate in sectors with the growth strategy.
- Improve the functioning of the labour market to help the economy absorb more labour, through reforms and specific proposals concerning dispute resolution and discipline.
- Support small businesses through better coordination of activities in small business agencies, development finance institutions, and public and private incubators.
- Improve the skills base through better education and vocational training.
- Increase investment in social and investment infrastructure to lower costs, raise productivity and bring people into the mainstream of the economy.
- Reduce the regulatory burden in sectors where the private sector is the main investor, such as broadband internet connectivity, to achieve greater capacity and lower prices.
- Improve the capacity of the state to effectively implement economic policy.

Source: National Planning Commission (2011).

The NDP proposes that by 2030 the economy should be close to full employment, with 11 million more jobs having been created. To achieve this, it targets an average economic growth rate of about 5.4 per cent per annum over the next 20 years. The plan envisages an economy that generates sufficient economic opportunities, which is more inclusive and dynamic and in which the fruits of growth are shared more equitably.

With regard to employment policies, the challenge facing labour market policy in South Africa has to do with promoting dynamic efficiency, skills enhancement and employment creation. Since the new political dispensation, government has introduced a number of reforms in the labour market aimed at addressing the problem of unemployment. A number of these reforms came in the form of new or revised labour regulations. Between 1994 and 2013, various pieces of legislation and legislative amendments have been passed by parliament, including the Employment Equity Act (1998), Skills Development Act (1998), Skills Development Levies Act (1998), Basic Conditions of Employment Act (1997), and the Labour Relations Act (1995).

The Employment Equity Act (1998) seeks to provide incentives for firms to redress the imbalances of the past in the labour market. It abolishes discrimination at the workplace and provides for the implementation of affirmative action by companies and the monitoring and reduction of wage differentials. The Skills Development Act (1998) provides an institutional framework to devise and implement mechanisms to finance and promote skills development at the workplace, while the Skills Development Levies Act (1998) provides for the imposition of a skills development levy on companies.

The Basic Conditions of Employment Act (1997) was one of the first major pieces of labour legislation to be adopted by the new democratic government, and it guarantees minimum conditions of employment. In essence, this legislation ensures the right to fair labour practices and regulates the basic conditions of employment. It is particularly aimed at protecting workers who fall outside the scope of collective bargaining. The Labour Relations Act (1995) protects the rights of employees to form unions and to strike. In principle, this act provides the framework for collective bargaining.

According to the Department of Labour (1996), labour market policy in South Africa is guided by the following objectives:

- The need to ensure that labour market policies contribute to the realisation of the vision of government, and that they are aligned with the broader policy of government;
- The need to ensure equity in the context of an increasing number of atypical work relationships;
- The need to ensure that labour market policies promote economic growth in a manner that contributes to greater protection and security of the workforce;
- The need to resolve labour inequalities in the workforce and promote representation of previously disadvantaged groups, especially with regard to skills training and improved working conditions;
- The need to broaden, deepen and upgrade the formation and utilisation of skills throughout the economy, including small, medium and large-scale enterprises.

According to the Centre for Development and Enterprise report (CDE, 2013), South African labour market policy is largely concentrated on ensuring 'decent jobs', but at the expense of lower rates of job creation. It is argued that this policy favours those who are already employed who are members of established unions and big businesses, to the detriment of lower-skilled workers in smaller firms, as well as the unemployed. The report argues that current labour market trends are propelled by rising real wages and inflexible labour regulation which are not compatible with the employment creation needed to address the unemployment crisis.

Nattrass (1998) raised a similar concern, namely that wage-setting institutions in South Africa do not promote employment creation. In her study, she showed that larger and more profitable firms have a strong incentive to participate in bargaining councils. Since they are more influential in setting a centrally negotiated wage, they tend to force higher wages onto smaller, less profitable firms through the extension mechanism. Faced with higher wages, these smaller firms then tend to reduce employment, externalise the labour function (through increased use of sub-contracting) or raise labour productivity to justify the higher wage.

Nattrass also argues that international evidence suggests that rigid labour policies and institutions that protect the wages of low-paid workers are likely to lead to job losses as international competition increases. Therefore, it is of great concern that in South Africa, the Labour Ministry is introducing even greater rigidities in the labour market through minimum wage policy at a time when the country's trade barriers have been reduced (Nattrass, 1998). Her research found that there were fundamental inconsistencies between the policies pursued by the Ministry of Labour and the growth policy embedded in GEAR. For instance, in projecting employment growth, the GEAR framework assumes strong output growth alongside rising labour intensity. It assumes that labour policies will ensure that more jobs are created for every unit of output. However, the mandatory extensions given to central bargaining councils and the new powers given to the Ministry of Labour to raise minimum wages clearly suggest that there are two different and opposing approaches at work, that is, labour market regulation and job creation.

Labour market reforms in South Africa have contributed to the general perception that labour regulations are not only inflexible but are also distortionary, which means that they may contribute significantly to employment losses by increasing labour costs (COSATU, 1999). According to Maziya (1999), the new labour relations legislation has the potential to adversely affect employment levels by leading to a wage structure that deviates from competitive levels. Mahadea (2003) similarly argued that the new labour policies have imposed rigidities on the labour market to such an extent that employers, burdened by these regulations, have tended to switch to capital-intensive methods to the detriment of employment creation.

Economic literature on the classical model shows that labour market flexibility is an important mechanism for job creation. This led Barker (1999) to argue that it is an important element in the battle against unemployment. According to Lewis (2002), in situations where wages are rigid, firms are unable to effectively respond to market shocks by adjusting wages downwards and they reduce the number of workers instead.

Most workers in the formal sector are protected by the Labour Relations Act (LRA), which established the collective bargaining system as the primary method of wage determination. Marsden (1995) argued that the reduction of pay differentials and job protection regulations, all of which are features of centralised collective bargaining envisaged in the LRA, could

negatively affect employment. Moreover, it is argued that the extension of collective bargaining agreements and minimum wages by the Minister of Labour to non-parties may very likely have destroyed jobs in small labour-intensive firms (Mahadea, 2003).

With regard to the Basic Conditions of Employment Act (BCEA), the dominant view is that this act has made the labour market less conducive to employment creation. Its critics argue that by increasing maternity, family and annual leave, and reducing hours of work, the legislation has potentially increased both direct and indirect labour costs (Mahadea, 2003), thereby reducing potential future job creation. A review done to measure the impact of the Act on small business growth estimated that it will increase labour costs in certain sectors by as much as 10 per cent (Sellars, 2000).

Another controversial issue in the BCEA stems from the determinations and powers given to the Minister of Labour to establish minimum terms and conditions of employment, including minimum wages. The conventional view suggests that an effective minimum wage will decrease employment (Freeman, 1993). Nattrass (1998) asserts that if the Ministry of Labour in South Africa exercised its new powers to raise minimum wages significantly, this would exacerbate the number of job losses. The Inter-American Development Bank (1998) expressed the view that empirical evidence from a number of developing countries suggested that when the enforced minimum wage was set at relatively low levels, the impact was mostly on the composition, rather than the levels, of employment.

In its review of South African labour market policies, the CDE (2013) raised particular concerns about the current labour market administration in relation to the following:

- While the LRA has been praised for its accompanying dispute resolution mechanisms, such as the Commission for Conciliation, Mediation and Arbitration (CCMA), this has often been used disproportionately by low-skilled workers, with the outcome in most cases being found in their favour, hence making this institution relatively burdensome for employers of low-skilled labour. The resolution of a case takes on average 1.4 days, which imposes burdens on employers, particularly in smaller firms which lack specialised human resources staff.

- Hiring and firing regulations: In 2011, South Africa was ranked third-last out of 142 countries in terms of its hiring and firing processes by the Global Competitiveness Report. Employers indicate that the time and effort involved in both these processes are obstacles to hiring new staff.
- Within the industrial labour relations system, trade unions are perceived to have the upper hand of creating a large union effect with wage gains that are not accompanied by productivity increases (Lewis, 2001). Bargaining councils and labour unions are associated with higher wages and lower employment levels in South Africa. It is asserted that bargaining councils enhance union power by having the authority to extend statutory wages to currently uncovered firms within sectors. In other words, even though bargaining councils are dominated by large firms and unions, their agreements are often extended to all businesses in a sector. This practice is damaging to small firms, with its impact estimated to account for one percentage point of unemployment.

The impact of labour unions in South Africa has been associated with higher wages. According to Fallon and Lucas (1997), unions in South Africa have created wage differentials that are greater than those experienced in other countries, and this has resulted in the reduction of employment levels. According to the available literature on labour retention, wage increases should not be greater than productivity increases, failing which one person's wage increase could be achieved only at the expense of another person's job (Mahadea, 2003). Between 2000 and 2011, labour productivity in South Africa grew by 3.33 per cent on average whereas over the same period unit labour costs increased by 6.16 per cent (QUANTEC, 2013). In addition, work stoppages related to industrial actions are costly and hinder labour absorption. In spite of formal sector employment not increasing in recent years, the number of workdays lost to work stoppages associated with industrial action rose from about 0.5 million in 2000 to 1.8 million in the first half of 2013 (SARB, 2013). From the above, it is clear that the current labour policies have not been conducive to labour market flexibility and employment creation. According to Mahadea (2003), lack of flexibility, as well as the increased cost of labour caused by labour legislation and union pressure, have a negative impact on job creation.

1.3. OBJECTIVES OF THE STUDY

Although several studies have explored the relationship between economic growth and employment for specific countries and across countries, no previous research has analysed this for the single-digit disaggregation into the eight major Standard Industrial Classification (SIC) divisions of the South African economy.

Listed below are SIC Codes and the respective description of economic sectors to be investigated in this study.

SIC CODE	SIC DESCRIPTION
2	Mining
3	Manufacturing
4	Utilities
5	Construction
6	Trade
7	Transport
8	Finance and business services
9	Community and social services

The objectives of this study are four-fold:

1. To determine how the relationship between employment and output growth in the eight non-agricultural (formal and informal) sectors of the South African economy has evolved, with a view to identifying key growth sectors that are employment-intensive. To achieve this, the study will evaluate employment elasticities in the eight major SIC divisions (sectors), in order to establish whether or not growth in these sectors is employment- intensive. This will provide insight into the sensitivity of sectoral employment to output growth, and the extent to which structural economic changes during this period have affected the various sectors.
2. To outline the data and methodological requirements for generating estimates of employment elasticities. In order to assess and quantify the linkage between sectoral output growth and employment, this study will use a combination of an arithmetical technique to calculate the *arc* elasticity of employment as well as regression analysis to estimate an econometric model of the relevant sectoral employment elasticities.

3. To investigate the sign and size of the different employment elasticities of output growth for different sectors within the non-agricultural sector of the South African economy for the period 2000:01-2012:04. To capture the employment elasticities of the major SIC divisions of the economy, a double-log linear regression form of the demand function for employment is estimated. The demand function is derived from the constant elasticity of substitution production function.
4. To better understand the key determinants of employment elasticities. This study uses a multivariate econometric model to quantify the relative importance of the key determining factors of employment elasticity, that is, partial elasticities of employment with respect to output, real wage rate, inflation, and user cost of capital.

1.4. METHODOLOGY AND OUTLINE OF THE STUDY

The research methodology used in this study will involve a survey of the literature on the topic and an analysis of secondary data (e.g. World Bank reports, Statistics South Africa reports, South Africa Reserve Bank Bulletins, etc.), through the use of various analytical techniques such as graphical, mathematical and econometric analysis. The intention is to estimate the sectoral employment intensity of output growth between 2000 and 2012 in the eight non-agricultural sectors of the economy. To ensure the robustness of the empirical results, the study will use two approaches to assess the growth-employment linkage. The first method is the simple *arc* elasticity of employment, which is used to compute a convenient measure of employment intensity of growth, or the elasticity of employment with respect to output growth, which was recently used by Hodge (2009) and Kapsos (2005). The second technique involves estimating a double-log regression model of the employment demand function. This is done to estimate employment elasticities in the eight non-agricultural sectors of the economy as well as the differential partial elasticities of employment with respect to the real wage rate, inflation and user cost of capital. This is discussed in detail in Chapter Four of this study.

This study is divided into six chapters. Following this chapter is Chapter Two, which provides the theoretical background to the relationship between employment and growth. The chapter includes an in-depth explanation of Okun's Law, the business cycle theory, the production function theoretical framework, and the employment intensity of growth. Okun's Law formalised an inverse relationship between the unemployment rate and growth in real

output. Using data for the United States, Okun concluded that there is a 1:3 relationship between the unemployment rate and changes in output, implying that a one percentage point increase in unemployment is correlated with a three per cent fall in the real growth of output (Okun, 1962).

The business cycle theory defines the short-run or periodic fluctuations between employment and growth as both variables deviate from their long-run trend paths. The new classical version of the business cycle theory developed by Kydland and Prescott (1982) assumes that random fluctuations are generated by the rate of technological change, and that individuals change their amounts of labour supply and spending in response to this. In terms of this reasoning, it is generally understood that sudden changes in aggregate supply or demand induce periodic fluctuations in growth around its long-term trend. These fluctuations are called business cycles and are responsible for fluctuations in employment.

The production function theoretical framework has been used in previous studies to demonstrate how alternative combinations of inputs (labour and capital) are used to produce a given level of aggregate output (GDP or Gross Value Added). A study by Schmid (2008) used the production theory to explain different expansion paths in the economy and the possibility of jobless growth. This helps to explain how decisions on employment are linked to decisions on production processes, as economic sectors employ different resource combinations, ranging from capital-intensive combinations (much capital and little labour) to labour-intensive combinations (much labour and little capital), in order to meet increases in demand. Isoquants are used to analyse and illustrate how different technologically efficient combinations of labour and capital can be employed to produce a given level of output. Production function theory is then used to explain the causal link between employment and output under a demand-side approach (Islam and Nazara, 2000). The estimate of employment elasticity derived from this analysis is a widely used indicator for examining how employment and output growth have evolved together over time. At the end of this chapter, some of the main determining factors of employment elasticity and the associated trade-offs involved will be discussed.

Chapter Three reviews studies that have investigated the empirical relationship between economic growth and employment, both domestically and internationally. This chapter gives a comprehensive review of the existing literature (both domestic and international) on the

employment and growth relationship, describing some of the historical differences between regions with respect to their employment intensity of growth, as well as an explanation for these differences. In addition, this chapter will examine the sectoral employment intensity of growth trends since the early 2000s in some of the BRICS countries, highlighting the periods during which these countries initiated important reforms that affected employment generation.

Chapter Four introduces the empirical labour demand model, which will be used later to investigate the sectoral employment intensity of output growth in South Africa. The labour demand model is then formulated as an econometric model to analyse empirically how the sectoral employment intensity of growth has evolved in the eight major SIC divisions of the South African economy. Some of the methodological issues and approaches to quantifying the relationship between sectoral output growth and employment, namely the simple arc elasticity of employment and the econometric method of regression analysis, are also explained in this chapter. Lastly, model specification and data source-related issues will be examined.

Chapter Five interrogates the data more closely through application of the various analytical techniques discussed in the previous chapter. This chapter presents the empirical results of the sectoral employment intensity of output growth in the eight major Standard Industrial Classification (SIC) divisions of the South African economy. The empirical results will indicate how sectoral output growth and employment have evolved over time, and help identify key growth sectors that are employment-intensive.

Finally, the conclusion of the study and its implications for further research are presented in Chapter Six.

CHAPTER TWO

THEORETICAL BACKGROUND OF THE EMPLOYMENT AND GROWTH RELATIONSHIP

2.1. INTRODUCTION

The previous chapter reviewed some of the stylised facts about market trends of employment and growth, as well as macroeconomic and labour market outcomes in South Africa. This chapter explains the theory behind these empirical relationships. The theoretical background to most studies that analyse the relationship between employment and growth is provided by Okun's Law, business cycle theory, the production function theoretical framework, and the employment intensity of growth.

2.2. OKUN'S LAW

The relationship between growth and unemployment has been widely studied based on what is known as Okun's Law. In his study, Okun (1962) formalised the inverse relationship between the unemployment rate and growth in real output into a statistical one. He estimated a coefficient (commonly known as Okun's coefficient) that postulates a specific empirical relationship between economic growth and the change in the rate of unemployment (output-unemployment elasticity), using US data. More specifically, his study concluded that there was a ratio of 1:3 describing the relationship between unemployment rate and output, which simply means that a one percentage point increase in unemployment will cause real growth of output to fall by approximately three per cent. Reversing the causality, a one percentage point increase in growth (above potential output) would lead only to a 0.3 per cent reduction in unemployment (Khemraj *et al.*, 2006).

2.2.1. The Derivation of Okun's Law

According to a seminar paper presented by Okun (1970), the relationship between the unemployment rate and the change in real GDP can be specified as:

$$\Delta U_t = -\left(\frac{1}{k}\right)\Delta \ln GDP_t \qquad (1)$$

where U is unemployment and k is the so-called Okun coefficient. Prachowny (1993) explains that the relationship between unemployment and output is derived from a production function for the economy, as well as from ancillary relationships in the labour market. A production function framework in log form can be written as:

$$y = \alpha(k + c) + \beta(\gamma n + \delta h) + \tau \qquad (2)$$

where

y = output

k = capital input

c = utilisation rate

n = number of workers

h = number of hours worked

α and β = output elasticities

γ and δ = contributions of workers and weekly hours to the total labour input

τ = technology factor.

The output elasticities contain various constraints, such that:

- α and β are each less than 1, in order to allow for the diminishing marginal product of a factor.
- $\alpha + \beta = 1$, in order to allow for constant returns to scale.
- $\gamma = \delta$, if the production process is indifferent to such an extent that the labour input is augmented, either through more workers with constant hours or more hours for the same workers.
- $\gamma = \delta = 1$ if the total labour input is equivalent to total labour hours.

The model assumes that potential output, which is denoted by y^*, is derived from the same production function, with inputs at their equilibrium values, also denoted by (*). As a result, the output gap in any period, represented by $y - y^*$, may be written as:

$$y - y^* = \alpha(k - k^*) + \alpha(c - c^*) + \beta\gamma(n - n^*) + \beta\delta(h - h^*) + (\tau + \tau) \qquad (3)$$

Given that l represents labour supply, the unemployment rate can be expressed as $u = l - n$, where the natural rate of unemployment, u^*, represents equilibrium in the labour market. At equilibrium, the labour supply is equal to the sum of employed workers plus 'equilibrium' vacancies i.e. $l^* = n^* + u^*$. Supposing that $\tau = \tau^*$ and $k = k^*$, while allowing the utilisation rate to differ between actual and optimal levels and substituting the unemployment rate, equation (3) can be rewritten as:

$$y - y^* = \alpha(c - c^*) + \beta\gamma(l - l^*) - \beta\gamma(u - u^*) + \beta\delta(h - h^*) \qquad (4)$$

From equation (4), it follows that parameter $\beta\gamma$ represents the link between the unemployment rate and changes in output. Prachowny (1993) assumes the value of this parameter to be approximately 0.75 in order to conform to the requirement that β is a measure of the proportion of total output which is earmarked for labour and where γ is close to unity. This follows his argument that most of this change in output is due to changes in factors other than unemployment, such as capacity utilization and hours worked. Holding these other factors constant reduces the association between unemployment and output to around 0.75 for every 1 percentage change in the unemployment rate.

The ratio of 1:3 postulated by Okun (1962) is derived from a complicated weighted sum of all other changes. This ratio implies that a 1 per cent increase in the growth rate above the trend rate of growth (or the growth in potential output) would lead only to a 0.3 per cent reduction in unemployment (Khemraj *et al.*, 2006). The opposite is also true, where a 1 per cent increase in unemployment implies a 3 per cent loss in GDP growth. According to Prachowny (1993), although potential output refers to the amount of goods and services produced at 'full employment', this does not mean that $u = u^*$, since y can still deviate from y^*, unless $c = c^*$, $l = l^*$ and $h = h^*$. In other words, even if the labour market for workers is operating at equilibrium, the presence of abnormal overtime suggests that the output gap will be positive. Hence, $y = y^*$ should not be interpreted as implying that there is labour market equilibrium, since there may be an excess supply of workers and abnormal overtime.

2.2.2. Different Interpretations Of Okun's Law

The Okun relationship originates from the observation that in order to produce more goods and services in the economy, more labour is required. The additional labour can be in the form of hiring more workers or increasing overtime. In the early 1960s, Arthur Okun documented different approaches to the output-unemployment relationship, which are collectively referred to as Okun's Law.

The difference approach. This version captures how changes in the unemployment rate move with growth in real output over the same period. The difference approach can be expressed empirically as:

$$(u_t - u_{t-1}) = \alpha + \beta\,(y_t - y_{t-1}) + \mathcal{E}_t \qquad (5)$$

where
u_t = unemployment rate in period t
y_t = GDP growth in period t
$\mathcal{E}_t$ = error term in period t

This approach captures the correlation between output growth and movements in unemployment, i.e. how output growth varies with changes in the unemployment rate. The parameter β is called the Okun coefficient, which measures the rate of change in the dependent variable due to a change in the independent variable. The expected sign of the coefficient is negative, since Okun proposed a negative relationship between the unemployment rate and GDP growth. That is, rapid output growth is associated with a falling unemployment rate, and slow (or negative) output growth is associated with a rising unemployment rate.

The gap approach. In this approach, Okun connected the level of unemployment to the gap between potential output and actual output. Regarding potential output, his study sought to identify how much output the economy would produce if it were operating under conditions of full employment. His study proposed that during full employment, the unemployment

level would be low enough to produce as much output as possible, without creating too much inflationary pressure. The gap approach is expressed empirically as follows:

$$(u_t - u^*) = \beta\,(y_t - y^*) + \mathcal{E}_t \qquad (6)$$

where

u^* = natural rate of unemployment

y^* = potential output

$\mathcal{E}_t$ = error term in period t

The gap version suggests that a high rate of unemployment is associated with underutilisation of resources in the economy, whereas a low rate of unemployment is associated with a higher level of output closer to potential output. When the gap is closed, the economy is said to be operating at its potential and unemployment is at its natural rate.

The dynamic approach. Okun also noted that both the past and current output can influence the current level of unemployment. In the dynamic approach, Okun's Law includes the current and past GDP growth rates, as well as past changes in the unemployment rate, as variables on the right-hand side, all explaining the variation in current unemployment rate on the left-hand side (Knotek, 2007). The dynamic version of Okun's Law is expressed as follows:

$$\Delta u_t = \beta_0 + \beta_1 y_t + \beta_2 y_{t-1} + \beta_3 y_{t-2} + \beta_4 \Delta u_{t-1} + \beta_5 \Delta u_{t-2} \qquad (7)$$

where

Δu_{t-1} = first lag of the change in unemployment rate

Δu_{t-2} = second lag of the change in unemployment rate

y_{t-1} = first lag of GDP growth

y_{t-2} = second lag of GDP growth

The above dynamic approach shows that there are two lags of GDP (y_{t-1} and y_{t-2}) and two lags of the change in unemployment rate (Δu_{t-1} and Δu_{t-2}) on the right hand side, that explains the variation in the current level of unemployment (Δu_t). Unlike the gap approach, the dynamic approach is not restrictive in terms of the timing of the connection between output growth and changes in unemployment. The drawback with this approach is that its

relationship does not have the same interpretation as the original difference and gap versions of Okun's Law.

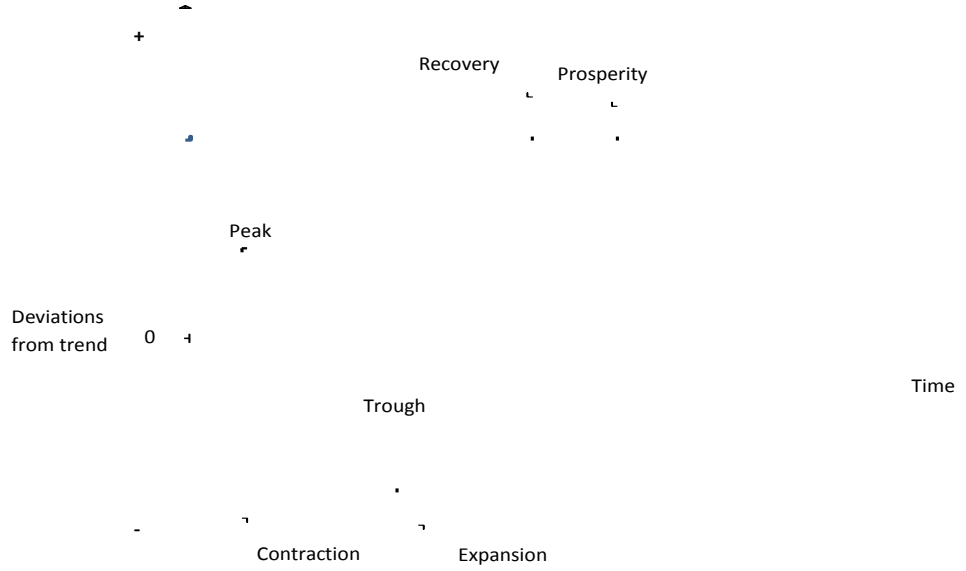
The production function approach. Another factor considered by Okun in his proposed relationships is the fact that the unemployment rate is also affected by the non-utilisation of resources in other sectors of the economy. According to Kontek (2007), the unemployment rate is at best a proxy variable for all the ways in which output is affected by idle resources. In the production function approach, to produce maximum achievable output there must be an optimum combination of labour, capital and technology. Studies show that the unemployment rate is not the only indicator of the total amount of labour used as an input; there are other factors to be considered, including population, the proportion of the population that is in the labour force and the number of working hours (Gordon, 1984 and Altig *et al.*, 1997). Incorporating all these components alongside capital and technology gives a more complete picture of what affects output, and this has led to the production function interpretation of Okun's Law reflected in equation (7) above.

One of the key benefits of the production function version of Okun's Law is that it has an underlying theoretical structure and allows for an assessment of all the economy's idle resources. One of the shortcomings of the Okun's Law is that it uses a crude approach in its analysis of the transmission of economic growth into employment as it does not give much consideration to the multiple structural mechanisms that account for job creation and job destruction.

2.3. THE BUSINESS CYCLE THEORY

The business cycle can be defined as periodic fluctuations in the pattern of economic activity (Vane and Thompson, 1994). Short-run macroeconomic variables such as employment and GDP deviate from their long-run trend paths, and these fluctuations are referred to as business cycles. A graphical representation of this definition is provided in Figure 2.1 below.

Figure 2.1: A simple business cycle



The amplitude of the cycle gives an indication of its severity and may be measured by the gap between a peak and the succeeding trough, or alternatively between a trough and the succeeding peak. A business cycle can be been divided into two broad periods, i.e. contraction (also referred to as recession) and expansion. The movement from the peak to the trough is called the contraction phase. More specifically, during contraction, economic output declines after the business cycle has peaked but before it becomes a trough. A contraction is indicated when real GDP has declined for two or more consecutive quarters. Contractions entail harsher economic conditions and a greater number of job losses as the economy enters a recession.

The movement from the trough to the peak is the called the expansion phase. During the expansion phase, business activity surges and economic output expands, and this occurs after reaching a trough. During this period, greater investment spending stimulates economic activity, leading to a multiplier effect on income and employment. This period is further divided into two sub-periods, i.e. recovery and prosperity. The recovery phase becomes prosperity when economic output exceeds the output at the previous peak of the business cycle.

Kydland and Prescott (1982) used this framework to demonstrate that an equilibrium business cycle could be generated by technological changes. Building on work done by Lucas and Prescott (1971), in their article titled 'Time to Build and Aggregate Fluctuations', Kydland and Prescott (1982) argue that business cycles can be studied using dynamic general equilibrium models. Their approach integrated growth and business cycle theories. It introduced an important modification to the standard growth model, which states that multiple periods are required to build new capital goods, and that only finished capital goods are part of the productive capital stock. Their classical version of the business cycle theory assumed that there are random fluctuations in the rate of technological change and that individuals change their amounts of labour supply and spending in response to these. It is based on this reasoning that sudden changes in aggregate supply or consumption induce short-term fluctuations in growth around its long-term trend. These fluctuations are called business cycles and are responsible for fluctuations in employment. It has been generally understood that when economies have been in the recovery phase of the business cycle, employment has grown at the same time or soon thereafter.

According to Andolfatto and MacDonald (2005), jobless recovery following a recession is predicted by neoclassical theory as new technology affects various sectors of the economy differently and as adjustments in the labour market get delayed. Their study assessed the properties of the Real Business Cycle (RBC) model, in which growth is driven by technological advances that improve total factor productivity, that vary in the degree to which they affect the structure of the economy, and that generate lasting labour market adjustments. Their study suggested that a combination of technology advances and job search yields income and employment dynamics that easily display recessions and jobless recoveries. However, their theory does not suggest that all technological advances lead to jobless recoveries, but instead makes a claim that whether or not technological advances lead to jobless recovery depends on the technology's scope and ease of implementation. In addition, their theory also asserts that while technological advances are initially characterised by recessions, these may have been a primary contributing factor to some recessionary episodes.

Prescott (1986) argued that technology shocks account for more than half of the fluctuations in the business cycle, and suggested a best point estimate of approximately 75 per cent. In his study, he computed total factor productivity (TFP) and used it as a measure of exogenous technology shocks. However, Hall (1988) and Evans (1992) disputed his results on the basis

that TFP can be estimated using military spending or monetary policy indicators, both of which are variables that are unlikely to affect the rate of technological progress. This implied that TFP, as computed by Prescott, was not a purely exogenous shock, but had some endogenous components. Other studies by Basu (1996) and Burnside, Eichenbaum, and Rebelo (1996) considered capital utilisation, while Burnside, Eichenbaum, and Rebelo (1993) used the labour effort variable to support the argument that the magnitude of true technology shocks is likely to be smaller than that of the TFP shocks used by Prescott.

However, King and Rebelo (1999) and Jaimovich (2004) argued that the fact that true technology shocks are smaller than TFP shocks does not mean that technology shocks are not important. In fact, by introducing capacity utilisation and mark-up variables in RBC models, true technology shocks were made less volatile than TFP. Furthermore, the inclusion of these variables significantly intensified the effects of technology shocks.

While there has not been much consensus on the source of business cycles, there is one important view regarding business cycles that has been historically held and on which there has been consensus. This view is based on the fact that during the recovery phase of the business cycle, when GDP is growing, employment would have grown at the same time or soon thereafter. However, this view has now been recently challenged by Andolfatto and MacDonald (2005), who argued that jobless recovery following a recession is what the neoclassical theory predicted, since technology advancement affects sectors differently and adjustments in the labour market are often delayed.

2.4. THE PRODUCTION FUNCTION THEORY

The production function theory has been used to answer the question as to how decisions related to employment are linked to decisions related to production. A macroeconomic production function is a mathematical expression that describes a systematic relationship between inputs and output in an economy. The Cobb-Douglas and the constant elasticity of substitution (CES) production functions have been used extensively, given their important role in economic forecasts and policy analysis. It can be expressed mathematically as a mapping: $Y = f(X)$, where X is a vector of factor inputs (X_1, X_1, $\cdot \cdot \cdot$, X_n) and $f(X)$ is the maximum output that can be produced for a given set of inputs X_i (Miller, 2008).

While production functions were originally designed for the individual firm within the microeconomic context, macroeconomists recognised the usefulness of this methodology as an important tool for estimating certain parameters that cannot be directly measured from national accounts data (Miller, 2008). The most important of these parameters is the elasticity of substitution between capital and labour.

Solow (1956) made a significant contribution to the new theory of macroeconomic dynamics and by introducing a new type of aggregate production function with a constant elasticity of substitution. Later, Arrow *et al.* (1961) and Brown and de Cani (1963) made further contributions by developing the theoretical and econometric foundations of the CES production function. As a result of these formations, the CES production function can be applied at both microeconomic (i.e. individual firm) and macroeconomic (i.e. overall economy) levels.

Since the elasticity of substitution (denoted by σ) measures the extent to which an economy can shift between factor inputs, typically labour and capital, this measure is defined as the percentage change in factor proportions resulting from a one-unit change in the marginal rate of technical substitution (MRTS). Graphically, MRTS can be expressed as the rate at which labour is substituted for capital, while holding output constant along an isoquant. It is the slope of the isoquant at a given point. Thus, in a two-input production function Y = f(K, L) and the elasticity of substitution between capital and labour is written as:

$$\sigma = \frac{\%\,\Delta(K/L)}{\%\,\Delta\,MRTS} = \frac{\partial(\frac{K}{L})}{\partial\,MRTS} \times \frac{MRTS}{(\frac{K}{L})} = \frac{\partial \ln(\frac{K}{L})}{\partial\,MRTS} \qquad (8)$$

where K and L represent capital and labour respectively, σ is an index that measures the rate at which diminishing marginal returns set in as one factor is increased relative to the other (Nelson, 1964). When σ is low, changes in the MRTS lead to small changes in factor proportions. In the extreme case of fixed proportions assumed by Leontief's (1941) input-output analysis,

$$Y = min\,(aK, bL)\ where\ a, b > 0 \qquad (9)$$

The resulting isoquants are L-shaped and σ = 0. This implies that changes in the MRTS will not cause any changes in factor proportions, which means that output is maximised by producing in fixed ratios. Another extreme case is the linear production function,

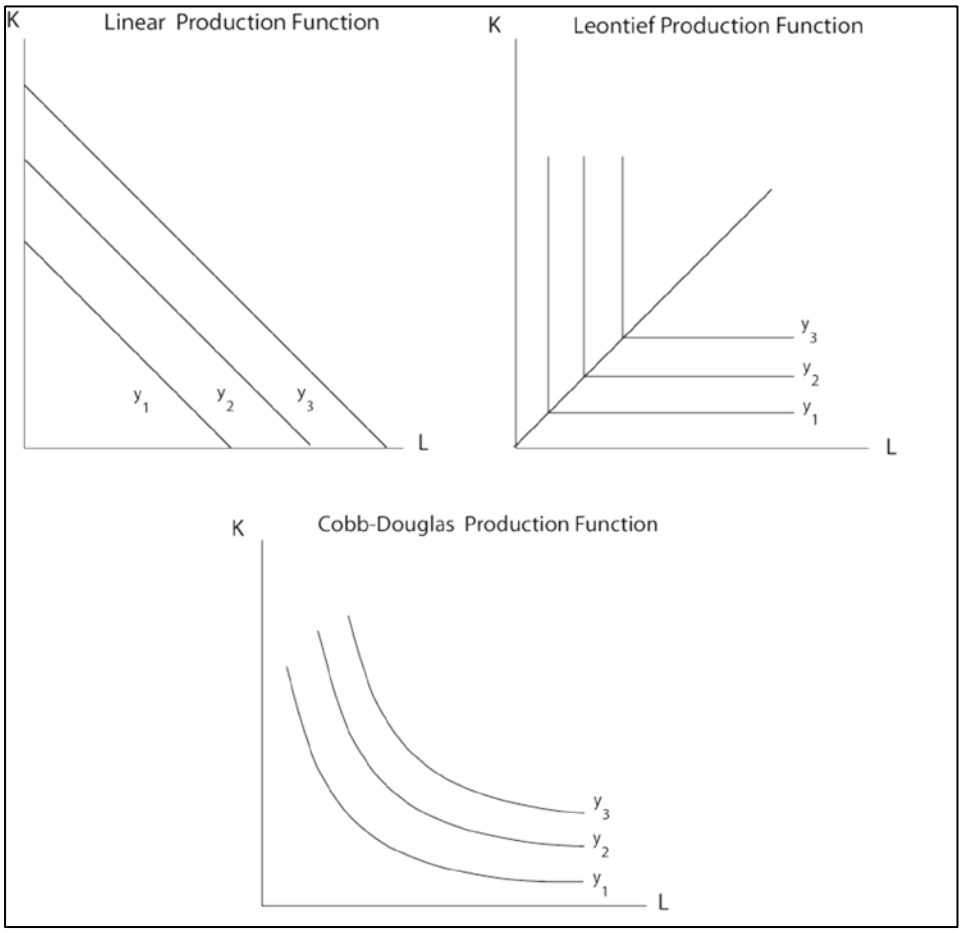
$$Y = aK + bL \tag{10}$$

where capital and labour are perfect substitutes. In this case, the MRTS is constant, the isoquants are straight lines and σ = ∞. The Cobb-Douglas form of the production function,

$$Y = A\,K^{-\alpha}\,L^{\beta} \tag{11}$$

lies between the two extremes, with σ = 1. This specification creates isoquants that are gently convex, as shown in the figure below.

Figure 2.2: Isoquant graphs representing different production functions and elasticities of substitution between capital (K) and labour (L)



The elasticity of substitution is the key to answering analytical questions about the distribution of national income between capital and labour. If markets are perfectly competitive, factors are paid their marginal product. The wage rate will equal the marginal contribution from an additional worker, and the return on capital will be the increase in output that a marginal increment of capital provides. Thus the elasticity of substitution of labour and capital is the relative change in capital intensity resulting from a small relative change in the ratio of the wage rate (w) and the rental rate (r) for a given level of output.

$$\sigma = \frac{\frac{\partial(\frac{K}{L})}{(\frac{K}{L})}}{\frac{\partial(\frac{w}{r})}{(\frac{w}{r})}} \frac{\partial(\frac{K}{L})}{\partial(\frac{w}{r})} \times \frac{(\frac{w}{r})}{(\frac{K}{L})} \quad (12)$$

According to Miller (2008), the elasticity of substitution can be rewritten as:

$$\sigma = \frac{\%\,\Delta(K/L)}{\%\,\Delta\,(\frac{w}{r})} = \frac{\partial ln(\frac{K}{L})}{\partial\, ln\,(\frac{w}{r})} \quad (13)$$

where different values of σ have different implications for the distribution of income. If σ = 1, any change in K/L will be matched by a proportional change in w/r and the relative income shares of capital and labour will stay constant. Any increase in the capital-labour ratio over time will be exactly matched by a percentage increase in the MRTS and an identical percentage increase in w/r. Constant shares of output are allocated to capital and labour, even though the capital-labour ratio may change over time.

Assuming perfect competition in both output and input markets, relative factor prices will be equal to the relative marginal products of these factors,

$$\frac{w}{r} = \frac{\frac{\partial Y}{\partial L}}{\frac{\partial Y}{\partial K}} \quad (14)$$

such that equation (12) can be rewritten as:

$$\sigma = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{\partial\left(\frac{\frac{\partial Y}{\partial L}}{\frac{\partial Y}{\partial K}}\right)}{\frac{\frac{\partial Y}{\partial L}}{\frac{\partial Y}{\partial K}}}} \quad (15)$$

The production functions that have been examined above are generic. The neoclassical production function that was first introduced by Solow (1956) allows for substitution between labour and capital. This means that the change in labour productivity is not only the result of technological change, as suggested by the Leontief production function, but can also be the result of relative changes in factor inputs. In other words, firms can choose between various combinations of labour and capital to produce the same amount of output. According to Barro and Sala-i-Martin (2004), a production function of the form Y = f(K, L, A), where K is capital, L is labour, and A is a measure of technology, is a neoclassical production function, based on the following basic assumptions:

- *Constant returns to scale*. The function f shows constant returns to scale. If capital and labour are multiplied by a positive constant, λ, then the amount of output is also multiplied by λ, as shown below:

$$f(\lambda K, \lambda L, A) = \lambda f(K, L, A) \text{ for all } \lambda > 0 \quad (16)$$

This assumption involves only capital and labour as the two rivals and excludes technology, hence constant returns to scale is not defined as f(λK,λL, λA) = λ f(K, L, A).

- *Positive and diminishing returns to private inputs*. For all K > 0 and L > 0, f exhibits positive and diminishing marginal products with respect to each input:

$$\frac{\partial f}{\partial L} > 0, \frac{\partial f}{\partial K} > 0, \frac{\partial^2 f}{\partial L^2} < 0, and\ \frac{\partial^2 f}{\partial K^2} < 0 \quad (17)$$

By holding the levels of technology and labour constant, each additional unit of capital renders additional output, but these additions decrease as the stock of capital rises. A similar interpretation applies to labour. That is, the neoclassical production function exhibits positive but diminishing marginal products of labour and capital.

- *Inada conditions*. The marginal product of labour (capital) approaches infinity as labour (capital) goes to zero, and approaches zero as labour (capital) goes to infinity:

$$\lim_{K \to 0} \frac{\partial f}{\partial K} = \lim_{L \to 0} \frac{\partial f}{\partial L} = \infty \quad (18)$$

$$\lim_{K \to \infty} \frac{\partial f}{\partial K} = \lim_{L \to \infty} \frac{\partial f}{\partial L} = 0$$

The Cobb-Douglas and the CES are the two most popular neoclassical production functions. A relatively simpler Cobb-Douglas production function provides a reasonable description of actual economies. It was first initiated by Paul Douglas and Charles Cobb in an effort to fit Douglas's empirical results for production, employment and capital stock in U.S. manufacturing into a simple function (Cobb and Douglas, 1928). This functional form became popular due to its flexibility and ease of use. The Cobb-Douglas form is written as:

$$\boldsymbol{Y = AK^{\propto}\ L^{1-\propto}} \quad (19)$$

where

Y = output

K = capital (input)

L = labour (input)

α = is a constant that takes values between 0 and 1

A = the level of technology (A > 0).

This function exhibits constant returns to scale and $\sigma = 1$. In order to verify this, we assume that if markets are competitive and factors are paid their marginal product, then α and $1-\alpha$ are equal to capital's and labour's share of output respectively. As discussed earlier, an elasticity of substitution equal to unity implies that these factor shares will remain constant for any capital-labour ratio, because any changes in factor proportions will be exactly offset by changes in the marginal productivities of the factor inputs. Hence, the observed income shares will be constant over time.

The elasticity of substitution in the Cobb-Douglas is equal to one. This can be verified by first considering the production function above in equation (19) and taking the marginal product of labour and capital as:

$$\frac{\partial Y}{\partial L} = (1-\alpha)\, AK^{\alpha}\ L^{1-\alpha-1} = (1-\alpha)\,\frac{Y}{L}$$

and (20)

$$\frac{\partial Y}{\partial K} = \alpha A K^{\alpha-1}\ L^{1-\alpha} = \alpha\,\frac{Y}{K}$$

Substituting these results into equation (15) yields the following:

$$\sigma = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{\partial\left(\frac{(1-\alpha)Y}{L}\right)}{\frac{\alpha Y}{K}}} = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{\partial\left(\frac{Y}{L}\right)}{\frac{Y}{K}}} = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}} = 1 \qquad (21)$$

According to Klump and Preissler (2000), equation (8) can be rewritten as:

$$\sigma = \left[\frac{\partial\left(\frac{K}{L}\right)}{\partial\, MRTS}\right] * \left[\frac{MRTS)}{\frac{K}{L}}\right] = \frac{f'(k)[f'(k)-kf'(k)]}{-kf''(k)f(k)} \qquad (22)$$

This makes the Cobb-Douglas production function a special case among the more general class of production functions, with its constant elasticity of substitution. The results of Equation (22) can be further transformed into a second-order partial differential equation in *k* as:

$$y = \frac{Y}{L} = f(k) = \gamma_1[k^{\rho} + \gamma_2]^{1/\rho} \quad (23)$$

and

$$Y = f(K, L) = \gamma_1[k^{\rho} + \gamma_2 L^{\rho}]^{1/\rho}$$

where γ_1 and γ_2 are referred to as constant integration and $\rho = (\sigma - 1) / \sigma$. As a result, by setting $\alpha = 1 / (1 + \gamma_2)$ and $C = \gamma_1 (1 + \gamma_2)$, we can arrive at the standard CES production function form, as introduced by Arrow *et al.* (1961), which is expressed as:

$$Y = \boldsymbol{C}\,[\boldsymbol{\alpha K^{\rho}} + (\mathbf{1} - \boldsymbol{\alpha})\boldsymbol{L^{\rho}}]^{1/\rho} \quad (24)$$

where *C* measures technical progress and the coefficients of α and $1 - \alpha$ are distribution parameters between zero and 1, which can be used to determine factor shares. The value of the substitution ρ is used to derive the elasticity of substitution σ.

The CES production function is more flexible, such that the elasticity of substitution is not limited to one, as in the Cobb-Douglas production function. Its linear homogeneous version is expressed as:

$$Y = \boldsymbol{C}\,[\boldsymbol{AL^{-\rho}} + \boldsymbol{BK^{-\rho}}]^{-1/\rho} \quad (25)$$

where the elasticity of substitution is equal to $\sigma = 1/(1 + \rho)$. In order to demonstrate this, we divide the marginal product of labour by the marginal product of capital as follows:

$$\frac{\frac{\partial Y}{\partial L}}{\frac{\partial Y}{\partial K}} = \frac{\rho A L^{-\rho-1}}{\rho B K^{-\rho-1}} = \frac{A}{B}\left(\frac{K}{L}\right)^{\rho+1} \quad (26)$$

Substituting the above equation into (15) gives the following:

$$\sigma = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{\partial\left(\frac{A}{B}\left(\frac{K}{L}\right)^{\rho+1}\right)}{\frac{A}{B}\left(\frac{K}{L}\right)^{\rho+1}}} = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{(\rho+1)\left(\frac{K}{L}\right)^{\rho}\,\partial\left(\frac{K}{L}\right)}{\left(\frac{K}{L}\right)^{\rho+1}}} = \frac{\frac{\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{(\rho+1)\,\partial\left(\frac{K}{L}\right)}{\frac{K}{L}}} = \frac{1}{1+\rho} \quad (27)$$

This implies that for the CES production function, the elasticity of substitution depends on the unknown parameter ρ. This is contrary to the Cobb-Douglas production function, where the elasticity of substitution is always equal to unity. Figure 2.3 below represents the CES production function, which is defined as:

$$Y = A\left(aL^{-\rho} + (1-a)K^{-\rho}\right)^{-1/\rho} \text{ with } \sigma = \frac{1}{1+\rho} \quad (28)$$

It can be noted from the figure below that:

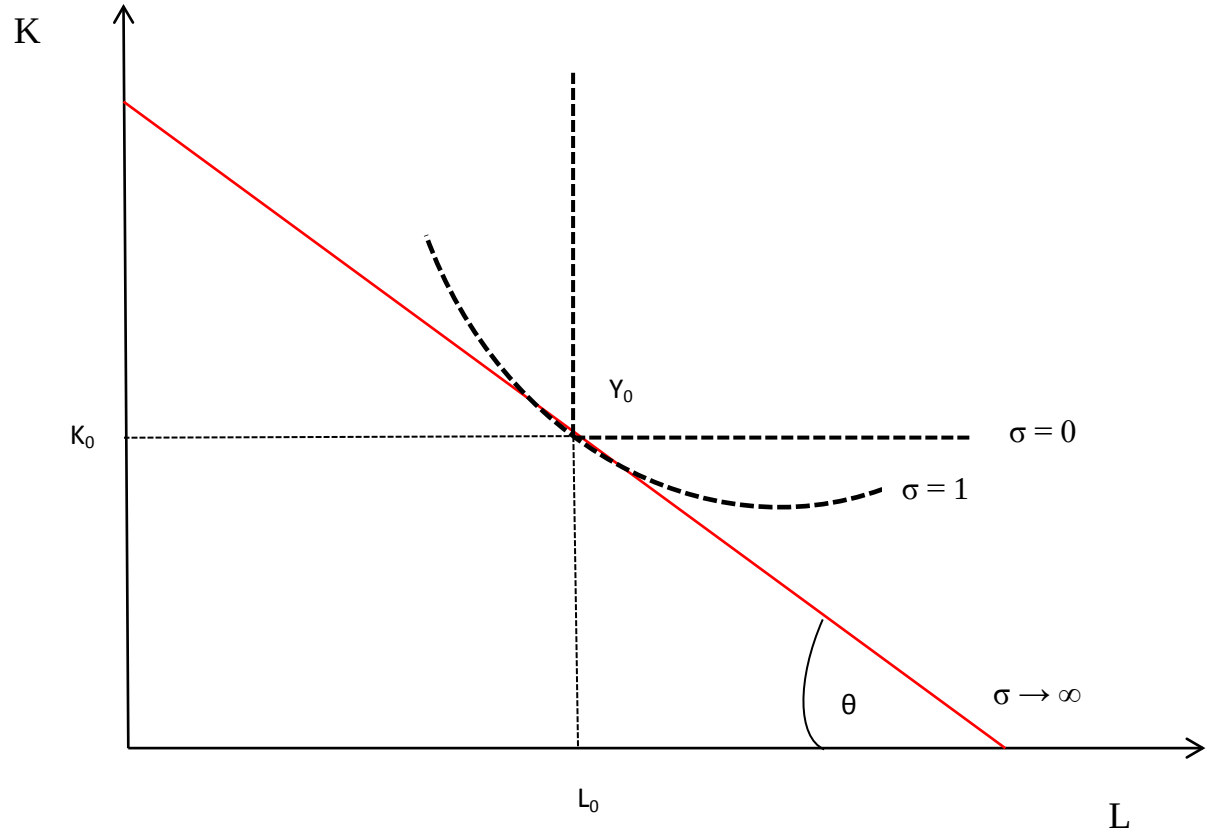
$\sigma \rightarrow 0$, as $\rho \rightarrow \infty$

$\sigma \rightarrow 1$, as $\rho \rightarrow 0$

$\sigma \rightarrow \infty$, as $\rho \rightarrow -1$

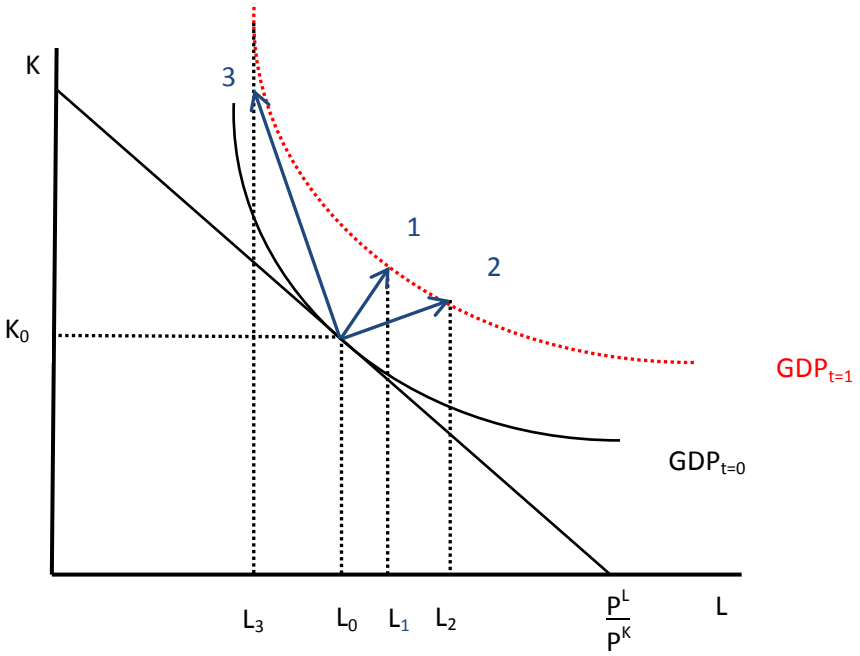
Therefore, the larger the value of ρ, the smaller the elasticity of substitution, such that as ρ approaches infinity, the elasticity of substitution becomes zero, as is the case for the Leontief production function. In addition, the figure shows that as ρ approaches zero, the CES production function approaches a Cobb-Douglas function, with elasticity of substitution equal to unity. In this sense, the Cobb-Douglas function can be viewed as a special case of the CES function. If ρ approaches -1, the elasticity of substitution becomes infinite and the isoquant becomes linear, as can be seen from the graphical representation of the CES production function below.

Figure 2.3: Isoquants of a CES production function



In his study, Schmid (2008) used the production theoretical framework to examine the employment intensity of growth in European countries. In doing so, his study hoped to answer the question why some countries perform better than others in generating greater employment. By examining the linkage between growth and employment, the study sought to validate the claim that the main cause of the European employment crisis is that economic growth is not sufficiently employment-intensive due to diverse rigidities in the labour market. The study commences with a two-dimensional representation of the production opportunities that exist when there are two variable inputs. To demonstrate this growth-employment linkage, a labour-capital plane, as depicted below, is used to show different input combinations that produce a specific level of output.

Figure 2.4: Production theoretical framework of the growth-employment linkage



If the lower curve ($GDP_{t=0}$) represents output produced at the beginning of a period, an increase in aggregate demand, represented by the higher isoquant curve ($GDP_{t=1}$), can be met in several ways. It can be met either by increasing inputs, by increasing productivity, or a combination of both. However, this adjustment process is determined by technology and the relative price of inputs. In order to produce a given level of output ($GDP_{t=0}$), the economy employs variable inputs in the form of labour (L) and capital (K), such that different combinations of inputs are utilised to produce a given level of output ($GDP_{t=0}$). Since the optimal employment of inputs depends upon the prices of the inputs, a change in the price of an input will induce a substitution towards a relative cheaper input, ceteris paribus.

In Figure 2.4, three different expansion paths are illustrated, depending on the relative prices of inputs. In expansion path 1, which is represented by the middle arrow, the relative proportion of input prices has not changed. This implies that in order to meet the new demand, firms are investing in capital and labour in the same proportions as before the expansion. That is, the labour-capital ratio remains unchanged. However, in the second expansion path, represented by the right-hand arrow, the price of labour has decreased. In this case, firms use a larger share of labour, such that economic growth results in a large

effect on employment growth. With regard to the third expansion path, indicated by the left-hand arrow, either the price of capital has decreased or the price of labour has increased. In this case, the new demand is met by a larger proportion of capital and a smaller proportion of labour, which is suggestive of the 'jobless growth' notion, where at higher levels of GDP growth, the amount of labour used has diminished compared to the situation at the beginning.

One of the limitations of the production function framework is that it is presumed to function within an equilibrium environment where there is perfect knowledge available to economic agents of the model. As a result an output is assumed to follow in a technically known way from the application of the inputs. There is no room for or analysis of differences in individual valuations of inputs and outputs. Furthermore, it ignores factors like the political and institutional environment in the analyses.

2.5. EMPLOYMENT INTENSITY OF GROWTH

According to Perugini (2009), elasticity of employment captures the responsiveness of the labour market to changes in macroeconomic conditions (as represented by GDP growth). Hence, its simplest formation is based on the concept of elasticity, whereby the responsiveness index describes the percentage reaction of employment that is associated with a 1 percentage change in output. A high employment elasticity indicates that growth in GDP leads to substantial employment creation, whereas an estimate closer to zero suggests a low correlation between economic growth and employment – this is jobless growth.

The concept of employment intensity has gained increasing popularity in recent years due to the policy centrality of the relationship between growth and employment. It explains the causal link of the employment-output relationship within the framework of a demand-side approach, where GDP acts as a representation of aggregate demand and the output effects of labour utilisation (Islam and Nazara, 2000). It serves as a useful way to examine how growth in economic output and employment have evolved together over time (Kapsos, 2005). It also provides insight into how employment generation varies for different sectors and population segments in the economy, and assists in detecting and analysing structural changes in employment over time.

The theoretical consideration of the employment and growth relationship may be integrated into a sector decomposition of this relationship in order to determine sector-specific employment elasticities, as carried out by Kapsos (2005). In his paper, the author used sectoral employment data to highlight differences in sectoral elasticities, by estimating the relationship between employment and gross value added in each sector where the differences in the value of these elasticities imply structural change evolutions.

Closely related to the employment intensity hypothesis is the role of formal education in relation to the skill levels of the workforce. Studies have found that education complements skilled labour but substitutes for unskilled labour. A study by Bartlett (2013) asserted that, in transition countries, general high school leavers with often inappropriate skills and qualifications have difficulty finding a job. However, university graduates tend to find jobs relatively easily because restructuring and technological change increases the demand for highly skilled workers. Verhaest and Omey (2012) found that the overall effect of education on skill acquisition was positive. Their study reported that jobs that require more formal education also entail more additional skill acquisition whereas low formal education jobs requires lower overall skill acquisition.

The National Development Plan (2011) has recognised the importance of improving the standards of education as one of the ways of dealing with structural weaknesses in the South African labour market. This reinforces the fact that the efficiency with which human capital is developed in the education system and used in the labour market has become a priority for policy makers.

A range of approaches are used to estimate the employment intensity of growth, varying from a very simple computation of the index to complex econometric estimation of the coefficient (Perugini, 2009). For instance, Bhorat and Oosthuizen (2008), Kapsos (2005), Hodge (2009) and Loots (1998) used the simple arc elasticity of employment technique to compute a convenient measure of employment intensity of growth. The second technique involves applying an econometric method of regression analysis, as in studies by Levine and Renelt (1992), Barro (1991), Becker *et al.* (1990), Ajilore and Yinusa (2011), Upender (2006), Mahadea and Simson (2010), Mazumdar (2000), Kapsos (2005) and Aktar and Ozturk (2009). These approaches, as well as the measure of employment elasticity to be used throughout this study, are discussed in detail in Chapter Four.

2.5.1. The Determinants of Employment Elasticity

This section discusses the main determinants of employment elasticity. Generally, employment growth has been associated with the rate of growth of output or value added. A study by Muzumdar and Sarkar (2007) emphasised the idea that a major determinant of employment elasticity is the way in which the fruits of output growth are divided between employment growth and wage growth. They identified three important elements that determine the value of employment elasticity, for a given growth rate of output. These include:

- Relative price - the relative rates of increase in the producer and consumer price indices (or domestic real exchange rate, DRER), which determine the value of the wage bill for workers;
- Wage share - the trend in the share of wages, that is, the rate of growth of the wage bill relative to value added output in current prices facing the producer; and
- The trade-off between increases in employment and increases in real wages.

An algebraic decomposition is used to quantify these three elements, such that:

$$L = \alpha\acute{u} + \alpha P_p - P_c - \acute{w} \qquad (29)$$

where

L = employment

α = technological and behavioural parameters (assumed to be constant over time)

ύ = value added (in constant producer prices)

P_p = producer price index

P_c = consumer price index

ẃ = real wage (average earnings per worker)

As a key determinant of employment elasticity, the DRER is an exogenously determined variable such that the prices of both producer and consumer goods and services are given to a firm. That is, the firm is a price taker in a competitive market and cannot influence the price of its products or wages in the labour market. The relative movements of both the producer

price and consumer price indices (i.e. DRER) transform the wage bill into real terms. If DRER falls over time, this implies that there would be less of a wage bill cake available to workers and *vice versa*. Also, a high DRER is associated with lower employment growth (or higher rate of unemployment), such that the DRER increases as employment decreases. That is, as DRER increases, the resulting increase from output growth may be transformed into higher wages rather than more employment, suggesting low employment elasticity. Ghose (1994) pointed to the increase in the DRER as an important factor in the rising capital intensity in some industries, which lowered employment elasticity.

The other two variables, i.e. the share of wages and the wage-employment trade-off, are both labour market variables which jointly determine the share of wages, the level of employment and the wage per worker. These variables can be explained together in neoclassical economics by the supply functions of labour and capital working through the production function. From the above equation (29), the negative relationship between ẘ and L indicates that there is a trade-off between real wages and employment. Since the causal link in the neoclassical model of labour markets runs from wages to employment, the real wage growth is determined first by the prevailing trends in the supply price of labour from alternative earnings. This in turn would create an employment growth response that is derived through an inverse functional relationship.

In the alternative, the post-Keynesian models emphasise the independence of the investment function from the general savings function. There is a long tradition in economics which has embraced the idea that firms finance investments principally from the internal surpluses generated by the firm, hence making investment rate a key determinant of employment elasticity. A study by Mazumdar and Sarkar (2007) has carefully shown a downward functional relationship between the investment rate and employment elasticity. The study showed that the spurt of investment growth – about three times the rate of growth of employment since the post 1990s, was in line with expectations of continued market expansion. The build-up in capital stock in this period that was much faster than the increase in the stock of labour was suggestive of the fact that employers were still wary about labour as a potentially high input cost. In fact, employers were more motivated to improve the quality of production through more mechanised techniques. This resulted in the drastic fall in employment elasticity. Furthermore, given the fact that firms require a significant fall in the share of wages in order to finance increases in the investment rate, this meant a smaller share

of the wage bill would be available to sufficiently elicit the supply of labour needed. Thus employment elasticity would be lower than otherwise.

In the economic literature, it is generally understood that the rate of investment of the firm is sensitive to market expectations. This sensitivity regarding the perception of the future by entrepreneurs makes the investment ratio follow a typically cyclical pattern. As already mentioned, the share of wages is determined by the investment ratio, implying that this ratio will have a cyclical pattern. Thus, during periods of optimism, the investment ratio will increase and the share of wages (and in the model α) will fall. This will have the effect of reducing the value of employment elasticity, assuming that all other things are constant.

Another important point involved in the firm's decision-making process has to do with the number of workers and supply of efficiency units per worker, given that these two variables are a function of the supply of work (in efficiency units). Mazumdar (2003) emphasised the fact that labour has two dimensions to its supply – the number of workers and the flow of efficiency units. The latter represents the number of hours worked per day or week as well as the intensity of work per hour. It is a positive function of the wage rate per worker. Thus, for the profit-maximising firm, the optimum combination of strategy is to select that combination where the marginal cost of hiring an extra body of workers is exactly equal to the marginal cost of increasing the same number of labour units by increasing the wage rate of the existing workforce. However, this condition conceals other factors that may affect the employer's choice, such as job security legislation and union pressure.
If, for instance, the 'insiders' have dominant influence in the workforce, employers might be compelled to locate a high wage per worker, as well as a high rate of supply of efficiency units. Similarly, job security laws and other institutional factors make employers wary of the cost of employing a large body of workers, which might be difficult to lay off. The employer's decision about the wage per worker, which is determined within the constraints just mentioned, yields both the supply of work units per worker and the wage cost per work unit.

Also, with regard to the third labour market variable, (i.e. wage-employment trade-off), it has been mentioned above that firms have the option of increasing the flow of labour units either by hiring more workers, or by eliciting more work units from the existing workforce by increasing the wage per worker. Most economies make a distinction between permanent

workers and contract labour of various types. Usually, firms operate with a core body of permanent workers whose size is slow to respond to changes in the current demand for labour, due to the high costs associated with the hiring-and-firing of permanent workers. As with the stock of fixed investment, the firm's stock of permanent workers is based more on expected demand. If current demand deviates from expected demand, firms may have to adjust the labour input for the period in question by varying the flow of labour units per worker, rather than the stock of labour. To achieve this, firms can introduce changes through wage-efficiency mechanisms, making the flow of labour per worker a (increasing) function of the wage per worker.

In cases where expectations about the future are positive, firms build up the stock of labour and there is less emphasis on increasing the wage per worker in order to elicit a larger inflow of labour units per worker. This will shift the wage-employment trade-off towards employment increase. Conversely, when there is a negative outlook about expected growth, firms tend to be more inclined to reduce the size of their labour force (through normal attrition of the quasi-fixed part and retrenchment of the non-tenured component) and meet their demand for labour input by increasing the wage per worker. In this case, the wage-employment trade-off will be biased towards wage growth.

The wage increase in this regard is driven by three main factors: (1) the inelasticity of an individual firm's labour supply; (2) the upward pressure on wages by firm-specific labour; and (3) the increase in wages needed to induce a larger flow of labour per worker.
During a recession, where there is pessimism about the future, factors (1) and (2) are presumably weak or totally absent, while an increase in the wage per worker can be expected in order to elicit a larger flow of labour per worker. The net effect is likely to be a slowdown in the rate of growth of wages, but the wage-employment trade-off might still reflect a shift towards wage growth if the relative decline in employment growth is high.

This suggests that the behaviour of the wage-employment trade-off is pro-cyclical, implying that employment tends to increase during periods of optimistic expectations and decrease in periods associated with gloomy prospects. Thus, as far as the impact on employment elasticity is concerned, the two elements of the decomposition model work in opposite directions with respect to economic cycles. During upswings, the wage share tends to decrease, leaving the share of profits in value added to be used for additional employment,

which means that the trade-off will favour a larger share for employment growth. The net effect on employment elasticity will depend on the relative strengths of these two effects.

2.6. SUMMARY AND CONCLUSION

This chapter explained the theoretical background to the relationship between employment and growth based on Okun's Law, the business cycle theory, the production function theoretical framework and the employment intensity of growth. Employment intensity can be divided into various sub-groups or sectors. The sectoral compositions of employment can be used to determine industry-specific elasticities. This chapter also discussed various approaches used in the analysis of the growth-employment relationship, from a simple computation of the index to complex econometric estimations of the coefficient. Finally, we discussed some of the main determining factors of employment elasticity and the associated trade-offs involved. The following chapter presents a literature review of studies that have investigated and analysed the empirical relationship between economic growth and employment, both internationally and for South Africa.

CHAPTER THREE

REVIEW OF EMPIRICAL STUDIES ON GROWTH AND EMPLOYMENT

3.1. INTRODUCTION

A number of studies have investigated and analysed the empirical relationship between economic growth and employment. Most of these studies are a response to the immediate challenge of employment creation faced by a number of countries. In these countries, it seems that growth, generally regarded as the creator of employment, is not able to create adequate employment opportunities for the growing unemployed population. Therefore, both growth and employment creation have become imperatives that resonate in most countries today. Following the aftermath of the 2008/09 financial crisis, a number of countries have been faced with the challenge of strengthening their weak recoveries and creating more jobs. There is a further recognition that even in countries that have experienced exceptionally high rates of economic growth, employment creation has declined. The reasons for this phenomenon are still not fully understood. These facts suggest that there is a strong need to better understand the employment-growth relationship.

During the past two decades Brazil, Russia, India, China and South Africa (the BRICS countries) have become important players in the globalisation process. Although some regard them as a highly heterogeneous group of countries with different sizes, populations and weight in the global economy, these countries enjoyed long and sustainable growth paths from 1990 to 2008, with the exception of South Africa. An analysis of the evolution of employment elasticities alongside economic growth trends and labour market outcomes is helpful for a better understanding of these countries' economies. The purpose of this chapter is two-fold. Firstly, it gives a comprehensive review of the existing literature (both domestic and international) on the employment and growth relationship. In doing so, it highlights the historical pattern among regions with respect to their employment intensity of growth and the reasons for this.

Secondly, this chapter describes the sectoral employment intensity of growth trends since the early 2000s in Brazil, Russia, China and South Africa, highlighting the periods during which these countries initiated important reforms that affected employment[1]. In this light, it further examines the effectiveness of labour market and macroeconomic policies supporting sustainable employment creation.

3.2. DEVELOPED ECONOMIES

Previous empirical studies of the employment intensity of growth in different regions and over different time periods provide useful information for comparative purposes. While certain studies have been limited to a single country or region, others have conducted extensive cross-country panel analyses.

A study by Padalino and Vivarelli (1997) examined the employment intensity of growth in the G-7 countries regarding concerns that technological changes may have weakened or even eliminated the positive correlation between growth and employment. Their study used a comparative theoretical perspective and an empirical investigation to address this issue. From a theoretical perspective, it used French regulation theory by Boyer (1988) to single out the characteristics of the post-Fordist era regarding the relationship between economic growth and employment. In other words, the question being asked was whether the crisis of post-Fordism only involved a decreasing pace of economic growth and employment, or whether there had been a structural breakdown in the growth and employment relationship.

According to the regulationist approach, both outcomes are plausible depending on the different hypotheses concerning the influence of technological changes. Those who believe that jobless growth can occur in post-Fordist societies are convinced that post-Fordist technologies are intrinsically more labour-saving than earlier Fordist technologies. However, others argue that there is a strong correlation between employment and growth, and dispute that there is a structural difference between the employment implications of Fordist and post-Fordist technological change.

[1] India, a BRICS member country, is excluded from this analysis due to the unavailability of sufficient sectoral data on growth and employment.

The study investigated the growth and employment relationship, both for the whole economy and in 36 manufacturing sectors of the G-7 countries. The period to be analysed was divided into two parts: the overall period of 1960-1994, including the Fordist period (1960-1973), and the post-Fordist period (1980-1994).

Using the regulation theory as a benchmark, the study first analysed this relationship during the 1960-1994 period and found that the overall employment elasticities for all countries, except the United Kingdom, showed positive values. Moreover, the study also found that there were marked differences between North America and Japan, and European countries. The results showed that while a doubling of GDP involved about a 50 per cent increase in employment in North America, they also showed that output elasticity of employment dropped to 0.08 per cent for Japan, 0.06 for Germany, France and Italy, and -0.05 for the United Kingdom. Thus North America was characterised by strong employment-intensive growth while Japan, France, Germany and Italy showed much weaker growth in terms of employment and the United Kingdom experienced jobless growth. Within the manufacturing sector, it emerged that the European countries were characterised by jobless growth, whereas North America still experienced positive employment elasticity although it was lower than for the economy as a whole.

After having evaluated the long-run pattern during the 1960-1994 period, the study assessed the structural differences between the Fordist and post-Fordist periods. Although it was shown that real GDP growth decreased in all G-7 countries during the post-Fordist period, the study found no evidence of structural change in the evolution of employment between the Fordist (1960-1972) and post-Fordist (1980-1994) periods. In fact, the results showed that employment elasticities increased in all countries during the post-Fordist period, with the exception of France and the United Kingdom. It was thus concluded that there was no evidence that the responsiveness of employment to growth had decreased in the post-Fordist period – if anything, the opposite trend emerged in five of the G-7 countries.

With regard to the manufacturing sector, the employment elasticities in all countries worsened in the post-Fordist era, with the exception of Japan, which increased from 0.14 during the Fordist period to 0.33 during the post-Fordist period. Based on this comparative analysis, the study inferred that the transition to post-Fordism had clear employment consequences in manufacturing, but not for the economy as a whole.

Rather, the study concluded that employment elasticity tended to increase in the post-Fordist era, whereby economies as a whole found ways of preserving employment growth. The study suggested that unless specific actions are taken to promote quality job creation in manufacturing, economic growth would have little effect on employment in this sector.

Boltho and Glyn (1995) analyzed data for the Organisation for Economic Co-operation and Development (OECD) countries during the period 1960-1993. The sample covered 16 OECD economies for which the required data was available. The study found that the periods of buoyant GDP expansion are inevitably associated with an increase in the number of jobs, while slow-downs result in growing unemployment. A long-run cross-sectional data analysis of selected episodes of boom and recession during the sample period showed that despite a sharp decline in GDP growth between the pre- and post-1970s oil shocks, growth in employment remained stable. The study also ran a cross-sectional regression analysis between GDP growth and employment, to establish whether or not differences in GDP performance can be linked to differences in job creation. The results confirmed that output growth rates clearly have a statistically significant influence on employment outcomes. The results suggested that, between 1975-82 to 1982-93, for every percentage point increase in a country's growth rate there was a corresponding improvement in employment of 0.98 percentage points. These findings cast further doubt on the notion of jobless growth as a description of the short- and medium-term performance of OECD economies.

In an attempt to establish how differences in macroeconomic policy account for differences in employment in industrialised countries, the study examined the role of public expenditure as a policy instrument for reducing unemployment. The findings suggested that not only did the average rate of public spending decrease (from 3.5 per cent per annum from 1973-1979 to as low as 2 per cent from 1982-1993), but the size and significance of the coefficients also diminished. The explanation given for the weaker correlation was that public expenditure had become less successful in generating increased output and hence employment. The view that the public sector holds limited potential for generating employment was reaffirmed by the OECD (1994), which stated that new jobs must be generated by the private sector because in nearly all countries, budget deficits and resistance to tax increases rule out significant expansion of the public sector.

A further analysis of alternative routes to job creation was done in various sectors where it is assumed that government does not purchase tradeables. The study asserted that, in general, attempts by individual countries to expand their economies could lead to rising output and employment in the tradeable sector. However, given the degree of competitiveness, the demand for these tradeables might rise even faster and ultimately cause deterioration in the current account. A classic example was that of France's expansion in the early 1980s and the United Kingdom's boom in the late 1980s, both typifying the limits of such expansion. With regard to France, although manufacturing production grew by almost 1 per cent per annum, manufacturing imports rose by 13 per cent per annum. In the case of the United Kingdom, although manufacturing experienced growth of 4 per cent per annum between 1986 and 1989, imports rose as much as 9 per cent per annum during this period. The study suggested that Keynesianism at the OECD level appeared to be blocked by opposition to increased government deficits and the international coordination of policies.

Boltho and Glyn (1995) proposed that the alternative route for job creation would be private services, under the precondition of a reduction in wages, which could be achieved through the free market route of deregulation. Allowing the market forces to depress wages would reduce the relative price of outputs and, depending on the elasticity of substitution between tradeables and private services, would lead to an increase in the volume of services consumed and thus to greater employment. Although existing employees in private services would bear the cost, the beneficiaries would include both consumers and new employees.

An alternative is to use tax-financed government expenditure to increase employment. One major advantage of increased public spending on goods and services was the fact that this usually created jobs directly and relatively predictably, whereas deregulation has very uncertain effects. Boltho and Glyn argued that while the level of personal consumption would remain unchanged, an increase in tax-financed public expenditure would increase GDP (and hence employment) on account of extra government spending. They suggested that government spending be earmarked to provide work for groups that have been particularly affected by joblessness. In other words, targeted government spending should give priority to the high rates of unemployment among the educationally less qualified or those in underprivileged areas. One of the key benefits of this strategy is that the employed pay tax and social security contributions, which cut the cost to government as a result of their employment, since they would have received social benefits had they been unemployed.

A study by Kapsos (2005) analyzed cross-country panel data for 160 economies, to examine employment elasticities for the general employed population, as well as for demographic groupings (such as women and youth) and for the three broad economic sectors (agriculture, industry and services) between 1991 and 2003. A multivariate log-linear regression model with country dummy variables was used to generate point elasticities. The study found that while the ratio of employment growth to total output growth was approximately 0.34 in the mid-1990s, it had declined to 0.30 during the period 1999 to 2003. This was attributed to the global slowdown that occurred in 2001. Other regional trends presented in the paper reflected a wide variation in employment intensity among regions. For instance, Africa and the Middle East registered the most employment-intensive growth between 1991 and 2003, which is a reflection of the region's large labour surplus. In addition, the study found that the rapid economic growth in the Asian and Pacific regions had led to larger productivity gains. The evidence on North America and Western Europe suggests a structural divide between the two regions. During the period under review, employment intensity in the North American region was found to be decreasing, whereas in Western Europe, it was found to be increasing. This is in line with the findings of Mourre (2004), who discovered that employment elasticity in the euro area increased from 0.4 to 0.6, while it fell from 0.6 to 0.4 in the United States between 1986 and 1990 and 1997 to 2000. His study further examined the employment intensity of growth in different economic sectors, and concluded that in the euro area, the services sector reflected high employment elasticities between 1997 and 2001, which contributed to the region's higher average employment elasticity.

Mourre (2004) examined whether or the pattern of employment growth in Europe during the 1997-2001 period differed from that recorded in the past, and what the underlying reasons for this could be. The study used quarterly data and estimated a standard employment equation for Europe as a whole, including the adjustment lag of employment to GDP over different sub-periods. The findings indicated that between 1970 and 2002, employment growth reacted to GDP with a mean lag of around 8 quarters.

Furthermore, the study also found that the median (50 per cent of the long-term effects) reaction to GDP had been stable over the past thirty years, at approximately 4.5 quarters. Overall, the reaction lags showed no evidence of change in the adjustment of employment to GDP relationship.

The study performed a trend analysis of employment and growth in the euro area between 1997 and 2001, which also confirmed that employment performance was largely attributed to robust economic growth in the second half of the 1990s. Similarly, it showed that the poor employment performance in the early 1990s was as a result of weak economic growth. Although most of the slowdown in employment was attributed to weak economic growth, the increase in real labour costs since mid-2000 also had a negative impact on employment growth in 2001 and the first half of 2002. This worsened the poor employment performance experienced in the early 1990s.

Since the euro area may have been affected by an aggregation bias, given the likely changes to country weights over time, the study undertook further analyses that took heterogeneity across countries into account. A structural break in the employment equation modelled as a dummy for the period 1997 to 2001 was estimated for selected EU and euro area countries. The regression results indicated that a group of countries, including Belgium, France, Ireland, Italy, the Netherlands and Spain, recorded robust employment growth that could not be explained by classical determinants, especially since breaks in these countries appeared to be significant in all regressions. By contrast, another group of countries including Austria, Finland, Germany, Greece and Portugal, did not experience any change in their employment pattern. In other words, employment performance in these countries was mostly explained by the traditional determinants.

The analysis of the sectoral composition of employment also revealed some interesting patterns. It showed that the share of sectors with high employment growth, particularly those in market-related services such as trade and financial and business services, was significantly higher at the beginning of the economic expansion in the late 1990s than at the beginning of the boom in the late 1980s. The strong growth in these sectors was found to be attributed to their high value-added growth. A high employment elasticity of 1.4 was recorded in the financial, real estate, rental and business services sectors between 1997 and 2001.

Mourre (2004) concluded that labour market reforms or other structural changes may have played a role in the good employment performance in the EU and euro countries. Some of these labour market reforms included the relaxation of job protection legislation (which facilitated employment creation in the late 1990s), subsidies to private employment and lower labour tax rates, all of which may well have contributed to employment growth.

Pini (1997) also examined employment intensity between different countries and found that employment elasticities in Germany and Japan increased during the period 1979-1995, as compared to the period 1960-1979. In his study, he also found negative employment elasticities in Italy and Sweden for the period 1990-1995. In their analysis of employment intensity among the G7 countries, Pianta *et al.* (1996) found evidence suggesting that the reforms introduced in major economic sectors had moderated the relationship between employment and economic growth. The study found that, over the 1980-92 period, a positive and significant relationship between gross value-added and employment was evident only in the US and Germany. An analysis by Gordon (1997) on cross- country differences in labour productivity growth, hence the employment intensity of growth, showed that productivity growth was slower in the construction sector than in other sectors of the economy. His study found similar evidence for the services sector. Buscher *et al*. (2000) and Löobe (1998) also concluded that a higher employment intensity of growth was due to the prominent role of the services sector. This is consistent with a study conducted by Dopke (2001), who found that in Europe, a more prominent role for the services sector corresponds to a higher employment intensity of growth. The study concluded that structural reform in favour of the services sector might assist in the fight against unemployment. A cross-country analysis by Kapsos (2005) on employment elasticities for 160 economies reported that Japan experienced job losses and a reduction in output in the agricultural sector, compared with an increase in employment and positive output growth in the services sector. Furthermore, his study found that growth in North America was associated with a moderate decline in employment in agriculture, an assertion that was supported by evidence that this sector was experiencing labour-substituting productivity growth.

In another study estimated for the period 1963-1986, Schettkat (1992) initially found that employment elasticity was much higher in the United States (low productivity growth) than in Germany (high productivity growth), reflecting growth-employment elasticities of 0.63 and -0.5 respectively. The varying productivity growth rates thus help to explain changes in employment creation in the manufacturing and services sectors of developed economies. Piacentini (1987) highlighted the fact that low productivity growth in the services sector can explain employment performance in the United States during the 1990s. This is in line with the findings of Pianta *et al.* (1996), who analysed the cases of Germany and Italy, based on data from 20 manufacturing sectors. He found that, on average, a positive correlation

between value-added and employment was significant only in the case of Germany. Moreover, he also found that innovation variables (such as R&D intensity and innovation expenditure) had a negative impact on employment in both Germany and Italy.

3.3. TRANSITION ECONOMIES

The transition economies generally have higher rates of economic growth over the business cycle than the developed economies. However, such growth is also more volatile and the absolute levels of unemployment tend to be higher in such countries than in the developed economies. This section reviews some of the research done on the employment-growth relationship in the transition economies and how they have performed compared to the experience of the developed economies in this regard.

A study by Gabrisch and Buscher (2005) provided a comprehensive perspective on unemployment dynamics in transition countries, to measure the responsiveness of labour markets to economic growth. It analysed the unemployment-growth dynamics in the eight new member countries from Central-Eastern Europe namely Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Their study sought to answer the question whether a high level of unemployment was still a response to on-going adjustment processes stemming from an incomplete transition, or a reflection of market rigidities, or was due to weak economic growth.

Generally, the relationship between employment and growth varied across countries owing to the differences in the degree of hidden unemployment before the transition, as well as labour market regulations. Their study indicated that evidence of stylised facts did not strictly link output and unemployment, at least in the first stages of the transition – between about 1990 and 1993/94. Instead, unemployment seemed to have taken a different course, in line with privatisation and related institutions. According to the study, unregulated privatisation and the first restructuring attempts in state-owned enterprises reduced employment in state industries that were already liberated. With mass privatisation in the Czech and Slovak Republics in 1993, unemployment rose rapidly, even after the period of output decline. As restructuring measures began to spread in privatised firms, this led to large-scale dismissals, where the extent of employment restructuring depended on the method of privatisation. For

instance, management-employee buy-outs initially entailed fewer dismissals in comparison to outright sales to foreign ownership.

The transition had also seen shifts in employment across various sectors of the economy. The services sector made significant gains, growing its share of total employment in virtually all cases by more than 50 per cent in 2001, while employment in the manufacturing sector fell as a share of total employment. In the Czech Republic, Estonia, Hungary and Poland, employment in the agricultural sector, where productivity was initially low, declined as a share of total employment. The decline in employment levels, as well as the effects of intersectoral shifts by the labour force, implied higher levels of productivity early in the transition. Successful transition economies were able to raise their productivity levels to well above pre-transition levels, whereas for others, productivity levels only increased marginally or slightly above pre-transition levels, suggesting that further restructuring to reduce unemployment was possible.

After reviewing the main stylised facts, Gabrisch and Buscher (2005) undertook an econometric analysis of the unemployment-growth relationship in transition economies, in order to establish whether or not this relationship still holds, 15 years after the transition began. The study results revealed that during the first transition stage, which was until 1994, declining output was responsible for unemployment only in the Czech Republic. During this period, unemployment in most of these Central-Eastern European countries seemed to be affected by transition-specific determinants. Estimates of the later period of the transition, between 1998:1 and 2004:4, showed a strong improvement in the significance and sensitivity of the results. The Okun coefficients were between 0.85 (Hungary) and 2.3 (Latvia), which suggested a high negative responsiveness of the unemployment rate to changes in GDP growth rates. The study concluded that the responsiveness of the unemployment rate to changes in output was evidence of completed transition. In addition, this responsiveness of unemployment to output provided opportunities for market economies to reduce the level of unemployment that existed from the first transition. Some of the suggested choices included increasing flexibility in the labour markets and supporting growth at a path higher than the level it was. In fact, the study suggested a growth rate of output significantly higher than productivity growth, which would necessitate a higher component of aggregate demand growth.

A study by Schiff *et al*. (2006) revisited this issue. It undertook a cross-country analysis of 11 countries in Central and Eastern Europe between 1993 and 2002, in order to explain the labour market dynamics during the transition, as well as differences between these countries. An assessment of the trends in the labour market revealed that during the period under review, labour participation rates had fallen below EU-15 levels[2]. Countries with the largest increases in unemployment rates were mostly those with the largest declines in participation rates. This decline in participation rates was due to the fact that these rates had previously been unusually high in centrally planned economies.

Despite the decline in participation rates, the study found that unemployment increased rapidly during the years of the transition and had remained high. This is in line with the findings of Gabrisch and Buscher (2005), who found no link between changes in output and unemployment in the first stages of the transition. The study reported double digit unemployment rates in Bulgaria, Croatia, Poland, Slovakia and the Baltic countries, while in the Czech Republic, Hungary and Slovenia, unemployment rates remained below 10 per cent. The study asserted that long-term unemployment was a major challenge for most transition economies, with the unemployed who had been out of work for more than a year reaching between 40 and 60 per cent in 2001-2002. This was roughly in line with the EU-15 countries, but far higher than the United States and a number of other OECD countries (Grogan and Moers, 2001).

Schiff's study also found that unemployment was regionally concentrated, with little evidence of labour migration helping to reduce this concentration. During the course of the early transition, regional unemployment moved in unison with aggregate unemployment in a given country. In countries such as Bulgaria, the Czech Republic and Hungary, the concentration of unemployment had increased further. One of the reasons given for limited labour mobility within these countries was housing market imperfections. The study highlighted the fact that transition economies are characterised by extremely high rates of home ownership, and making a move for employment purposes was therefore unattractive to most people. This is as a result of housing policies in some of these countries playing a key role in limiting workers' mobility to low-unemployment regions and on the movement of jobs to less prosperous areas.

[2] EU-15 refers to EU members pre-2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

According to the study, home ownership during the period under review was above 70 per cent in these countries and exceeded the average ownership rate of 55 per cent in the EU-15 countries.

The study also undertook an econometric analysis to determine the relationship between employment and economic growth in these transition economies during the period 1993-2002. The results suggested that both employment and unemployment rates were persistent. In other words, lagged unemployment was found to have a large positive effect on unemployment, as indicated by the fact that a 1 percentage point increase in the lagged unemployment rate raises the current unemployment rate by almost 0.6 of a percentage point. Similar results were recorded for employment, where a 1 percentage point rise in lagged employment generated around 0.6 of a percentage point increase in employment.

The results of the study also suggested that, as expected, the impact of growth on employment depended upon the country's stage of transition. In this regard, the employment elasticity value in the early transition was found to be insignificant and negative, but as the transition advanced, the link between growth and employment became more profound. For these countries, the average employment elasticity coefficient of 0.31 in the advanced phase of the transition suggested that a 1 percentage point increase in growth increased employment by a 0.31 percentage point. Similar results and interpretations were found in unemployment, namely that growth does not produce a reduction in unemployment in the early phases of the transition, but does so progressively in the later phases of the transition. In particular, the study suggested that completing the transition as quickly as possible allows employment to begin to rise again more rapidly.

In this regard, the study identified Hungary and the Czech Republic as the two transition countries that had a relatively strong labour market performance, whereas Bulgaria, Croatia and Slovakia revealed weaker performance. The study characterised the three underperforming countries as relatively slow reformers, given their respective transition indicators (private sector share of value added to GDP and private sector employment share to total employment). All of the slow reformers experienced stubbornly high unemployment rates during the period under review, and their share of long-term unemployment rate to total employment were significantly high and above that of rapid reformers. The study also reported that average wages in Croatia were higher than those in most Central-Eastern

European countries, and that this was not justified by proportionately higher value added per employee. Thus increases in real wages were not aligned with productivity growth in these countries. The main difference between good and bad performers was that those countries with relatively low unemployment tended to have good business climates. Therefore, the study suggested that successfully addressing a wide range of issues affecting a country's overall business climate can be critical in stimulating employment growth in transition economies.

Nesporova (2002) also studied the possible causal effects of economic reforms on the labour market in transition countries, providing suggestions on how to reshape economic policies to address employment challenges. To help cross-country comparisons, the study divided the transition decade into two phases: 1990-1994, a period characterised by major economic reforms and intense external shocks, and 1995-2000, which was a period of relative economic stability. At the onset of the transition, during the early 1990s, the labour market in these countries was characterised by full employment (with the exception of Yugoslavia). Although full employment was achieved by low wages, this had a de-motivating effect on workers. The study showed that widespread overstaffing (or labour hoarding) was common among many sectors and this had led to low levels of labour productivity. Subsequently, economic reforms and measures were put in place to reverse these negative characteristics. National economies were opened to world markets which led to rapid price liberalisation. However, greater competition resulted in a sharp decline in the economic performance of these countries, which was much worse than initially expected. The demand for labour shrank almost immediately and employment started to fall.

A comparative analysis of production and employment showed that some countries, such as the Czech Republic, Romania, Slovakia and Slovenia, were able to keep employment losses below those of production, at the cost of further losses in labour productivity. Other countries, such as Bulgaria, Hungary and Poland, achieved higher labour productivity through sharper cuts in employment. Similarly, countries that embarked on relatively high economic growth did not experience employment gains during the early transition period. The loss of employment in the formal sector of these economies led to a rapid growth in informal sector employment in all transition countries. The study reported that the size of the informal sector in these economies tended to correlate negatively with economic performance at a country level.

One of the reasons cited for the expansion of the informal sector was tax evasion, which had been attributed to legislative amendments in favour of economic development, and poor law enforcement. However, towards the end of the 1990s, changes in macroeconomic and structural factors contributed to reductions in unemployment virtually everywhere. This was also confirmed in the study by Schiff *et al*. (2006), who concluded that growth did not produce a reduction in unemployment in the early phases of the transition, but did so progressively in the later phases of the transition.

Izyumov and Vahaly (2003) investigated the Okun relationship between growth and unemployment in the transition economies during two periods: 1991-1994 and 1995-2000. The study divided a sample of 25 transition economies into groups of 'reform leaders' and 'reform laggards' on the basis of their candidacy status within the EU[3]. The analysis of the Okun relationship began with the 10 EU accession countries. Their study found that during the early period of the transition, the response of unemployment to changes in output was relatively weak. These findings are similar to those of Schiff *et al*. (2006), Gabrisch and Buscher (2005) and Nesporova (2002), as discussed above. The study found that the decline in output was more pronounced than the increase in unemployment. For instance, in 1992 output in Latvia fell by 34.9 per cent, while unemployment rose by only 3.3 percentage points, indicating an Okun ratio of -10.6. During the same year in Slovenia, output fell by 5.5 per cent, while unemployment rose by one percentage point, implying an Okun ratio of -5.5. For some countries output and unemployment often moved in an unusual fashion, with changes in real output and the unemployment rate moving together in the same direction. For example, in Poland, output rose by 2.6 per cent, while unemployment increased by 2.0 per cent in 1992. During the same year, in the Czech Republic, output decreased by 0.5 per cent and unemployment decreased by 1.5 per cent. Overall, the study found that during the early period of the transition, the link between unemployment and output was very unstable.

The results of the econometric analysis confirmed that during the early period of the transition, the Okun relationship could not be detected for the laggard group, but was found

[3] Reform leaders represented the 10 candidates for accession to the EU: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The reform laggards were 15 non-candidates, most of which were members of the Commonwealth of Independent States (CIS): Albania, Armenia, Azerbaijan, Belarus, Croatia, Macedonia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

to be marginally significant for the reform leaders. Furthermore, during the later period of the transition, between 1995 and 2000, results showed this relationship to be highly significant for reform leaders and for a sub-group of 10 laggards who were not affected by wars. On the whole, this confirmed the hypothesis of a weak link between growth and unemployment in the early phases of the transition, but a progressively stronger link in the later phases of the transition.

3.4. ASIA AND THE PACIFIC

Renewed interest in the relationship between growth and employment in the Asia and Pacific region has intensified following rural-urban migration that fuelled the growth of industry (Lewis 1954). While some countries in the region, such as Indonesia or the Philippines, have experienced relatively high unemployment levels, this region has for many years been the most economically dynamic region. The fact that it remains one of the top performers globally, even during the times of global economic crisis, raises the question whether growth has been jobless or not.

A study by Islam and Nazara (2000) investigated the evolution of the employment intensity of output growth in Indonesia's major economic sectors between 1977 and 1996. To analyse the responsiveness of the labour market to changes in macroeconomic conditions (as represented by output growth), both descriptive and econometric approaches were used. Results based on the descriptive method of computing the arc elasticity of employment showed that the overall employment elasticity value was 0.49. In addition, there were large fluctuations in each of the five major sectors being investigated, with some sectors even experiencing negative elasticity. The study concluded that the results derived using this approach would be difficult to use for policy formulation or even for monitoring purposes, since these fluctuations would make it difficult to analyse the sectoral composition of employment elasticity.

Subsequently, the study undertook an alternative econometric estimation method that produced a more stable series of sectoral employment elasticities. The results showed that the overall employment elasticity for Indonesia during the 1977-1996 period was 0.66 and had been stable since the end of the 1970s. Therefore, the estimates varied from a low of 0.49 (non-econometric method) to a high of 0.66 (econometric estimation method).

At a sectoral level, the results showed that the employment elasticity in agriculture was in excess of unity for the entire period of the analysis. In other words, a 1 percentage growth in agricultural output implied a more than 1 percentage increase in employment in the sector. The results further indicated that during the late 1970s and early 1990s, employment elasticity in this sector declined briefly, but recovered again in 1995 and 1996.

In the trade sector, the results of the study revealed a constant decline in the employment elasticity during the period under review, from 1.11 in 1977 to 0.79 in 1996. The study attributed the decline to the fact that this sector is home to the bulk of the informal sector and therefore acted as the employer of last resort, since this sector receives workers who cannot be absorbed by the formal sector. The growing number of workers in the formal sector at the expense of the informal sectors like trade was thus associated with declining employment elasticity in the latter. A similar argument was found to apply in the services sector, particularly from 1992 onwards. With regard to the industry sector, the results of the study showed relatively stable employment elasticity for the whole period, averaging 0.60.

In another study by Hanusch (2012), the author explored the net effect of growth on job creation by estimating the Okun's Law coefficient for eight East Asian countries between 2001 and 2011. He mentioned the fact that East Asia was not previously identified as a priority region for conducting a study on the relationship between employment and growth. This was mainly because it was a known fact that the mobilising factors of production, including labour, were the key drivers of the 'East Asian miracle' (Krugman, 1994; Kim and Lawrence, 1994; Mankiw, 1995; Young, 1992). As a result, unemployment in the region had always been considerably low.

Recent studies have, however, have shown interest in the Okun relationship between unemployment and growth in East Asia. This has been facilitated by the argument of the Lewis transformation, which concluded that the rural-urban migration which gave effect to the growth of the urban industry (Lewis, 1954) might have ended in many East Asian countries. Furthermore, it was argued that although for many years East Asia was considered to be an economically dynamic region with high growth, even during the recent global crisis, it recently experienced elevated unemployment levels. As a result, concerns were raised about whether or not growth was jobless.

The study by Hanusch (2012) undertook an empirical analysis based on the Autoregressive Distributive Lag model, in order to estimate the relationship between employment and growth in eight East Asian countries. The initial results of the study, which were based on a less sophisticated method that only focused on short-run effects, showed that for these eight countries, the effect of growth on employment was around 0.3 per cent (median at 0.32). However, the results based on a medium-term (i.e. one year) econometric analysis revealed a statistically significant relationship between employment and economic growth in most East Asian countries, except for the Philippines and Taiwan (China). Although significant in most of these countries, the elasticity coefficient was considerably volatile, ranging between 3.19 for China and 30.49 for Hong Kong (SAR, China).

According to a number of studies on the Okun relationship, the degree of variation of the Okun coefficient is dependent upon labour market institutions, particularly regarding the ease of hiring and firing workers (Moosa, 1997; Sögner and Stiassny, 2002; Cazes *et al*., 2011; Balakrishnan *et al*., 2009). In other words, regulations that protect workers against being laid- off often result in rigidities in the labour market, since employers cannot simply hire and fire workers in accordance with their business practice needs. The resultant increase in labour market rigidity and the associated costs of doing business ultimately increase the disincentives for firms to hire new labour, and therefore enhance unemployment. This is reflected by the relatively low value of the Okun coefficient. In fact, the study revealed that inertia in the labour market had a potential to reduce the responsiveness of employment to growth. By plotting the estimated Okun coefficients against hiring and firing scores obtained from the Doing Business Report, the study was able to show that more rigid labour market regulations resulted in lower Okun coefficients. The study further highlighted the fact that since Singapore and Hong Kong (SAR, China) have relatively more flexible hiring and firing rules, employment responded more significantly in these countries in the medium term. This response was found to be weaker in more strongly regulated countries, such as China and Taiwan (China).

After having established the variation of the Okun coefficient across countries, the study performed a further analysis that sought to explore whether this coefficient varied across time. In order to effectively undertake this analysis, the study isolated times of crisis, namely the Asian Crisis (1997-2000) and Global Crisis (2008-2011), distinguishing them from a period of calm (2001-2007).

The study began by stating that one of the important factors that can conceal the effect of growth on employment was the fact that jobs in agriculture tend to respond differently to growth, simply because agriculture is not commercial in most East Asian countries, and economic activity therefore affects farm employment less. According to the study, this argument is in line with the Lewis model, which states that farmers leave their land and migrate to cities in search of job opportunities and higher wages in the 'modern' sectors (Lewis, 1954). However, during times of economic contraction, these farm workers move back to their rural areas when they are laid off from their jobs in the modern sectors.

A trend analysis of growth and employment that separated employment in agriculture from employment in the non-agricultural sectors revealed that non-agricultural employment and growth moved together, whereas agricultural employment was countercyclical. The study confirmed this relationship through empirical testing. The results of the empirical analysis revealed that during times of crisis, the Okun coefficient sign in agriculture remained negative, which indicated that employment in agriculture responded in a counter-cyclical manner to growth. Therefore, the study concluded that agriculture appeared to be a fall-back for most farm workers who had been laid off from their modern sector jobs during periods of economic contraction.

A similar study by Lal *et al*. (2010) also estimated the Okun coefficient and its validity in some of the East Asian countries, such as China, Pakistan, India, Sri Lanka and Bangladesh, between 1980 and 2006. This research was done in order to establish the correlation between the unemployment gap and the output gap in these selected countries. An empirical investigation was done to see whether the association between the measures of unemployment gap and output gap was statistically significant in the long- and short-run. The study used the econometric methodology of cointegration analysis to determine the stationarity of variables and their long-run relationship respectively.

The results of the study, which were based on the Engle and Granger cointegration analysis, showed the existence of a long-run relationship between the output gap and unemployment gap in these countries. In other words, the presence of cointegrating vectors indicated the existence of a long-run structural relationship between the variables. This supported the proposition that a long-run relationship between output gap and employment gap existed in Pakistan, Bangladesh, India, Sri Lanka and China.

Furthermore, the long-run Okun coefficients were found to be statistically significant for Pakistan (-0.03), Bangladesh (-0.08), and India (-0.29), but not for Sri Lanka and China. The study therefore concluded that the Okun Law relationship may not be applicable in some developing countries, and that the governments of these countries should learn from those countries that have effectively eliminated unemployment, for example Korea, Malaysia and Singapore.

In a more wide-ranging cross-sectional study of 160 economies between 1991 and 2003, Kapsos (2005) examined employment elasticities for the generally employed population, demographic groups, and for the three broad economic sectors, namely agriculture, industry and services. The study was undertaken on a group of 160 economies, the largest set of world and regional estimates, with cross-country comparable employment elasticities, used in a study, for the period 1991 to 2003. Included in this analysis were estimates of employment elasticities for Asia and the Pacific. The results of the study indicated that Asia and the Pacific region experienced the most dynamic growth on a worldwide basis. Between 1991 and 2003, annual GDP ranged from 7.4 to 11.5 per cent in East Asia and from 5.1 to 6.0 per cent in South Asia.

However, the analysis of employment elasticities suggested that East Asia witnessed fairly low elasticities in relation to global figures. When assessed alongside the high GDP growth rates, the elasticity estimates suggested that this region experienced robust productivity growth during the period under review. The relatively steady unemployment rates implied that the region's growth had been reasonably employment-intensive, while at the same time allowing for a rapid increase in living standards through productivity growth. A demographic assessment showed that youth employment elasticities were on the decline during this period, as jobs were being shed. The study further indicated that this decline was as a result of the youth leaving the labour force (e.g. for further training), as opposed to a lack of employment opportunities. In South-East Asia, the results of the study indicated a large degree of volatility in overall economic and employment performance between 1991 and 2003. Although the region's output grew by more than 7.4 per cent per annum during this period, overall employment elasticity was recorded at a relatively low 0.39, implying job shedding. During the period corresponding to the Asian crisis, the region's employment elasticity also fell, thereby indicating that the reduction in economic output was met with an even greater reduction in employment.

The study also showed that the marked increase in youth employment elasticity during the crisis period was an indication that youth employment was disproportionately negatively affected by the crisis. At a gender level, the study found little difference in employment intensity between women and men, which was not surprising given the relative gender equality in terms of labour force participation rates.

In South Asia, the region experienced strong growth, which led to higher living standards, declining poverty rates and faster development. An assessment of employment elasticities according to gender revealed that those in South Asia were weaker than those in other regions, and this was associated with South Asia's relatively large gender gap in labour force participation, and the subsequent need for women to catch up to men in the labour market.

In terms of sector employment elasticities, the results of the study showed that in East Asia, a 1 per cent increase in output was associated with a 0.1 per cent increase in agricultural employment, a 0.07 per cent increase in industry and 0.47 per cent increase in services. Similarly, in South-East Asia, a 1 per cent increase in output was associated with no growth in agricultural employment, a 0.82 per cent growth in industry employment, and a 1.08 per cent increase in services sector employment. Thus agricultural growth was led by productivity growth, while growth in industry and services was led by employment growth. The study linked these figures to ongoing structural movements towards a larger share of industry and services sector employment in the region.

In South Asia, a 1 per cent increase in output was associated with an increase in agricultural employment of 0.38 per cent, an increase of 0.41 per cent in industry employment, and an increase in services sector employment of 0.46 per cent. South Asia showed less of a structural shift away from agriculture into the industry and services sectors. In stark contrast to South-East Asia, growth in agriculture was driven by employment, while growth in the industry and services sectors was due to labour productivity.

Upender (2006) found that in India during the post-reform period, which was after 1991, the positive magnitude of employment elasticity in the finance, insurance and real estate sectors was relatively high compared to the negative employment elasticity in the agriculture and hunting sector. This is an indication that reforms have reduced employment opportunities in the agriculture and hunting sector.

This is consistent with the findings of Sawtelle (2007), who indicated that even in those sectors exhibiting positive relationships between growth and employment, the strength of these relationships, as measured by their respective employment elasticities, differ from one another. Her findings strongly suggest that simultaneous targeted-industry labour market transition initiatives are desirable, in order to assist overall employment growth and distribute the effects of such growth evenly across sectors.

Building on his 2006 study, Upender (2011) investigated the signs and size of output elasticity of employment for different industries in the Indian economy after the economic reforms implemented during the periods 1969-1970 and 2004-2005. His results showed a positive magnitude of employment elasticity in the transport, storage and communication industries which was significantly higher than in the wholesale and retail trade and finance, insurance and real estate industries. This point to the fact that the labour absorptive capacity in the transport, storage and communication industries is relatively high. The labour absorptive capacity in the private sector during the post-economic reform period was found to be relatively high compared to the public sector, which indicates that reform measures have led to a reduction in employment opportunities in the public sector during the post-reform period. The employment elasticity with regard to all sectors combined was found to be negative during the post-reform period, implying that growth in the Indian economy has not been labour-intensive. This suggests that relying solely on macroeconomic equilibrium to tackle the challenge of unemployment was insufficient. Upender's study identified the need to review sector policies in order to generate more employment opportunities in the Indian economy.

3.5. LATIN AMERICA AND THE CARIBBEAN

The 2008/09 financial crisis renewed concerns about unemployment and job creation in developing countries. According to the International Labour Organization, more than a million people joined the ranks of the unemployed in Latin America and the Caribbean between the first quarter of 2008 and the first quarter of 2009 (ILO, 2009).

Navarro (2009) investigated the dynamics of aggregate employment in Latin America from a macroeconomic perspective, based on annual data from 1980 to 2008 covering 15 Latin American countries[4]. The study conducted a trend analysis on annual GDP, employment and real wages, which revealed that for two years before the 2008/09 recession and after the last year of negative GDP growth, these three variables were highly correlated in the region's 15 largest countries. In other words, both employment and wages behaved in a similar fashion in relation to GDP in the years before and after the recession. The study thus generalised that the dynamic of real wages was related to that of labour productivity, and that falling real wages tended to cushion a fall in employment during a recession. In order to explore this relationship further, the study employed an econometric analysis that sought to estimate dynamic labour demand, based on the information from 15 Latin American countries for the period 1980-2008.

Results based on a correlation matrix indicated a positive and statistically significant correlation between changes in employment and changes in GDP, while the correlation of employment with the other variables was found not to be statistically significant enough to be analysed. The results of the study further indicated that, as predicted by theory and in line with the literature, the employment-output elasticity was positive and significant. The short-term employment-output elasticity coefficients were found to be between 0.32 and 0.34, while the long-term coefficients were between 0.33 and 0.43. The study also reported that these coefficients were somewhat lower than those reported in another study by Weller (2000), which used the same database, but which only went up to 1998. It was thus concluded that even though the coefficients from both studies are not strictly comparable, given their specifications, the results still indicated a tendency for the responsiveness of employment to changes in GDP to diminish over time. The study therefore proposed that the positive employment impact of policies to stimulate aggregate demand should be enhanced during times of crisis.

A study by Kapsos (2005) estimated employment elasticity for Latin America and the Caribbean between 1991 and 2003. In the case of Latin America, the study found that employment elasticity declined from 0.65 between 1991 and 1995 to 0.45 between 1999 and 2003, hence reaffirming the suggestion by Navarro (2009) that there is diminishing

[4] The fifteen Latin America countries were: Argentina, Bolivia, Brazil, Chile, Colombia, Cost Rica, Ecuador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela.

employment elasticity over time in this region. The employment elasticities in the Caribbean also reflected a declining trend from an average of 0.43 between 1991 and 1995 to -0.42 between 1999 and 2003, as confirmed by the region's overall increase in the unemployment rate during this period. In addition, the study also revealed that although youth unemployment rates declined during the 1990s, the situation deteriorated in the early 2000s, with negative youth employment elasticity averaging -0.42 between 1999 and 2003.

The problem of youth unemployment was also found in the Latin American region. The study showed that in Latin America, youth employment elasticities had fallen from 0.38 between 1991 and 1995 to as low as -0.23 between 1999 and 2003. This was also confirmed by the rise in youth unemployment rates, which were sustained during this period (ILO, 2005). A further demographic analysis revealed that between 1991 and 2003, economic growth in Latin America had been more employment-intensive for females than males. This was mainly due to a substantial narrowing of the labour force participation gap between men and women over this period. This situation is somewhat different in the Caribbean, in that during the 1990s the region experienced relatively high female employment elasticities, which translated into large reductions in unemployment rates. However, this employment situation with regard to women later deteriorated during the 1999-2003 period.

At a sectoral level, the study found evidence of on-going changes in both Latin America and the Caribbean, which were indicative of a shift away from agricultural employment towards the services sector. The study further indicated that service sector growth in these regions was led entirely by employment, rather than by productivity, whereas industry value-added was shared equally between productivity and employment gains. The study concluded that during the 1991-2003 period, economic growth in Latin America was more employment-intensive than in the Caribbean, mainly due to the fact that the Latin American region had faster population and labour force growth than the Caribbean.

In a study by Pagés *et al*. (2009), the authors sought a better understanding of labour market trends in countries of Latin America and the Caribbean, as well as the factors contributing to the failure of some of these countries to create more jobs. A trend analysis of growth and employment revealed that although this region had experienced output growth since the 1980s, available data suggested that it was rather modest and had failed to prevent a continued divergence from other developing countries.

In fact, the study indicated that countries in this region had been outperformed by many countries with which they were on par in terms of income per capita in the 1970s. For instance, the study indicated that between 1990 and 2004, the region's average annual growth rate was just above 1 per cent, compared with more than 2 per cent in OECD countries. In addition, average income growth in East Asia and the Pacific was close to 6 per cent per year, which was well above that of Latin America.

The study attributed the modest economic performance to the slow rate of labour productivity. Between 1990 and 2004, productivity growth was less than 1 per cent per annum in all countries in the region, with the exception of Chile, the Dominican Republic, Trinidad and Tobago, and Uruguay, where it was well below the rates achieved in the fast-growing Asian countries. The study further indicated that in 2006, worker productivity in the region was 21 per cent of that of the United States, in comparison to 30 per cent in 1980. It was revealed that although productivity was weak in a number of countries within the region, much of the modest growth was attributed to strong and resilient job creation. In terms of employment growth, it was asserted that during the 1990-2004 period, the region outperformed a number of countries, with the employment intensity of output growth being higher than in many parts of the world. The study mentioned that during the 1990s, all countries in the region, except Argentina, Colombia, Jamaica, Paraguay and Uruguay, reflected an increase in employment rates and in most cases showed an increase of between 0.5 and 1.0 percentage points per annum in GDP per capita growth. Therefore, job creation had been associated with large increases in labour supply, which were brought about by increases in female labour force participation and a steadily growing working age population.

The study cited the fact that a majority of countries in Latin America and the Caribbean experienced a simultaneous increase in productivity and employment, thereby implying that growth in the region cannot be characterised as jobless. These countries included Brazil, Costa Rica, Guatemala, Mexico, El Salvador, the Dominican Republic, Mexico, Panama, Peru, and Trinidad and Tobago. Although growth increased in most countries in the region, some countries, including Argentina, Chile, Colombia, Jamaica and Uruguay, suffered jobless growth because labour productivity increased while the employment rate fell. The study also found that among those countries that experienced a trade-off between labour productivity and the employment growth rate, those that reinforced productivity performed better in terms of overall income growth.

However, those that experienced low productivity growth, combined with high rates of employment growth, were indicative of poor quality jobs being created in the region.

A comparison that was made based on the experiences of the period since 1990, and especially in the past decade, shed light on the nature of growth in the region. During this period, when income per capita dropped in half of the region's countries, the majority of these countries experienced growth in employment rates. Furthermore, and even more puzzling, was the fact that the employment growth rates in these countries did not improve in a noticeable way after economic conditions improved in the 1990s. The study thus concluded that the experience of labour markets in Latin America and the Caribbean during the 1980s was not one of jobless growth, but rather one in which employment followed labour supply. In support of its conclusion, the study presented evidence regarding the region's experience within an international context, which indicated that the employment rate in Latin America and the Caribbean outperformed that of many countries during the 1990s and early 2000s. However, despite this advantage, the study echoed concerns about the lack of productivity growth that accompanied strong employment growth rates, which had important implications for the quality of jobs in the region.

An OECD-commissioned study by Neri (2010) revealed that in Brazil, decent work was on the rise only after 2003, when part-time jobs and domestic work started to decrease. In addition, the study reported that during this period, temporary work and self-employment rates also dropped, reaching their lowest levels in 2008 since 1992. Since 2003, Brazil had started to generate at least twice as many formal jobs as before, reaching a total of more than 8.5 million net formal jobs by the end of 2003. Neri concluded that the impact of the years of schooling on formalisation trends was empirically important in the case of Brazil. He highlighted the fact that when children who receive a state education reach working age, they are more likely not only to have higher incomes, but to be in formal employment and contribute through taxes to the government.

A study by Anaya (1999) analysed labour market flexibility in 13 Latin American countries between 1960 and 1995 compared to that of the United States. Using the Okun's Law methodology, the paper estimated the response of unemployment, employment and real wages to changes in output throughout this period, as a way of measuring the ability of the labour market to absorb output shocks.

The results suggested that Latin American labour markets adjusted to output shocks through adjustments in real wages to a greater extent than in the United States. In particular, the study found that the Okun wage coefficients in Latin America were close to 1, compared to the United States coefficient value of 0.5. Furthermore, the study found that Latin American economies, with the possible exception of Chile and Bolivia, tended to have lower quantity responses to output, both in terms of unemployment and employment, than in the United States.

Menezes-Filho and Scorzafave (2007) estimated the employment elasticity of growth in Brazil. They found that short-run employment elasticities were smaller than long-run elasticities. For instance, between 1985 and 2004, the short-run elasticity coefficient was found to be low at 0.17, implying that a 1 percentage point increase in GDP would increase employment by 0.17 percentage points.

The long-run effects on employment were found to be more profound, as indicated by the larger elasticity values. Between 1985 and 1998, the study estimated the long-run elasticity to be 1.5. This figure was reported to have increased to 2.4 in 1999, thereby suggesting that growth in employment was attributed to the cumulative increases in GDP over time. It was further mentioned that following improvements in the economy during the late 1990s, GDP growth translated into new jobs at a faster rate. The study concluded that in order to continue along this positive path, Brazil needed to continue expanding the education of its workforce through its various programmes, so that the recipients can have a way out of poverty through participation in the labour market.

In another study that focused on Latin American labour market dynamics, Menezes-Filho and Scorzafave (2009) investigated the growth patterns and labour market conditions that have enabled Brazil to create jobs and to lower unemployment, despite increasing labour force participation rates. In their analysis of growth and labour market performance, the authors first discussed the varied attempts at economic transformation in Brazil since the 1980s. The study asserted that in terms of economic growth, the second half of the 1980s and the early 1990s were marked by unsuccessful policies that sought to reduce inflation rates. These policies had adverse effects on GDP growth rates – for instance, GDP growth fell by 4 per cent in 1994.

Brazil finally succeeded in stabilising inflation rates at around 8 per cent per year, which also improved its economic outlook. However, this was short-lived, as the fixed exchange rate regime could not accommodate the profusion of shocks experienced in the second half of the 1990s including the Mexico crisis in 1995, the Asian crisis in 1997, and the Russian crisis in 1998. Furthermore, the domestic currency suffered a major setback following the Central Bank's decision to allow the exchange rate to float. However, Brazil's implementation of an inflation targeting framework for monetary policy, alongside measures put in place to control public sector deficits, saw an improvement in GDP growth rates, which reached 6 per cent in 2007.

The study also analyzed the effects of greater trade openness in Brazil, which begun in 1988 and broadened after 1991. Trade liberalisation implied substantial tariff cuts, from an average level of about 63 per cent in 1986 to 15 per cent in 1994. As a result, labour shedding and increased productivity were experienced in those sectors facing greater competition. The workers in these comparative advantage sectors ended up mainly in the informal or self-employment sectors. The share of displaced workers with no work reallocation rose from 13 per cent to 22 per cent during this period.

Some stylised facts concerning growth and labour market performance in Brazil suggested that the labour force participation rate dropped unexpectedly in 1996, but later began to exhibit a sustainable growth, reaching 70.6 per cent in 2007. On the whole, figures on the labour participation rate demonstrated that although there was a continuous movement on the supply side of the labour market, it was not affected by the economic events discussed above. However, the numbers concerning unemployment further suggested that this movement did not find a corresponding response from the demand side of the labour market. In other words, labour demand did not grow fast enough to absorb the labour supply inflow. In fact, the study found that since 1985, there was an almost uninterrupted increase in unemployment in Brazil, from 4 per cent in 1985 to 10.5 per cent in 2004. This suggests that the economic changes discussed above contributed to the unemployment path. In other words, labour demand did not grow quickly enough to absorb the increases in labour supply. The study reported that it was only after 2004, when GDP growth recovered, that unemployment rates started to decrease.

With regard to employment and growth, the study found a close correlation between the two variables. In fact, the study showed that between 1985 and 1989, both GDP and employment grew at a rate of about 11 per cent. Furthermore, between 1989 and 2000, while employment increased by only 15 per cent, GDP rose by 24.4 per cent. The study also showed that during the period between 2000 and 2004, jobs were created at a 50 per cent faster rate than GDP growth.

3.6. AFRICA AND THE MIDDLE EAST

The regions in Africa and the Middle East generally have some of the highest employment elasticities relative to other regions of the world, which reflects the regions' unique growth, employment and poverty-related characteristics (Kapsos, 2005). A regional study by Kapsos (2005), which undertook cross-country regressions on the employment-growth linkage, showed that in the Middle East, overall elasticities were relatively higher than in Northern and sub-Saharan Africa between 1991 and 2003, signalling that labour productivity had declined. In the period between 1999 and 2003, the Middle East region succeeded in improving its labour productivity growth levels, although overall gains in output were still skewed heavily towards employment growth, rather than labour productivity growth. The differences in elasticities according to gender were found to be more significant in the Middle East region than in the African region. However, in both regions, the study found that there was a large difference in the gender distribution of employment elasticities, with female elasticities being substantially higher than those for males during the period under review. It was asserted that both regions have the highest gender gap in labour force participation, implying that the higher elasticities were indicative of catching-up in terms of women's participation in the labour force.

The study also noted that youth unemployment was a serious challenge for both regions. For instance, it argued that in North Africa, the low youth employment elasticity of 0.24 between 1991 and 1995 and -0.34 between 1999 and 2003 was a reflection of the rapidly increasing youth unemployment rates during these periods. The study further showed that in the Middle East, youth unemployment rates had remained stable during this period, ranging from 0.82 in the 1991-1995 period to 0.98 in the 1999-2003 period. With regard to the sub-Saharan African region, the study revealed that the high population growth rate necessitated high employment intensity of output growth, which consequently implied low labour productivity

growth. It was further suggested that low labour productivity growth has hampered development in the region.

In terms of sector employment-to-GDP elasticities, the study showed that in the Middle East and North Africa regions, the agricultural sector experienced the highest employment growth relative to the industry and services sectors. In contrast, overall employment intensity of growth in sub-Saharan Africa was highest in the services and industry sectors. When compared with value-added growth, the high employment elasticity in agriculture in the Middle East is indicative of declining productivity in the sector. In sub-Saharan Africa, the study reported that value-added growth in the agricultural sector had been driven mainly through employment growth, with some productivity gains realised, although they were not sufficient to reduce poverty levels.

Hararian *et al*. (2010) conducted a study to investigate the long-run relationship between GDP growth and unemployment for selected Middle East and North African (MENA) countries, including Turkey, Egypt, Israel and Jordan, between 1975 and 2005. Some of the findings of their study indicated that this region is characterised by a range of economies, with a variety of economic structures and labour markets. Several studies have shown that unemployment is one of the most critical economic and social problems facing the region today (ILO, 2009; Yousef, 2004, Raphaeli, 2006). With unemployment registered at 12.2 per cent in 2006, MENA remained the region with the world's highest unemployment rate (Hararian *et al*., 2010). According to the ILO reports (2009), the Middle East and North Africa had the world's highest unemployment rates in 2007, at 11.8 and 10.9 per cent respectively. Yousef (2004) estimated that unemployment in the MENA region is approximately 15 per cent of the labour force.

With the lowest employment-to-population ratio, at 47.3 per cent in 2006, labour force participation rates are very low in most countries in the region. An assessment of labour trends in individual countries in the region revealed that Egypt has experienced the highest rates of unemployment since the 1980s. In 1976, the unemployment rate was 4.8 per cent, after which it rose to 11.1 per cent in 1986, and thereafter declined to 9.0 per cent in 1996 (El-Mahdi, 2003). The stubbornly high unemployment rates persisted until recently, with the unemployment rate being estimated at 9.9 per cent in 2002 and 11.7 per cent in 2005.

Similarly, in Israel, the problem of high unemployment rates remains one of the most critical economic and social problems, despite the fact that the Israeli labour force is one of the most highly skilled in the world. Although the country has experienced an economic recovery in recent years, the unemployment rate remained at a high level. According to official statistics, it increased to 9.4 per cent in 2001 from 6.7 per cent in 1996. It rose to 10.3 per cent in 2002, and by the end of 2003, the unemployment rate in the country remained at 10.7 per cent (Hararian *et al*., 2010).

A study by Friedman and Suchoy (2004) suggested that the rapid increase in Israeli unemployment was due to both the business cycle and high immigration influx during the 1990s, as well as other structural changes in the labour market. However, the high rate of immigration from Eastern European countries and the former Soviet Union was identified as the main cause of the high unemployment rate in Israel (Hararian *et al*., 2010).

In Turkey, unemployment had become the main challenge for the Turkish economy, given the rapid growth of the working-age population and the increase in the number of young people. A study by Auer and Popova (2003) indicated that unemployment was largely a result of both demographic and economic factors. Berument *et al*. (2006) argued that within this context, 'the unemployment rate should follow the trends in the economy'. For instance, subsequent to the 2001 economic crisis, unemployment reached exceptional levels when it increased to 8.4 per cent in 2001 and to 10.3 per cent in 2002. Hararian *et al*. (2010) further reported that the rate of unemployment remained at high levels in recent years, registering 9.9 per cent in 2006 and 2007.

The study by Hararian *et al*. (2010) also undertook an econometric analysis of the relationship between employment and economic growth, with a view to testing the belief that there is a strong inverse relationship between GDP growth and unemployment in the MENA region. In other words, GDP growth will lead to a reduction in unemployment, as can be expected. It is within this context that this study sought to investigate the empirical relationship between unemployment and growth in Turkey and three MENA countries, namely Egypt, Israel and Jordan, during the period 1975 to 2005.

The results of the study, based on cross-country comparisons, revealed that for all 4 countries, GDP growth and unemployment were significantly negatively correlated.

An assessment of the magnitude of the value of the elasticity coefficients revealed that this relationship was stronger in Egypt and Turkey than in Israel and Jordan. Turkey and Egypt were able to create jobs much faster than Israel and Jordan, which suggested that growth in the latter was mainly explained by productivity.

Turning to studies of selected countries in sub-Saharan Africa, Fofana (2001) investigated the evolution of the relationship between economic growth and employment in the Ivorian modern private sector over time, as well as the employment elasticities of selected variables. The paper commenced by assessing some of the stylised facts about trends in employment and growth since the 1960s. The study highlighted the fact that the period between 1960 and 1970 was spectacular, in that the average growth rate reached its highest level of 7 per cent per annum.

This remarkable growth was labelled the Ivorian 'miracle'. However, the miracle was short-lived. This was due to the subsequent deterioration in the country's terms of trade in the late 1970s, the impact of external shocks such as the severe drought in the early 1980s and the OPEC oil price shocks, all of which contributed to a protracted economic recession, higher budget deficits and increased interest payments on the country's ballooning national debt. In 1980, the country's GDP growth rate became negative. Employment started to decline until 1994, when employment in the modern private sector reached its lowest level of 110,727 workers from approximately 250, 000 workers in 1980.

The government reacted by initiating a programme aimed at enforcing macroeconomic stabilisation and adjustment through the assistance of World Bank structural adjustment loans (SAL) between 1981 and 1986. Growth responded with an increase of 6.3 per cent in 1981 and 1.7 per cent in 1982, before it fell again by 0.01 per cent in 1983 and 7.1 per cent in 1984. The negative economic growth rate continued until 1994, following the devaluation of the domestic currency.

Some of the specific initiatives directed towards the labour market included the National Employment Policy (NEP), which was aimed at addressing the demographic disequilibrium characterised by high population growth rates and the labour force growth rate, which remained high in relation to the rate of job creation. The study asserted that these disequilibria were characterised by a labour supply that was far higher than the labour

demand. The increased supply of labour was due to a high inflow of new graduates into the labour market, as well as retrenched workers. In addition, the study highlighted the inadequacy of the education and training system as another factor that hindered the effective functioning of the labour market.

With regard to employment elasticities, cointegration analysis was used to investigate the employment-growth relationship, as well as simple regression to investigate the impact of specific macroeconomic variables on employment. The study emphasized the usefulness of the cointegration approach, since it enables an assessment of the time series characteristics of the data to be undertaken before an estimation is made, in order to avoid a spurious regression. Furthermore, it was also mentioned in the study that unlike other approaches, the cointegration approach allows for the identification of variables that impact strongly on the country's economic growth, thereby providing potentially more relevant economic policy advice.

The results of the cointegration analysis that were presented in the study showed that there was no cointegration between employment and economic growth, public expenditure, development aid and public investment. This suggested that employment and the other variables do not move together at the same rate in the long run. On this basis, the study concluded that jobless growth had occurred in the Ivorian economy. This was also confirmed by an upward sloping trend of GDP growth and a downward sloping employment trend since 1984, which suggested that the positive GDP growth rate did not translate into employment creation.

The ordinary least squares estimation of the relationship between employment and growth found that employment and GDP in Cote d'Ivoire were negatively correlated. The study used simple regression analysis to assess the link between employment and other selected variables, such as GDP, public expenditure, investment and development aid. His study found that the employment elasticities of growth, aid, public expenditure and investment were -0.11, -0.09, 0.02 and 0.26 respectively. Since employment and growth were found to be negatively correlated, the study concluded that the possibility of jobless growth exists in the country and that relying solely on measures to boost economic growth was not enough to tackle the challenge of unemployment.

The study recommended that efforts should be made to develop employment generating strategies through increased investments targeted at employment-intensive activities.

Ajilore and Yinusa (2011) investigated the employment intensity of output growth in Botswana. Their study used an econometric model to calculate employment elasticity in Botswana during the period 1990 to 2008. It sought to estimate a labour demand model of a double-log linear specification of the link between sectoral employment and other variables included in the demand for a labour model comprising the real wage rate, user cost of capital, sectoral gross value-added, and a measure for international exposure. The model was tested for cointegration in order to determine the existence of a long-run relationship between the model variables. The results of the study indicated a low total employment intensity of growth of around 0.01, which confirmed the fact that growth in Botswana has been largely driven by productivity improvements rather than labour demand growth.

At a sectoral level, the study found that the employment elasticity of sectoral output growth in banking, commerce, construction, manufacturing and mining were positive but weak, again indicating that growth in these sectors was more productivity-driven than employment-driven. Other sectors, including agriculture, government, transport, electricity, gas and water, exhibited negative employment elasticities, which signified negative employment growth and positive productivity growth. The study attributed the negative employment elasticity in the agricultural sector, for instance, to labour-replacing technologies and processes in the sector, implying that this sector is no longer able to absorb the growing rural labour force. The authors recommended the further promotion of a successful mineral-led economy that diversifies into sectors that are more labour-intensive.

3.7. EMPLOYMENT AND GROWTH AMONG THE BRICS COUNTRIES

The 2008/2009 recession and subsequent recovery intensified the debate about the relationship between economic growth and employment. Although empirical research shows that economic growth has a positive impact on employment, the magnitude of the impact is heterogeneous across countries. Among the BRICS countries, the impact varies depending on country-specific factors, such as the labour market structure and composition, as well as labour market regulations and policies (OECD, 2010). According to the International Labour Organization (2007), between the 1990s and 2000s the estimates of employment elasticity to

GDP growth were found to be larger in Brazil (0.7) and South Africa (0.6) than in India (0.3) and China (0.1). These variances are an indication of different growth patterns among these countries, whereby India and China's low elasticities are indicative of structural changes and productivity growth. Similar studies have also found different employment elasticities for a variety of countries (Dopke, 2001; Schettkat, 1992; Pianta *et al*, 1996; Crivelli *et al*., 2012).

According to the study by Kapsos (2005), global employment elasticity trends reveal that while the share of employment growth in total output growth has been approximately 33 per cent since the early 1990s, there has been a decline in the employment intensity of growth from 1999 to 2003. Global employment elasticity decreased from 0.34 in 1991-1995 to 0.30 in 1999-2003. However, a country-by-country analysis revealed mixed results, with significant differences in employment elasticities between various countries. The discussion below examines some of the BRICS country-specific estimates of employment elasticities for the main economic sectors, i.e. agriculture, mining, manufacturing, construction, wholesale trade and transport. However, India is excluded due to the lack of available data on employment and growth per sector.

3.7.1. Brazil

During the early 1990s, the Brazilian economy experienced a number of socio-economic transitions marked by significant macroeconomic reforms and a number of global and regional financial crises. One of these reforms was aimed at fighting hyperinflation, which only managed to stabilise in the mid-1990s at around 8 per cent per annum (OECD, 2010). The profusion of shocks from the second half of the 1990s also had an impact on Brazil's economy. These included the Mexico crisis in 1995, the Asian crisis in 1997, the Russian crisis in 1998, and the Argentine crisis in 2001. The implementation of various economic reforms, such as the introduction of inflation targeting as a framework for monetary policy, as well as controls on budget deficits, set the stage for sustainable growth after 2004 (Central Bank of Brazil, 2009).

Since then, the Brazilian economy has grown more rapidly and has shown remarkable resilience in recent years. Following the impact of the global financial crisis, where the economy experienced a contraction of -0.2 per cent in 2009, the country's GDP later grew by an average of 3.7 per cent per annum from 2010 to 2012 (World Bank, 2013). During the

recovery period, growth was driven mainly by external factors associated with an increased global demand for commodities, particularly from the Asian economies. Domestic production registered an annual increase of 10.4 per cent compared to the growth of -7.4 in 2009 and 3.1 in 2008 (Central Bank of Brazil, 2010).

Like most BRICS countries, the main challenge for Brazil has been to increase employment rapidly enough to cope with the high rates of growth in the labour force. Between 1990 and 2010, the working age population (15-64 years) in Brazil has increased on average by approximately 2 million people each year. In 2010, the number of employed persons increased by 3.5 per cent, compared with 0.7 per cent in the previous year, while the labour force rose by annual rates of 2 per cent and 0.9 per cent respectively. The increased number of employment opportunities in the past decade led to an increase in Brazil's labour force participation rate, which grew from 68.3 per cent in 1999 to 70.7 per cent in 2009. According to Menezes-Filho and Scorzafave (2009), it was only after 2004 when GDP recovered to sustainable levels that unemployment rates started to fall in a consistent manner. In another study, Menezes-Filho and Scorzafave (2007) estimated the GDP-employment elasticity for Brazil and found that short-run elasticities were relatively small compared to long-run impacts. In their findings for the period 1985-1998, long-run elasticity was estimated at 1.451 and increased in 1999 to 2.444, implying that employment growth was explained by GDP growth over time. Table 3.1 below indicates the country's historical sectoral employment elasticities and value-added growth by economic sector between 1999 and 2008.

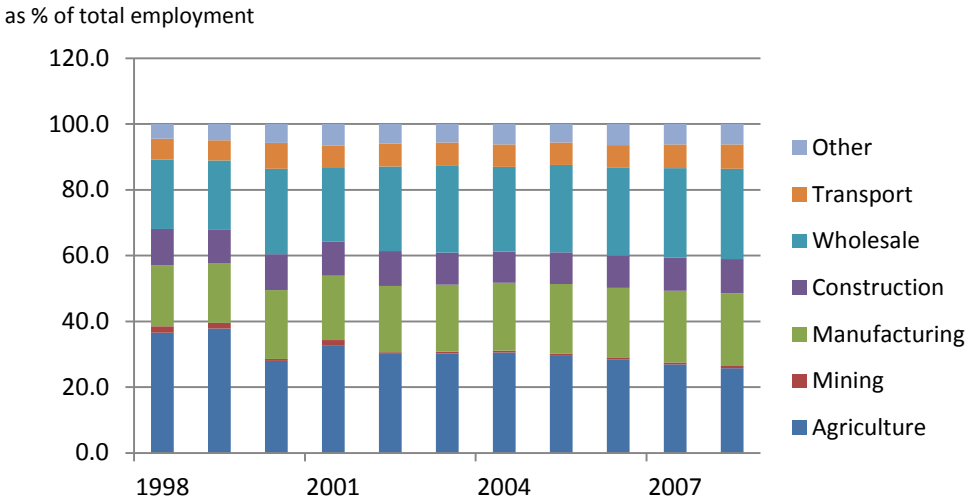
Table 3.1: Country estimates of employment elasticities: Brazil, 1999 – 2008.

	Employment elasticities			Value-added growth		
	1999 - 2002	2002 - 2005	2005 - 2008	1999 - 2002	2002 - 2005	2005 - 2008
Agriculture	-0.51	1.05	-0.52	16.1	8.6	16.8
Mining	-7.03	1.88	2.41	9.6	13.4	10.7
Manufacturing	3.21	1.31	1.05	9.0	11.9	9.8
Construction	-8.05	0.09	0.71	-2.3	4.9	18.5
Wholesale	7.64	1.20	0.43	5.4	12.0	20.8
Transport	1.85	0.76	0.89	16.9	9.8	16.5
Other	4.30	0.57	1.13	9.4	8.6	13.0

Source: International Labour Organization, LABORSTA database.

Table 3.1 shows that during the period 1999-2002, there were three instances of negative employment elasticity or jobless growth. These were in the agricultural sector (-0.51), mining sector (-7.03), and construction sector (-8.05). The negative employment elasticity in the agricultural sector can be associated with structural changes away from agriculture into the services sector, as the country experienced a decline in employment in agriculture, despite positive growth in agriculture value-added. The economic reforms that were initiated in the 1990s were aimed at achieving greater economic stability by shifting labour from low productivity agriculture to the higher productivity industry and services sectors (OECD, 2010). Until 2005, employment in the agricultural sector remained the largest, accounting for around 10 per cent of the workforce in Brazil. The number of workers in this sector exceeded 16 million in 2002, reaching a peak of approximately 17.5 million workers in 2005 (ILO, 2009). Since then, employment levels in this sector have declined, to 15.8 million workers in 2008. This is further reaffirmed in the figure below showing a decline in agricultural employment as a percentage of total employment from 29.7 per cent in 2005 to 25.8 per cent in 2008.

Figure 3.1: Employment by economic sector ('000s), Brazil, 1998-2008



Source: International Labour Organization, LABORSTA database.

Despite the declining employment levels, production in the agricultural sector continues to serve as the backbone of Brazil's economy, with approximately 70 per cent of the country's land being suitable for cultivation. The production of sugar cane, for instance, increased

from about 390 million tons in 2003 to more than 690 million tons in 2008. Being the second largest beef-producing country in the world after the United States, Brazil's share of agricultural production, as a percentage of GDP, averaged 25 per cent although it increased to 31 per cent in 2008.

In the mining sector, the relatively low employment elasticities and high value-added growth rates between 1999 and 2005 indicate that value-added growth has been driven more by gains in productivity than gains in employment. Although this sector employs fewer workers than in agriculture, technological advances have greatly increased its productivity over time. Technological transformation and economic reforms have also affected other sectors in different ways. The manufacturing sector, being the third largest employment sector, accounted for more than 13 million workers in 2007, from 10.6 million workers in 2002 (OECD, 2010). This sector contributed more than 13 per cent to GDP in 2008 (Central Bank of Brazil, 2010). Although it was perceived as an important sector in terms of employment, the low employment elasticities, together with high value-added growth rates, particularly between 2002 and 2008, also indicate that Brazil experienced robust growth in labour productivity in manufacturing during this period. This explains the progressive evolution in the manufacturing sector, which has been spurred by technological change and growth in manufacturing exports (Lattimore and Kowalski, 2008).

In the construction sector, negative employment elasticity accompanied negative growth in value-added output between 1999 and 2002, which implies that the falling employment could be attributed to a decline in output growth. However, 2002 to 2005 saw a gradual increase in value-added growth, together with a slight recovery in employment. In the most recent period, between 2005 and 2008, sector output grew by over 18 per cent and the employment elasticity of 0.71 per cent was high enough to translate into employment gains by the sector.

The wholesale trade sector is one of the country's most dynamic sectors. It has experienced expanding value-added growth over the past decade, boosted by rising consumer income and expenditure, which has in turn led to high levels of employment creation in this sector. The wholesale trade sector, Brazil's second largest employer after agriculture, had an average annual employment rate of 3.7 per cent, relative to the average all-industry benchmark of 2.8 per cent for the period 2002 to 2007 (ILO, 2009). Between 1999 and 2002, the value-added growth and sectoral employment elasticity figures indicate that the wholesale sector was both

the fastest growing and most job-intensive sector. However, from 2005 to 2008, value-added growth in this sector was driven more by gains in productivity than by gains in employment. These and other positive outcomes in other sectors were largely due to the major economic reforms that were introduced in the 1990s in Brazil, as well as the effects of global integration, which provided greater access to technologies, capital and financial markets (OECD, 2010).

3.7.2. Russia

The economic transition achieved by Russia, from a command to a more market-oriented economy, resulted in vast regional differences in growth rates. Between 1993 and 1997, annual average growth rates in real per capita income across the different regions ranged from -9.0 to 15.7 per cent (Berkowitz and DeJong, 2001). A number of regions maintained barriers against inter-regional trade and opposed the adoption of economic reforms (Berkowitz and Dejong, 1999). Even among the pro-reform regions, there was no uniformity, as some tended to favour alternative reform packages – for instance, the Magadan region aggressively pursued reforms related to state privatisation, but would not actively liberalise prices. Regional variations were also evident in the implementation of bankruptcy laws to protect creditors (Lambert-Mogilansky *et al*., 2007) and the quality of the commercial courts (Shvets, 2005).

The literature on the transformation of the former Soviet Union from a socialist to a capitalist system suggests a positive relationship between the depth of regional reforms and growth. According to Berkowitz and DeJong (2002), there should be a positive association between reform and the growth of new enterprises. In fact, Johnson *et al*. (1999) found that in countries where policy reforms actively secured property rights for new enterprises, these enterprises tended to increase their retained earnings set aside for future investments. Shleifer and Vishny (1994) further argued that privatisation improves growth prospects by reducing the inefficiencies associated with the separation of control and ownership in state-owned enterprises. According to Osband (1992) and Murphy *et al*. (1992), price liberalisation enhances growth and welfare by removing distortions, such as bribery and black markets, which arise from the scarcities generated by a socialist pricing system.

Russia's economic transformation history can be characterised by two distinct periods. First, between 1993 and 2000, Russia experienced tremendous regional diversity in entrepreneurial activity and economic growth. Berkowitz and DeJong (2005) found that differences in reform policies, as well as human capital, during the initial stages of the transition in turn led to differences in entrepreneurial activity. Moreover, they found that entrepreneurial activity was an engine for growth. The existence of a link between entrepreneurial activity and growth in post-Soviet Russia was further supported by evidence, at national level, of the importance of entrepreneurial activity as a source of growth in other post-socialist economies. For instance, McMillan and Woodruff (2002) concluded that the strong economic growth experienced by Poland and China before 2000 was as a result of the considerable entrepreneurial development that these countries experienced, as opposed to the economic stagnation in Russia, which was largely due to the lack of market incentives that inhibited entrepreneurship. After 2000, this relationship was obscured by several factors which had significant implications for economic growth at national and regional levels. At the national level, these factors included surges in oil and gas prices, as well as currency devaluation, while at the regional level, these included the federal government's effort to centralise economic policy making (Desai *et al*., 2003).

After 2000, bank credit emerged as an important engine for growth. Before 2000, there was no discernible empirical relationship between financial development and growth in the former Soviet Union. This was because prior to 2000, bank-issued credit in Russia was virtually non-existent, at least outside Moscow (Berkowitz and DeJong, 2011). Instead, the banks were engaged primarily in deposits, savings and speculative investment services. However, since 2000, banks' credit extension has grown considerably, though unevenly, at regional level. The extension of bank credit lagged in regions that resisted the adoption of policy reforms, particularly those within Russia's Red Belt, which maintained a communist influence (Berkowitz and DeJong, 2005). Between 1993 and 2000, economic growth in Russia averaged 2.2 per cent across regions, while between 2000 and 2007 growth averaged 14.8 per cent, with most regions experiencing growth in excess of 9 per cent. They suggest that the major difference between these two periods can be explained by the aggregate shocks in the economy that were experienced after 2000, which included surges in oil and gas prices, as well as currency devaluation, as explained above.

During the economic reform period that started in the mid-1990s, a new socio-economic system that allowed for private ownership, effective government control, income distribution and a mix of socialism and capitalism was considered (Wolnicki, 2006). As with most post-communist states, low labour absorption was also a common challenge in Russia. As the number of regions carried out massive privatisations after 1990, it was required as a condition of sale that new owners should freeze the levels of employment for periods of up to five years (Linz, 1998). In order to obtain a political mandate for privatisation, corporations were required to provide job protection clauses. Moreover, these corporations were expected to provide welfare benefits and free medical care for the unemployed, whose expectations were high, although they had limited knowledge of the skills needed in the job market (Rutkowski, 1990). However, as privatisation and market reforms progressed and employment freeze clauses expired, unemployment began to climb and peaked in the mid-1990s. The relatively high rates of economic growth from 2000 up until the global financial crisis in 2008 reignited the expansion of demand for labour. However, given the limited labour resources, as well as the existence of imbalances in labour demand and supply, the persistence of these trends resulted in an increase in imported labour.

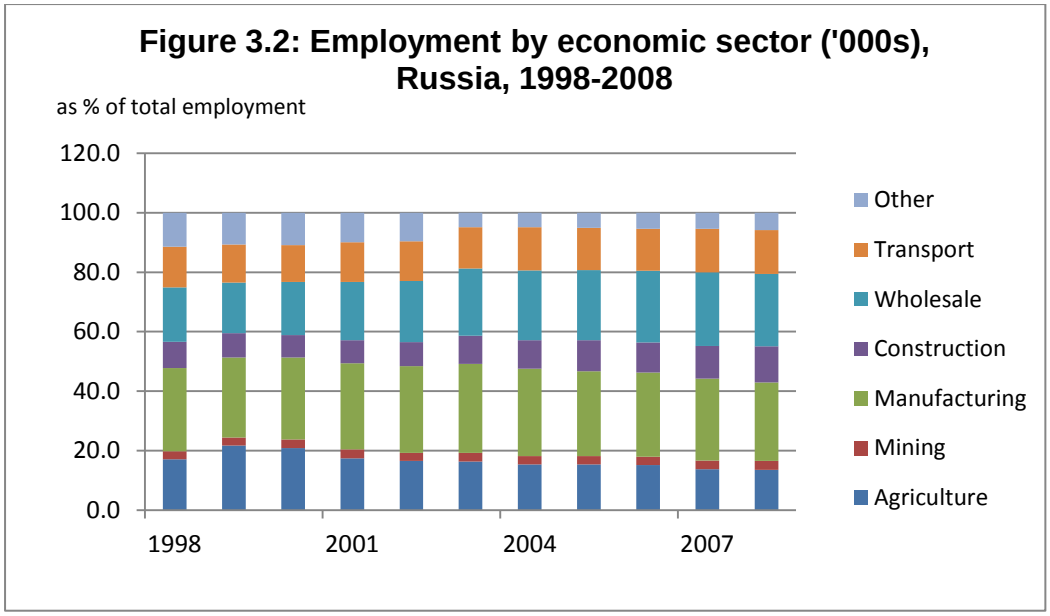
A weak response in the dynamics of employment to changes in output is an important feature of the Russian labour market. This legacy of low labour elasticity was mainly responsible for the slow absorption of excess labour in post-Soviet Russia (Wolnicki, 2006). A number of studies on firms in transition economies have found low employment elasticity in the initial stages of the transformation process. Table 3.2 below indicates the country's historical sectoral employment elasticities and value-added growth by economic sector between 1999 and 2008.

Table 3.2: Country estimates of employment elasticities: Russia, 1999 – 2008.

	Employment elasticities			Value-added growth		
	1999 - 2002	2002 - 2005	2005 - 2008	1999 - 2002	2002 - 2005	2005 - 2008
Agriculture	-0.73	9.88	-1.14	28.1	-0.9	10.1
Mining	0.16	0.10	1.68	16.4	22.8	5.5
Manufacturing	0.62	-0.18	-0.57	21.6	22.8	12.2
Construction	0.14	0.72	0.44	32.6	36.4	41.6
Wholesale	1.01	0.35	0.09	26.2	35.5	39.8
Transport	0.45	0.24	0.24	18.5	20.3	21.1
Other	-0.76	-4.16	0.50	7.5	11.5	29.7

Source: International Labour Organization, LABORSTA database.

Despite a dramatic growth in value-added output in most sectors, the low employment elasticities are indicative of firms' failure to adjust employment levels commensurate with increases in sector output. During the initial phase of economic transition during the 1990s, as the regions undertook massive privatisations, it was required that new owners should freeze the levels of employment for periods of up to five years. This allowed a marginal employment response. However, as these employment freeze clauses expired, privatised enterprises shed unproductive surplus labour, especially those firms which were competing with others in the mature, capital-rich and technologically advanced European Union. The increase in sector productivity, mainly from high capital labour ratios, explains the decrease in the demand for labour, as a number of sectors experienced improvements in labour skills, management and the wider use of capital-intensive, labour-saving technologies. During the period 1999 to 2002, the negative employment elasticity of -0.73, combined with high value-added growth rates of 28.1 in the agricultural sector, showed clearly how this sector experienced jobless growth alongside robust productivity gains. Table 3.2 also shows two other instances of negative employment elasticity or jobless growth in the manufacturing sector during the periods 2002 to 2005 and 2005 to 2008. According to Linz (1998), the unsustainably low employment elasticities in Russia's manufacturing sector were as a result of inherited socialist production and employment patterns. The elasticity coefficient was found to be very low compared to other transition economies at a similar stage in the transformation process.



Source: International Labour Organization, LABORSTA database.

According to Mironova (2010), industry indicators such as monthly gross wages and salaries have an influence on employment dynamics in Russia. In other words, the higher the relative wages, the more people seek work in that sector of the economy and vice versa. This has resulted in an excess number of employees in industries with higher wages, and a lack of them in sectors with the lowest wages. In her study, she also found that the highest wages were observed in transport, communications and financial services, whereas the lowest wages were found in agriculture, manufacturing, and hotels and restaurants. These staffing imbalances are confirmed in the figure above. For instance, the transport sector reflects an upward increasing trend in employment levels, whereas the agricultural sector is experiencing a declining trend.

3.7.3. China

China has enjoyed a long period of sustained economic growth since the late 1970s. Since 1978, when it began to implement its major macroeconomic reforms, real GDP growth has averaged around 11 per cent per annum. From 1990 to 2008, China recorded an impressive economic performance, with its share of total world GDP increasing from 1.6 per cent in 1990 to 7.1 per cent in 2008, out-performing some of the G-7 countries such as Canada, France, Germany and the United Kingdom.

In 2007, the economy grew by 11.9 per cent, with GDP per capita at 11.4 per cent more than the previous year. Despite the financial crisis of 2008, GDP still achieved a 9 per cent growth rate in that year. These positive growth outcomes were attributed to reforms that were aimed at achieving greater economic stability and liberalisation. These reforms, most of which started in the 1980s, favoured structural changes and an export-led growth path, which shifted labour from the low productivity agricultural sector to the high productivity industry and services sectors. This led to a reduction in agriculture's share of output and a corresponding increase in the shares of the industrial and services sectors (OECD, 2010).

The sectoral shift in the Chinese economy from the primary sector to the non-agricultural sectors is characterised by two features (Fang *et al*., 2009). First, being a developing country, China has the typical growth pattern of a shrinking primary sector, which depicts the trend of economic transformation in which the share of the primary sector to GDP steadily decreases. From 1990 to 2007, the share of the primary sector in GDP declined from 27.1 per cent to 11.3 per cent. In contrast, the share of non-agricultural sectors to GDP has increased where, for instance, value-added growth in the tertiary sector increased from 31.6 per cent of GDP in 1990 to 40.1 per cent in 2007. Second, unlike the pattern observed in developed economies, with expansion in the tertiary sector accompanied by contraction of the secondary sector (OECD, 2010), the share of the manufacturing sector in China's GDP has remained fairly constant since 1978. This shows China's ability to capitalize on its competitive advantage in labour-intensive sectors.

These sectoral shifts have significantly altered labour market outcomes in China. During periods of rapid industrialisation, there is a considerable increase in the rate of rural to urban migration, which in turn shapes the labour markets. Despite institutional disincentives and barriers, rural workers and households migrate to urban areas in search of more job opportunities, which yield greater expected benefits than the associated costs. Over the past few decades, China has experienced the fastest rate of urbanisation in the world. This process has been propelled by an unprecedented internal migration, as the influx of low-skilled labour surpluses in rural areas migrate to cities (Ghose, 2005). This has resulted in the expansion of low labour cost non-agricultural sectors in urban areas, while increasing productivity in the agricultural sector. This phenomenon contributed significantly to shaping labour market outcomes through resource reallocation with the shift away from low productivity agricultural employment to higher productivity industrial and services sectors.

As with other BRICS countries, China's challenge has been to increase employment fast enough to cope with the high growth rate in the labour force. China is still characterised by a large excess of labour in the rural areas. Between 1993 and 2008, the working age population increased, on average, by more than 7 million per annum (OECD, 2010). During the same period, employment growth remained below GDP growth, as reflected in declining growth-employment elasticities in some sectors. This is the result of the important structural changes and productivity growth that were previously mentioned. Table 3.3 below depicts the country's sectoral employment elasticities and value-added growth by economic sector between 1999 and 2008.

Table 3.3: Country estimates of employment elasticities: China, 1999 – 2008.

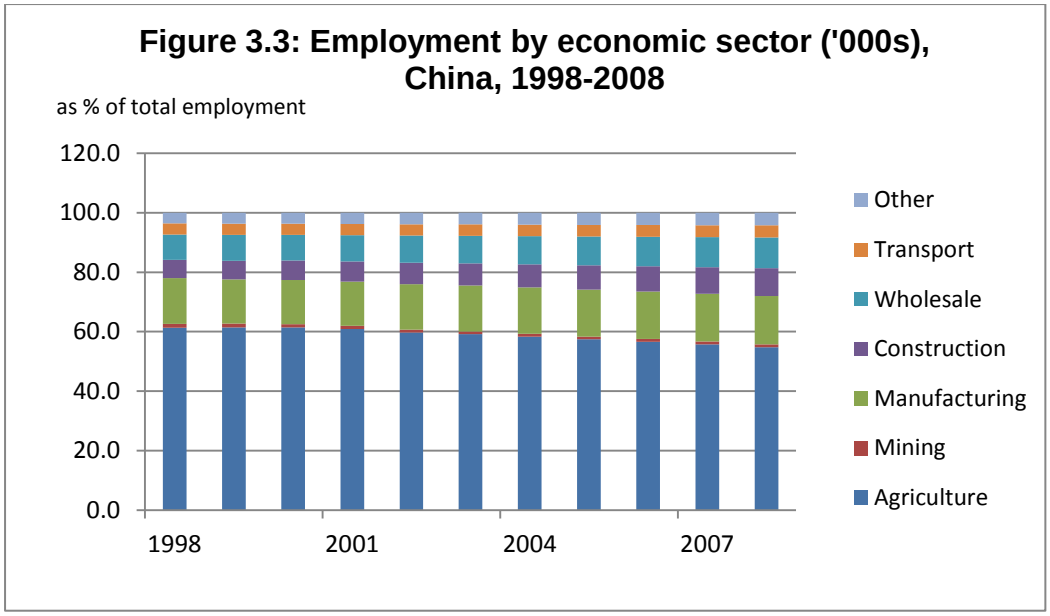
	Employment elasticities			Value-added growth		
	1999 - 2002	2002 - 2005	2005 - 2008	1999 - 2002	2002 - 2005	2005 - 2008
Agriculture	-0.36	-0.23	-0.24	8.3	14.7	14.8
Mining	-0.55	-0.18	0.17	29.9	49.6	42.6
Manufacturing	0.05	0.08	0.09	51.1	50.8	49.2
Construction	0.62	0.37	0.31	22.8	40.6	49.1
Wholesale	0.15	0.21	0.13	30.3	34.4	59.2
Transport	0.12	0.04	0.16	26.6	35.1	32.0
Other	0.12	0.15	0.12	37.9	35.9	44.3

Source: International Labour Organization, LABORSTA database.

Examining the historical sectoral employment elasticities, together with value-added growth rates, can be a useful indicator for measuring structural economic changes and labour market compositions. As can be seen in the table above, during the three periods from 1999 to 2008, the agricultural sector realised very low negative employment elasticities and rapid value-added growth rates. The negative employment elasticities, combined with high value-added growth rates, imply that the agricultural sector experienced a decline in the employment intensity of output growth and robust productivity growth. Because of the rapid urbanisation process, labour migration led to an expansion of low labour cost non-agricultural sectors, while increasing productivity in the agricultural sector.

The manufacturing sector showed a tremendous increase in value-added growth, coupled with positive yet very low employment elasticities during the entire period under review. In other words, in spite of the large influx of low-skilled labour surpluses from rural areas, growth in manufacturing has also resulted mainly from labour productivity growth, rather than employment growth. In fact, according to Ghose (2005), during the initial periods of labour productivity gains in manufacturing, particularly from 1996 to 2002, manufacturing employment declined at a rate of more than 3 per cent per annum, while growth in labour productivity was nearly 12 per cent per annum. This suggests that the low employment effect of growth in the manufacturing sector was largely due to a rapid technological change involving a significant increase in the capital and skill intensity of output.

A similar pattern is also evident in all other sectors (i.e. construction, wholesale and transport), as these also show positive but low employment elasticities and high value-added growth rates. Given the effects of transformation from a dual economy to an industrialised country, multiple factors, such as the acceleration in migration of rural surplus workers as well as the process of rapid technological change in industry, have led to increased labour productivity growth and the worsening of employment conditions in urban China. Because of the control to deter migration, rural migrants found it difficult to get permanent living residency in urban areas. Also, since, migrant workers were not expected to live in cities permanently, in most cases their spouses, parents, and children were left behind in home villages. This made rural population more dependent and in turn weakening the capability of social and economic development in rural areas.



Source: International Labour Organization, LABORSTA database.

While agriculture's share of the labour force declined from 1999 to 2008, this sector still accounts for well over half of all employment, even though its importance is diminishing. This comparison suggests that the labour absorptive capacity of the agricultural sector is larger in relative and absolute terms. However, in view of the major contributions by the non-agricultural sector to China's economic growth, it is no surprise that the non-agricultural sector is becoming much more capital-intensive. While the degree of labour intensity is still high by global standards, the direction of change favours the substitution of capital for labour. The results of mechanisation are evident throughout industrial enterprises, with the use of automatic devices, conveyor belts and pneumatic tools to reduce manual labour in assembly operations. According to the World Bank (2012), some of the key labour market challenges and priorities lying ahead for China in the coming decade include the urgency of moving up in global production systems, facilitating greater structural transformation, fostering research and innovation, as well as increasing technical skills among young graduates.

3.7.4. South Africa

Previous studies on employment and growth in South Africa have taken several forms. Some of these studies have adopted a narrative (or qualitative) approach (Nattrass, 1998; Loots, 1998; Mahadea, 2003; Strydom, 1996; Hofmeyer, 1996; Abedian and Schneier, 1987; Kingdon and Knight, 2005; Altman, 2008).

Others have adopted a more quantitative and statistics-based methodology (Mahadea and Simson, 2010; Hodge, 2009; Bhorat and Oosthuizen, 2008; Simkins, 1977; Bhorat and Leibbrandt, 1998).

The qualitative studies on growth and employment reveal that the challenge of joblessness in South Africa stems from comparatively weak long-term growth, globalisation and labour legislation, crime and corruption, as well as increasing capital intensity (Nattrass, 1998; Mahadea, 2003; Schoeman and Blignaut, 1998; Loots, 1998). According to Mahadea (2003), South Africa's need to create employment is closely associated with the attainment of high and sustainable economic growth rates. The current growth rates have not been sufficient to create employment opportunities for the growing South African labour force (Loots, 1998). The rate of unemployment remains stubbornly high, despite the relatively high rates of economic growth recorded since 2000 until the onset of the 2007/8 financial crises and global recession that followed it. The employment absorption capacity of the labour force has declined in recent years, from 45 per cent in 2008 to 41 per cent in 2012.

Moreover, despite the introduction of a number of government policies and strategies, such as the Growth, Employment and Redistribution (GEAR) strategy, Special Development Initiative (SDI), Accelerated Shared Growth Initiative for South Africa (ASGISA), New Growth Path, National Development Plan, Umsobomvu Youth Fund, and the Jobs Fund, the problem of jobless growth has not been resolved. In tackling the challenge of low growth and high unemployment, South Africa needs to establish an economic environment that is conducive to the development of business entrepreneurship, since it is the entrepreneur's action that gives rise to growth and employment (Mahadea, 2003).

The process of trade liberalisation in South Africa gained momentum in 1995 following the withdrawal of international sanctions that had been imposed during the apartheid era. Although this process unlocked South Africa's opportunities to conduct trade with the rest of the world, the resulting export growth failed to strengthen the labour absorption capacity enough to reduce unemployment (Mahadea and Simson, 2010). According to the World Bank Development Report (1997), for an economy to effectively respond to high levels of unemployment and competition, trade liberalisation must be complemented by labour market flexibility.

In South Africa, various new labour laws have imposed greater rigidities on the labour market. Employers burdened by restrictive and costly labour regulations resorted to capital-intensive methods (Mahadea and Simson, 2010).

The South African Reserve Bank's 2001 Annual Report revealed that the South African economy had suffered from jobless growth phenomenon. It was further asserted that although the country achieved marked improvement in its economic performance after 1994, it fell short of other emerging markets and was insufficient to dent overall unemployment levels (Faulkner et al, 2013). More recently the South African Reserve Bank reported that in 2015, the bulk of the jobs that were created were in the informal sector rather than in the formal sector of the economy, while roughly one in four workers remained unemployed (SARB, 2015).

The Bank indicated that jobless growth was in part attributed to increasing capital intensity. In its report on the social impact of globalisation, the International Labour Organisation (1998) identified trade liberalisation as one of the causes of increasing capital intensity. The ILO report (1998) highlighted that trade liberalisation may have shifted production in favour of capital-intensive sectors, to the detriment of labour-intensive ones. According to Nattrass (1998), approximately two million jobs were lost since the early 1980s due to large investments being channelled into capital-intensive sectors and technologies. The manufacturing sector in South Africa has been proven to be far more capital-intensive than in any other middle income country, including countries such as Brazil, Malaysia, Mexico and South Korea.

Another reason cited for the increasing capital intensity of production is the shortage of skilled labour, which weakens growth and hinders development in labour-intensive sectors (ILO, 1998). While South Africa is faced with the challenge of attracting labour-intensive foreign direct investments (FDI), the country is losing rich human capital, as people with marketable skills emigrate to other countries due to poor employment prospects in South Africa (Mahadea, 2003). Moreover, given the fact that between 40 and 60 per cent of the workforce is illiterate, increasing the demand for skilled labour can be unsustainable, unless employee skills are improved without the concomitant increase in labour costs (Nattrass, 1998). Current as well as proposed government industrial policies are aimed at addressing, among other things, the skills shortage that is currently undermining the promotion of labour-

intensive small and medium enterprises. In 1998, the South African government enacted the National Skills Act, and in 1999 it established Sector Education Training Authorities (SETAs), in order to charge firms a skills levy to be reimbursed if firms could provide evidence that their employees underwent approved training (Mahadea, 2003).

Quantitative and statistics-based studies, including those by Hodge (2009); Bhorat and Oosthuizen (2008); Mahadea and Simson (2010); Marinkov and Geldenhuys (2007); Terreblanche (2002) and Mahadea (2003), have investigated the empirical relationship between economic growth, employment and other policy and institutional variables suggested by theory for South Africa.

Hodge (2009) studied the employment performance of the South African economy using the *arc* elasticity of employment. This indicator was also used in studies by Kapsos (2005) and Ajilore and Yinusa (2011) to compute a convenient measure of the employment intensity of growth. The *arc* elasticity of employment is the proportionate change in employment divided by a proportionate change in output during a given period. It thus measures the responsiveness of employment to growth.

In his study, Hodge (2009) constructed annual time series data on total formal sector employment, dated as far back as 1946, in order to measure the relationship between economic growth and formal sector employment. He found that the employment coefficient was relatively stable over long periods of time, with an average value of 0.5, which suggested that a one percentage point increase in output is associated with a half a percentage point increase in formal sector employment. This stability was disrupted by a brief but sharp decline in the employment coefficient value during the mid-1990s, after which it was re-established and continued to be stable. The study concluded that the high unemployment rate in South Africa since the mid-1990s was due mainly to large increases in the labour force, not a chronic deficiency in growth or employment performance, as it was generally thought.

Mahadea and Simson (2010) examined the problem of low employment economic growth performance in South Africa for the period 1994 to 2008. Their study adopted the Harrod-Domar model as a heuristic guide to analyse the real economic growth of South Africa, as well as the least squares regression method to examine the long-term relationship between growth and employment.

Domar (1946) demonstrated that a country's savings and incremental capital output ratio (ICOR) provide the key to investment-led growth. In light of the optimistic view that South Africa needs a growth rate of 6 per cent in order to create 400 000 jobs annually, the study by Mahadea and Simson (2010) asserted that an estimated ICOR of 6.1 per cent between 1996 and 2000 implies that South Africa must invest close to 37 per cent in order to attain a 6 per cent growth rate. However, the model results further indicated that insufficient investment is the main constraint in South Africa.

Bhorat and Oosthuizen (2008) examined the trends in non-agricultural formal sector employment and real GDP between 1967 and 2002, in order to complement their assessment of estimates of employment elasticities. Their study revealed that prior to 1990, output expansion was accompanied by employment growth. Thus, an elasticity coefficient of 0.76 between 1970 and 1980 suggested that a 1 percentage increase in real GDP was associated with a 0.76 percentage increase in formal employment. In contrast, the figures for the periods after 1990, where output growth was accompanied by a decline in employment growth, employment elasticity fell from -0.55 between 1990 and 1996 to -1.29 between 1996 and 2002. The negative signs of these elasticities are a reflection of decreasing employment in response to rising real GDP. It was on this basis that the study suggested that jobless growth was indeed a characteristic feature of the post-apartheid South African economy. However, the employment data on which this argument was based excludes both the agricultural and informal sectors, which have varied over time in their exact coverage. In addition, the study asserted that the reliance on simplistic methods confused correlation with causality. On the whole, the study concluded that econometric analyses that control for the multitude of factors that impact on the economy, and use the same employment data, have been unable to prove that growth was jobless.

Marinkov and Geldenhuys (2007) estimated Okun's coefficient for the South African economy using data from 1970 to 2005. Their study found no cointegrating relationship between the unemployment and output series. It showed that employment growth had become less responsive to economic growth since the mid-1980s, possibly due to structural shifts in production and employment. The study found that for the period 1996-2000, the very low employment coefficient of 0.06 is indicative of the notion of jobless growth.

It was recommended that the extent to which total unemployment (not only cyclical unemployment) responds to output should be investigated, as well as the factors associated with other types of unemployment, before any definite policy recommendations can be made. Similarly, Terreblanche (2002) concluded that structural shifts, together with the increasing capital intensity of production, have led to a decrease in the elasticity of employment with respect to output.

Mahadea (2003) examined data on formal non-agricultural employment and GDP for the period 1994-2000. In his study, he showed that the GDP-employment ratio has been constantly negative since 1994, with an average figure of -1.4 during the period 1995-2000. According to his study, this implied that South Africa's growth has not been neutral, but rather labour displacing. Using 1995 as a base year, data on the aggregate labour employment index on the formal non-agricultural employment decreased from 101.1 in 1994 to 89.8 in 2000, and declined further to 88.5 in the second quarter of 2001, and to 88.3 in the third quarter of 2001 (SARB, 2002).

In a later study, Mahadea and Simson (2010) found that labour absorption had improved. The GDP-employment ratio which measures economic output per person employed has been positive, with the highest figure of 0.968 being recorded in 2008. Hodge (2009) also examined the employment elasticity of output of the 6-year moving averages for the period 1946 to 2007. The study found that the employment coefficient had been relatively stable over long periods of time, with an average value of about 0.5. Between 1992 and 1995, the employment coefficient experienced a brief but sharp decline, recording a negative value of -1.7 in 1994. During this period, real GDP growth averaged 0.5 per cent per annum, while average annual employment declined by 0.8 per cent per annum. The study mentioned that the early to mid-1990s marked an exceptional period of jobless growth and job shedding, despite sluggish yet positive growth. However, the study further indicated that during the late 1990s, the employment coefficient returned to its long-term average of 0.5 and increased further to 0.8 by 2007 before the onset of the global financial crisis and recession.

Based on the above, it is clear that there are significant differences regarding the various empirical estimates of employment elasticity. These are largely dependent upon the methodology used and the precise time periods of the study.

The next section provides more recent evidence on the trends in employment elasticities that will assist in formulating a better understanding of the South African labour market.

Mahadea (2003) argued that if the economy is to respond effectively to high levels of unemployment, economic reforms need to be complemented by greater labour market flexibility. As a vital mechanism in the battle against unemployment, labour market flexibility allows employers to alter certain aspects of their input resources to meet their business demands (Barker, 1999). A multitude of labour regulations imposing rigidities in the labour market are a burden to employers. Legislation cannot compel employers to create jobs, it simply provides an incentive to switch to capital-intensive methods or otherwise economize on labour inputs, thereby reducing the labour absorptive capacity of growth (Mahadea, 2003). His study revealed that the problem of unemployment can be assessed more accurately when the change in GDP is linked to the change in employment, which is measured as a change in GDP/change in employment ratio. He further indicated that the GDP/employment ratio in South Africa has been consistently negative since 1994, averaging -1.4 during the period 1995 to 2000, which is an indication of labour displacement. Labour displacement to GDP worsened to -6.1 in 1996. This study showed that despite specific actions and initiatives by government, jobless growth appears to have worsened, rather than improved.

The differences in employment elasticity outcomes discussed above shed some light on production in South Africa, indicating that it may have shifted in favour of capital-intensive sectors, to the detriment of labour-intensive ones. According to Nattrass (1998), millions of jobs have been lost in South Africa over the past decades as a result of investments being channelled increasingly into capital-intensive sectors and technologies. The South African Reserve Bank also attributed jobless growth in part to increasing capital intensity (SARB, 2001). The South African manufacturing sector has become far more capital-intensive than its middle income counterparts in Mexico, Brazil, South Korea and Malaysia (Nattrass, 1998). An ILO report (1998) highlighted South Africa's contradiction of continuing to specialise in capital-intensive goods in the face of high unemployment (Hayter *et al*., 1999). In this report, the ILO argued that the removal of certain industrial incentives which favoured capital-intensive sectors could have been expected to shift export patterns in favour of labour-intensive sectors, thereby stimulating job creation.

3.8. SUMMARY AND CONCLUSION

Most studies that have investigated the empirical relationship between employment and growth are based on estimates of the output elasticity of employment. While some of these studies were a response to the immediate challenge of employment creation, others were aimed at addressing fears regarding reforms that may have weakened or even eliminated the positive correlation between growth and employment.

The theoretical background in some of these studies was borrowed from the French regulation theory, which sought to identify the characteristics of the post-Fordist era (1980-1994) regarding the relationship between economic growth and employment**.** This regulationist approach was based on the hypothesis concerning the influence of technological changes, which suggested that jobless growth did occur in post-Fordist societies and that post-Fordist technologies, brought about by economic growth, were intrinsically more labour-saving than earlier Fordist technologies. Other studies in the literature have based their analysis on Okun's Law, in order to analyse the phenomenon of jobless growth, whereby a decreasing value of Okun's coefficient is viewed as an indicator of jobless growth. Others have simply interpreted a weak employment elasticity value as an indicator of jobless growth. Furthermore, while some studies have used the production theoretical framework to estimate a standard demand for labour equation, others have relied on the classical version of the business cycle theory, which assumes random fluctuations (or business cycles) that are in turn responsible for fluctuations in employment.

A number of the studies which were reviewed in this chapter used quantitative and statistics-based approaches to investigate the empirical relationship between economic growth, employment and other policy and institutional variables suggested by theory. In summary, a review of these studies demonstrated that most regions displayed mixed effects of the responsiveness of employment to changes in output growth. For instance, in developed countries, during the period 1960-1994, studies reviewed confirmed that output growth rates had a statistically significant influence on employment outcomes. However, recent studies have also found that employment intensity in the North American sub-region have been decreasing whereas in Western Europe it has been increasing.

In other exceptional cases, jobless growth was found to exist in countries such as the United Kingdom, Italy, France and Belgium. This phenomenon has been attributed to technological changes, structural changes, and changes in macroeconomic variables.

With regards to transition economies, the employment-growth relationship was found to be rather dynamic. This was owing to the on-going adjustment processes that were attributed from an incomplete transition and market rigidities. During the periods of early transition, the employment elasticity value was found to be insignificant and negative. However, as the transition advanced, the link between employment and growth showed a strong improvement.

In the Asian and Pacific region, studies done covering the period 1980-2011 revealed a statistically significant relationship between employment and economic growth. These studies supported the proposition of a long run relationship between employment and economic growth in most countries in the region, except for the Philippines and Taiwan, China.

A similar pattern emerged in the Latin American and Caribbean region, showing a positive response in employment to changes in output growth. A number of the studies reviewed, most of them done between 1960 and 2010, indicated a positive and significant value of employment elasticity. In some cases this value was found to be diminishing overtime and this was reaffirmed by the region's overall increase in the unemployment rate.

Studies on the African and Middle East region, showed a high employment elasticity value relative to the regions of the world due to this region's unique growth, population, poverty and employment profile. In fact, these studies found that the overall employment elasticities were relatively higher in the Middle East sub-region than in the Northern and sub-Saharan Africa between 1991 and 2003. Within the Middle East, the high elasticity value for Turkey and Egypt was indicative of the fact that these countries were able to create jobs much faster while growing than their peers within the sub-region.

At a sectoral level, the Middle East and North Africa experienced high employment elasticities in the agricultural sector compared to the industry and services sectors. The high employment elasticity the agricultural sector was suggestive of falling productivity levels in this sector.

In the sub-Saharan Africa, employment elasticity was the highest in the industry and services sectors. Value-added growth in these sectors was driven largely by employment gains, even though not sufficient enough to reduce poverty levels.

A review of studies in some of the BRICS countries revealed that, between 1990 and 2000, employment elasticity was the highest in Brazil (0.7) followed by South Africa (0.6) than India (0.3) and China (0.1). At a sectoral level, the employment elasticity trends were heterogenous across sectors, reflecting on country-specific factors, such as the labour market structure and composition, as well as labour market regulations and policies.

In South Africa, the differences in employment elasticity outcomes identified in the studies reviewed shed some light about country's production. The low and deteriorating employment elasticity reported by most studies indicate that production may have shifted in favour of capital-intensive sectors, to the detriment of labour-intensive ones. Other studies were able to show that the challenge of joblessness in South Africa, was attributed to factors such as the comparatively weak long-term growth, globalisation and labour legislation, crime and corruption, as well as increasing capital intensity. The main findings for each of the studies reviewed are discussed in Appendices 1.1 and 1.2.

The next chapter of this study discusses the empirical labour demand model of the South African economy and presents the methodology to be used to investigate the sectoral employment of output growth.

CHAPTER FOUR
MODELLING SECTORAL EMPLOYMENT ELASTICITIES IN SOUTH AFRICA

4.1. INTRODUCTION

In the previous chapter we examined empirical studies of the relationship between GDP and employment, both within the South African context and internationally. Within the South African context, the employment performance of the economy was discussed, as well as the concerns expressed about the inability of the South African economy to provide adequate employment for the increasing number of job seekers, hence 'jobless growth'. The purpose of this chapter is to explain the empirical labour demand model of the South African economy, which will be used to investigate the sectoral employment intensity of output growth in the following Chapter Five. The labour demand model will be incorporated into an econometric model to investigate empirically how the sectoral employment intensity of growth has evolved in the eight major Standard Industrial Classification (SIC) divisions of the economy, with a view to identifying key growth sectors that are employment-intensive.

This chapter is divided into five sections. Section 4.2 discusses the empirical labour demand model of the South African economy. Section 4.3 presents the methodology used to investigate the sectoral employment of output growth, while section 4.4 discusses the sources of data to be used. The last section 4.5 concludes the chapter.

4.2. THE LABOUR DEMAND MODEL

In a macro-production function of the economy, labour input (demand for labour) and the other complementary factors of production are combined to produce the national output. The demand function for labour can be derived either from a Cobb Douglas production function or a Constant Elasticity of Substitution (CES) production function, by solving the marginal product of labour equation for labour input variables (Upender, 2006). The choice of the Cobb Douglas function is appropriate for generating an employment function when the regression coefficient of output is close to unity. The alternative choice of using CES is appropriate where the regression coefficient of output is significantly different from unity.

To generate an appropriate employment function, this study uses the CES production function, since the regression coefficients of sectoral output in some sectors were found to be significantly different from unity. The CES production function can be specified as follows:

$$GVA_t = A \{\alpha K_t^{-\rho} + (1-\alpha) E_t^{-\rho}\}^{-\eta/\rho} \quad (1)$$

where

GVA_t = Gross Value Added (sectoral output)

K_t = Capital (input)

E_t = Employment/labour (input)

A = Efficiency parameter; $A > 0$

η = Returns to scale parameter; $\eta > 0$

α = Distribution parameter; $0 < \alpha < 1$

ρ = Extent of substitution (between K and E) parameter, $\rho > -1$, and related to elasticity of substitution; $\sigma = 1 / 1+\rho$

The derivative of labour (i.e. the marginal product of labour (MP_L)) from Equation (1) can be written as follows:

$$dGVA_t / dE_t = \eta (1-\alpha) / A^{\rho/\eta} . GVA_t^{(1+\rho)/\eta} / E_t^{\rho+1} \quad (2)$$

The above MP_L expression is solved for the E_t input variable to derive the empirical labour (employment) demand function:

$$\eta (1-\alpha) / A^{\rho/\eta} . GVA_t^{(1+\rho)/\eta} = E_t^{\rho+1}$$

$$[\eta (1-\alpha) / A^{\rho/\eta} . GVA_t^{(1+\rho)/\eta}]^{1/\rho+1} = E_t$$

$$E_t = [\eta (1-\alpha) / A^{\rho/\eta} . GVA_t^{(1+\rho)/\eta}]^{1/\rho+1}$$

$$E_t = [\eta (1-\alpha) / A^{\rho/\eta}]^{1/\rho+1} . GVA_t^{(1+\rho/\eta)(1/\rho+1)}$$

$$E_t = \beta_0 GVA_t^{\beta 1} \quad (3)$$

where

$$\beta_0 = [\eta (1-\alpha) / A^{\rho/\eta}]^{1/\rho+1}$$

$$\beta_1 = (1+\rho/\eta)(1/\rho+1)$$

$$\beta_1 = 1+\rho/\eta . \sigma$$

σ (elasticity of substitution) $= 1/\rho+1$

Log-transformation of Equation (3) yields the following employment function:

$$ln\ E_t = ln\ \beta_0 + \beta_1\ ln\ GVA_t$$
$$= \beta_0 + \beta_1\ ln\ GVA_t + \ \ldots\ \ \beta_n\ lnX_{nt} + \varepsilon_t \qquad (4)$$

where $\beta_0 = ln\ \beta_0$.

This model is linear in parameters β_0 and β_1, and a linear regression model therefore exists. Although it is clear from Equation (1) that the relationship between output and the two inputs (labour and capital) is nonlinear, it is linear in the logs of these variables. Therefore, Equation (4) is a double-log linear regression model.

4.3. METHODOLOGY

While previous studies have investigated the relationship between aggregate GDP and employment in South Africa, this study focuses on the single-digit code of the major Standard Industrial Classification (SIC) divisions of the economy (i.e. the main economic sectors). Two approaches will be used to assess and quantify the linkage between sectoral output growth and employment, namely the arc elasticity of employment and the econometric method of regression analysis.

4.4. ARC ELASTICITY OF EMPLOYMENT APPROACH

The first technique to be used is the arc elasticity of employment. This method has recently been used by Hodge (2009) and Kapsos (2005) in their studies for computing a convenient measure of employment intensity of growth, provided by the elasticity of employment with respect to output growth. The arc elasticity of employment is expressed as a proportionate change in employment divided by a proportionate change in output over a given period, which can be summarised as follows:

$$\varepsilon_t = \frac{(E_t - E_{t-1} / E_{t-1})}{(Y_t - Y_{t-1} / Y_{t-1})} \qquad (5)$$

The numerator gives the percentage of employment (E) between the periods t and t-1, whereas the denominator expresses the percentage change in output (Y_t). Kapsos (2005) explains the link between output and employment by introducing a third variable, labour productivity:

$$Y_t = E_t \times P_t \quad (6)$$

where Y_t and E_t are, as before, output and employment, while P_t is equal to labour productivity (output per worker). If we assume that current and past employment rates, as well as past changes in productivity rates, as variables on the right-hand side, both explaining the variation in output growth rates on the left-hand side, the following holds:

$$\Delta Y_t = \Delta E_t + \Delta P_t \quad (7)$$

In other words, for a given amount of output growth, ΔY, any increase in the rate of employment growth must be met by an equal and opposite decrease in labour productivity growth and vice versa. When drawing conclusions about employment elasticities, it is thus also necessary to consider the productivity side of the relationship. If Equation (7) is divided by output growth, ΔY, it can be concluded that:

$$\varepsilon_t = 1 - \frac{\Delta P}{\Delta Y}, \text{ where } \varepsilon_t = \frac{\Delta E}{\Delta Y} \quad (8)$$

The ILO study by Kapsos (2005) clarifies the relationship between employment elasticities (ε_t), output, employment and productivity as set out in Table 4.1 below. The table summarises the inferences that can be drawn from examining employment elasticities and GDP growth rates together.

Table 4.1: Interpretation of employment elasticities.

	GDP growth	
Employment elasticity (ε)	**Positive GDP growth**	**Negative GDP growth**
$\varepsilon < 0$	(-) employment growth (+) productivity growth	(+) employment growth (-) productivity growth
$0 \leq \varepsilon \leq 1$	(+) employment growth (+) productivity growth	(-) employment growth (-) productivity growth
$\varepsilon > 1$	(+) employment growth (-) productivity growth	(-) employment growth (+) productivity growth

- The upper left-side box shows that countries with a positive GDP growth rate and negative employment elasticity are associated with negative employment growth and positive productivity growth.

- The middle left-side box indicates that countries with a positive GDP growth and employment elasticity coefficient between 0 and 1 are associated with positive employment and productivity growth, whereby a higher elasticity within this range indicates more employment-intensive (low productivity) growth.

- The lower left-side box shows that economies with a positive GDP growth and employment elasticity greater than 1 have positive employment growth and negative productivity growth.

- The three boxes in the right-side column have a direct opposite interpretation of the relationship between employment elasticity and GDP growth rates, and thus provide information about employment and productivity.

According to Kahn (2001), employment elasticities for developing economies should be about 0.7 until these economies attain upper middle income status. His study demonstrated that elasticities will gradually fall as a country becomes more developed and less labour-abundant. He argued that labour-abundant economies, particularly those with high incidences of poverty, must achieve relatively higher employment intensity than the less labour-abundant economies.

While the arc elasticity methodology is computationally simple, it has been shown that year-on-year employment elasticities calculated using this method tends to have a high level of instability (Islam and Nazara, 2000). Ajilore and Yinusa (2011) raised a similar concern regarding the usefulness of arc elasticity measures for forecasting purposes where, for example, the base year is abnormal, such that the elasticity obtained does not reflect the 'normal' relationship between employment and output. Their study revealed that in Botswana, for instance, the base year for certain industries is represented by a large number of traditionally low productivity, labour-intensive activities, which will no longer be representative of subsequent activities under a different investment incentive programme that favours capital-intensive industries.

4.5. ECONOMETRIC APPROACH

The second technique involves applying the econometric method of regression analysis adopted from the works of Fofana (2001); Kapsos (2005); Ajilore and Yinusa (2011); Bhorat and Oosthuizen (2008); Sawtelle (2007); Upender (2006); and Mahadea and Simson (2010). A number of quantitative and statistics-based studies have investigated the empirical relationship between economic growth, employment and other policy and institutional variables suggested by theory using the regression analysis approach. Fofana (2001) investigated the empirical relationship between employment and GDP in Cote d'Ivoire, and concluded that it was negative. In his study, he used simple regression analysis to assess the linkage between employment and other selected variables such as GDP, public expenditure, investment and development aid.

After undertaking a series of tests on the data, including a unit root test for stationarity in the variables, and a cointegration test to determine the existence of long-run relationships, his study found that the employment elasticities of growth, aid, expenditure and investment were

-0.11, -0.09, 0.02 and 0.26 respectively. Since employment and growth were found to be negatively correlated, the study concluded that the possibility of jobless growth exists in the country, and that relying solely on macroeconomic equilibrium was not enough to tackle the challenge of unemployment. The study recommended that efforts should focus on developing employment-generating strategies through increased investments and the reorientation of investments towards employment-intensive activities.

Kapsos (2005) used a cross-country panel data regression analysis for 160 economies. In his study he examined employment elasticities for the general employed population, the demographic groupings (such as women and youth) and the three broad economic sectors, namely agriculture, industry and services, between 1991 and 2003. His study used a multivariate log-linear regression model with country dummy variables to generate point elasticities. The study established that while the ratio of employment growth to total output growth had been approximately 0.34 in the mid-1990s, it had, however, declined to 0.30 during the period 1999 to 2003. This was attributed to the global slowdown that occurred in 2001. Other regional trends presented in the study reflected a wide variation in employment intensity among regions. For instance, Africa and the Middle East registered the most employment-intensive growth between 1991 and 2003, which is a reflection of the regions' large surplus labour. In addition, the study found that the rapid economic growth in the Asian and Pacific regions had led to larger productivity gains. This differs from the evidence presented on North America and Western Europe, which supports the notion of a structural divide between the two regions. In other words, during the period under review, employment intensity in the North American region was found to be decreasing, whereas in Western Europe it was found to be increasing. This is in line with the finding of Mourre (2004) that employment elasticity in the Euro area increased from 0.4 to 0.6, whereas it fell from 0.6 to 0.4 in the United States during the periods 1986 to 1990 and 1997 to 2000. His study further examined employment intensity of growth in different economic sectors and concluded that in the Euro area, the services sector reflected high employment elasticities between 1997 and 2001, which contributed to the region's overall employment elasticity.

A similar methodology was applied in the study by Ajilore and Yinusa (2011). Their study used regression analysis to calculate employment elasticity in Botswana during the period 1990 to 2008. It sought to estimate a labour demand model of a double-log linear specification by assessing the linkage between sectoral employment and other variables

included in the demand for labour model, comprising the real wage rate, user cost of capital, sectoral gross value-added, and a measure for international exposure. As a preliminary step in the econometric analysis of time series data, a unit root test was performed on all variables. The model was also tested for cointegration in order to determine the existence of a long-run relationship in the model variables. The results of the study indicated that the total employment intensity of growth in Botswana was quite low at 0.01. At a sectoral level, the study found that the employment elasticity of sectoral output growth in banking, commerce, construction, manufacturing and mining were positive but weak, indicating that growth in these sectors is more productivity-driven than labour employment-driven.

To capture the employment elasticities of the main SIC divisions of the economy and the differential partial elasticities of employment with respect to the real wage rate and user cost of capital, the double-log linear regression Equation (8) is extended and estimated. Equation (8) is rewritten as:

$$lnE_t = \beta_0 - \beta_1 \ln W_t + \beta_2 \ln r_t + \beta_3 \ln GVA_t + \beta_4 \ln \pi_t + \beta_5 \ln D_t + T_t + \varepsilon_t \quad (9)$$

where t = 1, …, 52 indicate quarters. The dependent variable, E_t , represents total formal non-agricultural employment, in thousands of persons in the respective economic sectors, in quarter *t*. A dummy variable, D_t, was created to cater for the 2008/9 financial crisis in the estimation. The eight economic sectors for employment are:

EMP_MIN = mining
EMP_MAN = manufacturing
EMP_UTIL = utilities
EMP_CON = construction
EMP_TRAD = trade
EMP_TRANS = transport
EMP_FIN = financial and business services
EMP_SOC = social and community services

The explanatory variables are:

W_t = quarterly nominal wages, seasonally adjusted, measured in millions of constant 2005 Rands.

r_t = is the user cost of capital, proxied by long-term bond interest rates.

π_t = inflation rate measured in terms of the Consumer Price Index (CPI).

D_t = 1 (if there is recession)

= 0 (otherwise)

GVA_t = gross value-added (GVA) in constant 2005 prices. The eight economic sectors for gross value-added are:

GVA_MIN = mining

GVA_MAN = manufacturing

GVA_UTIL = utilities

GVA_CON = construction

GVA_TRAD = trade

GVA_TRANS = transport

GVA_FIN = financial and business services

GVA_SOC = social and community services

TIME (T_t) = quarterly time trend variable, where t = 1 is April 2000 and t = 52 is December 2012.

ε_t = error term.

Thus, the functional relationship to be analysed in this study is as follows:

$$\begin{matrix} & (-) & (+/-) & (+/-) & (+) & (+) & (+) & (+) \\ E_{it} = f\ (W_t, & r_t & , \pi_t, & GVA\_MIN_t, & GVA\_MAN_t, & GVA\_UTI_t, & GVA\_CON_t \\ & (+) & (+) & (+) & (+) & & & \\ GVA\_TRA_t, & GVA\_TRANS_t, & GVA\_FIN_t, & GVA\_SOC_t), & & & & \end{matrix}$$

The model hypothesises that employment in persons (not hours) responds to macroeconomic variables, and that employment decisions by firms depend upon the most recent data

(previous quarter) known prior to the employment activity. The signs hypothesised for the model coefficients are as follows:

W_t : *negative*. An increased percentage change in nominal wages creates upward pressures on the cost per unit of production, causing employers to reduce their demands for labour.

r_t : *positive or negative*. An increase (decrease) in long-term bond interest rates will decrease (increase) the demand by employers for capital and will decrease (increase) the demand for consumer goods and services. The decreased (increased) demand for capital will decrease (increase) labour productivity, and the decreased (increased) demand for consumer goods and services will decrease (increase) the derived demand for labour. In these circumstances, employment would be inversely related to long-term interest rates. However, in some industries, capital may be a substitute for labour. Therefore, an increase in long-term bond interest rates may decrease the demand for capital, and consequently increase the demand for labour. In this case, long-term interest rates would be positively related to employment.

π_t : *positive or negative*. An increase in the rate of inflation as measured by the CPI implies higher marginal revenue products of labour, and therefore a subsequent increase in demand for labour by employers. Alternatively, an increase in the rate of inflation may decrease consumer demand for goods and services, thereby decreasing the derived demand for labour.

GVA_t : *positive*. The expansion of sector real gross value-added will generate increased derived demand for workers (not only worker hours) as employers view increased real sector output as a signal of future increased demand for final consumer goods and services.

The logarithmic specification of Equation (9) ensures that the β_i can be interpreted as elasticities (Kapsos, 2005). For instance, β_2 is the (partial) elasticity of employment with respect to the user cost of capital, holding all other things constant. Likewise, β_3 is the (partial) elasticity of employment with respect to output – in other words, it measures the percentage change in employment for a 1 percentage change in sectoral output (or GVA), holding other things constant. The parameter of primary interest in this study will be β_3, the sectoral output elasticity of employment, which will enable the identification of those sectors in the economy that are employment-intensive. A positive elasticity value of 0.5, for instance, implies that a 1 percentage point increase in gross value-added is associated with

half a percentage point increase in employment. The estimates of employment elasticity that will be generated from Equation (9) above are based on the assumption that employment is a primary function of output (Ajilore and Yinusa, 2011). Therefore, the elasticity coefficients that will be generated for individual economic sectors are indicative of the responsiveness of the employment to sectoral output.

4.5.1. Testing for Cointegration: The Engle-Granger Methodology

Engle and Granger (1987) propose a 'four step' testing procedure to determine whether or not the residuals of the variables in a long-run regression equation are stationary. In other words, it seeks to determine whether or not an equilibrium relationship exists between the variables. Each of the four steps of this procedure is explained below.

STEP 1: UNIT ROOT TEST

When dealing with time series data, it is important to assess whether or not the individual series are stationary, and several tests are available to do this. If the series under investigation are stationary, this means that the series do not exhibit unit roots, hence the series are said to be I(0). However, if the series are non-stationary in their level form, but stationary in the first difference form, they are said to be integrated of order 1 or I (1). Most time series are able to be classified as being integrated of order *d*, I(*d*), which means that the series must be differenced *d* times to produce a stationary time series. The most common approach for investigating the stationarity of a time series is the Augmented Dickey-Fuller (ADF) test proposed by Engle and Granger (1987). In this study, the ADF test will be used, which is written as follows:

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\beta_1} + \boldsymbol{\beta_2 t} + \boldsymbol{\delta Y}_{t-1} + \sum_{\boldsymbol{i=1}}^{\boldsymbol{m}} \boldsymbol{\alpha}_i \, \Delta \mathbf{Y}_{t-i} + \boldsymbol{\varepsilon}_t$$

where Y_t is the relevant time series, t is the time trend, ε_t a white noise error term, and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$. The hypothesis of the ADF test can be stated as follows:

Null hypothesis: Ho: $\beta = 0$

Alternative hypothesis: $H_1: \beta < 0$

If the null hypothesis is not rejected, this implies that the time series is non-stationary. Similarly, a rejection of the null hypothesis implies that the time series is stationary or I(0). A time series is said to be stationary when the process by which the data is being generated is the same over time. In other words, the series' mean, variance and covariance with lagged values of itself should not change with time (Hansen and King, 1996). The study by Song and Witt (2000) discussed the importance of selecting the appropriate lag length for time series data, since the ADF test tends to over-reject the null hypothesis when using too few lags, and to reduce the degrees of freedom when there are too many lags. This study uses the Schwarz Information Criterion (SIC) to select the appropriate lag length of the ADF test.

STEP 2: COINTEGRATION TEST

Cointegration tests are used to determine whether there is a long-run relationship between the variables in a model. If two time series *Yt* and *Xt* are both I(*d*), then any linear combination of the two time series will also be I(*d*). This means that the residuals obtained from regressing Y_t on X_t are I(*d*). Suppose, for example, that $Y_t = \beta_1 X_{1t} + \beta_2 X_{2t} + \varepsilon_t$, where $Y_t \sim$ I(0), $X_{1t} \sim$ I(1) and $X_{2t} \sim$ I(1), then $\varepsilon_t \sim$ I(1). However, a cointegrating vector ($\beta_1 \beta_2$) could exist, such that ($\beta_1 X_{1t} + \beta_2 X_{2t}$) ~ I(0). In such a case, ε_t will be stationary, since $Y_t \sim$ I(0) and also ($\beta_1 X_{1t} + \beta_2 X_{2t}$) ~ I(0). If two series are non-stationary but their linear combination is stationary, the two series are said to be cointegrated. In other words, the two series move together at the same rate in the long run.

The theory of cointegration was first developed and introduced by Engle and Granger (1987). Since then, a number of methods for testing cointegration have been proposed in the general literature, such as the Johansen cointegration analysis and the Cointegrating Regression Durbin-Watson (CRDW) test. This study will apply the ADF unit root test on the residuals, which is commonly known as the Engle-Granger cointegration test.

From Equation (9), the signs of the parameters are expected to be $\beta_1 < 0$, $\beta_2 >$ or < 0, and $\beta_3 > 0$. The residual-based ADF test for cointegration will determine whether or not these

variables are cointegrated. Cointegration would suggest that there is a long-run or equilibrium relationship between them.

If the variables are cointegrated, an Ordinary Least Squares (OLS) regression would yield a consistent estimator of the cointegrating parameters β_1, β_2 and β_3. The OLS method will be used to determine the parameters of the equation. It is one of several methods of obtaining the sample regression function (SRF) as an estimator of the true population regression function (PRF). It is based on the principle that the estimators of the parameters of PRF are chosen in such a way that the residual sum of squares (RSS) $\sum e_i^2$ are as small as possible. In other words,

$$\sum e_i^2 = \sum (Y_i - \hat{Y}_i)^2$$

$$= \sum (Y_i - \hat{\beta}_1 - \hat{\beta}_2 X_i)^2$$

The OLS method is popular because of its many desirable features. Given the assumptions of the classical linear regression model, OLS estimators (in the class of unbiased linear estimators) have minimum variance. This means that they are BLUE (best linear unbiased estimators). Therefore, this study employs the OLS method to estimate the β_s more accurately and to satisfy the BLUE property. In the OLS results, R^2 reflects the regression equation's ability to determine the dependent variable's behaviour. In other words, it measures the proportion or percentage of the total variation in the dependant variable explained by the regression model (i.e. goodness of fit). However, since the conventional R^2 does not take the degree of freedom into account, this study makes use of the adjusted R^2 as a measure of goodness of fit that is adjusted for the degrees of freedom. The study also uses a logarithm model so that the parameters of the model can be interpreted as elasticities.

STEP 3: ERROR CORRECTION MODEL

Having obtained the estimates of the long-run relationship, the next step of the Engle-Granger procedure is to estimate the short-run Error Correction Model (ECM). The residuals from the long-run equation (ε_{t-1}) are used to obtain information about the speed of adjustment to equilibrium. Given the long-run equation $Y_t = \beta X_t + \varepsilon_t$, the ECM formation of the dynamic

autoregressive distributive lag (ARDL) model $Y_t = \alpha_0 + \gamma_0 X_t + \gamma_1 X_{t-1} + \alpha_1 Y_{t-1} + \upsilon_t$ is derived as follows:

$$Y_t - Y_{t-1} = \alpha_0 + \gamma_0 X_t + \gamma_1 X_{t-1} + \alpha_1 Y_{t-1} - Y_{t-1} + \upsilon_t$$

$$\Delta Y_t = \alpha_0 + \gamma_0 X_t + \gamma_1 X_{t-1} - (1 - \alpha_1) Y_{t-1} + \upsilon_t$$

$$\Delta Y_t - \gamma_0 X_{t-1} = \alpha_0 + \gamma_0 X_t - \gamma_0 X_{t-1} + \gamma_1 X_{t-1} - (1 - \alpha_1) Y_{t-1} + \upsilon_t$$

$$\Delta Y_t = \alpha_0 + \gamma_0 \Delta X_t + \gamma_0 X_{t-1} + \gamma_1 X_{t-1} - (1 - \alpha_1) Y_{t-1} + \upsilon_t$$

$$\Delta Y_t = \alpha_0 + \gamma_0 \Delta X_t + (\gamma_0 - \gamma_1) X_{t-1} - (1 - \alpha_1) Y_{t-1} + \upsilon_t$$

$$\Delta Y_t = \gamma_0 \Delta X_t - (1 - \alpha_1)[Y_{t-1} - \alpha_0 / (1 - \alpha_1) - (\gamma_0 - \gamma_1) / (1 - \alpha_1) X_{t-1}] + \upsilon_t$$

ECM: $$\Delta Y_t = \gamma_0 \Delta X_t - (1 - \alpha_1)[Y_{t-1} - \beta_0 - \beta_1 X_{t-1}] + \upsilon_t$$

where $\alpha_1 < 1$. The long-run equilibrium is represented by the lagged residual $\varepsilon_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1}$. When the equilibrium condition holds, $\varepsilon_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1} = 0$. However, during periods of disequilibrium, it measures the distance away from equilibrium and $\varepsilon_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1}$ is known as the error-correction term. The size of the coefficient $-(1 - \alpha_1)$ indicates the speed of adjustment towards equilibrium, such that small values of $-(1 - \alpha_1)$ tending to -1 indicate that economic agents remove a large percentage of disequilibrium in each period (i.e. adjustment is rapid). Larger values tending towards 0 indicate a slow adjustment, while extremely small values less than -2 indicate an overshooting of equilibrium. A zero value is indicative of no adjustment (i.e. equilibrium condition). Positive values imply that Y_{t-1} diverges from the long-run equilibrium path, which is inconsistent with the notion of economic equilibrium and short-run adjustment.

STEP 4: DIAGNOSTIC TESTING

After the error correction model is estimated, it is important to assess the adequacy (or appropriateness) of the model. To assess model adequacy, diagnostic tests are conducted on the error correction model to determine whether or not any of the assumptions of the classical normal linear regression model have been violated. These tests include the Jarque-Bera test for normality, which indicates that the residuals are normally distributed, with a zero mean and variance; the Ljung-Box Q test of no autocorrelation in residuals; the Breusch-Godfrey LM test for serial autocorrelation; the ARCH-LM test for no autoregressive conditional

heteroscedasticity; White's test for heteroscedasticity; and Ramsey's RESET, which is a general test for model misspecification.

The Engle-Granger 'four step' testing procedure has gained popularity due to its simplicity in estimating a static model using OLS, and then performing a unit root test on the residuals. Also, by estimating the short-run Error Correction Model using the residuals from the estimated long-run regression equation, it is possible to obtain information regarding the speed of adjustment back to equilibrium. This method has been widely used in the context of employment intensity of output growth by authors such as Fofana (2001); Kapsos (2005); Ajilore and Yinusa (2011); Sawtelle (2007); and Upender (2006).

4.6. DATA SOURCES AND DESCRIPTION

This study uses quarterly data covering the period from 2000:01 to 2012:04. The secondary data on the variables used in this empirical study include total employment, sectoral gross value-added, nominal wages as the price for labour, long-term bond interest rates as the price of capital, and the inflation rate. The data on employment was sourced from the Quarterly Labour Force Survey (QLFS) reports (various issues) of Statistics South Africa (STATSSA). Data on gross value-added (at constant 2005 prices) was also obtained from STATSSA. Data on wages, long-term bond rates and inflation rates were sourced from the South African Reserve Bank (SARB) database. Employment is measured as the number of employees in the South African non-agricultural formal sector. Sectoral output is proxied by gross value-added in constant 2005 prices. The nominal wage variable is measured as average employee earnings by sector in Rands. The inflation rate is measured in terms of the CPI, which is published in the South African Reserve Bank's Quarterly Bulletin Statistics.

4.7. SUMMARY AND CONCLUSION

This chapter explained the labour demand model that will be used to estimate employment elasticities at the sectoral level. The main focus is on the responsiveness of sectoral employment to changes in sectoral output. However, the model also includes nominal wages, the user cost of capital and the inflation rate as hypothesized determinants of employment. The theoretical model is linked to an econometric model, to allow for an empirical investigation of how the sectoral employment intensity of growth has evolved, as well as the

identification of key sectors that are employment-intensive. The chapter also explained the Engle-Granger cointegration methodology which will be used to estimate the model. In Chapter Five, the data are examined more closely using the various analytical techniques discussed in this chapter, to investigate the sectoral employment intensity of output growth in the eight SIC divisions of the economy.

CHAPTER FIVE

EMPIRICAL EVIDENCE: RESULTS AND INTERPRETATION

5.1. INTRODUCTION

The theoretical discussion provided in Chapter Two of this study, as well as the model specification of the demand for labour in Chapter Four, are the cornerstones of the empirical analysis presented in this section. This chapter seeks to interrogate the data more closely through the application of various analytical techniques, in order to investigate the sectoral employment intensity of output growth in the eight major Standard Industrial Classification (SIC) divisions of the economy. It will explain how the sectoral employment intensity of growth has evolved, with a view to identifying key growth sectors that are employment-intensive. Discussed below are the two approaches used to assess and quantify this employment-growth relationship, namely the simple arc elasticity of employment and the econometric method of regression analysis.

5.2. SIMPLE ARC ELASTICITY OF EMPLOYMENT, 1999-2012

The general perception of employment performance in South Africa has been rather negative. Critics argue that despite improved economic growth rates during the 1990s and 2000s, these gains have not been translated into increased utilisation of the country's labour resources. It is argued that, with the exception of the year 2008, the ratio of GDP growth to employment growth has been far less than 1, which indicates that South Africa's job creation performance against GDP has been rather weak for most years between 2002 and 2010 (Mahadea, 2012). In fact, according to Mahadea and Simson (2010), although the economy registered positive economic growth over the past 15 years since the demise of apartheid, the formal sector in South Africa has been unable to provide adequate employment for job-seekers. It is against

this backdrop that it is widely held that the South African economy has experienced 'jobless growth' during its past expansion phase.

According to the International Labour Organisation (ILO), jobless growth refers to GDP growth that is associated with a decline in the level of employment (Kapsos, 2005). Oosthuizen and Bhorat (2004) provide a conceptual definition of jobless growth, which refers to a situation where the overall economy is growing, but the absolute employment level is stagnant or falling, hence resulting in a near-zero or negative employment rate. An alternative, yet similar definition is provided by Altman (2003), who suggests that the term may be used to describe a situation whereby the overall economy is growing, while the rate of unemployment is rising, which means that employment growth is lagging behind labour force growth. Based on these broad definitions, an assessment of the employment intensity of growth will be done for the period 1999-2008, using the simple elasticity approach.

Table 5.1 below provides aggregate percentage changes in real GDP and employment, as well as employment elasticities, for the three periods under investigation. The employment elasticity estimates were generated using the arc elasticity of employment, as outlined in Chapter Four of this study. According to Loots (1998), these are not output-employment elasticities, but they have nevertheless been used to provide evidence of the notion of jobless growth. The table indicates a variation in employment elasticities during the periods under review. In other words, during the four periods between 1999 and 2012, for every percentage point increase in real GDP, total employment grew within the range of 0.13 and 2.76 percentage points. Between 1999 and 2002, the employment elasticity was 1.03 per cent, which suggests that a 1 percentage increase in GDP was accompanied by a 1.03 percentage increase in employment. Similarly, a study by Oosthuizen and Bhorat (2004) found that the simple output elasticity of total employment for the period 1995 to 2002 was 0.81. It is also important to note that of these four periods, employment generation was the strongest in the period from 2002 to 2005. It is during this period that employment elasticity was 2.76 per cent and this was also a period of rapid growth. According to the Survey of Employment and Earnings in Selected Industries (SEE), which was conducted by Statistics South Africa, approximately 4.63 million people were employed in the formal non-agricultural sectors of the economy at the end of March 2002. This reflects an annual decrease of 0.9 per cent or approximately 40 000 employees since March 2001 (SARB, 2002).

However, from 2005 to 2008, employment elasticity fell to 1.24 per cent from 2.76 per cent registered in the period 2002 to 2005. During the most recent period, between 2008 and 2012, employment elasticity deteriorated further to 0.13.

This is a reflection of the consequences of the financial market turmoil that intensified towards the end of 2008, as well as the environment of tighter monetary policy aimed at containing inflationary pressures, which severely affected employment levels, especially the export-oriented sectors of the economy (SARB, 2008). Employment losses, particularly in the manufacturing, as well as trade, catering and accommodation services sectors, suppressed growth in overall employment in the formal non-agricultural sector in 2008. Nevertheless, these results still suggest that output and employment have expanded during the post-apartheid era, which indicates that growth has not been jobless. On the other hand, this does not imply that employment generation has been adequate. Recent calculations reveal that South Africa needs GDP growth of around 5.4 per cent in order to reduce unemployment to acceptable levels (National Planning Commission, 2011). With a growth of this magnitude, it is estimated that unemployment would fall to 6 per cent by 2030 and that 11 million more jobs would be created over the next 20 years.

Table 5.1: Real GDP, employment and employment elasticities in the non-agricultural formal sector, South Africa, 1999 – 2012.

	Annual percentage change		
	Real GDP	**Employment**	**Employment elasticity**
1999 - 2002	3.2	3.3	1.03
2002 - 2005	4.1	11.3	2.76
2005 - 2008	5.0	6.2	1.24
2008 - 2012	2.3	0.3	0.13

Source: Author's own calculations using SARB data (various years).

According to the National Development Plan (2011), although it is acknowledged that the acceleration of economic growth could advance employment creation, lifting the current binding constraints could be an effective way of spurring labour-absorptive growth. While many of these factors are already policy commitments, very little has materialised yet in this regard.

While aggregate data may suggest that the total employment elasticity of growth remained positive during the four periods, between 1999 and 2012, the relationship between output and employment elasticity varied significantly across sectors. Table 5.2 below illustrates the sectoral employment elasticities and gross value-added growth by economic sector.

Table 5.2: Employment elasticities and growth in value added by economic sector, South Africa, 1999 – 2012.

	Employment elasticities				Value added growth			
	1999 - 2002	2002 - 2005	2005 - 2008	2008 - 2012	1999 - 2002	2002 - 2005	2005 - 2008	2008 - 2012
Construction	-1.35	-0.22	0.54	0.49	3.76	8.63	11.47	4.20
Finance	1.29	0.58	0.40	0.44	5.68	5.96	7.65	3.23
Manufacturing	-0.45	0.18	-0.04	-17.73	3.66	3.10	5.13	-0.14
Mining	-7.88	1.52	-3.22	-0.86	-0.42	1.72	-1.31	-1.06
Social and personal services	-0.81	0.49	0.59	0.91	0.54	2.71	4.14	2.93
Trade	0.34	0.39	0.51	0.52	4.96	4.35	4.83	1.99
Transport	-0.56	0.09	0.17	2.02	7.11	6.39	5.25	2.45
Utilities	-1.73	0.06	2.33	-18.65	0.62	4.64	2.26	-0.19

Source: Author's own calculations using QUANTEC data.

Beginning with **Construction**, it is clear that this sector experienced diverse employment outcomes. Between 1999 and 2005, the employment elasticity reflects the sector**'**s very poor employment generation. This sector experienced employment losses, largely due to the contraction in activity with regard to residential construction, as financing costs increased and the weak housing market translated into fewer building plans being approved (SARB, 1999). During the period 2005 to 2008, the sector witnessed accelerated value-added growth rates alongside an increase in employment intensity. The recovery of employment performance was evidenced by the large number of jobs that were created as non-residential building activity countered the depressed situation in residential building activity (SARB, 2008). The most recent period witnessed a decrease in employment elasticity, coupled with a substantial decline in value-added growth. This suggests that the reduction in output in this sector was met with a relative decline in employment growth than in productivity growth.

The employment elasticity figures in the **Finance** sector show an almost opposite pattern to those of the construction sector. The employment elasticity values in the finance sector exceeded those in the construction sector during the initial periods. The sector experienced

overall increases in value-added growth ranging between 3.23 and 7.65 per cent throughout the entire period under review. During these four periods, growth in the finance sector averaged 5.6 per cent per annum, thereby making a substantial contribution to real gross domestic production. This is the largest and fastest growing segment of the South African economy (Altman, 2006). According to O'Connell (1999), developed economies that have succeeded in dealing with the challenge of high unemployment have relied on the expansion of high-value services such as finance, business and professional services. Previously, this sector had relied on the growth of other sectors – however, given increasing segmentation and niching, this sector has become a driver for growth (Altman, 2006). This is indicative of the sectoral shift that characterised the output structure of the South African economy from the 1970s until recently, from primary and secondary sector activities to tertiary sector activities (Bhorat and Oosthuizen, 2008).

The intensification of value-added output by the tertiary sector has subsequently impacted the nature of employment shifts in the economy. The finance sector has become an important contributor to private sector employment. According to STATSSA, in 2003 there were about 357 000 individuals working in the finance and related industries, with a further 1.77 million people in the business services and wholesale and retail trade industries (STATSSA, 2003). It has been reported that these sectors have been growing at a rate of 3 to 5 per cent per annum (Altman, 2006). This reaffirms the argument by Bhorat and Oosthuizen (2008) that the structure of South Africa's domestic production is now more readily characterised by a large share of tertiary output, hence removing concerns that the South African economy is overly resource-based.

Manufacturing has experienced low and declining employment elasticities. The issue of low employment elasticity amplifies the significance of the intensification of the changing structure of the economy, which is shifting away from both the primary and secondary sectors towards tertiary or service-based output. Between 2002 and 2005, value-added growth in the manufacturing sector declined from 3.66 to 3.10 per cent, before rebounding to 5.13 per cent during the period 2005 to 2008. The decline in manufacturing output growth between 2002 and 2005 coupled with an increase in employment elasticity of 0.18, implies that this sector experienced low productivity growth in this period. Also, it is important to note that even though the sector maintained positive value-added growth during the periods 1999-2002; 2005-2008 and 2008-2012, employment elasticity remained negative. This

reinforces the fact that South Africa has increasingly specialised in capital- intensive products, after having shifted production in favour of capital-intensive sectors to the detriment of labour-intensive ones (Samson *et al*., 2001). Accordingly, the manufacturing sector had been shedding jobs almost uninterruptedly from the mid-1990s until the second quarter of 2011, with an estimated 30 per cent of the manufacturing workforce being dismissed during this period (SARB, 2012). These job losses have continued despite steady increases in gross fixed capital formation in the manufacturing sector throughout this period, as the sector continued to mechanise in an effort to remain globally competitive.

Government interventions through various growth initiatives such as the Industrial Policy Action Plan (IPAP) and Manufacturing Competitiveness Enhancement Programme (MCEP) have been aimed at promoting job creation and supporting labour-intensive and value-adding manufacturing firms.

Mining performed even worse than manufacturing in terms of output and employment growth for the period as a whole. The sector experienced a negative value-added growth of 0.42 per cent during the first period between 1999 and 2002 which continued negative during the third and fourth periods. The poor performance by the mining sector, particularly during the 1999–2007 upward phase of the business cycle, indicates that the South African mining industry was not able to capitalise on the protracted buoyancy in commodity prices that largely characterised this period (SARB, 2008). Much of the contraction during this period was attributed to, among other things, rising input costs, closure of various mines and shafts owing to safety incidents, curtailment of electricity supplies, infrastructure constraints, regulatory constraints, shortages of appropriately skilled staff, and bottlenecks in the procurement of goods and services.

A look at the trends in employment elasticities reveals that there has been a deterioration in the sector's employment intensity of growth. Initially, the sector registered a significant negative employment elasticity value of 7.88 per cent in the first period. Accordingly, the sector incurred job losses in this period due to declining commodity prices, especially the price of gold which declined to a 20-year low by the middle of 1999 (SARB, 1999). Also, between 2005 and 2012, both employment elasticity and value-added growth were negative. Hence, the negative value-added growth rates of 1.31 per cent in 2005-2008 and -1.06 per cent in 2008-2012 were accompanied by job shedding in the sector. It was at this time that

the sector struggled, following the effects of the 2008 financial crisis which led to sharp contractions in value-added growth, which went hand-in-hand with negative employment elasticity.

In the **Social and Personal Services** sector, the sector-specific elasticity trend reveals an on-going structural change. Between 1999 and 2002, the negative employment elasticity value of 0.81 was accompanied by an increase in value-added growth of 0.54 per cent. This means that as sectoral output grew, jobs were shed in the industry. Thus, for every 1 percentage point increase in value-added growth, employment has been reduced by 0.81 percentage points. This implies that value-added growth in the community, social and personal sector has been driven by productivity growth, where an increase in value-added growth has been associated with a decline in employment. Being the single largest employer within this sector, the public sector made determined efforts to reduce its overall size of personnel during this period. The employment reduction in the public sector resulted primarily from a process of "right-sizing", which was aimed at enhancing the quality of public service delivery (SARB, 2001). In 2000, declines in employment were recorded at all levels of the public sector, ranging from 0.3 per cent in local government departments to 8.4 per cent in governmental transport, storage and communication. Public sector employment decreased further at a rate of 3.3 per cent in the year to March 2001, which was largely due to a spate of resignations and early retirements of employees in the sector.

Between 2002 and 2012, this sector maintained a sturdy momentum in terms of value-added growth. The strong growth in sectoral output resulted in a recovery in overall employment intensity from 0.49 during the second period to 0.91 during the last period. Between 2002 and 2005, a 1 percentage point increase in value-added growth was associated with a 0.49 percentage point increase in sectoral employment. Between 2008 and 2012, the employment intensity trend continued to increase to 0.91. These figures are a reflection of the progression of various initiatives introduced by government in an effort to enhance job creation. It was in this period that phase two of the extended public works programme was announced by government, with the aim of creating an additional 500 000 jobs by the end of 2009 (SARB, 2009). During this period, the public sector increased its employment significantly, thus reversing its previous attempts at right-sizing and shedding of less skilled employees.

In the **Trade** sector, employment elasticities ranged between 0.34 and 0.52 over the four periods. The smallest employment elasticity of output growth of 0.34 occurred between 1999 and 2002, which was also the period with the highest value-added growth. The subsequent periods have seen significant increases in employment elasticity, from 0.39 in 2002-2005 to 0.52 in 2008-2012. The value-added growth of 4.35 per cent between 2002 and 2005, as well as 4.83 per cent between 2005 and 2008, continued to sustain employment generation during this period. The employment gains during these two periods were largely attributed to the catering and accommodation sub-sectors, following a significant increase in tourism activity. According to the South Africa Reserve Bank's report (2002), the room and bed occupancy rates rose by 12.9 per cent and 13.7 per cent respectively in the year to March 2002, following the depreciation of the rand. According to Bhorat and Oosthuizen (2008), there has been a distinct shift in the share of employment across the nine main sectors of the economy since 1995. They argue that the wholesale and retail trade sector has become the single largest employer in the economy, signifying a change from the time when the public sector (contained within the community, social and personal services) remained the economy's single largest employer. It is asserted that such a change also reinforces the argument that South Africa's growth is consumption- rather than investment-driven, and the rise in employment in this final goods sector lends some credence to this view. Between 2002 and 2008, employment in this sector increased at a rate of 8.2 per cent annually (Bhorat and Oosthuizen, 2008). The rate of decline in value-added growth in the sector during the last period, between 2008 and 2012, was largely due to depressed economic conditions that adversely affected its three major sub-sectors, namely wholesale, retail and motor trade.

Transport experienced low employment elasticities during the first three periods. Between 1999 and 2002, value-added growth has been associated with a reduction in employment in the transport sector. The negative employment elasticity of 0.56 during this period points to the fact that this sector experienced labour-substituting productivity growth, where productivity gains were achieved at the expense of job shedding. Accordingly, unemployment rose during this period, due to a combination of factors that affected a number of other sectors. These included persistent pressures on domestic producers to be competitive in an increasingly globalised market, as well as the negative consequences of the increase in industrial action, which resulted in the loss of 3.1 million working days in 1999 (SARB, 2000). Further developments in the labour market that had a negative effect on employment

were related to aspects of the labour legislation dealing with unfair dismissal procedures, probation periods, retrenchments, conditions of employment.

The second, third and fourth periods witnessed a recovery in the sector's employment intensity of growth, with positive value-added growth rates being associated with employment creation.
Between 2002 and 2005, every percentage point of value-added growth was associated with an increase in employment of 0.09 per cent, 0.17 per cent in 2005-2008 and 2.02 per cent in 2008-2012. The relatively higher employment elasticities in the last period is indicative of a much stronger correlation between value-added growth and employment growth in this sector.

Between 1999 and 2002, employment elasticity in the **Utilities** sector reflected very poor employment generation, with a negative employment elasticity of 1.73 being registered during this period. Although this sector is relatively small in terms of employment, the private sector employment opportunities experienced in 2000 were more pronounced in the electricity-generating sector, reflecting a decrease in employment of 6.4 per cent in that year (SARB, 2001). Between 2002 and 2005, the sector had begun to experience more rapid value-added growth, coupled with an increase in employment elasticity. Accordingly, in 2005, employment recovered by 3.3 per cent, following a number of large projects in the electricity generation sector by Eskom, in an effort to boost existing electricity generation capacity (SARB, 2005).

Between 2005 and 2008, employment performance further improved. During this period, the sector's output grew by 2.26 per cent, with an elasticity of 2.33, indicating robust employment generation. Accordingly, in 2007, employment in the sector increased by 2.9 per cent, which was largely due to the process followed to meet the increased electricity demand through upgrades to existing electricity generating and transmission facilities at the Medupi, Kusile and Ingula power stations.

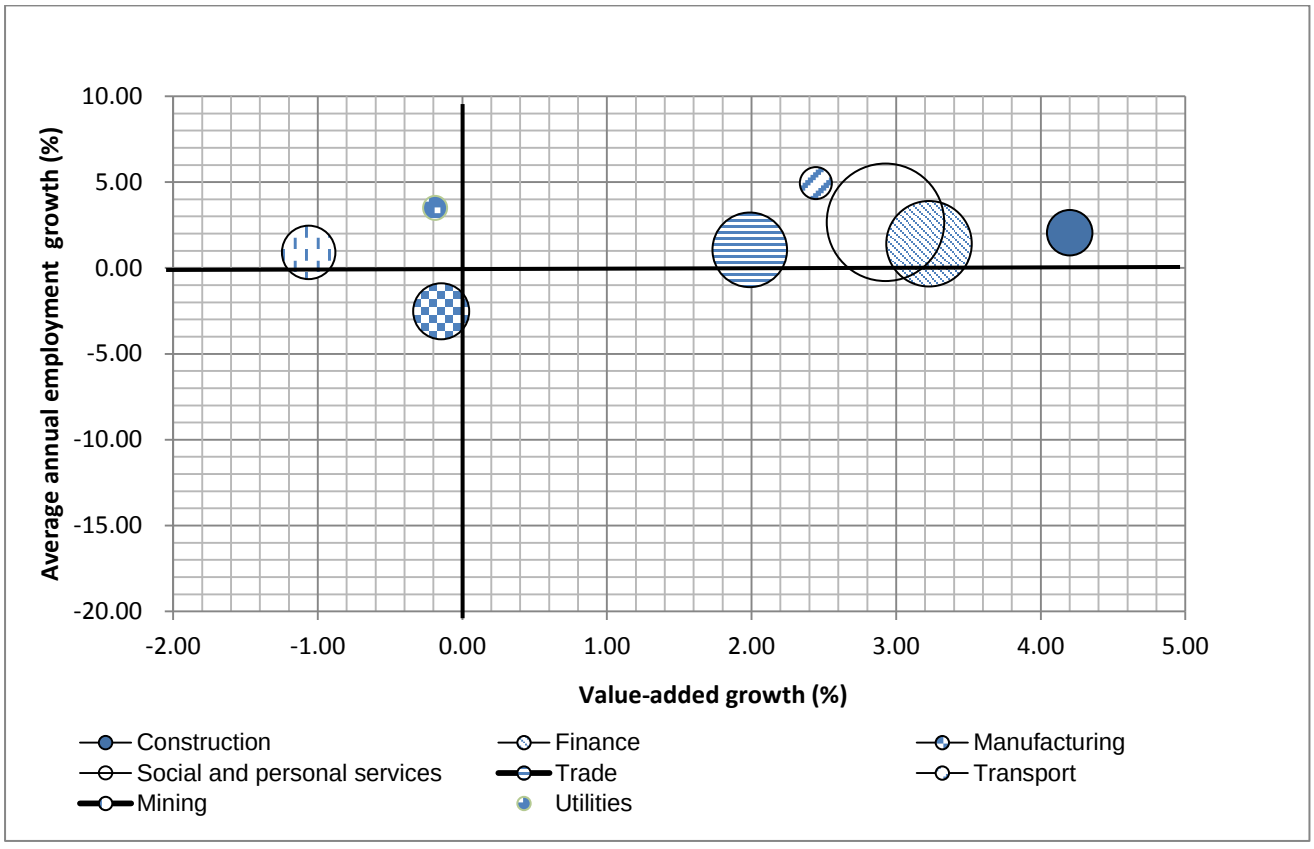
During the last period, between 2008 and 2012, employment elasticity significantly deteriorated reflecting the sector's very poor overall employment generation in the period. Accordingly, in 2009, the sector incurred substantial job losses at an annual rate of 2 per cent. Employment in the electricity generation sector decreased further in 2011, following labour

unrest at the construction site of Eskom's new Medupi power station (SARB, 2012). These job losses occurred in spite of the pressing demand for electricity and the large-scale expansion drive by the electricity-supply sector.

Based on the above discussion, it is clear that the response of employment generation to changes in value-added growth has been fairly heterogeneous across sectors. Changes in the level of employment creation could be related to general and sector-specific factors prevalent during a given period (Oosthuizen and Bhorat, 2004). Therefore, sectors that experience favourable economic conditions and increased output are more likely to create jobs than sectors that face less favourable economic conditions and falling output.

In Figure 5.1 below, value-added growth and employment growth are sectorally related in a manner that clearly identifies sectors that have performed best in terms of employment generation between 2008 and 2012.

Figure 5.1: Employment and value-added growth rates by sector, 2008-2010



Source: QUANTEC database (various years).

The figure uses information on value-added growth and employment growth between 2008 and 2012 in a four quadratic plane. It shows the variation of average annual employment growth among sectors. Each sector is represented by a circle and its size symbolises the relative size of employment in that sector in 2012. Therefore, a large circle would represent a sector that employs more people than a smaller circle. Most sectors experienced growth in both value-added and employment between 2008 and 2012, with the exception of the mining, manufacturing and the utilities sectors. The construction sector, with its very high value-added growth, experienced relatively low employment growth, which reflects the sector's robust labour productivity growth.

The finance sector grew fairly rapidly during this period and recorded a higher average annual employment growth rate of 1.42 per cent. According to the International Labour Organisation's Report (2011) on Key Indicators of the Labour Market (KILM), as with most parts of the world, the finance and services sectors have grown rapidly, while creating employment opportunities at the same time.

According to Altman (2006), the largest and fastest growing segments of the South African economy are now found in the services sector, from finance and business to community services. The services sector appears to be an important location for future job creation, and approximately 70 per cent of South African employment is found in this sector (Mayer, 2005). Sub-sectors within this sector were responsible for more than 7 million jobs in 2008, representing an average annual growth of 8.89 per cent. Employment in the finance sector recorded the largest increase of 3.09 per cent, followed by the trade sector with 2.47 per cent, and the social and personal services sector with 2.45 per cent.

The utilities sector's high employment growth and low value-added growth indicate that the sector has been sufficiently employment-intensive during this period. This follows the response by the sector towards meeting the pressing demand for electricity, as well as the large-scale expansion drive by the electricity supply sector. Given the implementation of a number of these and other projects, the electricity generation sector has contributed meaningfully towards employment creation during this period.

The mining and manufacturing sectors performed poorly in terms of their respective sectoral value-added growth and employment growth rates. The mining sector registered a negative value-added growth rate, despite a positive yet a more moderate employment growth. The contraction in value-added by the mining sector during this period was partly due to a decline in output volumes on account of a sharp decline in commodity prices. Also, apart from power outages which adversely affected total mining production, the mining sector experienced rising input costs and closures of various mines and shafts owing to safety audits.

The mining sector, being directly influenced by these constraints, experienced a reversal of earlier employment gains which then led to a more moderate average employment growth during this period (SARB, 2009).

The manufacturing sector recorded both negative employment growth as well as negative value-added growth of -2.54 per cent and -0.14 per cent respectively, during this period. In light of this, it would seem as though job shedding was indeed a characteristic feature of this sectors during this period. The poor employment outcome in the manufacturing sector can be attributed to the continuing process of mechanisation in an effort to remain globally competitive (SARB, 2012). In addition, the sector remains vulnerable due to a fairly depressed global demand for South African manufactured products, subdued domestic demand conditions, volatile exchange rate of the rand and industrial action.

There are a number of conclusions that can be drawn from the above discussions. Firstly, while the aggregate figures of employment elasticity suggest that jobless growth at a national level may not have occurred, certain sectors may have experienced a decrease in employment between 1999 and 2012. Secondly, sectors within the tertiary sector namely finance, trade, transport and the social and personal services have shown to be the best performing sectors. Thus the changing structure of the economy between 2005 and 2012 has been reflected in sectoral employment shifts away from the primary sector towards the tertiary sector. Thirdly, employment elasticities generated using the simple arc elasticity approach produced significant volatility. As can be seen in Table 5.2, the employment elasticities for each of the eight sectors fluctuated a great deal. Such volatility makes employment elasticities very difficult to use for policy formulation or monitoring purposes (Islam and Nazara, 2000).

A different method of producing a stable series of sectoral employment elasticity is an econometric technique. Oosthuizen and Bhorat (2008) suggested that employment elasticity of output growth could be more formally derived through the econometric estimation of a labour demand function. This method involves the estimation of Equation (9) in Chapter Four, for each sector, and the results are discussed below.

5.3. REGRESSION RESULTS OF THE ECONOMETRIC MODELLING OF EMPLOYMENT ELASTICITIES

This section presents the results and interpretation of the regression analysis based on the empirical tests and estimations that were undertaken. As a preliminary step in the empirical analysis, this study commenced by investigating the integration properties of the series. This was done in order to establish the presence of unit roots in the data and to apply appropriate modelling procedures. In other words, in order to determine whether a variable is stationary or non-stationary, it is important to test for the presence of unit roots, so as to avoid a spurious regression (Harris, 1995). By differencing data to remove the non-stationary (stochastic) trend, a spurious regression problem can be avoided. While there are several ways to test for the presence of unit roots in the data, this study utilised the Augmented Dickey-Fuller approach to test the null hypothesis that a series contains a unit root, against the alternative of stationarity. The results of the Augmented Dickey-Fuller test, as illustrated in Table 5.3 below, suggest that none of the variables are stationary in levels (except for interest rates, inflation and the utilities' employment series). This implies that the non-stationary variables must be differenced. Further tests indicated that the non-stationary variables are stationary after the first and second differencing, suggesting generally differenced stationary series of order one, I(1), and two, I(2), respectively.

Table 5.3: Augmented Dickey-Fuller (ADF) unit root test on series.

Series	Levels	First differences	Second differences
EMP_AGGR	-2.466	-3.636***	
EMP_CON	-1.636	-7.687***	
EMP_FIN	-1.395	-7.643***	
EMP_MAN	-2.938	-7.640***	
EMP_MIN	-1.581	-4.754***	
EMP_SOC	-2.299	-9.701***	
EMP_TRAD	-1.890	-6.741***	
EMP_TRANS	0.222	-7.630***	
EMP_UTIL	-3.956***		
GDP	-0.910	-4.380***	
GVA_CON	-2.003	0.974	-3.833***
GVA_FIN	-1.677	-2.377	-12.002***
GVA_MAN	-0.865	-3.718***	
GVA_MIN	-1.888	-11.919***	
GVA_SOC	-1.306	-1.739*	
GVA_TRAD	-0.653	-1.678	-124.969***
GVA_TRANS	-2.604	-3.933**	
GVA_UTIL	-1.950	-1.994**	
N_WAGE_AGGR	0.213	-7.603***	
N_WAGE_CON	-0.185	-7.696***	
N_WAGE_FIN	-0.962	-8.375***	
N_WAGE_MAN	0.227	-8.396***	
N_WAGE_MIN	-0.128	-8.103***	
N_WAGE_SOC	0.243	-3.337**	
N_WAGE_TRAD	-0.671	-7.577***	
N_WAGE_TRANS	-2.654	-9.148***	
N_WAGE_UTIL	0.699	-11.144***	
R_RATE	-3.316**		
INFL_RATE	-3.570***		

* statistically significant at 10% level.

** statistically significant at 5% level.

*** statistically significant at 1% level.

A long-run relationship between sectoral employment and other selected variables was also tested for using cointegration regression methodology, whereby the residuals obtained from the Ordinary Least Squares (OLS) estimation were subjected to unit root analysis. Empirical studies indicate that series that are cointegrated move together in the long run at the same rate, meaning that they obey an equilibrium relationship in the long run (Davidson and MacKinnon, 1993). This implies that if economic growth and employment are cointegrated, they should move together in the long run at the same rate. That is, economic growth should be employment intensive (Fofana, 2001). However, if the two series were not cointegrated, it is an indication of the possibility of jobless economic growth.

Based on the Engle-Granger (1987) cointegration test, the results suggest that the residuals from certain regressions were stationary, hence cointegrated. These results are presented in Table 5.4 below, which indicates four cointegrating regressions, namely in the finance and business services; manufacturing; transport; and utilities sectors, thereby suggesting a long-run relationship between employment and the other variables.

Table 5.4: Cointegration test on residuals from sectoral employment and other selected variables.

Industry Sector	t-Statistic (ADF test on residuals)	Decision
Aggregate economy	-3.02	Not co-integrated
Construction	-2.66	Not co-integrated
Finance and business services	-5.20***	Co-integrated
Manufacturing	-4.98**	Co-integrated
Mining	-3.23	Not co-integrated
Social and community services	-3.83	Not co-integrated
Trade	-2.89	Not co-integrated
Transport	-5.00***	Co-integrated
Utilities	-5.57***	Co-integrated

Notes: The critical values for the Engle-Granger cointegration test on regression residuals at 1%, 5% and 10% are -5.00173, -4.31461 and -3.97286, respectively. (*) indicate parameters are significant at 10% level; (**) significant at 5% level; and (***) significant at 1% level.

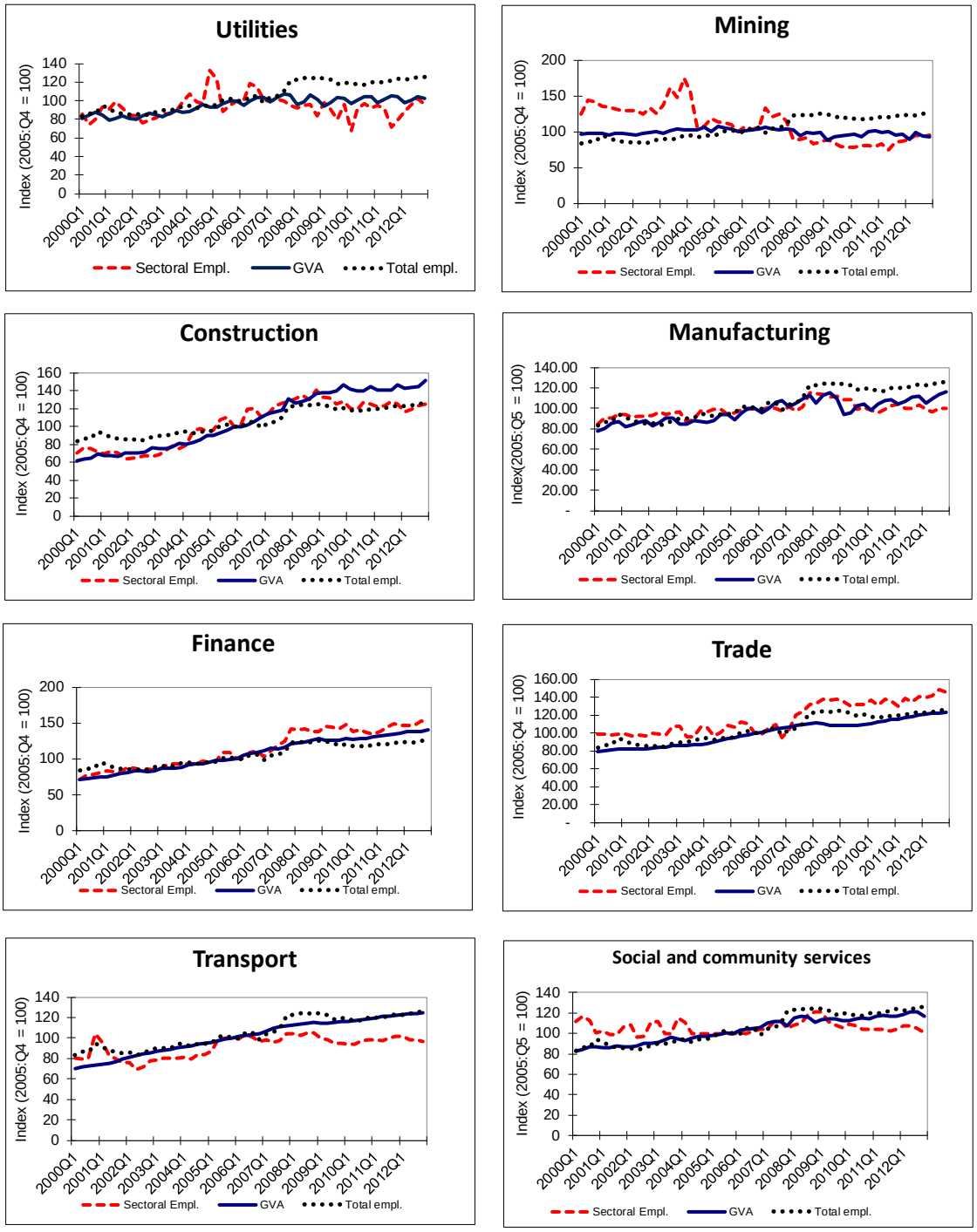
These results also show the other sectors that are not cointegrated. In these cases, the absolute value of the computed test statistic is lower than the critical value at 10 per cent confidence level, suggesting that employment and sectoral growth do not move together in the long run, at the same rate. Most importantly, the residual-based cointegration test showed that total non-agricultural employment and the GDP variables are not cointegrated. Consequently this implies that jobless growth did occur in the economy during the 2000:01-2012:04 period. This is indicative of the inability of the economic growth to create adequate

employment for the increasing number of job seekers. This is reaffirmed in the study by Marinkov and Geldenhuys (2007), who also found that unemployment and GDP were not cointegrated and hence concluding that, for South Africa, these variable do not share the same long run properties.

Similarly, a sectoral division of the employment-output relationship revealed no cointegration detected in the construction, mining, social and community services and trade sectors. Therefore, this also implies that jobless growth did occur in these sectors during the period under review. This is further evident in Figure 5.2 below which indicates that in the construction sector, for instance, an upward sloping trend of GVA growth continued after 2009Q1, whereas in the same period the employment growth trend was declining. A similar pattern can be seen with respect to the other non-cointegrating sectors.

According to the South African Reserve Bank's 2001 Annual Report, the country's jobless growth, which has affected a number of sectors, can be attributed to a number of factors, including rising capital intensity, pressures on domestic producers to remain competitive within the global economy, and the slow pace of foreign direct investment inflows into South Africa (SARB, 2001). Similarly, an ILO report by Hayter *et al*. (1999) identified other factors that may have increased jobless growth, including the shortage of skilled labour, which hinders the development of labour-intensive sectors. Another factor mentioned is trade liberalisation, which may have shifted production in favour of capital-intensive sectors, to the detriment of labour-intensive ones. Unless the construction, mining, trade and social and community services sectors are specifically orientated towards activities that are labour-intensive, the employment elasticity in these sectors will remain significantly low.

Figure 5.2: Employment and GVA in the formal non-agricultural sector: 2000Q1-2012Q4



Source: Statistics South Africa, Labour Force Survey (LFS), (various years).

Table 5.5 below presents the coefficient estimates of the model based on the ordinary least squares estimation of the relationship between employment and selected macroeconomic variables.

Table 5.5: OLS estimates of the relationship between employment and other macroeconomic variables.

Dependant variable: Employment ($Dlemp_t$)	Aggregate economy	Construction	Finance and business services	Manufacturing	Mining	Social and community services	Trade	Transport	Utilities
Constant	12.47***	-8.55***	6.29*	10.42	10.20	5.29	12.20	12.07***	12.35**
	(32.85)	(-2.90)	(1.85)	(1.14)	(1.05)	(1.10)	(1.37)	(3.79)	(2.08)
Output (proxy by GDP and sectoral GVA)	0.45***	0.90***	1.56***	0.46***	0.19	0.83***	0.29*	0.47*	0.27
	(4.82)	(3.67)	(6.24)	(2.92)	(0.32)	(2.39)	(1.88)	(1.85)	(0.71)
Labour costs (wages)	-0.12***	-0.95***	-0.57***	-0.07*	0.09	-0.01	-0.03	-0.28*	-0.19
	(-2.63)	-3.68	(-2.65)	(-0.13)	(0.20)	(-0.08)	(-0.05)	(-1.63)	(-0.63)
User cost of capital (Interest rates)	0.004	-0.02***	0.02***	-0.01	-0.03	0.02***	-0.01	0.03***	-0.05***
	(1.32)	(-2.51)	(2.73)	(-1.12)	(-1.06)	(2.31)	(-1.02)	(2.78)	(-2.79)
Inflation rate	0.005**	-0.03**	0.02***	-0.003	-0.03	0.02***	-0.01	0.03***	-0.06***
	(2.14)	(-2.97)	(3.51)	(-0.60)	(-1.30)	(2.33)	(-0.90)	(3.47)	(-3.19)
Time trend		-0.04***	0.01*	6.02	(-0.02)	-0.004	0.002	0.01***	-0.0004
		(-5.47)	(1.90)	(-0.01)	(-1.08)	(-0.81)	(0.17)	(3.08)	(-0.04)
Dummy (2008/9 recession)	-0.01	0.04	0.07**	0.11***	-0.07	0.08***	0.04	0.04	-0.04
	(-0.54)	(0.63)	(2.11)	(2.60)	(-0.64)	(2.11)	(0.65)	(0.90)	(-0.43)
Summary statistics									
Adjusted R^2	0.91	0.92	0.97	0.62	0.73	0.23	0.49	0.88	0.28
F-statistic	90.33	102.13	295.85	15.15	21.23	3.56	9.06	62.53	4.38
Prob (F-statistic)	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Number of observations	52	52	52	52	52	52	52	52	52
Estimation method	Least squares	Least squares	Least squares	Least squares	Least squares	Least squares	Least squares	Least squares	Least squares

* statistically significant at 10% level.

** statistically significant at 5% level.

*** statistically significant at 1% level.

t-statistics are shown in brackets

In the above table, the coefficients assigned to sectoral output correspond to the employment elasticity of output growth, ε, whereby its interpretation points to the interrelationship between employment and output growth. Therefore, in the above results, employment and sectoral output growth were positively correlated in all eight sectors during the period from 2000:01 to 2012:04. The absolute values of the elasticities across sectors differed substantially. For example, the employment elasticity in the construction sector is 0.90, but in the trade sector it is only 0.47. This signifies the degree of variance of employment elasticities across industry sectors, from very inelastic (0.27 in the utilities sector) to quite elastic (1.56 in the finance sector) responses to changes in sectoral output.

The overall employment elasticity of output growth in South Africa during this study period was quite inelastic at 0.45, though statistically significant at the 1 per cent level. This suggests that total non-agricultural employment was relatively unaffected or rather less responsive to changes in GDP growth, hence signalling an increase in capital input and total factor productivity. This is in line with the findings by other studies. For instance, according to Mahadea (2012), the average capital-labour ratio increased from R166 016 in 2000 to R186 631 in 2010, reflecting rising capital intensity in production. In addition, his study reported that except for the year 2008, the ratio of GDP growth to employment growth has been far less than one, reflecting that South Africa's job creation performance against GDP has been weak for most years during the period 2002–2010. Nattrass (1998) reported that a number of jobs in South Africa have been lost as a result of investment being channelled increasingly into capital intensive sectors and technologies.

In addition a study by Marinkov and Geldenhuys (2007) also found that employment growth has become less responsive to economic growth since the mid-1980s. It found that, between 2001 and 2005, a 1 per cent increase in real GDP was associated with a 0.45 per cent increase in employment (which is the same as that reported in our findings). Their study identified the sluggish growth as well as structural shifts in output as the main causes that led to structural shifts in the demand for certain categories of labour. A number of other studies seem to suggest that these structural shifts, together with the increasing capital intensity of production, have led to a decrease in the elasticity of employment growth with respect to output growth (Terreblanche, 2002; UNDP, 2003; Bhorat, 2004).

Within the primary sector, the table above shows that employment intensity of output growth in the mining sector is insignificant, suggesting that structural shifts in this sector could not induce an increase in employment opportunities. According to Bhorat and Oosthuizen (2008), the nature of output shifts across the economy's main sectors provides clues about the changing structure of the economy, which is moving away from primary towards tertiary or service-based output. A sectoral analysis by the South African Reserve Bank (2009) showed that during the prolonged 1999–2007 upward phase of the business cycle, growth in real gross domestic product was widely spread among the main sectors, with the exception of the mining sector, where production increased only slightly as a whole. The weakening of this sector therefore impacted on the nature of sectoral employment shifts, with the least growth occurring in this sector. This sector, having being directly influenced by the substantial decline in international commodity prices in 2008/09, experienced a reversal of earlier employment gains. During this period, employment in the gold mining sector declined by around 7 500 in the six-month period to the first quarter of 2009, while in the non-gold mining sector, this decline amounted to approximately 20 500 jobs.

In addition, bearing in mind that the mining sector is obviously capital-intensive, these structural changes also account for the greater impact of technological and productivity improvements in the mining sector, to the detriment of labour absorption in this sector. A study by Samson *et al*. (2001) explained that the capital-to-labour ratio in the major sectors of the economy is indicative of rising capital intensity in the mining sector. This study found that sectors which are not education-intensive, such as mining, are growing more slowly or even contracting as their capital intensity increases, and they are shedding jobs. This serves to confirm the low labour absorptive capacity in the mining sector and the corresponding high levels of unemployment.

In the secondary sector, both construction and manufacturing are statistically significant and positively correlated with employment. The estimate of employment elasticity of sectoral growth in construction is significantly close to unity, which suggests that a one percentage point increase in output will increase employment by 0.90 per cent. The high elasticity coefficient in this regard points to the fact that the labour absorptive capacity in this sector is relatively high. Between 1995 and 2005, this sector created the largest number of jobs within the secondary sector, where more than 500 000 employment opportunities were created.

Despite a brief job shedding experienced by the sector during the second and third quarters of 2008, partly due to electricity-related backlogs, the level of employment had recovered by the end of the year, as non-residential building activity countered the depressed state of residential building activity. This was attributed to infrastructural development related to the hosting of the 2010 FIFA World Cup tournament and various other infrastructural developments, such as the Gautrain Rapid Rail Link. Through these infrastructure development projects, the sector made a meaningful contribution to counter the job shedding experienced by construction companies involved in residential building activities.

The employment elasticity of growth in the manufacturing sector is weak, although it is significant at the 10 per cent level. This indicates that growth experiences in this sector have been driven largely by productivity, rather than employment. The increase in productivity growth in the manufacturing sector can be linked to the growth in the capital/labour ratio in this sector. In their study, Samson *et al*. (2001) confirmed rising capital intensity in the manufacturing sector in South Africa during the period 1992 to 1999. This rising capital intensity (declining labour intensity) is in part responsible for the sector's experience with regard to job losses. Employment levels in the manufacturing sector declined from a high of 1.6 million in 1995 to an estimated 1.1 million in 2011, reflecting the strong competitive forces and productivity imperatives in the sector (SARB, 2012). This sector shed jobs almost uninterruptedly from the middle of the 1990s until the second quarter of 2011, with an estimated 30 per cent reduction in the manufacturing workforce over this period. This prompted government to step up various growth initiatives in an effort to promote job creation, including but not limited to the Industrial Policy Action Plan (IPAP), which aimed at providing support to relatively labour-intensive and value-adding manufacturing firms that had been adversely affected by the global financial crisis. These and other initiatives are an affirmation that sectoral output growth alone cannot guarantee substantial employment growth in this sector. Instead, simultaneous targeted industry labour market initiatives may be needed to assist with employment growth.

Employment in the utilities sector is indicated as having a positive but not significant relationship to sectoral output, which suggests that structural changes in the sector and other macro factors, besides GVA, play a more critical role in determining employment in this sector.

Since the utilities sector is capital-intensive, increasing employment in this sector depends mainly on the expansion of installed capacity (Ajilore and Yinusa, 2011). Therefore, sustained spending to meet the increased electricity demand in the country will support growth in employment in this sector.

Within the tertiary sector, the employment elasticity coefficients for finance and business services, social and community services, transport and trade indicate a positive and significant relationship between employment and sectoral output. The employment elasticity coefficients in finance and business services (1.56), social and community services (0.83), transport (0.47) and trade (0.29) are an indication of the important role of the tertiary sector's output in employment generation. According to Pattanaik and Nayak (2011), much of the increase in economic performance in the tertiary sector is because of lack of employment opportunities in other sectors of the economy. This is indicative of the sectoral shift that characterised the output structure of the South African economy from the 1970s until recently, from primary and secondary sector activities to tertiary sector activities (Bhorat and Oosthuizen, 2008). According to O'Connell (1999) developed economies that have succeeded in dealing with the challenge of high unemployment have relied on the expansion of high-value services such as finance, business and professional services. A study by Rodrik (2008) also asserted that the South African manufacturing sector had lost ground to the tertiary sector since the 1990s.

While these results confirm the growing importance of the role of the tertiary sector, it should be noted that this sector relies to some extent on the growth of other sectors. In other words, instead of being independent, the performance of the sectors within the tertiary sector is interdependent with the growth of other sub-sectors. The significant contribution by the manufacturing sector cannot be ignored in this regard. According to Altman (2006) the interdependence that exists between the services and manufacturing sectors is suggestive of a bi-directional linkage between these sectors. That is, the causal direction can move either way, where manufacturing can stimulate demand in services (as in the transport sector) or services stimulating demand for manufacturing (as in retail for fast moving consumer goods). A classic example involves the success of the Motor Industry Development Plan that supports domestic production of vehicles for the local and export markets. This has knock-on positive effects on the transport and the services sector in general.

However given increasing segmentation and niching, sectors within the tertiary sector are still regarded as drivers for growth (Altman, 2006).

The coefficients of the wage variable represent the elasticity of employment with respect to wages. The theoretical model suggested in this study assumes a negative relationship between wages and employment. In other words, higher wages put upward pressure on labour costs and cause firms to substitute capital for labour, thereby reducing the demand for labour (employment) and increasing the marginal productivity of labour (Wakeford, 2004). This inverse relationship is confirmed by the negative coefficients of the wage variable found in all the sectors, with the exception of the mining sector. The negative and significant coefficients of the wages variable in the construction (-0.95), finance (-0.57), manufacturing (-0.07), and transport (-0.28) sectors suggest that growth in wages occurred at the expense of employment.

In fact, a study by Klein (2012) suggests that 'excess' real wage growth accounted for at least 25 per cent of the employment loss in South Africa during the period 2008-2010. In his study, Klein concluded that the rapid growth of the real wage, which overtook the labour productivity growth in most sectors, played an important role in suppressing employment creation during this period.

With regard to the coefficients for the user cost of capital variable, the degree and signs of employment elasticity vary across individual sectors, which is in line with the model assumptions. The user cost of capital coefficients for the construction and utilities sectors is negative and significant. These results suggest that employment in the construction and utilities sectors is negatively correlated with the rising user cost of capital. Thus, we can conclude that in these capital-intensive sectors, the increase in long-term interest rates (a proxy for user cost of capital) has resulted in a decrease in the demand for consumer capital goods and services, which has in turn decreased the derived demand for labour (Sawtelle, 2007). Similarly, the positive and significant elasticity coefficient in the finance, social services and transport sectors suggests that an increase in the user cost of capital will result in an expansion in employment in these sectors. Lastly, as hypothesised, the signs for the inflation coefficient are mixed. The inflation coefficients in the finance, social services and transport sectors are positive and significant at the 1 per cent level. This suggests that employment expansion levels were achieved at the expense of high inflation in these sectors.

In contrast, the signs of the coefficients of the inflation variable in the construction and utilities sectors are negative and significant. This means that inflation has a negative impact on employment in these sectors. We can therefore deduce that in these sectors, an increase in the rate of inflation will result in a decrease in the demand for consumer capital goods and services, which will in turn decrease the derived demand for labour.

With regard to the error-correction terms, the cointegrating vectors for finance, manufacturing, transport and utilities are statistically significant at 1 per cent level (Table 5.6). The error-correction terms correct between 42 and 72 per cent of the errors in the models after the short-run disturbances. These error correction coefficients indicate that (with the exception of utilities) finance, manufacturing and transport adjust relatively more slowly towards the underlying equilibrium since the parameter estimate of their respective lag residual shows that 0.52, 0.53 and 0.42 percentage of disequilibrium is removed in each period, respectively.

Table 5.6: Results of the error-correction model.

Dependant variable: Employment ($Dlemp_{it}$)	Finance	Manufacturing	Transport	Utilities
EC $term_{t-1}$	-0.52***	-0.53***	-0.42***	-0.77***
	(-4.23)	(-4.30)	(-3.14)	(-5.42)
Dln_wage_fin(-1)	-0.47***			
	(-2.85)			
Dln_wage_man(-1)		-0.91***		
		(-2.45)		
Dlemp_man(-1)		0.22*		
		(1.64)		
Dlemp_trans(-1)			-0.35***	
			(-2.75)	
R_RATE			-0.004**	
			(-2.20)	
R_RATE(-2)				0.006*
				(1.50)
Diagnostic Tests				
Jarque-Bera (p-value)	0.02	0.00	0.05	0.10
Ljung-Box Q (p-value)	0.65	0.11	0.45	0.26
Breusch-Godfrey LM Test (p-value)	0.49	0.43	0.54	0.53
ARCH-LM (p-value)	0.64	0.42	0.35	0.95
White (p-value)	0.96	0.28	0.19	0.85
Ramsey RESET (p-value)	0.61	0.15	0.42	0.70

* statistically significant at 10% level.
** statistically significant at 5% level.
*** statistically significant at 1% level.
t-statistics are in brackets

Furthermore, the diagnostic tests reveal that the error-correction models are correctly specified and conform to the statistical assumptions of the classical linear model.

The diagnostic checks performed include the Jarque-Bera test for normality in the residuals; the Ljung-Box Q test of no autocorrelation in residuals; the Breusch-Godfrey LM test for serial autocorrelation; the ARCH-LM test for no autoregressive conditional heteroscedasticity, White's test for heteroscedasticity, and Ramsey's RESET test for misspecification. Based on the tests that were performed, the results show that the residuals of the models do not have problems of misspecification, serial correlation and heteroscedasticity. Furthermore, the results of the normality test show that the residuals are normally distributed, with a zero mean and variance. These results suggest that the estimated regression model is well specified and generally conforms to economic theory and the assumptions underlying our modelling procedures.

So far we have proved that finance and business services, manufacturing, transport and the utilities sectors obey an equilibrium relationship in the long run and that their error-correction terms are statistically significant at 1 per cent. The next step, however, would be to test for the patterns of Granger causality across these variables. That is, we apply a Granger causality test in order to investigate the possibility that sectoral output and employment affect each other in the short run. Or, put differently, we want to investigate any causal directions detected by these two variables.

Table 5.7: Short run causality tests.

	H_0: No Granger causality from Dln_GVA to Dln_employment.	H_0: No Granger causality from Dln_employment to Dln_GVA.
Finance	2.60805*	3.31090**
	(0.0853)	(0.0460)
Manufacturing	2.60811*	1.53398
	(0.0850)	(0.2270)
Transport	0.05625	0.04479
	(0.9454)	(0.9562)
Utilities	0.94478	1.11493
	(03965)	(0.3370)

* statistically significant at 10% level.
** statistically significant at 5% level.
*** statistically significant at 1% level.
p-values are shown in brackets

Table 5.7 presents the results of the Granger causality test. The causality inference of the Granger test suggests uni-directional and positive short run causal effects from GVA to employment in the manufacturing. That is, in the period reviewed, a short run causal link

from output to employment was found to exist only in this sector. A bi-directional and positive short run causal effect was found in the finance and business services sector. This means that, in this sector, output and employment reinforce each other in the short run. The interpretation of the empirical results of short run links between sectoral GVA and employment suggests that sectoral output growth in the finance and business services and manufacturing sectors is employment enhancing. Therefore since employment adjusts to output changes in these sectors, attention should, in dealing with the challenge of high unemployment in the short run, be placed on the expansion of these sectors, i.e. wherever output goes in these sectors, employment will follow.

Given the elasticity coefficients (in Table 5.5) derived from the OLS estimation of the relationship between employment and growth, it is possible to quantify the impact of output intensity of sectoral growth through sectoral simulation. Projecting economic growth rates against these elasticities and baseline employment levels enables the econometric model to predict employment trends over the medium term. Table 5.8 below shows aggregate and sectoral baseline employment levels as at 2012:04. As can be seen, sectors within the tertiary sector account for the largest share of total non-agricultural employment. Together, these sectors contribute more than 60 per cent of total non-agricultural employment, followed by the construction (20.9 per cent) and primary sectors (15.8 per cent).

Table 5.8: Total non-agricultural employment, by sector as at 2012:04.

Sectors	Total employment	as % of total employment
Aggregate economy	14 524	100.00
Construction	1 132	7.79
Finance and business services	1 950	13.42
Manufacturing	1 814	12.49
Mining	380	2.62
Social and community services	3 251	22.38
Trade	3 108	21.40
Transport	877	6.04
Utilities	102	0.70

Source: Statistics South Africa, LFS (various years).

Since the main elasticity of interest in this study is the elasticity of employment with respect to output, Table 5.9 below lists the respective employment elasticity values for each sector based on the results of Table 5.5.

Table 5.9: Computed employment elasticity of output growth.

Sectors	Employment elasticity
Aggregate economy	0.45
Construction	0.9
Finance and business services	1.56
Manufacturing	0.46
Mining	0.19
Social and community services	0.83
Trade	0.29
Transport	0.47
Utilities	0.27

Table 5.10 below relies on the elasticities reported in Table 5.9 above to illustrate the impact on the number of jobs created for a given percentage change in GDP. As can be seen, there are considerable differences in the projected number of jobs created by each sector depending on the values of the corresponding elasticities, for a given percentage change in GDP. For instance, in the case of manufacturing, using the corresponding elasticity coefficient derived from the OLS regression yields 22 530 jobs per quarter, for a 2.7 percentage change in GDP. Similarly, 26 702 additional jobs are created if GDP increased by 3.2 per cent. Obviously, given its relatively high elasticity value, the finance and business services sector yields a higher additional number of jobs for a given percentage change in GDP than any other sector.

Table 5.10: Number of additional jobs created per quarter, for a given percentage change in GDP.

	% change in GDP		
Sectors	2.7%	3.2%	3.5%
Aggregate economy	176 454	209 131	228 737
Construction	27 508	32 602	35 658
Finance and business services	82 092	97 294	106 415
Manufacturing	22 530	26 702	29 205
Mining	1 949	2 310	2 527
Social and community services	72 855	86 347	94 442
Trade	24 328	28 833	31 536
Transport	11 129	13 190	14 427
Utilities	744	881	964

Note: This table is based on elasticities reported in Table 5.6.
The projections are based on 2012:04 employment levels.
GDP growth projections are taken from National Treasury's 2014 Budget Review.

The finance and business services sector has become an important contributor to private sector employment. According to Statistics South Africa (2012) there were about 1.74 million individuals working in the finance and business services in 2011, with a further 3.06 million people in the wholesale and retail trade. The services sector has become an important location for future job creation in South Africa (Altman, 2006). Approximately 70 per cent of South African employment is found in this sector (Mayer, 2005). It has been reported that these sectors have been growing at rate of 3 to 5 per cent per annum (Altman, 2006). This reaffirms the argument by Bhorat and Oosthuizen (2008) that the structure of South Africa's domestic production is now one more readily characterised by a large share of tertiary output, removing concerns that the South African economy is overly resource-based.

A report by the OECD (2010) on the assessment of economic transformation reported that its general trend depicts an expansion in the tertiary sector that is accompanied by a simultaneous contraction of other sectors. In South Africa, current trends show that employment levels in the trade, catering and accommodation services sector increased by 1,1 per cent in 2011, while employment levels in the finance, insurance, real estate and business services sector increased by 2,5 per cent. This was attributed to the robust growth in household consumption expenditure, alongside a gradual acceleration in private sector credit extension (SARB, 2012). A well-functioning tertiary sector provides important opportunities to strengthen employment and productivity. Investment in the tertiary sector is necessary to foster new employment opportunities and will assist in improving the overall employment intensity in South Africa.

According to a study by Samson *et al*. (2001), formal sector unskilled jobs have been shed since the 1990s, while the demand for scarce skilled labour and capital has risen. Their study reported that in sectors which heavily employ less-educated workers, capital intensity has increased. The effect on economic growth has largely benefited sectors which rely more on relatively educated labour, and in those sectors capital intensity has not significantly increased. Table 5.11 below shows how the skills mix changed over time across the different sectors of the South African economy between 1995 and 2008[5].

[5] Sectoral employment data classified by skills category, sourced from STATSA and ILO's LABORSTA Database, was only available up to 2008 during the time of this analysis.

Table 5.11: Skills share of total employment by sector, 1995-2008.

Main Sectors	Year	Skilled	Semi-skilled	Low skilled	Total
Aggregate economy	1995	0.09	0.59	0.32	1.00
	2002	0.11	0.61	0.28	1.00
	2007	0.14	0.48	0.38	1.00
	2008	0.13	0.51	0.36	1.00
Construction	1995	0.06	0.74	0.19	0.99
	2002	0.06	0.74	0.20	1.00
	2007	0.06	0.60	0.34	1.00
	2008	0.09	0.63	0.28	1.00
Finance	1995	0.17	0.77	0.06	1.00
	2002	0.25	0.67	0.08	1.00
	2007	0.25	0.61	0.14	1.00
	2008	0.25	0.59	0.16	1.00
Manufacturing	1995	0.06	0.74	0.19	0.99
	2002	0.10	0.75	0.15	1.00
	2007	0.11	0.45	0.44	1.00
	2008	0.11	0.48	0.41	1.00
Mining	1995	0.04	0.77	0.19	1.00
	2002	0.04	0.89	0.07	1.00
	2007	0.04	0.41	0.55	1.00
	2008	0.07	0.45	0.48	1.00
Social and personal services	1995	0.13	0.71	0.15	0.99
	2002	0.19	0.70	0.11	1.00
	2007	0.17	0.40	0.43	1.00
	2008	0.13	0.45	0.42	1.00
Trade	1995	0.14	0.66	0.20	1.00
	2002	0.10	0.60	0.30	1.00
	2007	0.11	0.54	0.35	1.00
	2008	0.11	0.57	0.32	1.00
Transport	1995	0.19	0.69	0.12	1.00
	2002	0.23	0.64	0.12	0.99
	2007	0.22	0.29	0.49	1.00
	2008	0.18	0.27	0.55	1.00
Utilities	1995	0.06	0.79	0.14	0.99
	2002	0.09	0.82	0.08	0.99
	2007	0.12	0.72	0.16	1.00
	2008	0.17	0.58	0.25	1.00

Source: OHS, 1995; LFS 2002:2 (STASSA); ILO's LABORSTA Database (various years)

From the table above, the experience of most of these sectors indicates a gradual shift away from low-skilled workers towards semi-skilled and skilled labour. The construction and manufacturing sectors, for instance, indicate a substitution process that shows low-skilled occupations being replaced by semi-skilled workers. While the capital intensity has increased in these sectors, studies have also found that capital complemented skilled labour but substituted unskilled labour in the production process (Bergstrom and Panas, 1992). A significant number of losses of low-skilled labour were incurred in the mining,

manufacturing, social and personal services and the utilities sectors. In all sectors the share of semi-skilled employment is relatively larger compared to other skills categories, with utilities, manufacturing, construction, mining and finance dominating in this category in terms of their respective sector skills composition of employment. This implies that employment growth in these sectors was most evident amongst semi-skilled workers during this period. In addition, employment in finance, transport and to a lesser extent in the social and personal services, continued to be skills-biased. The pattern of employment in these sectors is the one that displaces semi-skilled jobs more in favour of skilled occupations. For instance, in the finance sector, between 1995 and 2002, the proportion of skilled workers increased by 0.08 percentage points while that of semi-skilled workers declined by 0.1 percentage points. On whole, economy-wide aggregate data on the demand for skills shows declining proportions of low-skilled workers and higher shares of semi-skilled and skilled occupations, suggesting that growth during this period remained skills-biased.

5.4. SUPPLY-SIDE AND LABOUR MARKET CONSTRAINTS

The NDP envisages that the unemployment rate can be reduced to 6 per cent by 2030. It anticipates that 11 million jobs can be created subject to an average growth of 5.4 per cent over this period. However, current data shows that the South African labour force market has been growing rapidly over the past recent years. Table 5.12 below shows that labour force grew by 0.26 per cent per annum, in the period 2008-2012.

Table 5.12: Employed, unemployed and labour force trends, 2008-2012.

	2008	2012	Change: 2008-2012	
			000	% p.a
South Africa				
Population 15-64 yrs	31 544	33 945	2 400	1.52
Labour Force	18 808	19 053	244	0.26
Employed	14 438	14 284	-154	-0.21
Unemployed	4 371	4 769	398	1.82
Not economically active	12 736	14 892	2 156	3.39
Rates (%)				
Unemployment rate	23	25	-	-
Employed / population ratio (Absorption)	46	42	-	-
Labour force participation rate	60	56	-	-

Source: Statistics South Africa, Labour Force Survey (LFS), (various years).

During this time, while labour force recorded a positive growth, employment growth has subdued to around 0.21 per cent. The gap between labour force growth and employment growth has resulted in the rising numbers of unemployed individuals (Bhorat and Oosthuizen, 2008). The table also shows that, during this period, the labour force participation rate fell from 60 to 56 per cent.

There are various factors that account for labour market constraints in South Africa. Some of these are discussed below.

Inflexible labour market

Lack of flexibility in the South African labour market has contributed to low participation and absorption rates. It is argued that the country's labour relations system heavily favours "insiders" - people who are already employed, members of established unions and big businesses, at the expense of "outsiders" - of low skilled workers and the unemployed (CDE, 2013). Furthermore, there is a general concern that labour regulations and bargaining council agreements are not compatible with the large-scale creation of new jobs required to combat the unemployment crisis. According to Mahadea (2003) the Labour Relations Act (1995) which governs industrial wage determination, sets high standards for employers in South Africa. It imposes a burden on the firms' total wage bills and real transaction costs of doing business in South Africa (Mahadea and Simson, 2010). These burdensome obligations make hiring and firing very prohibitive for employers. In 2011, the Global Competitiveness Report ranked South Africa third last, out of 142 countries in terms of its hiring and firing processes (World Economic Forum, 2012). According to a report by the Centre for Development and Entreprise (2013), employers indicated that time, trouble and hassle of both these processes were the obstacles to hiring new staff.

Collective bargaining and the impact of unions

Generally, collective bargaining and unionisation are often associated with higher wages and lower employment levels in South Africa. According to Mahadea (2003) unions in South Africa are strong and their influence has caused wages to rise. A CDE (2013) study suggested that those who are both members of a union and covered by a bargaining council earn 16 per cent more in wages than those who are neither. It is further asserted that while bargaining councils are typically dominated by large firms and unions, their agreements are

often extended to other smaller firms within the sector. This has a damaging effect to smaller firms and entrepreneurs and accounts for the reduction in employment levels. It is argued that wages in South Africa are 4 or 5 times higher than in Lesotho (Mahadea, 2012). If wages were permitted to moderate by unions, this could have a positive effect on employment.

Low skill level and skills mismatch

The South African labour market is characterised by high levels of low skilled labour and low-skilled potential employers who do not have the capacity to administer or comply with the requirements of the labour laws (Mahadea and Simson, 2010). At the same time, the country's pool of skills is limited in the short term. This is indicative of the persistent skills mismatch that exists in the economy. Moreover, this situation of an abundant supply of low skilled labour relative to few high skilled workers, has been exacerbated by the large-scale emigration of skilled labour. A number of young talented individuals, with marketable skills and entrepreneurial abilities, are emigrating as they perceive poor employment prospects within the country, partly due to issues such as the high crime rates and discrimination practices (Faulkner et al, 2013). In light of the prevailing skills mismatch, increasing the demand for skilled labour might not be sustainable unless the level of employee skills is improved.

Crime and corruption

Crime and corruption have been identified as a threat to investment and growth in South Africa (Schoeman and Blignaut, 1998). The high levels of crime in the country have branded South Africa as a high risk investment destination. According to Benjamin (2008), at least a fifth of South Africa's small businesses reported that they had incurred losses in their annual turnover as a result of crime, through direct and indirect costs. Another factor dampening investor confidence is the high levels of corruption reported in both the private and public sectors. Shady deals and other shenanigans in the broader judicial system create doubts about the ethical behaviour and rent-seeking tendencies of some public officials (Mahadea, 2003).

5.5. SUMMARY AND CONCLUSION

Recently, concerns have been raised about the inability of the South African economy to provide sufficient employment for the increasing number of job seekers. The rate of unemployment remains stubbornly high, despite South Africa registering positive and sustained growth rates since the demise of apartheid more than 15 years ago. This chapter explored these issues by examining how the employment intensity of growth in the non-agricultural formal sector has evolved, with a view to identifying key growth sectors that are employment-intensive. The findings that were derived from the simple arc elasticity approach reveal that while the aggregate figures of employment elasticity suggest that jobless growth at a national level may not have occurred, certain sectors may have experienced declines in employment between 1999 and 2012. Sectoral trends in employment elasticities reveal that there has been a decrease in employment intensity in the mining and manufacturing sectors. These sectors reflected negative employment elasticities between 2005 and 2008, suggesting that jobless growth was indeed a characteristic feature of these sectors during this period. Other sectors experienced growth in both value added and employment elasticity during this period. In particular, sectors within the tertiary sector were the best performing sectors, which highlights the changing structure of the economy and the employment shift away from primary towards secondary and tertiary sectors.

These results somewhat differ with those derived using an econometric technique. Results of cointegration analysis showed that total non-agricultural employment (both in the formal and informal sectors) and the GDP series are not cointegrated, and hence do not move together in the long run. Consequently this implies that jobless growth did occur in the economy during the period reviewed. This reaffirms the view that South Africa is more capital intensive (and less labour intensive), which in turn facilitated a structural adjustment that led to the weakening of the employment-growth relationship. Findings of the sectoral division of the employment-output relationship revealed a long-run relationship between employment and growth in all sectors except in the mining, construction, social and community services and trade sectors. In particular, this indicates that the observed growth performance in these sectors has been more labour productivity-driven than labour employment-driven.

This confirms the rising capital intensity that has been experienced in these sectors. Hence, sectoral growth alone cannot guarantee substantial employment growth in these sectors, but

simultaneous targeted industry labour market initiatives may be desirable to assist employment growth.

The positive and significant coefficients for employment elasticities in finance and business services, social and community services, trade and transport indicate that growth experiences in these sectors are more labour employment-driven. Moreover, the quite elastic employment elasticity values in the finance and business services sector, construction, social and community services and, to a lesser extent, in the transport sector are a strong indication of the role of the tertiary and secondary sectors in employment generation in South Africa. In particular, sectors within the tertiary sector are the best performing sectors, in terms of employment intensity of output growth, reflecting the changing structure of the South African economy and the nature of employment shifting away from primary and more towards the tertiary sector.

Although the results confirm the growing importance of the role of the tertiary sector, this sector relied on the growth of other sectors. Its performance is interdependent on the growth of other sub-sectors. The significant contribution by the manufacturing sector cannot be ignored in this regard. It has help support the demand in the services sector. Through the Motor Industry Development Plan, the manufacturing sector brought about positive spill-over effects on the transport and the services sector in general. However, due to growing segmentation and niching, the tertiary sector is still regarded as driver for growth.

The three skills classifications show that most sectors experienced a gradual shift away from the demand for low-skilled workers towards demand for semi-skilled and skilled labour. In particular, the pattern of employment in sectors within the tertiary sector shows declining proportions of low-skilled workers and higher shares of semi-skilled and skilled occupations. On the whole, aggregate data on the demand for skills during this period remained skills-biased in favour of the tertiary sector.

A well-functioning tertiary sector can provide important opportunities to strengthen employment and productivity. Investment in the tertiary sector is necessary to foster new employment opportunities and can assist in improving the overall employment intensity in South Africa.

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATIONS

6.1. INTRODUCTION

This study reviewed some of the market trends of employment and growth, as well as macroeconomic and labour market outcomes in South Africa. It explained the theoretical background of the employment-growth relationship. It further conducted a thorough survey of the literature on the employment intensity of output growth, both internationally and for South Africa. This was followed by an econometric analysis of sectoral data for the period 2000:01 to 2012:04, to estimate employment elasticities in the eight non-agricultural SIC sectors of the South African economy. The possible reasons for varying employment elasticities across the sectors were explored. This chapter provides a summary of the main conclusions in relation to the study objectives presented in the first chapter and looks at some policy implications that can be drawn from this. Some of the limitations of this study and suggested areas for future research are discussed at the end of the chapter.

6.2. SUMMARY OF THE MAIN CONCLUSIONS

This study has documented the wide and varied research showing that persistently high levels of unemployment have become a common problem in many countries. Currently, over 200 million people throughout the world are unemployed, most of them among the youth. This situation intensified during the post-2008 global recession, which saw a number of countries with weak recoveries battling to increase growth and employment. In South Africa, there are only two out of five persons of working age (41 per cent) that currently have a job. This is relatively low when compared with 65 per cent in Brazil, 71 per cent in China, and 55 per cent in India (National Treasury, 2011).

Renewed interest in the relationship between employment and economic growth has led to growing concerns about the inability of the South African economy to provide sufficient employment for the increasing number of job-seekers. The rate of unemployment remains stubbornly high, despite South Africa registering positive and sustained growth rates since

the demise of apartheid more than 15 years ago. Between 2002 and 2010, the ratio of employment growth to GDP growth has been far less than one, an indication of South Africa's weak job creation performance experienced in the past recent years (Mahadea, 2012). This study explored these issues by examining how the employment intensity of growth in the eight non-agricultural sectors of the economy has evolved, with a view to identifying key growth sectors that are employment-intensive.

A review of the main stylised facts regarding general economic trends and labour market outcomes in South Africa showed that, between 2005 and 2011, overall employment growth has been slower than growth in GDP. These trends showed that GDP growth was met with a relative decline in employment growth and an increase in productivity growth. In the period between 2009 and 2011, total non-agricultural employment fell by 0.6 per cent, while the labour productivity rate grew by 2.3 per cent. Thus productivity growth has improved at the expense of employment growth in South Africa throughout much of the past recent period.

The relationship between employment and growth began to deteriorate as early as the 1990s due to rising capital intensity and structural shifts that occurred in the economy. Nattrass (1998) showed that since South Africa embarked on trade liberalisation in the 1990s, exports have become progressively less labour-intensive and more capital-intensive. This implied that the country had begun to specialise in capital-intensive products, resulting in a structural adjustment and weakening of the employment-growth relationship. The flat trend of the capital-to-labour ratio in the early 1990s already indicated a weak correlation between employment and growth. Its upward trend in the 2000s indicated the further substitution of capital for labour. During this period, the unemployment rate had begun to increase steadily each year and employment growth had become even less responsive to economic growth.

To investigate the changing nature of the employment-growth relationship in South Africa, this study used a combination of the simple arc elasticity technique and an econometric estimation of the labour demand function to determine the relevant sectoral employment elasticities. The findings derived from the simple arc elasticity approach reveal that at a national aggregate level, South Africa may have escaped the strict definition of jobless growth. Both output and employment increased during the post-apartheid period between 1999 and 2012, indicating that for every percentage point increase in real GDP, total employment also increased within a range of 0.13 to 2.76 percentage points. During the four

periods reviewed, employment generation was the strongest in the period from 2002 to 2005, and this was also a period of rapid growth. From 2005 to 2008, total employment elasticity decreased to 1.24 per cent. More recently, between 2008 and 2012, it has deteriorated further to 0.13. This was an early reaction to the effects of the global financial crisis, which intensified towards the end of 2008. Also, contributed to the situation was a tighter monetary policy environment that was aimed at containing inflationary pressures, implemented in the third quarter of 2008 (SARB, 2008). Both of these factors severely affected employment levels.

At a sectoral level, the employment elasticities reveal a decline in employment intensity, particularly in the mining, manufacturing and the utilities sectors. Between 2008 and 2012, these sectors reflected negative employment elasticities, which suggested that jobless growth was indeed a characteristic feature of these sectors during this period.

The poor performance of the mining sector, particularly during the 1999-2007 upward phase of the business cycle, clearly shows that this sector was not able to capitalise on the buoyancy in commodity prices that largely characterised this period. Negative value-added growth rates of 1.31 per cent and 1.06 per cent in 2008-2012 were accompanied by job shedding in the sector, and it was during this period that the sector struggled, following the effects of the financial crisis in 2008.

The manufacturing sector experienced low and declining employment elasticities throughout the 1999-2012 sample period. The negative employment elasticities and positive value-added growth rates in this sector, particularly between 2005 and 2008, indicate that value-added output growth has been driven more by gains in productivity than in employment. The negative employment elasticity in this sector is due to structural changes which have seen the economy moving away from the primary and secondary sectors towards tertiary or service-based sectors. This was confirmed by the decline in employment in the manufacturing sector, despite positive value-added growth.

During the most recent period, namely between 2008 and 2012, all other sectors experienced both value-added and employment elasticity growth. In particular, sectors within the tertiary sector, namely finance, trade, transport and the social and personal services, were found to be

the best performing sectors. This further highlighted the changing structure of the economy and the shift in employment from the primary to the tertiary sector.

One of the shortcomings of the simple arc elasticity technique as an analytical tool is that the elasticity estimates display a large degree of volatility from one period to another, making it difficult to use this tool for policy formulation or monitoring purposes. In addition, since this technique is based on an incomplete modelling framework, the elasticity estimates can give an incorrect picture of the labour market.

An alternative method of producing a stable series of sectoral employment elasticities was derived from the formal econometric estimation of a labour demand function. The results obtained using this technique were, in some cases, similar to those using the simple arc elasticity method. As in the arc elasticity approach, the finance and business services and the transport sectors were also found to be significantly employment intensive using the econometric approach. Furthermore, although the manufacturing and utilities sectors reflected a negative employment elasticity in the arc elasticity approach, these sectors were found to be significantly employment-intensive when applying the econometric approach.

The results of the cointegration analysis showed that the total non-agricultural employment and GDP series were not cointegrated, which means that they did not move together in the long run. This implies that jobless growth did occur in the economy during the period under review. This reaffirms the view that production in South Africa has become more capital-intensive (and less labour-intensive), thereby weakening the historic employment-growth relationship.

The findings of the sectoral division of the employment-output relationship revealed a long-run relationship between employment and growth in all sectors except mining, construction, social and community services, and trade. This indicates that the observed growth performance in these sectors has been more labour productivity-driven than labour employment-driven. This confirms the rising capital intensity that has been experienced in these sectors.

The positive and significant coefficients of employment elasticities in finance and business services, social and community services and the trade and transport sectors indicate that

growth experiences in these sectors were more labour employment-driven. Moreover, the fairly elastic employment elasticity values in the finance and business services, construction, social and community services and, to a lesser extent, the transport sector, are a strong indication of the role of the tertiary and secondary sectors in employment generation in South Africa. Sectors within the tertiary sector are the best performing sectors in terms of employment intensity of output growth, reflecting the changing structure of the South African economy and the shift in employment away from the primary and towards the tertiary sector.

Data on employment in the three skills classifications shows that most sectors have experienced a gradual shift away from the demand for low-skilled workers towards semi-skilled and skilled labour. In particular, the pattern of employment in sectors within the tertiary sector clearly shows the decreasing proportion of low-skilled workers and higher proportion of semi-skilled and skilled occupations. On the whole, aggregate data on the demand for skills during the 1995-2008 period showed a strong bias towards the employment of skilled labour in a growing tertiary sector.

6.3. POLICY IMPLICATIONS

This study estimated the employment intensity of output growth in eight non-agricultural sectors of South Africa, using quarterly data for the period 2000:01 to 2012:04. The results derived from a formal econometric estimation of a labour demand function revealed that employment elasticities differ markedly across industry sectors. The results, based on national aggregate figures, indicated that there was no long-run equilibrium relationship between employment and growth during the sample period. This confirms the view that this relationship has grown weaker since the early 2000s, due to rising capital intensity. During this period, South Africa intensified its trade liberalisation policies, and exports became less labour-intensive and more capital-intensive, while imports increased in highly labour-intensive sectors. To the extent that trade liberalisation results in such structural adjustment, short-term job losses become inevitable (Nattrass, 1998). Therefore, it is important that macroeconomic and labour market policies remain aligned with each other, particularly during periods of adjustment, so that those who lose jobs in contracting sectors are able to find new ones in the rapidly expanding sectors.

An analysis of the sectoral division of the employment-output relationship also revealed no cointegration in the construction, mining, social and community services, and trade sectors. In other words, jobless growth was experienced in these sectors during the sample period, meaning that growth performances across these sectors have been more labour productivity-driven than labour employment-driven. Relying solely on macroeconomic policies to tackle the challenge of unemployment will thus not be enough. Sectoral growth alone cannot guarantee substantial employment growth, and targeted industry labour market initiatives may also be necessary to assist employment growth in these sectors.

These results also confirm the existence of a long-run relationship between employment and growth in the finance and business services, manufacturing, transport and utilities sectors. In particular, the results show that the tertiary sector performed best in terms of higher employment elasticity of output growth. The tertiary sector has a significantly higher employment multiplier relative to other sectors, and accounts for over half of South African GDP (Tregenna, 2008).

Although the results confirm the growing importance of the role of the tertiary sector, this sector relied on the growth of other sectors. Its performance is interdependent on the growth of other sub-sectors. The significant contribution by the manufacturing sector has helped support the demand in the services sector. In particular, through the Motor Industry Development Plan, the manufacturing sector has had knock-on effects on the transport and the services sector in general. However, due to growing segmentation and niching, the tertiary sector is still regarded as the driver for growth.

A well-functioning tertiary sector can provide important opportunities to strengthen employment and productivity. Investment in the tertiary sector is necessary to foster new employment opportunities and can assist in improving the overall employment intensity in South Africa.

6.4. LIMITATIONS OF THE STUDY AND AREAS FOR FUTURE RESEARCH

Although due diligence has been exercised in maintaining the scientific integrity of the study, as with any statistical study, the following are noteworthy limitations of this study, as a result of which some areas for future research will be suggested:

i. In this study, the focus has only been on employment generation, and the results do not say anything about the quality of jobs generated by economic growth. In other words, while the results suggest that there is a cointegrating long-run relationship between employment and growth in certain sectors, no inferences can be drawn about the quality of employment. More research is needed to carefully examine the quality of jobs in these sectors based on survey data that was not available at the time of this study.
ii. Although it has been reported in previous studies that there is an overall positive effect between education and skills acquisition (Verhaest and Omey, 2012), this study did not elaborate on the role of education in enhancing the skills needed in the labour market. As a future research study, it might be important to investigate the efficiency with which human resources are developed in the education system and used in the South African labour market.
iii. The other study limitation relates to the frequency of data used in the analysis in Chapter Five. The study used quarterly time-series data in order to perform a cointegration test for the existence of a long-run relationship. This can result in the problem of estimation inaccuracy, because such data smooth out monthly variations which could lead to information loss.
iv. The labour market data used in this study are based on the STATSSA's LFS. The population coverage of the LFS is known to be low (varying from only 20,000 households in 1980s to about 32,000 households since 2000). Many residents living in informal and other communal establishments are not covered by the sample and the coverage of short-term or recently arrived migrants is not comprehensive.
v. Closely related to this are concerns often raised about the quality of data available in developing countries, which are commonly centred on the reliability of the empirical results. As indicated in the section on data sources and description in Chapter Four, the data sets used in this study are sourced from independent and reliable data

collection agencies such as STATSSA and SARB, and these are the best available data sets with respect to the variables used in this empirical study. Other empirical studies that have pursued similar topics have also made use of these data sets. Therefore, the results of this study are not expected to have been affected by the quality of data in any different way from the results of other published studies that have used the same data sets.

vi. Another limitation of the study is that seasonal effects were not incorporated into the time-series cointegration analysis. This was necessary to avoid relevant information loss that is critical to the series. Seasonal dummy variables were omitted to focus on the key explanatory variables, which are sector-specific gross value-added growth, inflation, user cost of capital, and wages. Future research could be conducted using de-seasonalised data, in order to take seasonal effects into account and identify a solution for the over-differencing issue. This may help strengthen evidence of a statistical relationship in the absence of seasonal effects.

vii. The historic data on employment sourced from STATSSA's LFS are available as far back as 2000. Prior to this, employment data suffer structural breaks resulting from changes in the sampling frame as well as updates and replacements done to previous official data sets. Initially, employment data in South Africa were available on an annual basis, as published in the South African Labour Statistics (SALS), by the then Central Statistical Service, which was later renamed Statistics South Africa. In 1994, the employment statistics that were published in SALS were replaced by the annual October Household Surveys (OHS).

In 1998, the Survey of Employment and Earnings (SEE) was introduced as a key source for tracking non-agricultural formal sector employment (Bhorat and Oosthuizen, 2008). The SEE drew data from a sample of only about 10 000 firms across the economy. Therefore, the level of detail in this survey's coverage (until very recently) rendered this data source of little use as a source of national employment statistics.

The OHS was later replaced by the Labour Force Survey (LFS) from 2000 onwards. The LFS provides a broader sectoral coverage, as it distinguishes between formal and informal employment. The LFS, which is published by Statistics South Africa, is viewed as the most comprehensive and reliable source of employment trend data for

the past decade (Altman, 2008). Thus, due to the difficulties associated with other sampling surveys, this study used the LFS to construct a more accurate and complete picture of post-apartheid employment patterns, as is now common practice.

While this study may indeed assist in informing future policy discussions, a number of interesting future studies could be pursued. Firstly, several other determinants of labour demand in South Africa, beyond those analysed in this study, could be investigated. In this regard, taxes (levied on firms), transfer payments, degree of international exposure and sectoral capacity utilisation are some areas which could be considered. Secondly, it is important to assess the role that structural policies may play in influencing the degree of responsiveness of sectoral employment to growth. Lastly, a complementary micro-level study could be of value, which would focus on some of the lower SIC divisions, as this study focused solely on the major SIC divisions of the economy.

REFERENCES

Abedian, I. and Schneier, S. 1987. *An Analysis of Formal Sector Employment in South Africa: Its Implications for Poverty and Future Employment Strategies*. SALDRU Working Paper No. 7, Southern African Labour and Development Research Unit (SALDRU), University of Cape Town.

Adanu, K. 2005. A cross-province comparison of Okun's coefficient for Canada. *Applied Economics,* 37: 561–570.

African Development Bank. 1998. *African Development Bank Report: Human Capital Development*. African Development Bank.

Ajilore, T. and Yinusa, O. 2011. An analysis of employment intensity of sectoral output growth in Botswana. *Southern African Business Review,* 15(2): 26-42.

Akçoraoğlu, A. 2010. Employment, economic growth and labor market performance: the case of Turkey. *Ekonomik Yaklasim,* 21: 101-114.

Aktar, I. and Ozturk, L. 2009. Can unemployment be cure by economic growth and foreign direct investment in Turkey? *International Research Journal of Finance and Economics,* 27(2009): 204-211.

Altig, D., Fitzgerald, T. and Rupert, P. 1997. *Okun's Law Revisited: Should We Worry About Low Unemployment?* Economic Commentary. Federal Reserve Bank of Cleveland.

Altman, M. 2003. The state of employment. In Daniel, J., Habib, A. and Southall, R. (eds), *State of the Nation: South Africa 2003-2004*. Cape Town: HSRC Press: 158-183.

Altman, M. 2006. Identifying employment-creating sectors in South Africa: the role of services industries. *Development Southern Africa* 23(5): 627-647.

Altman, M. 2008. Revisiting South African employment trends. *South African Journal of Economics,* 76 (2): 126-147.

Anaya, J.A.G. 1999. *Labor Market Flexibility in Thirteen Latin American Countries and the United States: Revisiting and Expanding Okun Coefficients*. Working Paper No. 136. Center for Research on Economic Development and Policy Reform.

Andolfatto, D. and MacDonald, G. 2005. *Jobless Recoveries*. Available at: http://www.olin.wustl.edu/faculty/macdonald/Jobless.pdf . (Accessed July 02, 2013).

Arrow, K.J., Chenery, H.B., Minhas, B.S. and Solow, R.M. 1961. Capital-Labour Substitution and Economic Efficiency. *Review of Economics and Statistics,* 43: 225-250.

Artis, M.J., Kontolemis, Z.G. and Osborn, D.R. 1997. Business Cycles for G7 and European Countries. *The Journal of Business,* 70(2): 249-279.

Attfield, C.L.F. and Silverstone, B. 1998. Okun's Law, Cointegration and Gap Variables. *Journal of Macroeconomics,* 20: 625-637.

Auer, P. and Popova, N.2003. *Labour Market Policy for Restructuring in Turkey: The Need for More Active Policie*s. Employment Paper 2003/51. Geneva: ILO.

Baker, D. and Schmitt, J. 1998. *Macroeconomic roots of high European unemployment: the impact of foreign growth.* Paper presented at the conference on "Creating Competitive Capacity: Reassessing the Role of the U.S. and Germany Labour Market Institutions in the New Economy", 23-25 October, Washington, DC.

Balakrishnan, R., Das, M. and Kannan, P. 2009. Unemployment Dynamics During Recessions and Recoveries: Okun's Law and Beyond. In IMF (eds.), *IMF World Economic Outlook: Rebalancing Growth.* Washington, DC: IMF.

Barker, F. 1999. *The South African Labour Market: Critical Issues for Renaissance*. Pretoria: J.L. Van Schaik Publishers.

Barro, R.J. 1991. Economic growth in a cross-section of countries. *Quarterly Journal of Economics,* 106: 407-444.

Barro, R. and Sala-i-Martin, X. 2004. *Economic Growth*. Cambridge: MIT Press.

Bartlett, W. 2013. *Skill Mismatch, Education Systems, and Labour Markets in EU Neighbourhood Policy Countries*. Working Paper No. WP5/20. European Institute, London School of Economics and Political Science.

Basu, S. 1996. Procyclical Productivity, Increasing Returns or Cyclical Utilization? *Quarterly Journal of Economics,* 111: 719-751.

Becker, G., Murphy, K. and Tamara, R. 1990. Economic growth, human capital and population growth. *Journal of Political Economy,* 98: 12-37.

Benjamin, C. 2008. South Africa: Crime crippling small business, *Business Day*, 17 July 2008.

Bergstrom, V. and Panas, E. 1992. "How Robust is the Capital Skills Complementarity Hypothesis?" *Review of Economics and Statistics,* 74(3): 540-546.

Berkowitz, D. and DeJong, D. 1999. Russia's internal border. *Regional Science Urban Economics,* 29: 633-649.

Berkowitz, D. and DeJong, D. 2001. *Policy reform and growth in the post-Soviet Russia*. William Davidson Institute Working Papers Series 405. William Davidson Institute, University of Michigan.

Berkowitz, D. and DeJong, D. 2002. Accounting for growth in Post-Soviet Russia. *Regional Science Urban Economics,* 32: 221-329.

Berkowitz, D. and DeJong, D. 2005. Entrepreneurship and post-socialist growth. *Oxford Bulletin of Economics and Statistics,* 67(1): 25-46.

Berkowitz, D. and DeJong, D. 2011. Growth in post-Soviet Russia: a tale of two transitions. *Journal of Economic Behavior and Organisation,* 79: 133-143.

Berument, H., Dogan, N. and Tansel, A. 2006. Economic Performance and Unemployment: Evidence from an Emerging Economy - Turkey. *International Journal of Manpower,* 27(7): 604-623.

Bhorat, H.2001. *Labour Market Challenges in the Post-apartheid South Africa: A Country Profile.* Development Policy Research Unit, UCT.

Bhorat, H. 2004. Labour market challenges in the post-Apartheid South Africa. *South African Journal of Economics* 72(5): 940-977.

Bhorat, H. & Leibbrandt, M. 1998. *Estimates of wage-employment elasticities for South Africa.* Unpublished paper.

Bhorat, H. and Oosthuizen M.J. 2008. Employment shifts and the 'jobless growth' debate, in *Human Resources Development Review: 2008.* Cape Town: HSRC Press.

Black, P. and Rankin, N.1998. On the cost-increasing effects of new labour laws in South Africa. *South African Journal of Economics,* 66 (4): 452-463.

Boltho, A. and Glyn, A. 1995. Can macroeconomic policies raise employment? *International Labour Review,* 134: 451-470.

Boyer, R. 1988. Technical change and the theory of regulation, in Giovanni Dosi; Christopher Freeman; R. Nelson; Gerald Silverberg; Luc Soete (eds.): *Technical change and economic theory.* London, Pinter, pp. 67-94.

Brown, M. and de Carni, J.S. 1963. Technological Change and the Distribution of Income. *International Economic Review,* 3: 289-309.

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.

Burnside, C., Eichenbaum, M. and Rebelo, S. 1993. Labor Hoarding and the Business Cycle. *Journal of Political Economy,* 101: 245-273.

Burnside, C., Eichenbaum, M. and Rebelo, S. 1996. Sectoral Solow Residuals. *European Economic Review,* 40: 861-869.

Buscher, H., Falk, M., Gäoggelmann, K., Ludsteck, J., Steiner, V. and Zwick, T. 2000. Wachstum, BeschÄaftigung und Arbeitslosigkeit. *ZEW Wirtschaftsanalysen* 48, Nomos, Baden-Baden.

Calitz, E. 1997. Aspects of the Performance of the South African Economy. *South African Journal of Economics,* 66 (3): 314-331.

Cazes, S, Verick, S. and Al Hussami, F. 2011. *Diverging Trends in Unemployment in the United States and Europe: Evidence from Okun's Law and the Global Financial Crisis*. Geneva: Employment Sector: Employment Working Paper 106.

CDE. 2013. Rethinking South Africa's Labour Market: Lessons from Brazil, India and Malaysia. Johannesburg: Centre for Development and Enterprise.

Central Bank of Brazil. 2009. *Annual Report*, Volume 45, Banco Central do Brasil/Department of Economics (Depec), Brazil.

Central Bank of Brazil. 2010. *Annual Report*, Volume 46, Banco Central do Brasil/Department of Economics (Depec), Brazil.

Cobb, C. and Douglas, P. 1928. A Theory of Production. *American Economic Review*, 18: 139-250.

COSATU.1999. *COSATU Submission on Labour Market Policy in the Era of Transformation.* Available at: www.cosatu.org.za/docs/1999/labr-mkt.htm. (Accessed November 11, 2014).

Crivelli, E., Furceli, D. and Toujas-Bernate, J. 2012. *Can policies affect employment intensity of growth? A cross-country analysis*. IMF Working Paper No. WP/12/218.

Daveri, F. and Tabellini, G. 1997. *Unemployment, growth and taxation in industrial countries*. Bocconi University, Mimeo.

Davidson, R., and MacKinnon, J.G. 1993. Estimation and Inference in Econometrics. New York*: Oxford University Press*.

Department of Finance. 1996. *Growth, Employment and Redistribution: A Macro-Economic Strategy. Summary*. Pretoria, South Africa: Department of Finance.

Department of Labour (South Africa). 1997. *Basic Conditions of Employment Act, No. 75 of 1997*. Pretoria: Government Printer.

Department of Labour (South Africa). 1998. *Employment Equity Act, No. 55 of 1998.* Pretoria: Government Printer.

Department of Labour (South Africa). 1998. *Skills Development Act, No. 97 of 1998*. Pretoria: Government Printer.

Department of Labour (South Africa). 1999. *Skills Development Levies Act, No. 9 of 1999*. Pretoria: Government Printer.

Department of Labour (South Africa). 1995. *Labour Relations Act, No. 66 of 1995*. Pretoria: Government Printer.

Department of Labour. 1996. *Restructuring the South African Labour Market: Report of the Presidential Commission to Investigate Labour Policy. June 1996*. Pretoria: Government Printer.

Desai, R.M., Freinkman, L.M. and Goldberg, I. 2003. *Fiscal Federalism and Regional Growth: Evidence from the Russian Federation in the 1990s*. World Bank Policy Research Working Paper no. 3138. Publisher?

Domar, E D. 1946. Capital Expansion, Rate of Growth and Employment. *Econometrica,* 14:137-147.

Dopke, J. 2001. *The employment intensity of growth in Europe.* Kiel Working Paper, No. 1021. Germany: Kiel Institute of World Economics.

El-Mahdi, A. 2003. *GPN Global Labor Market Database: Egypt*. Global Policy Network. Available at: www.globalpolicynetwork.org (Accessed September 13, 2014).

Engle, R.F. and Granger, C. W. J. 1987. Co-Integration and Error Correction: Representation, Estimation, and Testing *Econometrica*, 55(2): 251-276.

Evans, CL.1992. Productivity Shocks and Real Business Cycles. *Journal of Monetary Economics,* 29: 191-208.

Fallon, P. and Lucas, R. 1997. *South African labour markets: adjustments and inequalities*. Washington: World Bank.

Fang, C., Yang, D. and Meiyan, W. 2009. *Migration and labor mobility in China*. Institute of Population and Labor Economics, Chinese Academy of Social Sciences. Available at: http://mpra.ub.uni-muenchen.de/19187/. (Accessed October 24, 2013).

Farbel, H S. 1986. The analysis of union behaviour, in Ashenfelter, O. and Layards, R. (eds.) *Handbook of Labour Economics.* Vol. II. North Holland, Amsterdam.

Faulkner, D., Loewald, C. and Makrelov, K. 2013. *Achieving higher growth and employment: Policy options for South Africa*. Working Paper No. WP/13/03. South African Reserve Bank.

Fofana, N.F. 2001. *Employment and economic growth in the Cote d'Ivore: an analysis of structural determinants*. *African Development Bank Review*, 98-112.

Fourie, F.C van N. 1997. *How to think and reason in macroeconomics*. Cape Town: Juta.

Fraser, J. 1999. Brain drain worse than feared. *Star Business Report*, 4 October 1999: 5.

Freeman, R.B. 1993. Labour market institutions and policies: help or hindrance to economic development? in *Proceedings of the World Bank Annual Conference on Development Economics 1992.* Washington: World Bank.

Friedman, A. and Suchoy, T. 2004. The NAIRU in Israel: An Unobserved Components Approach. *Israel Economic Review*, 2(2): 125-154.

Garibaldi, P. and Mauro, P. 1999. *Deconstructing job creation*. Paper presented at the conference Le Nuove Frontiere della Politica Economica, June, Rome. IMF Working Paper No. WP/99/109.

Gabrisch, H. and Buscher, H. 2005. *The Unemployment-Growth Relationship in Transition Countries.* Germany: Institut Für Wirtschaftsforschung Halle – Iwh..

Ghose, A.K. 1994. Employment in Organized Manufacturing in India. *Indian Journal of Labor Economics*, 37(2): 141-62.

Ghose, A.K.2005. *Employment in China: recent trends and future challenges*. Employment Strategy Paper 2005/14. Geneva: ILO.

Gordon, R. 1997. The time-varying NAIRU and its implications for economic policy. *Journal of Economic Perspective,* 11: 11-32.

Gordon, R.J. 1984. Unemployment and Potential Output in the 1980s. *Brookings Papers on Economic Activity,* 2: 537–564.

Gows, R. and Roy, J. 1997. *The Medium Term Budget Policy Statement: More Realistic Assumptions and Positive Long-Term Consequences*. 8 December 1997. Johannesburg: Rand Merchant Bank.

Grawitzsky, R. 1996. Jobless growth trends continuous. *Business Day*, 29 September 1999:3.

Grogan, L. and Moers, L. 2001. Growth Empirics with Institutional Measures for Transition Countries. *Economic Systems,* 25(4): 323–344.

Hall, R. 1988. The Relation between Price and Marginal Cost in U.S. Industry. *Journal of Political Economy*, 96: 921-947.

Hansen, P. and King, A. 1996. The determinants of health care expenditure: A co-integration approach. *Journal of Health Economics*, 15: 127-137.

Hanusch, M. 2012. *Jobless growth? Okun's Law in East Asia*. World Bank Policy Research Working Paper No. WPS6156.

Haririan, M., Bilgin, M.H. and Karabulu, G. 2010. The Relationship between GDP and Unemployment: Evidence from MENA Countries. *Zagreb International Review of Economics & Business*, 13(1): 17-28.

Harris R. I. D. 1995. Using Cointegration Analysis in Econometric Modelling, Prentice Hall Publishing, Essex England.

Harris, R. and Silverstone, B. 2001. Testing for asymmetry in Okun's law: a cross-country comparison, *Economics Bulletin,* 5(2): 1−13.

Hayter, S., Reinecke, G. and Torres, R. 1999. *ILO Report on the Social Impact of Globalisation*. Geneva: International Labour Organisation.

Hodge, D. 2009. Growth, employment and unemployment in South Africa. *South African Journal of Economics*, 77(4): 488-504.

Hofmeyer, J. 1996. The South African labour market, in Maasdorp, G, 1996: *Can South and Southern Africa become Globally Competitive Economies?* London: Macmillan.

ILO.1998. *World Employment Report 1998-1999: Employability in the Global Economy – How Training Matters*. Geneva: International Labour Organisation.

ILO. 2005. *Global Employment Trends 2005.* Geneva: ILO.

ILO. 2009. *Global Employment Trends – Update*. Geneva: ILO.

ILO. 2007. *Key Indicators of the Labour Market.* 5th Edition. Geneva: ILO.

ILO. 2009. *Decent work country profile: Brazil.* Geneva and Brasilia: ILO.

ILO. 2011. *Efficient Growth, Employment and Decent Work in Africa: Time for a New Vision.* Geneva: ILO.

ILO. 2011. *Key Indicators of the Labour Market*. 7th Edition. Geneva: ILO.

ILO. 2013. *Global Employment Trends 2013: Recovering from a Second Jobs Dip.* Geneva: ILO.

ILO. various years. *LABORSTA Database*. Department of Statistics. Geneva: ILO.

Inter-American Development Bank. 1998. *Economic and Social Progress Report, 1998-1999*.Washington, D.C: John Hopkins University Press.

Islam, R. 2006. *The nexus of economic growth, employment and poverty reduction: an empirical analysis: issues in employment and poverty*. Discussion Paper No. 14. Geneva: Employment Strategy Department, International Labour Office.

Islam, I. and Nazara, S. 2000. *Estimating Employment Elasticity for the Indonesian Economy*. Jakarta: International Labour Organization.

Izyumov, A. and Vahaly, J. 2003. The Unemployment–Output Tradeoff in Transition Economies: Does Okun's Law Apply? *Economics of Planning*, 35: 317–331.

Jaimovich, N. 2004. *Firm Dynamics, Markup Variations, and the Business Cycle*. Mimeo. San Diego: University of California.

Johnson, S., McMillan, J. and Woodruff, C. 1999. *Property rights, finance and entrepreneurship*. Mimeo, Stanford University Business School, 22 June.

Kapsos, S. 2005. *Employment intensity of growth: trends and macroeconomic determinants*. Employment Strategy Paper 2005/12. Geneva: ILO.

Kaufman, R. 1988. An International Comparison of Okun's Laws. *Journal of Comparative Economics,* 12: 182-203.

Khan, A.R. 2001. *Employment policies for poverty reduction*. IEPDP No. 1. Geneva: ILO.

Khemraj, T., Madrick, J. and Semmler, W. 2006. Okun's Law and jobless growth. *Schwartz Centre for Economic Policy Analysis,* Policy Note 3.

Kim, J. and Lawrence, J. 1994. The Sources of Economic Growth of the East Asian Newly Industrialized Countries. *Journal of Japanese and International Economies*, 8(3): 235-271.

King, R.G. and Rebelo, S. 1999. Resuscitating Real Business Cycles, in John Taylor and Michael Woodford, eds. *Handbook of Macroeconomics*, 1B: 928-1002.

Kingdon, G. and Knight, J. 2005. *Unemployment in South Africa, 1995-2003: Causes, Problems and Policies*. Paper presented at the "10 Year Review of the South African Economy" conference, Stellenbosch University, Stellenbosch, South Africa, 28-29 October 2005.

Klein N. 2012. *Real Wage, Labor Productivity, and Employment Trends in South Africa: A Closer Look*. IMF Working Paper No. WP/12/92. Washington DC: IMF.

Klump, R. and Preissler, H. 2000. CES Production Functions and Economic Growth. *Scandinavian Journal of Economics,* 102: 41-56.

Kontek, E.S. 2007. *How Useful is Okun's Law*? Federal Reserve Bank of Kansas City. Available at: http://www.kc.frb.org/publicat/econrev/PDF/4q07Knotek.pdf . (Accessed June 27, 2012).

Krugman, P. 1994. The Myth of Asia's Miracle. *Foreign Affairs,* 73(6):61-78.

Kydland, F. and Prescott, E. 1982. Time to Build and Aggregate Fluctuations. *Econometrica,* 50: 1345-1371.

Lal, I., Muhammad, S.D., Jalil, M.A. and Hussain, A. 2010. Test of Okun's Law in Some Asian Countries: Co-Integration Approach. *European Journal of Scientific Research,*1:73 -80.

Lambert-Mogilansky, A., Sonin, K. and Zhuravskaya, E. 2007. Are Russian Commercial Courts Biased? Evidence from a Bankruptcy Law Transplant. *Journal of Comparative Economics,* 35, 254-277.

Lattimore, R. and Kowalski, P. 2008. *Brazil: selected trade issues*. OECD Trade Policy Working Paper No.71. Paris: OECD.

Leontief, W. 1941. *The Structure of the American Economy, 1919-1939*. New York: M.E. Sharpe Inc.

Levine, R. and Renelt, D. 1992. A sensitivity analysis of cross-country growth regression. *American Economic Review,* 82(4): 942-963.

Lewis, J.D. 2001. *Reform and Opportunity: The Changing Role and Pattern of Trade in South Africa and SADC*. Africa Region Working Paper Series No. 14. Washington, DC: The World Bank.

Lewis, J.D. 2002. Promoting Growth and Employment in South Africa. *South African Journal* of *Economics*, 70(4): 725-776.

Lewis, W.A. 1954. Economic Development with Unlimited Supplies of Labor. *Manchester School*, 22 (2): 139–191.

Linz, S.J. 1998. *Ownership and employment in Russian industry: 1992-1995*. William Davidson Institute Working Paper No.138. University of Michigan Business School.

Löobe, K. 1998. Sectoral employment elasticities in Germany, in Addision, J.T. and Welfens, P. *Labour markets and social security*. Heidelberg: 91-122.

Loots, E.1998. *Job creation and economic growth*. Paper presented at the Biennial Conference of the Economic Society of South Africa, September, Potchefstroom, South Africa.

Lucas, R.E. Jr. and Prescott, E.C. 1977. Investment under Uncertainty. *Econometrica*, 39: 659-681.

Madden, G.M. and Tuckwell, R.H. 1975. The output-employment relationship in Australian industry. *Economic Record,* 51: 421-427.

Mahadea, D. 2003. Employment and growth in South Africa: hope or despair? *South African Journal of Economics,* 71(1):21-48.

Mahadea, D. 2012. Prospects of entrepreneurship to the challenge of job creation in South Africa. *Journal of Developmental Entrepreneurship,* 17(4): 1-17.

Mahadea, D. and Simson, R. 2010. The challenge of "Low Employment Economic Growth" in South Africa: 1994 – 2008. *South African Journal of Economic and Management Sciences,* 13(4): 391-406.

Mahomedy, A.C. 2013. International trade and labour demand elasticities: empirical evidence from South Africa. *Studies in economics and econometrics,* 37(2): 63-92.

Mankiw, G.N. 1995. The Growth of Nations. *Brookings Papers on Economic Activity*, 275-310.

Marinkov, M. and Geldenhuys, J. 2007. Cyclical unemployment and cyclical output: an estimation of Okun's coefficient for South Africa. *South African Journal of Economics,* 75(3): 373-390.

Marsden, D. 1995. *The impact of industrial relations practices on employment and unemployment*. The OECD Jobs Study Working Paper No.3. Paris: OECD.

Mayer, M. 2005. *Trade in services*. Report prepared for the Director General's Employment and Economic Cluster. Pretoria: Government of South Africa.

Maziya, M. 1999. *Contemporary Labour Market Policy and Poverty in South Africa*. Development Policy Research Unit Working Paper Series No 99/34. Cape Town: University of Cape Town.

Mazumdar, D. 2000. *Trends in employment and the employment elasticity in manufacturing 1971-92: an international comparison*. Paper presented at the Tips 2000 Annual Forum 18-20 September, Glenburn Lodge, Muldersdrift.

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.

Mazumdar, D. and Sarkar, S. 2007. *Employment Elasticity in Organized Manufacturing in India*. Toronto: Munk Centre for International Studies.

McKay, A. and Reis, R. 2006. *The Brevity and Violence of Contractions and Expansions*. Princeton University. Available at: http://www.princeton.edu/~rreis/papers/McRcycles.pdf [2006-05-12].

McMillan, J. and Woodruff, C. 2002. The Central Role of Entrepreneurs in Transition Economies. *Journal of Economic Perspectives*, 16: 153-70.

Menezes-Filho, N. and Scorzafave,L. 2009. *Employment and inequality outcomes in Brazil*. Insper Working Paper, WPE: 200/2009. Brazil: Insper Instituto de Ensino e Pesquisa.

Menezes-Filho, N. and Scorzafave, L. 2007. "Oferta e Demanda por Trabalho no Brasil". *Mimeo*.

Miller, E. 2008. *An Assessment of CES and Cobb-Douglas Production Functions*. Congressional Budget Office Working Paper Series, 2008, No.5. Washington DC: Congregational Budget Office.

Mironova, E.S. 2010. The analysis and prediction of employment in the Russian Federation by types of economic activity. *Studies on Russian Economic Development*, 21(6): 651-665.

Mohr, P. 2011. *Economic Indica*tors. 4th Edition. Pretoria: Unisa Press.

Moosa, I.A. 1997. A Cross-Country Comparison of Okun's Coefficient. *Journal of Comparative Economics*, 24: 335-356.

Mourre, G.2004. *Did the pattern of aggregate employment growth change in the Euro Area in the late 1990s?* European Central Bank Working Paper Series, 2004, No. 358. Brussels: European Central Bank.

Murphy, K. M., Shleifer, A. and Vishny, R.W. 1992. The transition to a market economy: pitfalls of partial reforms. *Quarterly Journal of Economics,* 57(3): 889-906.

National Planning Commission. 2011. *National Development Plan.* Pretoria: National Planning Commission .

National Treasury. 2011. *Estimates of National Expenditure.* Pretoria: National Treasury.

National Treasury. 2012. *Budget Review*. Pretoria: National Treasury.

Nattrass, N 1998. *Growth employment and economic policy in South Africa: a critical review.* Centre for Development and Enterprise, CDE Focus No. 2.

Navarro, L. 2009. Employment dynamics and crises in Latin America. *CEPAL Review*, 99: 23-40.

Nelson, R. 1964. Aggregate Production Functions and Medium Range Growth Projections. *American Economic Review,* 54: 575-606.

Neri, M.C. 2010. The decade of falling income inequality and formal employment generation in Brazil, in OECD, *Tackling Inequalities in Brazil, China, India and South Africa: The Role of Labour Market and Social Policies.* OECD Publishing. Available at: http://dx.doi.org/10.1787/9789264088368-4-en

Nesporova, A. 2002. *Why unemployment remains so high in Central and Eastern Europe*. Unpublished paper.

Nickell, S. and Layard, R. 1998. Labour market institutions and economic performance, in *Handbook of Labour Economics.* Amsterdam: North Holland.

O'Connell, P.J .1999. *Astonishing success: economic growth and the labour market in Ireland*. Employment and Training Papers, No. 44. Geneva: ILO.

OECD. 1994. *The OECD Economic Outlook* No.55, June. Paris: OECD.

OECD. 2010. *Tackling Inequalities in Brazil, China, India and South Africa: The Role of Labour Market and Social Policies*. Paris: OECD Publishing.

Okun, A. 1962. 'Potential output: Its measurement and significance', in *Proceeding of the Business and Economic Statistics Section of the American Statistics Society*. American Statistical Association, 98-104.

Okun, A. 1970. 'Potential GDP: Its measurement and significance', in Okun, A. (ed.). *The Political Economy of Prosperity*. Washington, DC.: The Brooking Institution.

Oosthuizen, M.J. and Bhorat, H. 2004. *The South African Labour Market 1995-2002*. Paper presented at the DPRU/TIPS Forum, 13-15 October, Cape Town.

Osband, K. 1992. Economic crisis in a shortage economy. *Journal of Political Economy,* 100: 673–690.

Padalino, S. and Vivarelli, M. 1997. The employment intensity of economic growth in the G-7 countries. *International Labour Review,* 136(2):191-213.

Pagés, C., Pierre, G. and Scarpetta, S. 2009. *Job Creation in Latin America and the Caribbean: Recent Trends and Policy Challenges*. Washington, DC: The World Bank and Palgrave Macmillan.

Palley, T.I 1993. Okun's Law and the Asymmetric and Changing Cyclical Behaviour of the USA Economy. *International Review of Applied Economics,* 7: 144-162.

Pattanaik, F. and Nayak, N.C. 2011. Employment Intensity of Service Sector in India: Trend and Determinants. *2010 International Conference on Business and Economics Research*, Vol.1. Kuala Lumpur, Malaysia: IACSIT Press.

Pereira da Silva, L. 1996. *Higher Growth and Employment for South Africa*: The Options. Paper prepared for the Policy on Macroeconomic Policy Coordination, South African Reserve Bank, Pretoria, 14 February 1996.

Perugini, C. 2009. Employment Intensity of Growth in Italy: A Note Using Regional Data. *Regional and Sectoral Economic Studies*, 9(1):59-105.

Piacentini, P. 1987. Why rates of growth of employment differ: a quantitative approach to an international comparison. *Labour,* 1(2): 93-105.

Pianta, M., Evangelista, R. and Perani, G. 1996. The dynamics of innovation and employment: an international comparison. *Science Technology Industry Review,* 18:67-93.

Pini, P. 1997. *Occupazione, Tecnologia e Crescita: Modelli Interpretativi ed Eevidenze Empiriche a Livello Macroeconomico*. Paper Presented to the Conference of the Accademia Nazionale dei Lincei on "Sviluppo tecnologico e disoccupazione: trasformazione della societa", held in Rome, 16-18 January 1997.

Prachowny, M.J.F. 1993. 'Okun's law: theoretical foundations and revised estimates. *Review of Economics and Statistics*, 75: 331-336.

Prescott, E. 1986. Theory Ahead of Business-Cycle Measurement. *Carnegie-Rochester Conference Series on Public Policy,* 25:11-44.

QUANTEC. 2013. Data retrieved September 01, 2013 from QUANTEC online database.

QUANTEC. 2014. Data retrieved August 27, 2014 from QUANTEC online database.

QUANTEC. various years. Data retrieved May 21, 2014 from QUANTEC online database.

Raphaeli, N. 2006. *Unemployment in the Middle East - Causes and Consequences*. The Middle East Media Research Institute, Inquiry and Analysis Series Report No. 265.

Richter, K. and Witkowski, B. 2014. *Does Growth Generate Jobs in Eastern Europe and Central Asia?* Working Paper No. 6759. New York: World Bank, Poverty Reduction and Economic Management Department.

Rodrik, D. 2008. Understanding South Africa's economic puzzles. *Economics of Transition*, 16(4): 769–797.

Rutkowski, M. 1990. *Labour hoarding and future unemployment in Eastern Europe: the case of Polish industry.* Discussion Paper No. 6, LSE Centre for Economic Performance.

Sammler, W. and Zhang, W. 2005. *The impact of output growth, labour market institutions, and macro policies on unemployment*. Working paper, SCEPA, in preparation.

Samson, M., MacQuene, K. and van Niekerk, I. 2001. *Capital/skills intensity and job creation: an analysis of policy options*. Paper presented at the Tips 2001 Annual Forum 10-12 September, Misty Hills, Muldersdrift.

SARB. 1999. *Annual Economic Report*. Pretoria: SARB.

SARB. 2000. *The South African Reserve Bank Quarterly Report*. Pretoria: SARB.

SARB. 2001. *The South African Reserve Bank Quarterly R*eport. Pretoria: SARB.

SARB. 2002. *The South African Reserve Bank Quarterly Report*. Pretoria: SARB.

SARB. 2002. *Annual Economic Report*. Pretoria: SARB.

SARB. 2005. *Annual Economic Report*. Pretoria: SARB.

SARB. 2007. *Annual Economic Report*. Pretoria: SARB.

SARB. 2008. *The South African Reserve Bank Quarterly Report*. Pretoria: SARB.

SARB. 2009. *Annual Economic Report*. Pretoria: SARB.

SARB. 2009. *The South African Reserve Bank Quarterly Report*. Pretoria: SARB.

SARB. 2012. *Annual Economic Report*. Pretoria: SARB.

SARB. 2012. *The South African Reserve Bank Quarterly Report*. Pretoria: SARB.

SARB. 2013. *The South Africa Reserve Bank Quarterly Bulletin*. Pretoria: SARB.

SARB. 2014. *The South Africa Reserve Bank Quarterly Bulletin* (data sets). Pretoria: SARB.

SARB. 2015. *The South Africa Reserve Bank Quarterly Bulletin*. Pretoria: SARB.

SARB. various years. *The South Africa Reserve Bank Online Database*. Pretoria: SARB.

Sawtelle, B. 2007. Analyzing the link between real GDP and employment: an industry sector approach. *Business Economics*, 42: 46-54.

Schettkat, R. 1992. *The Labor Market Dynamics of Economic Restructuring: The United States and Germany in Transition*. New York: Praeger Publishers.

Schiff, J.A., Egoume´-Bossogo, P., Ihare, P., Konuki, and Tand Krajnya´k, K. 2006: *Labor market performance in transition: the experience of Central and Eastern European countries*. IMF Occasional Paper No. 248, July. Washington DC: IMF.

Schlemmer, L. and Levitz, C. 1998. *Unemployment in South Africa: The Facts, the Prospects, and an Explanation of Solutions*. Johannesburg: South African Institute of Race Relations.

Schmid, G. 2008. *Full Employment in Europe: Managing Labour Market Transitions and Risks*. Massachusetts, USA: Edward Elgar Publishing.

Schoeman, N.J. and Blignaut, J.N. 1998. Socio-economic environment and labour absorption in South Africa. *South African Journal of Economics*, 66(3): 145-154.

Sellars, C. 2000. Unemployment, Policy and Social Partnership. *South African Journal of Economics,* 68(3): 484-513.

Shleifer, A. and Vishny, R. 1994. Politicians and firms. *Quarterly Journal of Economics,* 109: 995–1025.

Shvets, J. 2005. Judicial Bias in Russian Commercial Courts. *Mimeo,* London School of Economics.

Simkins, C.E.W. 1977. Measuring and predicting unemployment in South Africa. In Simkins, C.E.W. and Clarke, D. (eds). *Structural unemployment in South Africa.* Pietermaritzburg: University of Natal Press.

Siphambe, H.K. 2007. *Growth and employment dynamics in Botswana: a case study of policy coherence.* Working Paper No. 82. Geneva: International Labour Office, Policy Integration and Statistics Department.

Sögner, L. and Stiassny, A. 2002. An Analysis of the Structural Stability of Okun's Law: A Cross-Country Study. *Applied Economics*, 34:1775-1787.

Solow, R. 1956. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics,* 70: 65-94.

Song, H. and Witt, S.F. 2000. *Tourism Demand Modelling and Forecasting: modern econometric approaches*. Cambridge: Pergamon.

STATSSA. 2000–2004. Labour Force Surveys, September 2000–2004. Pretoria: STATSSA.

STATSSA. various years. *Labour Force Survey*. Pretoria: STATSSA.

STATSSA. various years. *October Household Survey.* Pretoria: STATSSA.

Strydom, P.D.F.1996. *Economic growth*. AIPA Report, February 1996. Johannesburg.

Terreblanche, S. 2002. *A History of Inequality in South Africa, 1652-2002*. Pietermaritzburg: University of Natal Press.

Tregenna, F. 2008. The Contributions of Manufacturing and Services to Employment Creation and Growth in South Africa. *South African Journal of Economics,* 76(2): 177-204.

UNCTAD. 2012. Macroeconomic Policies to Promote Growth and Job Creation: A UNCTAD Contribution to the Special High-level Meeting of the Economic and Social Council with the Bretton Woods Institutions, the World Trade Organization, and the United Nations Conference on Trade and Development, presented on 12-13 March 2012, New York.

United Nations Development Programme. 2003. *South Africa Human Development Report – The Challenge of Sustainable Development in South Africa: Unlocking People's Creativity*. Cape Town: Oxford University Press.

Upender, M. 2006. Output elasticity of employment in the Indian economy: an empirical note. *Applied Econometrics and International Development,* 6(1):197-206.

Upender, M. 2011. Differential output elasticity of employment during post-economic reform period in the Indian economy. *The Singapore Economic Review*, 56: 189–202.

Vane, H. and Thompson, J.L.1994. *Current Controversies in Macroeconomics: An Intermediate Text*. United Kingdom: Edward Elgar Publishing.

Verhaest, D. and Omey, E. 2012. *The relationship between formal education and skill acquisition in young workers' first jobs*. Working Paper No. 768. Universiteit Gent.

Vosloo, W.B. 1994. *Entrepreneurship and Economic Growth*. Pretoria: HSRC.

Wakeford, J. 2004. The Productivity-Wage Relationship in South Africa: An Empirical Investigation. *Development South Africa*, 21: 109–132.

Weber, C.E. 1995. Cyclical Output, Cyclical Unemployment, and Okun's Coefficient: A New Approach. *Journal of Applied Econometrics,* 10: 433-445.

Weiler, J. 2005. *Problemas de empleo, tendencias subregionales y politicas para mejorar la inserción laboral.* Macroeconomia del desarrollo series. No. 40 (LC/L.2409-P). Santiago, Chile: Economic Commission for Latin America and the Caribbean (ECLAC). United Nations publication.

Wolnicki, M. 2006. Jobless growth: a new challenge for the transition economy of Poland. *International Journal of Social Economics,* 33(3): 192-206.

World Bank. 2012. *Job Trends*. Washington, DC: World Bank.

World Bank. 2013. *World Databank Website.* Available at: http://econ.worldbank.org. (Accessed May 7, 2013).

World Development Report. 1997. *The state in a changing world*. New York: Oxford University Press.

World Economic Forum. 2012. The Global Competitiveness Report 2012–2013. World Economic Forum. Geneva. Available at: http://www.weforum.org/en/index.htm . (Accessed January 19, 2016).

Young, A. 1992. A Tale of Two Cities: Factor Accumulation and Technical Change in Hong Kong and Singapore, in *NBER Macroeconomics Annual 1992,* edited by Olivier J. Blanchard and Stanley Fisher. Cambridge, MA: MIT Press, 13-54.

Yousef, T.M. 2004. Employment, Development and the Social Contract in the Middle East and North Africa. Background paper for *Unlocking the employment potential in the Middle East and North Africa: towards a new social contract*. Washington DC: World Bank.

Appendix 1.1: A summary of empirical research on international employment intensity of growth.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Ajilore and Yinus (2011)	The study explores the employment intensity of sectoral output growth in Botswana with a view to identifying key sectors of the Botswana economy that are employment intensive.	Botswana	1990-2008	employment (number of employees)	Aggregate and sectoral GDP, wages as the price of labour, market interest rates as the price of capital, and a measure of international exposure or openness index	Cointegration approach and OLS regression analysis.	The results of the study indicated a low total employment intensity of growth in Botswana of around 0.01, confirming the fact that growth in Botswana has been largely driven by productivity improvements, rather than labour demand growth. At a sectoral level, the study found that employment elasticity of sectoral output growth in banking, commerce, construction, manufacturing and mining were positive but weak indicating that growth in these sectors is more productivity driven rather than labour employment driven. Other sectors exhibited negative employment elasticities, signifying negative employment growth and positive productivity growth. The study attributes the negative employment elasticity in the agricultural sector to labour replacing technologies and processes in the sector, implying that this sector is no longer able to absorb the growing rural labour force.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Anaya (1999)	To study labour market flexibility in 13 Latin American Countries since the 1960s and 1970s by looking at the sensitivity of employment and unemployment, and real wages with respect to output.	Latin America	1960-1995	Aggregate employment and unemployment (number of persons)	Real wages, inflation, and output.	Cyclical relationships are studied by constructing Okun coefficients for unemployment, employment, and wages using first differences and the cyclical component of a Hodrick-Prescot (HP) decomposition of the series.	The results suggested that the Latin American labour markets adjust to output shocks more through adjustments in real wages than in the United States. In particular the study found that the wage Okun coefficients in Latin America were close to 1 compared with the United States coefficient value of 0.5.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Boltho and Glyn (1995)	To investigate whether differences in the stance of macroeconomic policy help to account for differences in the employment experiences of the industrialized countries.	Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, United Kingdom and the United States.	1960-1993	Average annual growth rate of total employment; average annual growth rate of private sector employment; average annual growth rate of total hours worked.	Average annual growth rate of GDP.	Cross-section regressions.	The results confirmed that output growth rates clearly have a statistically significant influence on employment outcomes. The results suggested that for every 1 per cent increase in a country's growth rate, there was a corresponding improvement in the employment record. These finding were essential in casting doubts on the notion of jobless growth as a description of the short and medium term performance of the OECD economies.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Dokpe (2001)	To address the central question on what economic policy can do to achieve more employment for a given rate of growth and to shed light on the validity of the empirical regularity between unemployment or employment and output growth.	Europe	1971-1999	Unemployment rate(defined by the OECD/ILO convention), the change of total employment, the change of dependent employment, the change of the employment rate (defined as the ratio of total employment to total population in working age), the change of the hours worked.	Real GDP growth	Estimation of the Okun coefficient using the cointegration approach and OLS regression analysis.	The study found that in Europe, a more prominent role of the services sector corresponds to a higher employment intensity of growth, and concludes that structural reform in favour of the services sector might assist in the fight against unemployment.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Fofana (2001)	To investigate how the relationship between economic growth and employment in the Ivorian modern private sector had evolved over time, as well as the employment elasticities of selected variables.	Cote d'Ivoire.	1975-1995	Employment (number of employees in the private sector).	GDP, public expenditure, development aid and public investment.	Cointegration approach and OLS regression analysis.	The results of cointegration analysis showed that there was no cointegration between employment and economic growth, public expenditure, development aid, and public investment. This suggested employment and these variables do not move together in the long run at the same rate. On this basis the study thus concluded that jobless growth had occurred in the in the Ivorian economy.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Gabrisch and Buscher (2005)	To answer the question whether high unemployment was still a response to on-going adjustment processes stemming from an incomplete transition, or a reflection of market rigidities, or was due to weak economic growth.	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia.	1994:01-2004:04	Unemployment rate.	GDP growth rate, US treasury bill, growth rate of total exports.	Two-stage least squares (TSLS) and panel regressions.	The study results revealed that during the first transition stage, which was until 1994, changes in output were responsible for unemployment in the Czech Republic only. That is, during this period, a number of other transition countries experienced jobless growth. However, estimates of the later period of the transition, between 1998:1 and 2004:4 showed a strong improvement in significance and sensitivity of the results. The study concluded that the responsiveness of the unemployment rate to changes in output was evidence for completed transition.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Hanusch (2012)	To explore the net effect of growth on job creation by estimating the Okun's Law coefficient for eight East Asian countries.	South Korea, Singapore, Hong Kong SAR, China, Taiwan, Malaysia, Philippines and Thailand.	2001-2011	Employment (%)	Total GDP (constant prices)	Autoregressive Distributive Lag model.	The results based revealed a statistically significant relationship between employment and economic growth in most East Asia countries, except for the Philippines and Taiwan, China
Hararian et al.(2010)	To investigate the long-run relationship between GDP growth and unemployment for selected MENA countries.	Turkey, Egypt, Israel, and Jordan.	1975-2005	Unemployment rate	GDP growth	OLS regression analysis.	The study results revealed that for all 4 countries, GDP growth and unemployment were both negatively correlated. An assessment of the magnitude of the value of the elasticity coefficients revealed that this relationship was stronger in Egypt and Turkey than in Israel and Jordan. Hence these results were indicative of the fact that Turkey and Egypt were able to create jobs much faster while growing, in contrast with those of Israel and Jordan which suggested that growth in these countries was mainly explained by productivity.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Islam and Nazara (2000)	To assess how employment intensity of output growth had evolved in Indonesia's major economic sectors.	Indonesia	1977-1996	Sectoral Employment	Total GDP per sector	Descriptive method and simple OLS regression.	The results showed that employment elasticity in agriculture was in excess of unity for the entire period of the analysis. In the trade sector, the results of the study revealed a constant decline in the employment elasticity during the period under examination. With regards to the industry sector, the results of the study showed relatively stable employment elasticity for the whole period.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Izyumov and Vahaly (2003)	To investigate the Okun relationship between growth and unemployment in the transition economies.	Reform leaders: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia. Reform laggards: Albania, Armenia Azerbaijan, Belarus Croatia, Macedonia Georgia, Kazakhstan Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.	1991-1994 and 1995-2000	Unemployment level	Real GDP growth	Regression analysis using standard least squares approach	Results confirmed that during the early periods of the transition, the Okun relationship could not be detected for the laggards group but marginally significant for the reform leaders. Also, during the later period of the transition, between 1995 and 2000, the relationship was strongly significant for reform leaders and for a sub-group of 10 laggards not affected by wars. On whole, this confirmed the hypothesis of a weak link between growth and unemployment in the early phases of the transition but a progressively strong linkage in the later phases of the transition.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Lal et al.(2010)	To estimate the Okun coefficient and its validity in some of the East Asian countries.	China, Pakistan, India, Sri Lanka and Bangladesh	1980-2006	Unemployment	GDP	Econometric methodology of cointegration analysis.	The study results showed an existence of a long run relationship between output gap and unemployment gap gap in these countries. That is, the presence of cointegrating vectors indicated the existence of a long run association between the variables. As a result, this supported the proposition that in Pakistan, Bangladesh, India, Sri Lanka and China the long-run relationship between output gap and employment gap existed.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Kapsos (2005)	To examine employment elasticities for the general employed population as well as for demographic groupings (such as women and youth) and for the three broad economic sectors (i.e. agriculture, industry and services.	160 economies[6]	1991-2003	Average annual growth in working-age population, share of employment in services, share of employment in industry, gender gap in labour force participation.	Average annual inflation rate, proportion of years with conflict, average percentage of trade in total GDP, average trade balance, malaria deaths per 100,000 inhabitants, highest individual tax rate, rigidity of employment index.	Multivariate log-linear regression model	The study found that Africa and Middle East registered the most employment intensive growth, which is a reflection of the regions' large labour surplus. The rapid economic growth in the Asian and Pacific regions led to larger productivity gains. Employment intensity in the North American region was found to be decreasing whereas in Western Europe it was found to be increasing. The study also found that employment elasticity in the services sector within the Euro area was relatively high.

[6] Australia, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, Canada, United States, Australia, New Zealand, Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovakia, Slovenia, Turkey, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, China, Hong Kong-China, Korea, Macau-China, Mongolia, Cambodia, Fiji, Indonesia, Lao People's Dem. Rep., Malaysia, Myanmar, Papua New Guinea, Philippines, Singapore, Solomon Islands, Thailand, Viet Nam, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela, Bahamas, Barbados, Dominican Republic, Guyana, Haiti, Jamaica, Puerto Rico, Suriname, Trinidad and Tobago, Bahrain, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, Yemen, Algeria, Egypt, Morocco, Sudan, Tunisia, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Rep., Chad* Comoros* Congo* Côte d'Ivoire* Dem. Rep. of the Congo* Equatorial Guinea* Eritrea* Ethiopia* Gabon* Gambia* Ghana* Guinea* Guinea-Bissau* Kenya* Lesotho* Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Linz (1998)	To examine the hypothesis that in the first stage of the transition processes the Russian industry exhibited a low labour elasticity and that employment changes were highly correlated with ownership structure.	Russia	1992-1995	Industry employment (number of employees)	Firm level output	OLS regression analysis.	The results showed that given the socialist production and employment patterns that Russia inherited, manufacturing firms in Russia experienced an unsustainably low elasticity of labour in the first stage of the transition process. In addition, the results also indicated that ownership structure tend not to be a major influence on employment changes for the Russian firms.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Menezes-Filho and Scorzafave (2007)	To estimate the GDP-employment elasticity in Brazil	Brazil	1985-2004	Aggregate employment (number of persons)	GDP	Simple arc elasticity of employment approach	The results showed that the short run employment elasticities were smaller compared to the long run elasticities. In addition, these results revealed that, since 1999, the long run elasticity increased even further, suggesting that growth in employment was explained by the accumulation of GDP impacts over time. It was further cited that following improvements in the economic conditions during the late 1990s, the economy was able to transform GDP growth into new jobs at a more accelerated path. The study concluded that in order to continue in this positive path, Brazil needed to continue expanding the education of its workforce through its various programmes, so that the recipients can have a way out of poverty through participation in the labour market.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Mourre (2006)	To examined whether the pattern of employment growth in Europe during the 1997-2001 period differs from that recorded in the past, and what could be the underlying reasons.	Europe as a whole	1970-2002	Total employment (employees plus self-employed) in terms of persons employed.	GDP, real compensation per employee, total taxes on labour, institutions employment protection, unionization, bargaining coordination, unemployment benefits replacement ratio, unemployment benefits duration.	Regression analysis using standard least squares approach.	The study concluded that its findings for the euro as a whole might be affected by an aggregation bias given the likely changes to country weights over time. An analysis took into account heterogeneity across countries showed evidence of structural break in employment behaviour that was usually an indication that employment developments could have been affected by labour market reforms or structural changes. Some of these labour market reforms included the relaxation of job protection legislation, subsidies to private employment and lower labour tax rates, all of which contributed to employment growth.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Navarro (2009)	To investigate the dynamics of aggregate employment in Latin America from a macroeconomic point of view covering 15 Latin American countries[7].	Latin America	1980-2008	Aggregate employment (number of persons)	GDP, averages of real wages, trade volumes as a percentage of GDP and the real exchange rate.	OLS and the Hahn, Hausman and Kuersteiner technique	The results of the study found that, as predicted by theory and in line with the literature, the employment-output elasticity was positive and significant. The short term employment-output elasticity coefficients were found to be between 0.32 and 0.34 while the long term coefficients were between 0.33 and 0.43. The results also indicated the tendency for the responsiveness of employment to changes in GDP to diminish over time.

[7] The fifteen Latin America countries include Argentina, Bolivia, Brazil, Chile, Colombia, Cost Rica, Ecuador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Nesporova (2002)	To investigate causes for the poor employment performance and high unemployment in the transition countries of Central and Eastern Europe and Central Asia (CEECA).	Albania, Armenia, Azerbaijan, Belars, Bulgaria, Croatia, Czech Republic, Estonia ,Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russian Federation, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, Yugoslavia.	1990-2000	Employment (i.t.o. number of persons employed).	GDP growth, investment, small enterprises.	Comparative analysis of production and employment.	The study concluded that growth did not produce a reduction in unemployment in the early phases of the transition but did so progressively in the later phases of the transition.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Padalino and Vivarelli (1997)	Examines the employment intensity of growth in the G-7 countries.	United States, Japan, Germany, France, Italy, United Kingdom and Canada.	1960-1994	Employment (number of employees) and of working time (total hours of work = numbers of employees times per capita working time)	Real GDP and population growth rates.	Presumably non-linear regression analysis using least squares	The study results showed that while a doubling of GDP involved about 50 per cent employment increase in North America, this elasticity dropped to 0.08 per cent for Japan, 0.06 for Germany, France and Italy, and down to -0.05 for the United Kingdom. This meant North America was characterised by employment intensive growth, while Japan, France, Germany and Italy indicated moderate growth in terms of employment and the United Kingdom experienced jobless growth.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Sawtelle (2007)	To examine industry-sector employment responsiveness to the long-term real GDP expansion that occurred during 1991-2001period, with the view to give insight into the jobless recovery phenomenon experienced in the U.S. economy.	United States	Monthly data for April 1991 to March 2001.	Total non-farm employment (thousands of persons) in 15 industry sectors[8]	Real GDP, output per person on non-farm business, Employment Cost Index, Consumer Price Index (all urban consumers), civilian labour force level (16 years of age and over, in thousands), Bank prime loan rate and monthly time trend.	Simple and Expanded Model equations estimated ordinary least squares.	The results identified certain industries exhibiting "jobless recovery" characteristics (having negative employment elasticities) and in those sectors exhibiting positive relationships between growth and employment, the strength of these relationships, measured by their respective employment elasticities, differ from one another.

[8] Total non-agricultural, mining; construction; manufacturing; durable goods manufacturing; non-durable goods manufacturing; transportation and public utilities; wholesale and retail trade; wholesale trade; retail trade; finance, insurance, and real estate; services; government; federal government; state and local government.

Empirical paper	Purpose of the study	Origin-destination(s)	Period	Dependent variable(s)	Independent variable(s)	Research method(s)/ Estimation model(s)	Empirical results
Schiff et al. (2006)	A cross-country analysis to explain the labour market dynamics during transition and the differences among the Central and Eastern European countries.	Central Eastern Europe	1993-2002				Similar to Gabrisch and Buscher (2005), the study found that unemployment increased rapidly during the years of the transition and had remained high. At a regional level, the study found that unemployment was regionally concentrated and there was little evidence that migration was significantly reducing this concentration. During the early transition regional unemployment was moving in unison with aggregate unemployment in a given country.
Upender (2006)	To examined the responsiveness of employment to changes in output during pre (1982-1990) and post (1991-2000) economic reform periods by estimating a derived demand function for employment with an interaction variable.	India	1982-2000	Employment in the private organized sector employing 10 or more persons and the public sector comprising all government agencies.	Real GDP at factor costs.	A double-log regression model with an interaction variable to time series annual data.	The study found that during the post reform period, the positive magnitude of employment elasticity in the finance, insurance and real estate sector was relatively high compared with the negative employment elasticity in the agriculture and hunting sector. This implied that reforms had deteriorated employment opportunities in India's agricultural sector.

Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Upender (2011)	To investigate the sign and size of output elasticity of employment for different industries in the Indian economy after the economic reforms implemented from the period 1969-1970 to 2004-2005.	India	1969-1970 to 2004-2005	Employment (number of persons) in private organised sector and public sector comprising all government agencies and local bodies	Real GDP at factor cost	A double-log regression model of demand function for employment, derived from the constant elasticity of substitution (CES) production function was estimated.	Empirical results showed that a positive magnitude of employment elasticity in the transport, storage and communication industries was found to be significantly high relative to the wholesale and retail trade and financing, insurance and real estate industries. The labour absorptive capacity in the overall private sector during the post economic reform period was found to be relatively high compared to the public sector. The employment elasticity with regards to all sectors combined was found to be negative, during the post reform period, implying that growth in the Indian economy has not been labour intensive.

Appendix 1.2: A summary of empirical research on domestic employment intensity of growth.

Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Bhorat and Oosthuizen (2008)	To closely interrogate the data on growth and employment in South Africa with the view to analyse the empirical basis of the jobless growth phenomenon.	South Africa	1990-2005	Aggregate total employment (number of employees)	Real GDP	Simple GDP elasticity of employment.	Their study revealed that, prior to 1990 output expansion was accompanied by employment growth. For periods after 1990 output growth was accompanied by a decline in employment growth. Employment elasticity fell from -0.55 between 1990 and 1996 to -1.29 between 1996 and 2002. This was a reflection of decreasing employment in response to rising real GDP. The study thus suggested that indeed jobless growth was a characteristic feature of the post-apartheid South African economy. However, the study noted that the employment data on which this argument was made excludes both agriculture and the informal sector. It asserted that reliance on simplistic methods confused correlation with causality. On whole, the study concludes that econometric analyses that control for the multitude of factors that impact on the economy, and using the same employment data, have been unable to show that growth was jobless.

Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Hodge(2009)	To examine the aggregate trends in growth, employment and unemployment in South Africa and to measure the relationships between them.	South Africa	1946-2007	Aggregate employment and unemployment	GDP growth	Simple arc elasticity of employment.	The study found that the employment elasticity was relatively stable over long periods, with an average value of 0.5, suggesting that a one percentage point increase in growth is associated with a half a percentage point increase in employment growth. This stability was disrupted by a brief decline in the elasticity value, during the mid-1990s after which it was re-established and continued to be stable. The study concluded that the high unemployment in South Africa in the mid-1990, was due to a large increase in the labour force not a deficiency in growth or employment performance as it was generally though.

Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Loots (1998)	To establish whether or not these goals set out in the GEAR strategy concerning employment-creating economic growth are attainable.	South Africa	1970-1996	Aggregate employment	Real GDP growth	Simple arc elasticity of employment approach.	The results showed a deterioration in GDP elasticity of employment since the 1970s. These results showed that GDP elasticity of formal non-agricultural employment was a negative figure of -0,55 during the period 1990-1996, indicating the inability of economic growth to create formal employment. The only sectors in the formal economy that exhibited positive elasticities were the private services and the government sector with elasticities of 0,32 per cent and 2,1 per cent respectively. Based on these findings the study concluded that economic growth on its own does not significantly contribute to the creation of new job opportunities. This implies that the inability of the economy to create sufficient employment opportunities is indeed evidence that South Africa is experiencing a situation of jobless economic growth.

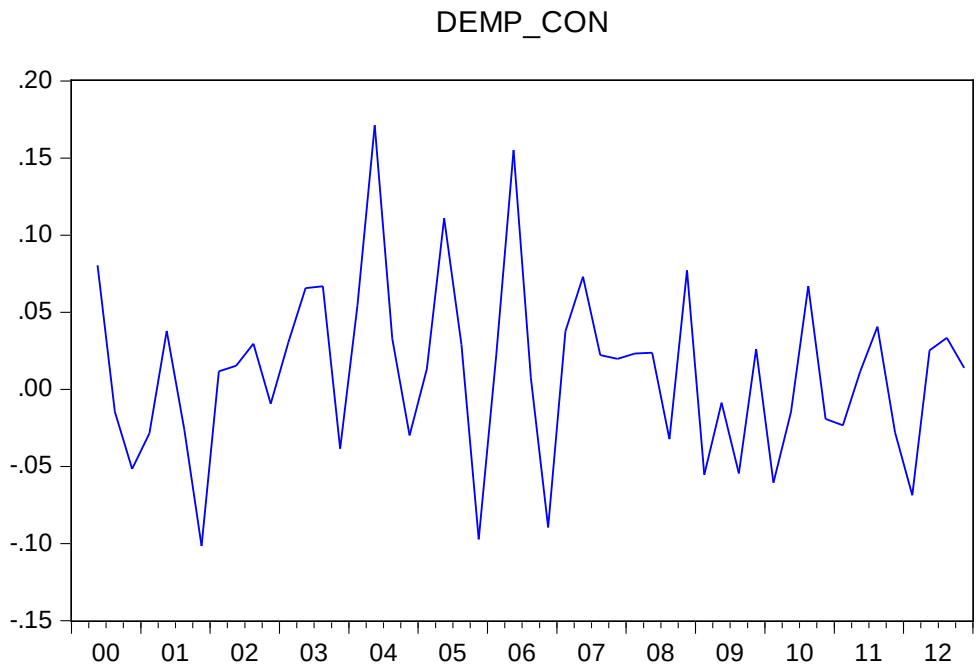
Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Mahadea and Simson (2010)	To examine the problem of low employment economic growth performance, by drawing on the Harrod-Domar model and regression analysis.	South Africa	1994-2008	Marginal employment effect (or change in employment growth)	Real GDP growth	Harrod-Domar model and regression analysis	The results of the study indicated that the impact of growth on marginal employment was positive and less than proportionate, given the statistically non-significant coefficient of real GDP growth found to be 0.1541. The study concluded that, given the current global economic climate, there was no simple solution for the cycle of sluggish growth and high levels of joblessness in South Africa. It recommended the creation of sound environment conducive to labour absorption development and business entrepreneurship.

Empirical paper	Purpose of the study	Origin-destinations	Period	Dependent variables	Independent variables	Research method(s)/ Estimation model(s)	Empirical results
Marinkov and Geldenhuys (2007)	To estimates Okun's coefficient for the South African economy in order to investigate the inverse relationship that exists between cyclical output and cyclical unemployment.	South Africa	1970-2005	Unemployment rate.	Real GDP growth.	Estimation of the Okun coefficient using the cointegration approach.	The study found no cointegrating relationship between the unemployment and output series. It showed that employment growth has become less responsive to economic growth since the mid-1980, possibly due to structural shifts in production and employment. It found that the very low employment coefficient of 0.06 in 1996-2000 was suggestive of the notion of jobless growth. It was thus recommended that the extent to which total unemployment responds to output should be investigated further.

Appendix 2.1: Unit root test results: employment, output, wages, inflation and interest rates.

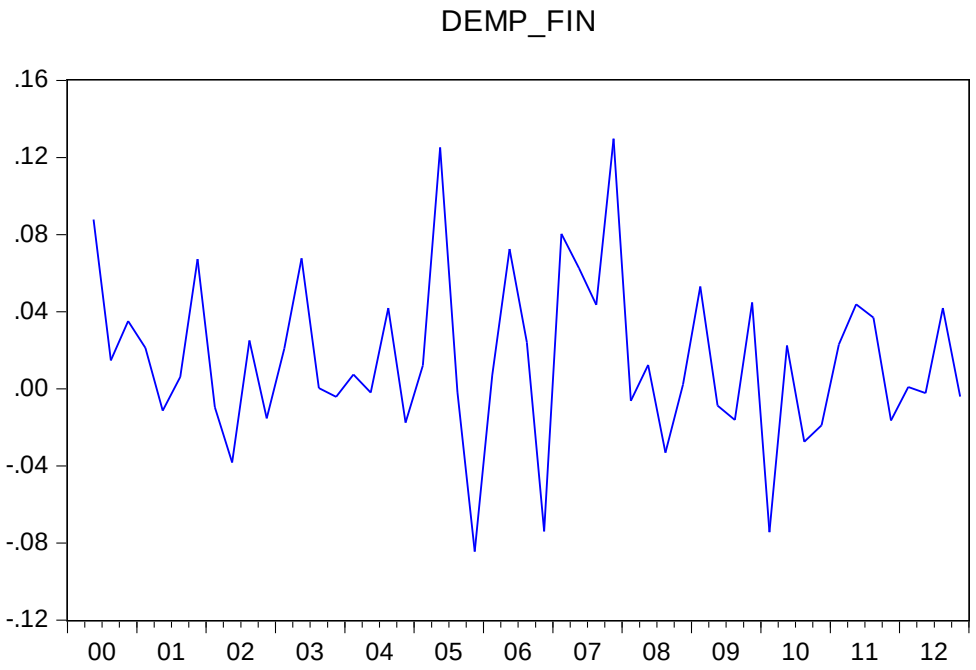
EMP_CON	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-1.993	6.894***
	Intercept	4	-1.636	7.662***
	None	4	0.929	---
First difference	Trend and intercept	1	-7.687***	21.672***
	Intercept	3	-1.938	26.824
	None	3	-1.694*	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



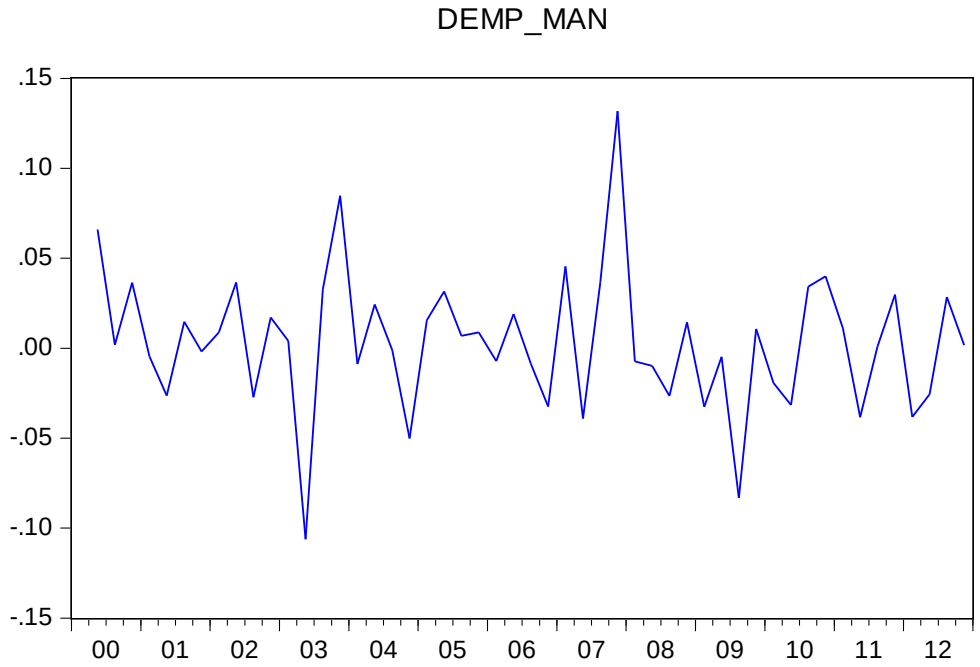
EMP_FIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.626	3.769
	Intercept	0	-1.395	1.947
	None	0	2.435	---
First difference	Trend and intercept	0	-7.582***	28.792***
	Intercept	0	-7.643***	58.415***
	None	0	-7.015***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



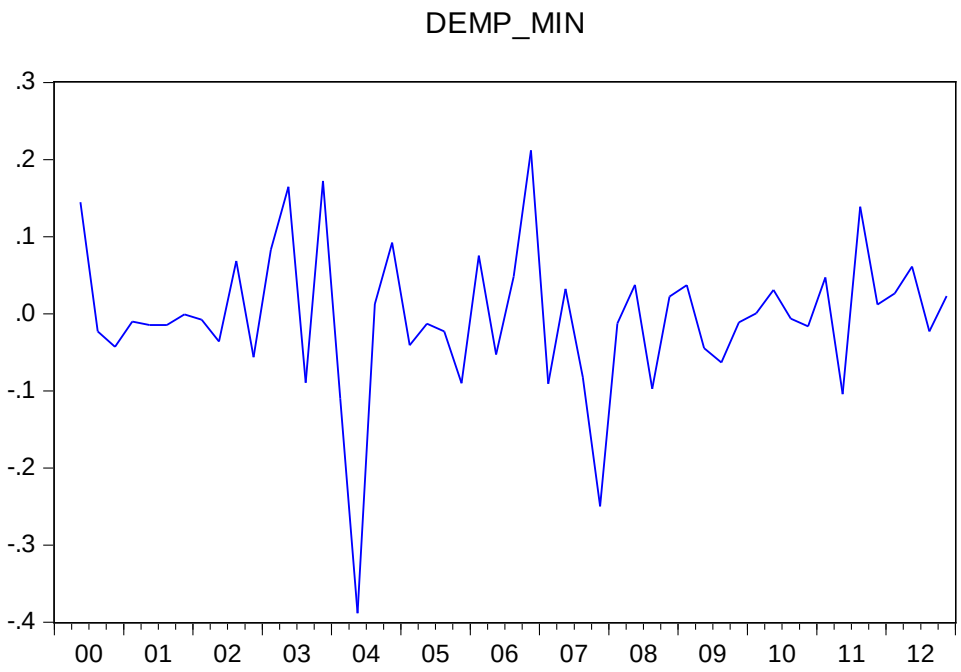
EMP_MAN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.938	4.769***
	Intercept	0	-2.883	8.314***
	None	0	0.574	---
First difference	Trend and intercept	0	-7.640***	29.265***
	Intercept	0	-7.681***	59.001***
	None	0	-7.741***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



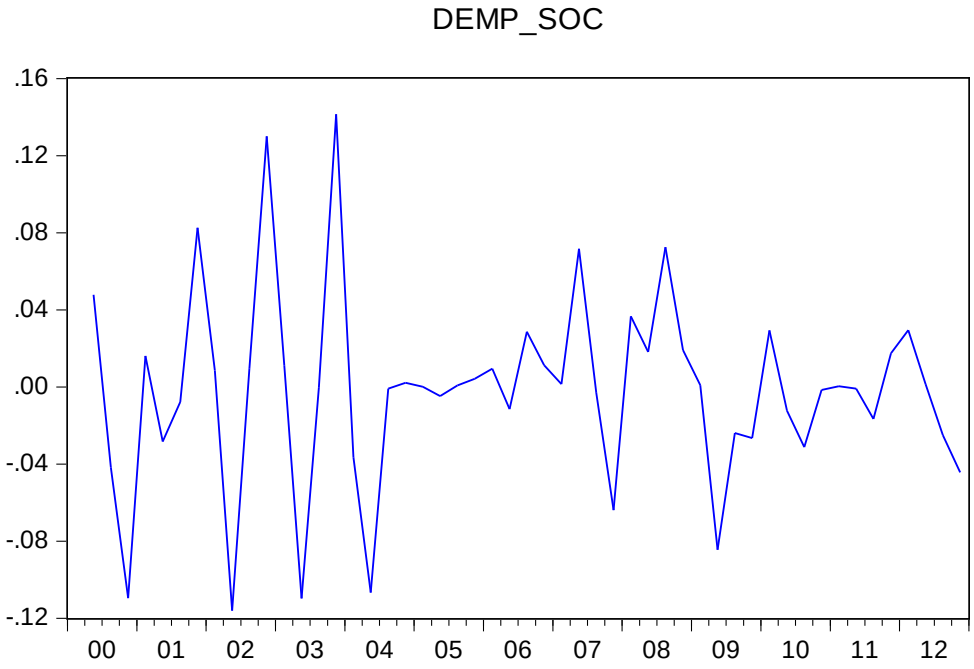
EMP_MIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.957	4.373***
	Intercept	0	-1.581	2.500
	None	0	-0.419	---
First difference	Trend and intercept	3	-4.753***	15.320***
	Intercept	3	-4.793***	19.537***
	None	3	-4.754***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



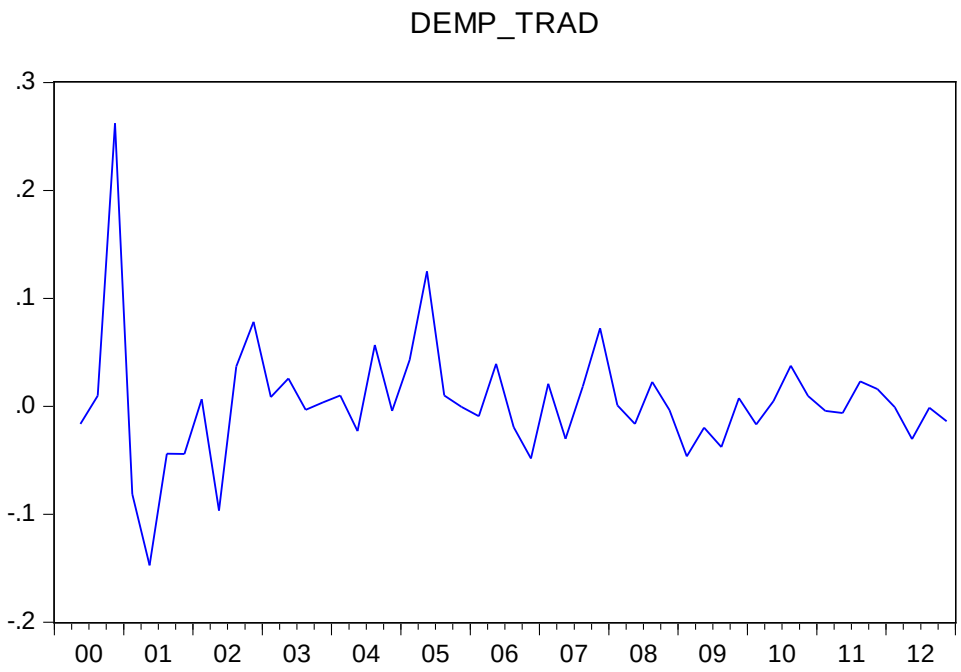
EMP_SOC	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	2	-2.526	9.370***
	Intercept	2	-2.299	12.053***
	None	2	-0.454	---
First difference	Trend and intercept	1	-9.527***	31.630***
	Intercept	1	-9.629***	48.345***
	None	1	-9.701***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



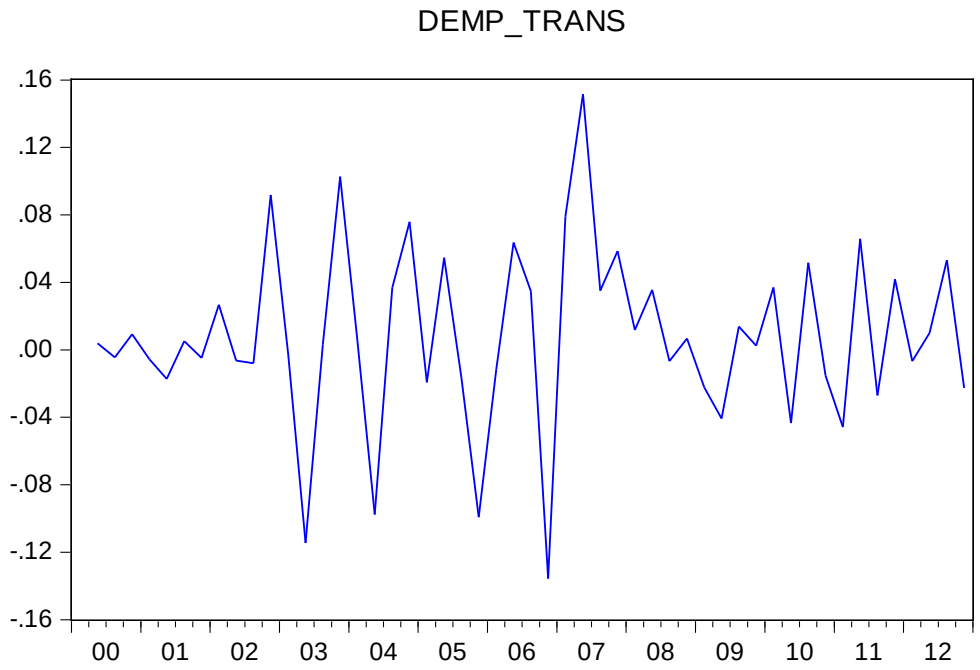
EMP_TRAD	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.375	2.867*
	Intercept	0	-1.890	3.572*
	None	0	0.435	74.683
First difference	Trend and intercept	0	-6.652***	22.138***
	Intercept	0	-6.704***	44.940***
	None	0	-6.741***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



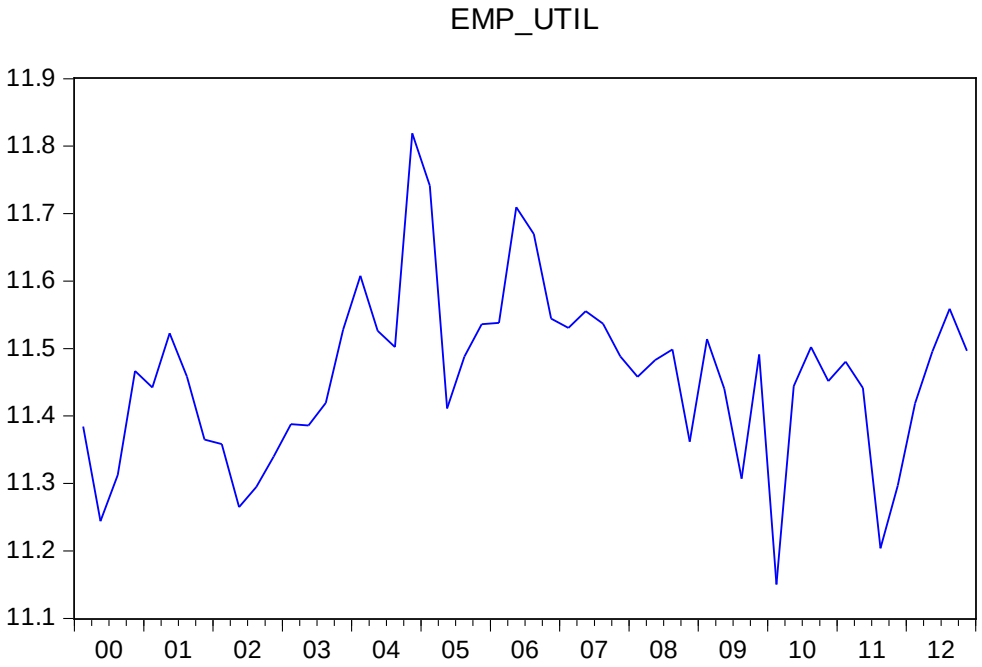
EMP_TRANS	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.211	5.223***
	Intercept	8	0.222	4.342***
	None	8	2.584	---
First difference	Trend and intercept	7	-4.727***	13.750***
	Intercept	7	-4.707***	15.624***
	None	1	-7.630***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



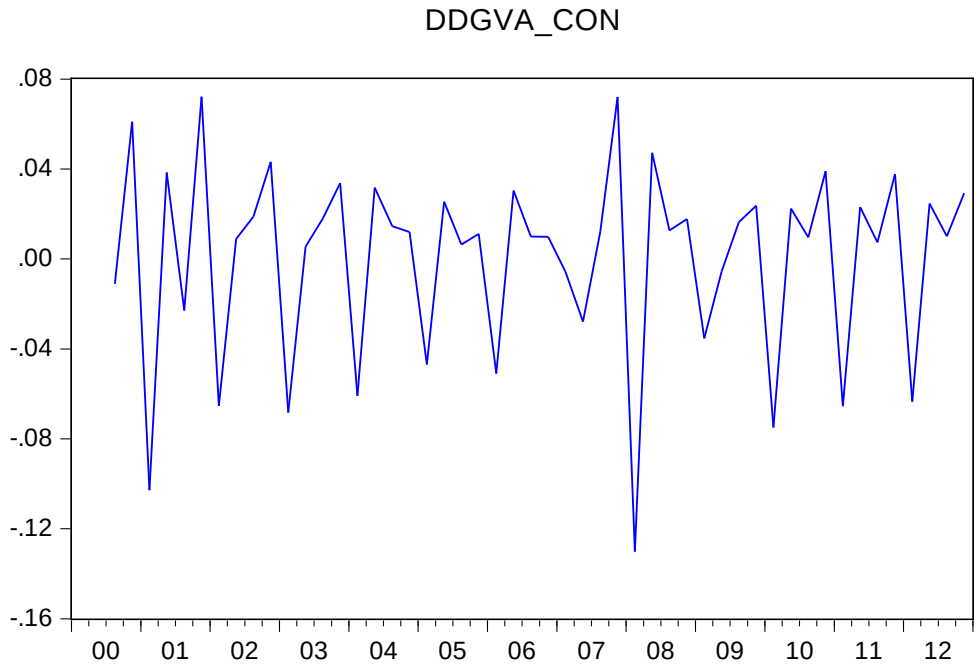
EMP_UTIL	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.917***	7.676***
	Intercept	0	-3.956***	15.652***
	None	2	0.379	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



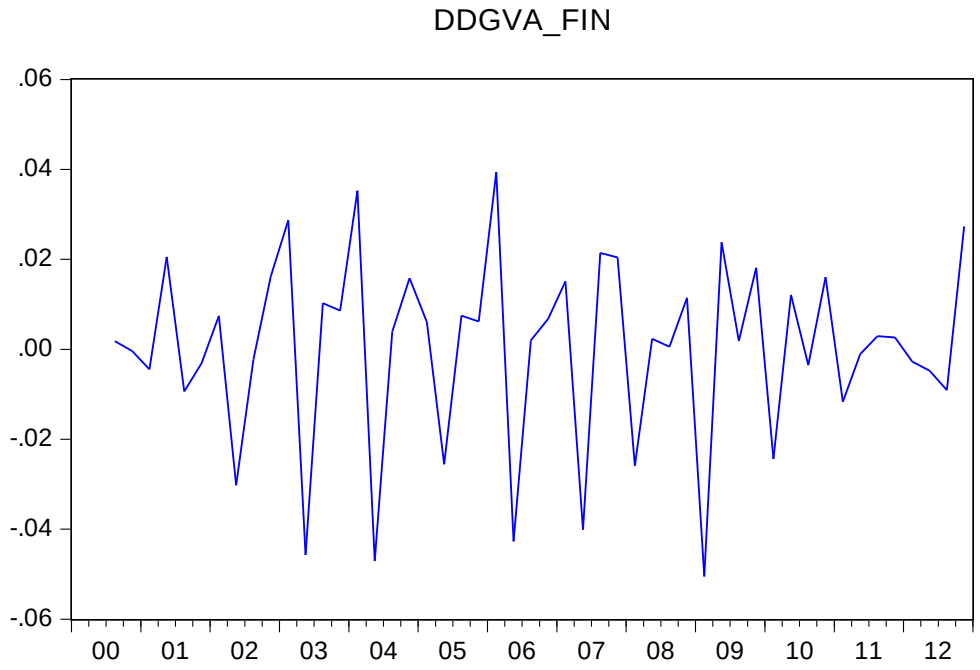
GVA_CON	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	10	-4.774	12.094***
	Intercept	8	-2.003	9.047***
	None	8	0.662	---
First difference	Trend and intercept	7	-1.643	23.787***
	Intercept	7	-0.974	25.054
	None	7	-0.645	---
Second difference	Trend and intercept	6	-3.921***	84.607***
	Intercept	6	-3.788***	96.318***
	None	6	-3.833***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



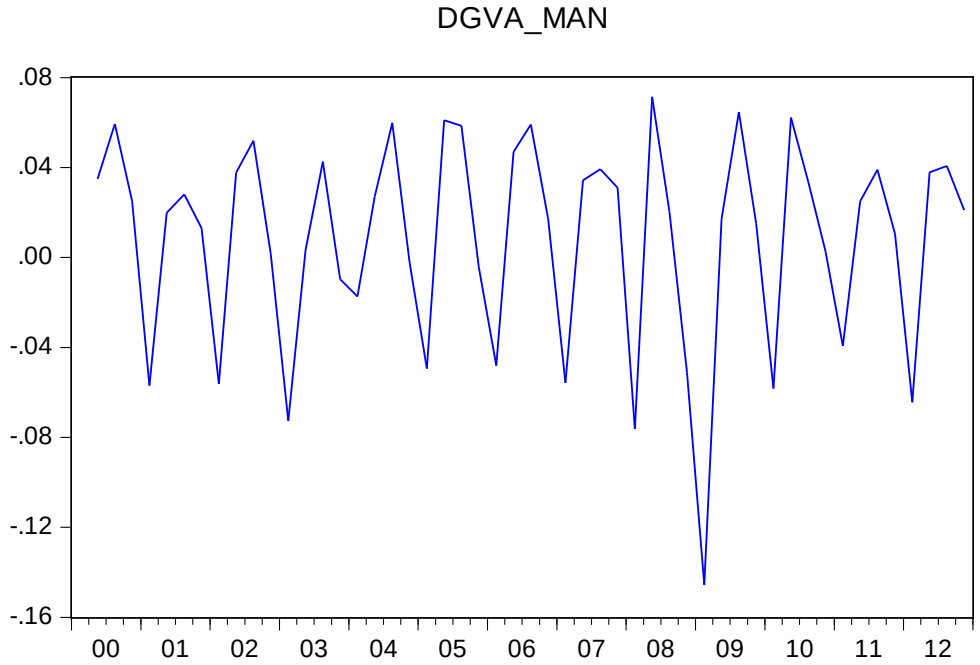
GVA_FIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-1.583	4.104***
	Intercept	4	-1.677	4.494***
	None	4	1.541	---
First difference	Trend and intercept	3	-2.377	17.459
	Intercept	3	-1.893	20.807***
	None	3	-1.019	---
Second difference	Trend and intercept	2	-11.739***	70.950***
	Intercept	2	-11.873***	96.738***
	None	2	-12.002***	137.440

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



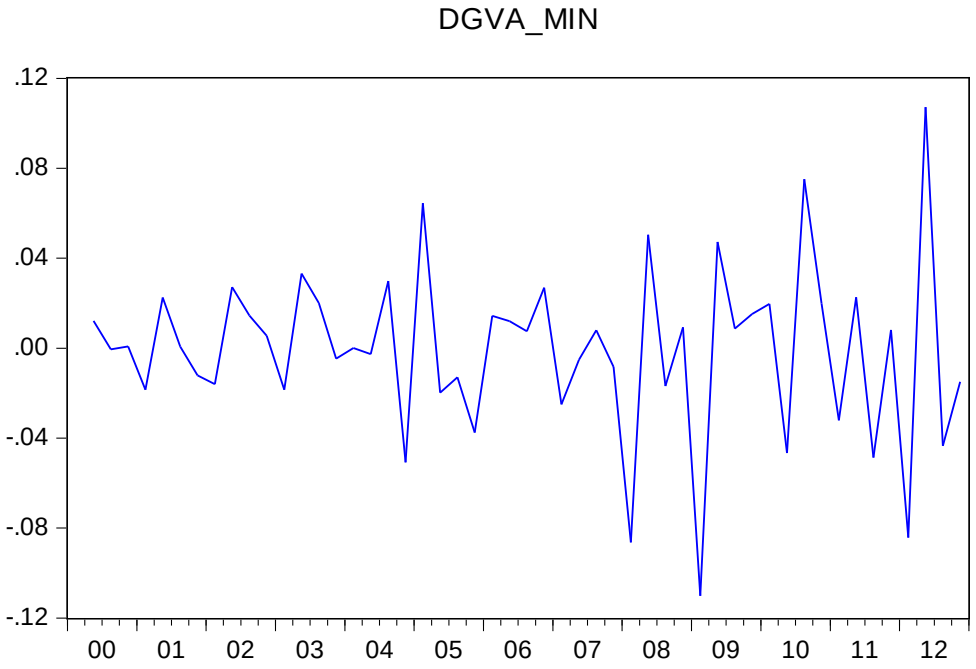
GVA_MAN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	5	-1.798	15.585***
	Intercept	5	-0.865	17.107***
	None	5	1.712	---
First difference	Trend and intercept	4	-3.673**	41.165***
	Intercept	4	-3.718***	50.598***
	None	4	-3.220***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



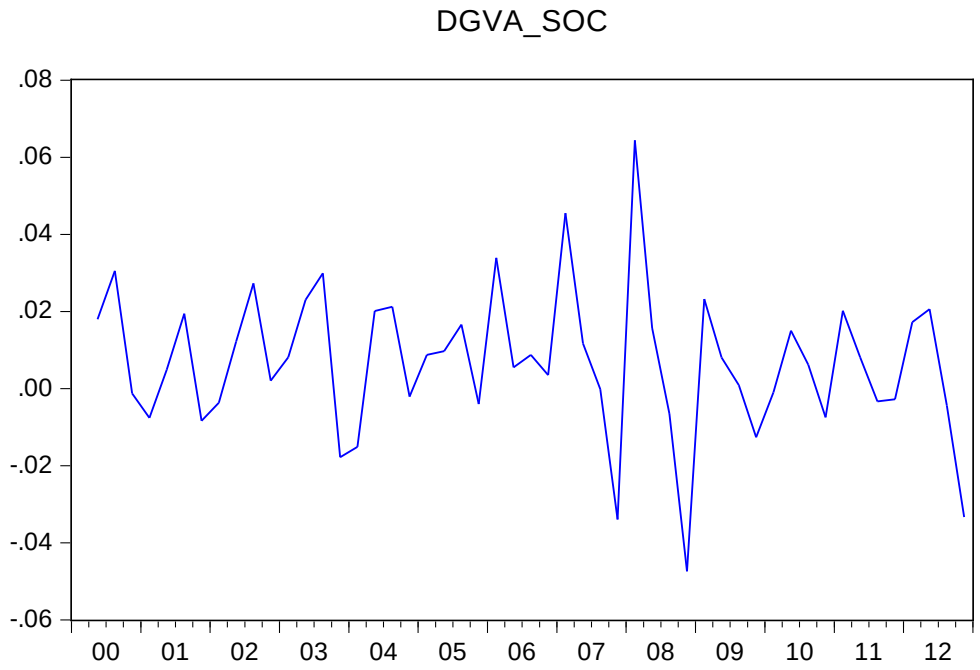
GVA_MIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.643	6.819**
	Intercept	1	-1.888	9.672***
	None	1	-0.230	---
First difference	Trend and intercept	0	-11.786***	69.454***
	Intercept	0	-11.804***	139.334***
	None	0	-11.919***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



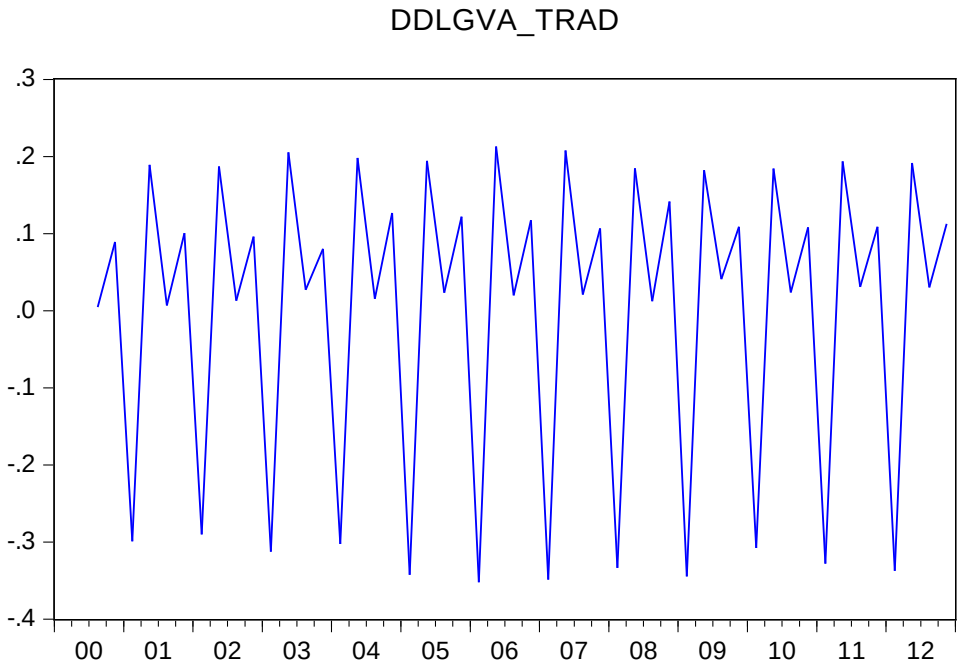
GVA_SOC	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-1.078	7.736***
	Intercept	4	-1.306	9.212***
	None	4	1.786	---
First difference	Trend and intercept	3	-2.718	28.196***
	Intercept	3	-2.515	34.755***
	None	3	-1.739*	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



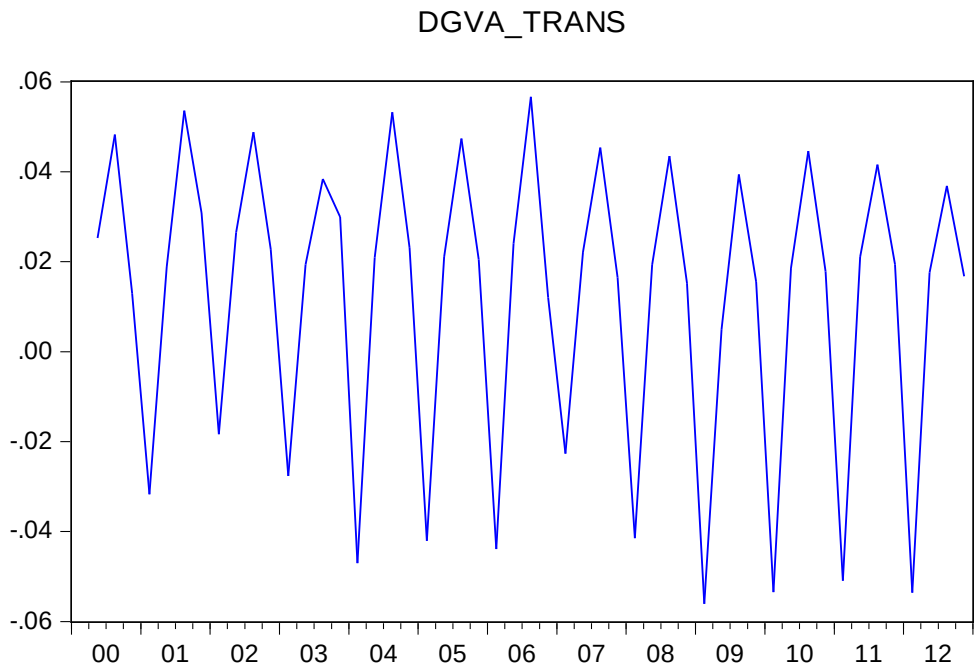
GVA_TRAD	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-3.071	793.694***
	Intercept	4	-0.653	796.575***
	None	4	1.279	141.840
First difference	Trend and intercept	3	-1.659	2226.320***
	Intercept	3	-1.678	2850.425***
	None	3	-1.069	---
Second difference	Trend and intercept	2	-122.039***	8698.550***
	Intercept	2	-123.485***	11873.73***
	None	2	-124.969***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



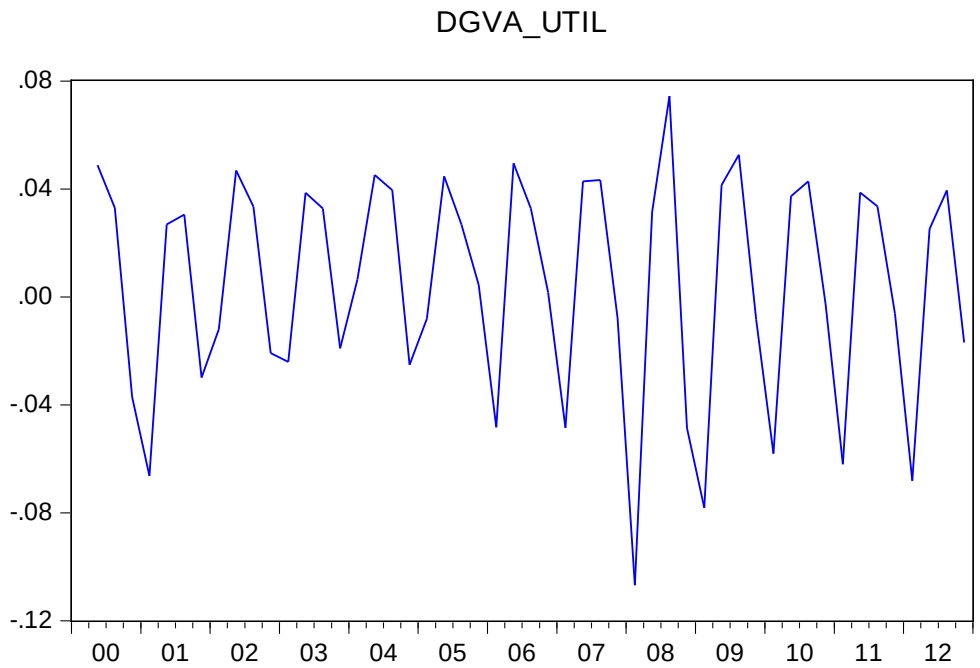
GVA_TRANS	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-1.675	107.617***
	Intercept	4	-2.604	129.146***
	None	4	0.693	---
First difference	Trend and intercept	6	-3.933**	210.187***
	Intercept	3	-1.101	312.202***
	None	3	-0.997	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



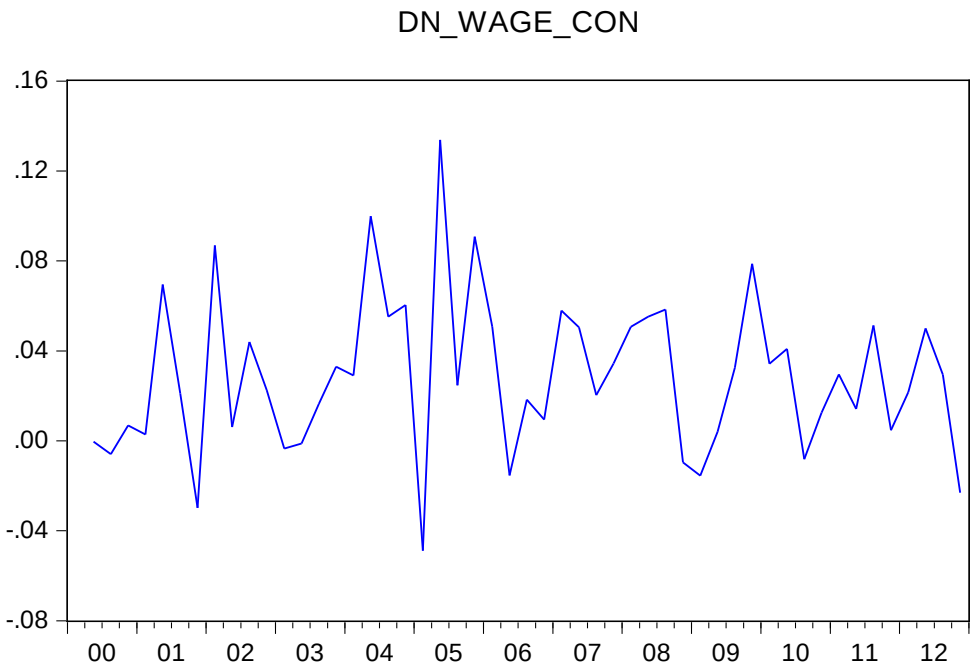
GVA_UTIL	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-1.396	31.100***
	Intercept	4	-1.950	37.822***
	None	4	1.067	---
First difference	Trend and intercept	3	-2.551	89.110***
	Intercept	3	-2.273	107.972
	None	3	-1.994**	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



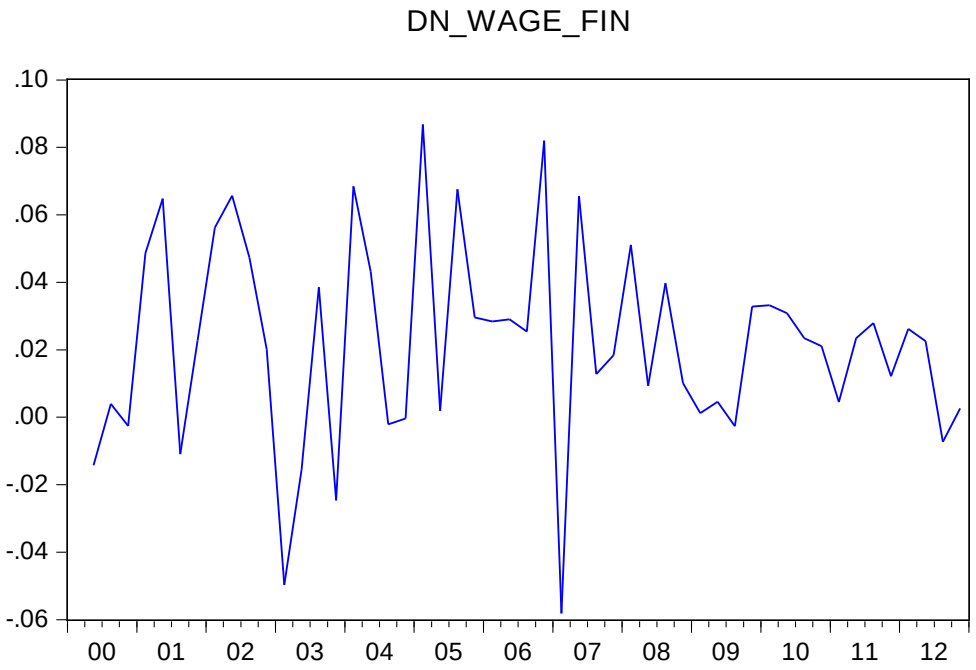
N_WAGE_CON	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.444	2.991***
	Intercept	0	-0.185	0.034
	None	0	5.777	---
First difference	Trend and intercept	0	-7.595***	29.004***
	Intercept	0	-7.696***	59.230***
	None	1	-2.580***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



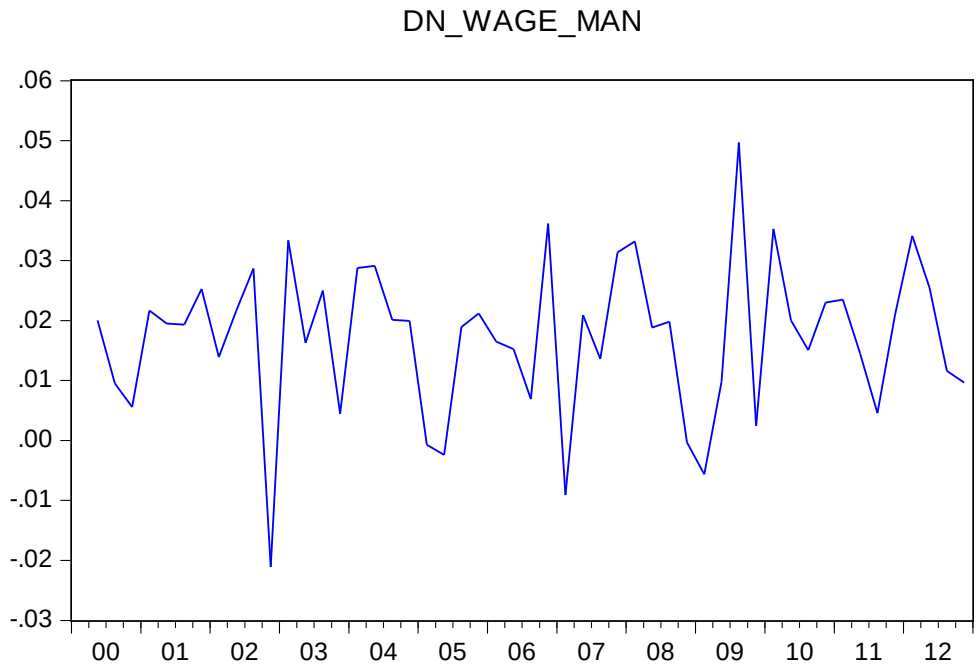
N_WAGE_FIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.540	3.317
	Intercept	1	-0.962	1.267
	None	1	5.002	---
First difference	Trend and intercept	0	-8.375***	35.172***
	Intercept	0	-8.387***	70.344***
	None	1	-2.968***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



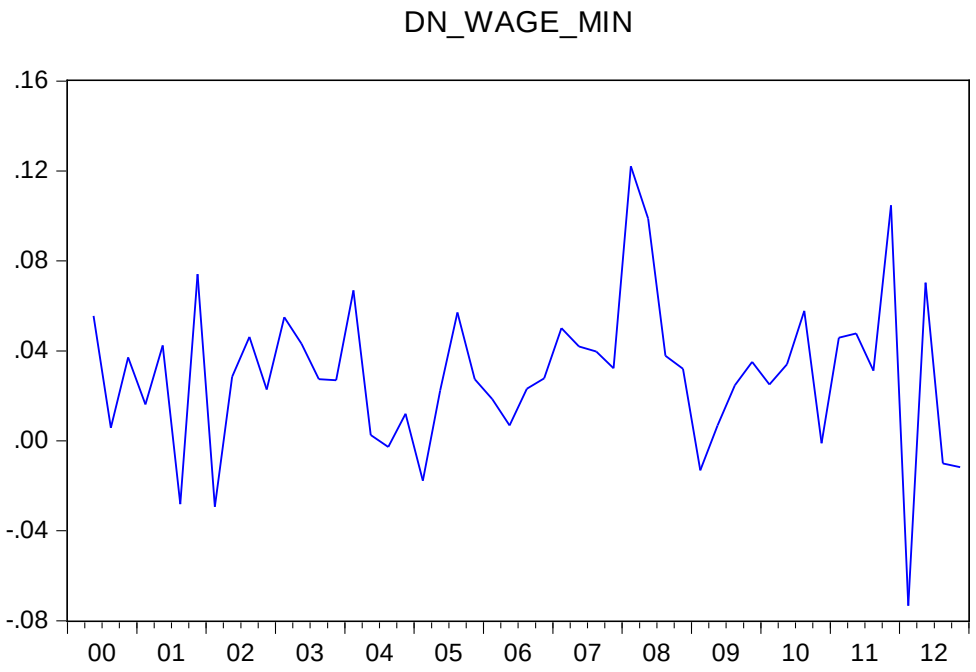
N_WAGE_MAN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.390	5.844***
	Intercept	0	0.227	0.052
	None	0	9.533	---
First difference	Trend and intercept	0	-8.396***	35.252***
	Intercept	0	-8.434***	71.144
	None	1	-1.961**	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



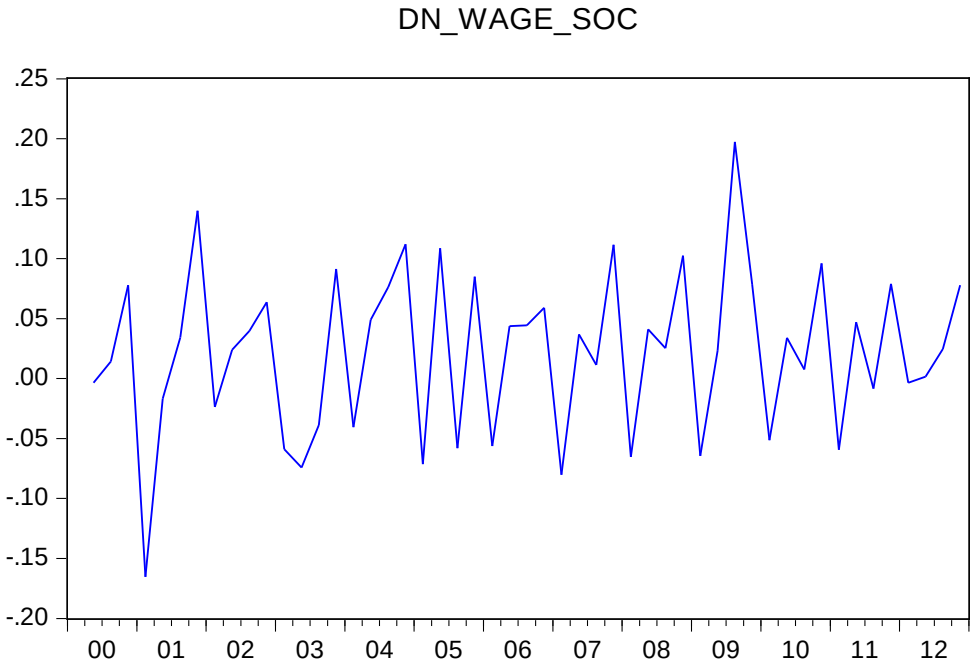
N_WAGE_MIN	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.642	6.819
	Intercept	1	-1.888	9.672
	None	1	-0.230	---
First difference	Trend and intercept	0	-11.786***	69.453***
	Intercept	0	-11.803***	139.340***
	None	0	-11.919***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



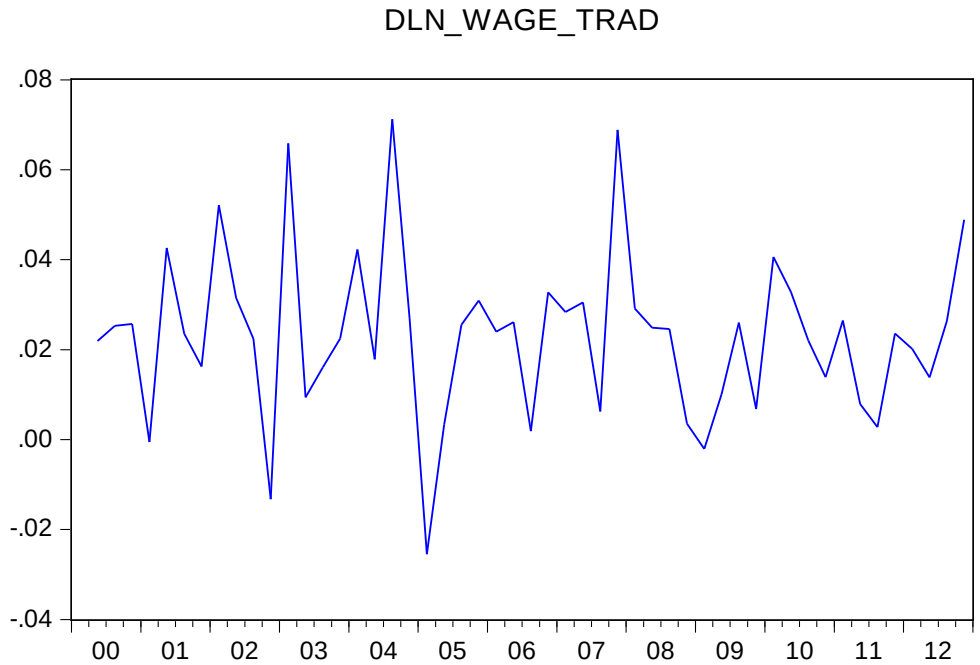
N_WAGE_SOC	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	4	-2.358	5.444***
	Intercept	4	0.243	4.742***
	None	4	2.664	---
First difference	Trend and intercept	6	-4.989***	21.351***
	Intercept	3	-3.337**	34.429***
	None	3	-1.947**	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



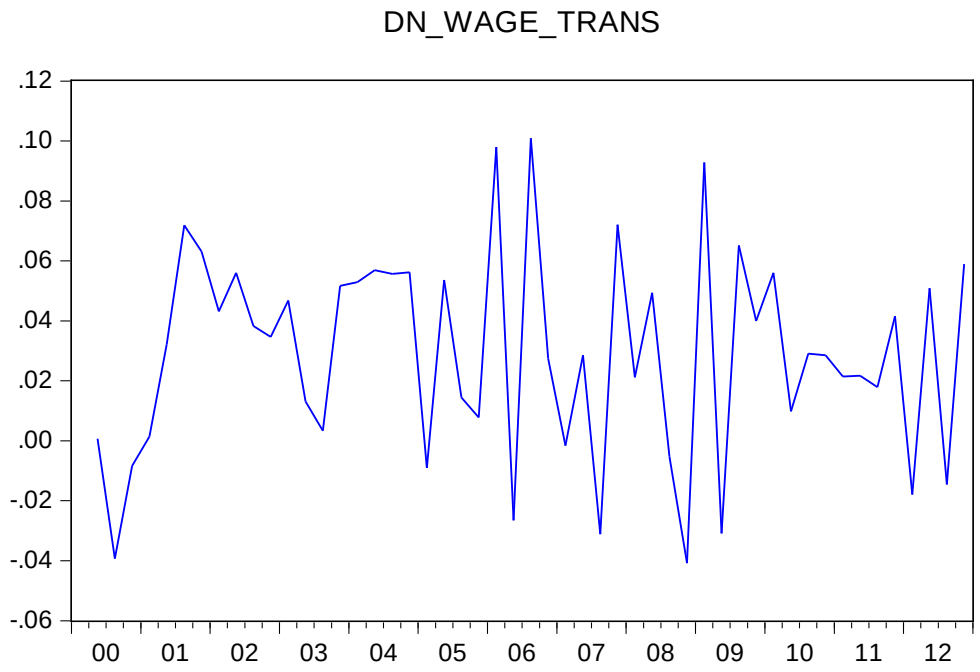
N_WAGE_TRAD	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-2.773	3.974**
	Intercept	0	-0.671	0.451
	None	0	8.812	---
First difference	Trend and intercept	0	-7.542***	28.493***
	Intercept	0	-7.577***	57.404
	None	0	-0.563	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



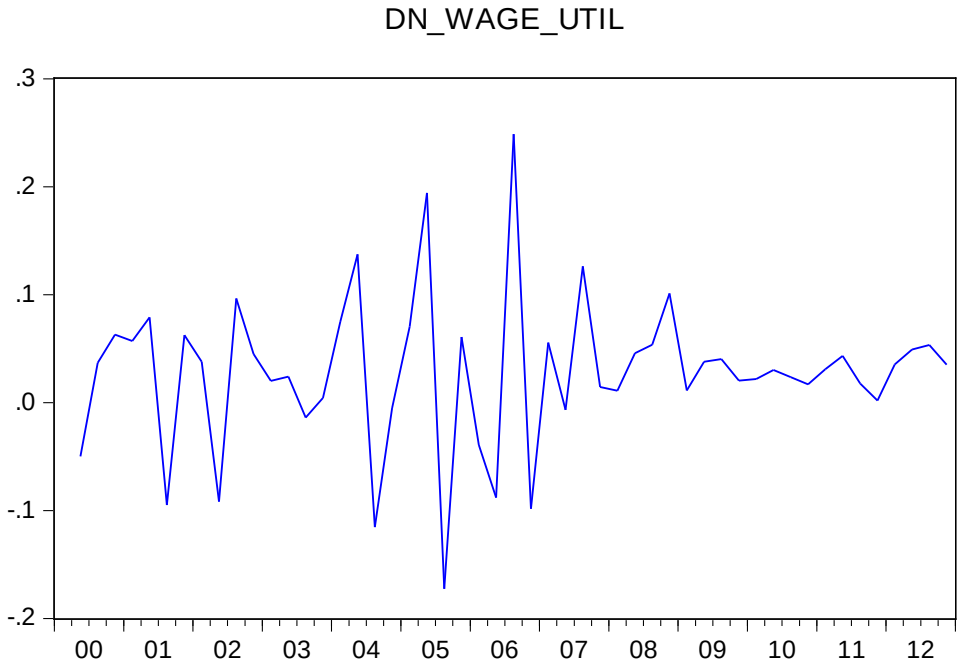
N_WAGE_TRANS	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	1	-1.375	2.010
	Intercept	1	-0.694	2.135
	None	1	5.889	---
First difference	Trend and intercept	0	-9.096***	41.367***
	Intercept	0	-9.148***	83.682***
	None	2	-1.454	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



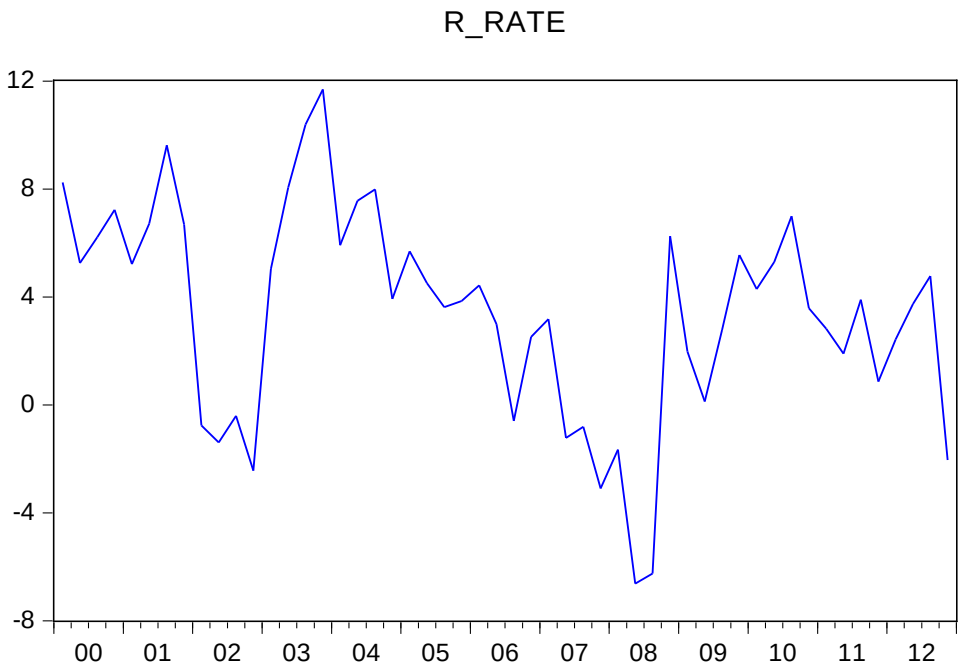
N_WAGE_UTIL	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-4.367	9.723***
	Intercept	3	0.699	5.023***
	None	2	4.897	---
First difference	Trend and intercept	1	-8.054***	45.266***
	Intercept	0	-11.144***	124.186***
	None	0	-8.966***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



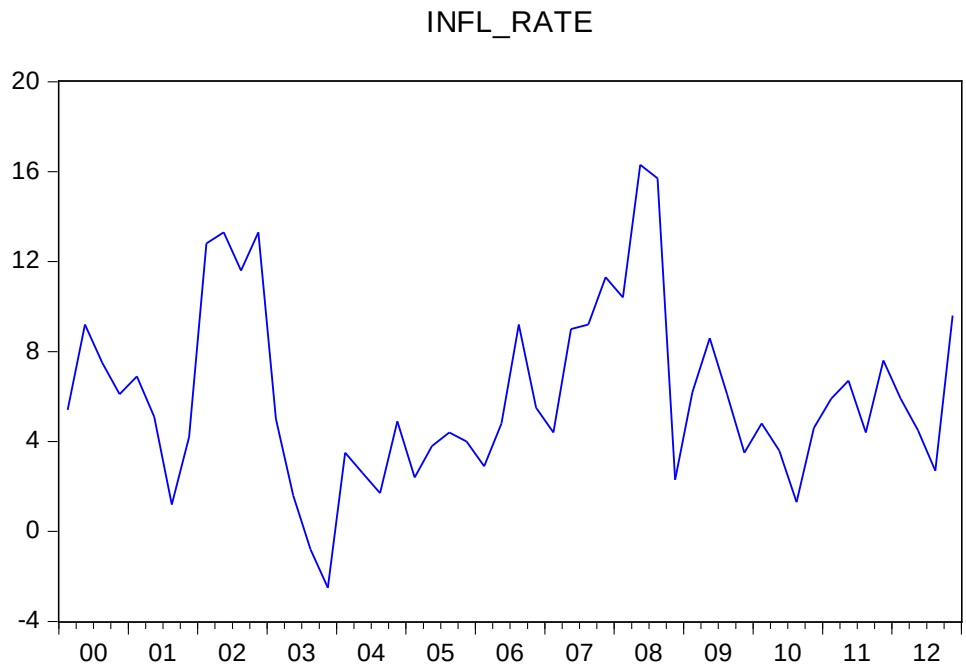
R_RATE	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.515**	6.180***
	Intercept	0	-3.316**	10.999***
	None	0	-2.707***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



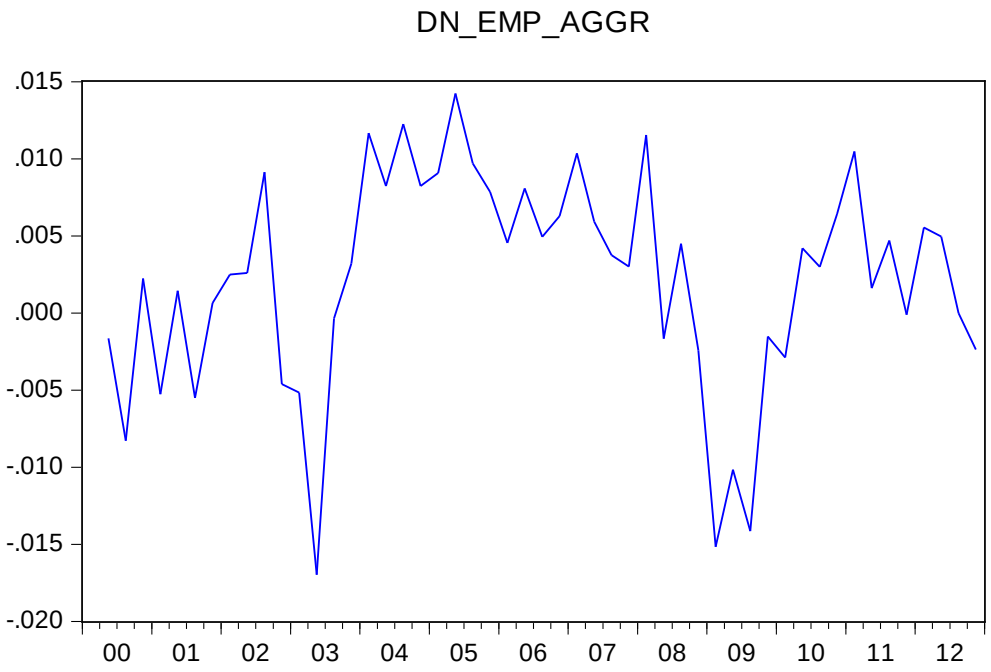
INFL_RATE	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.529**	6.250***
	Intercept	0	-3.570***	12.745***
	None	0	-1.682*	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



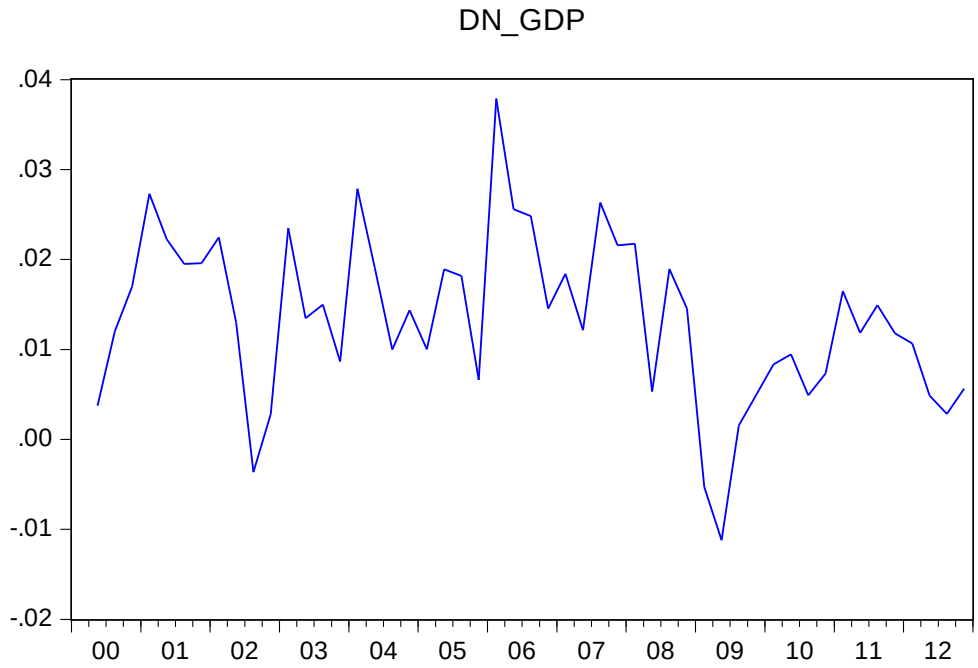
EMP_AGGR	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	2	-2.466	8.689***
	Intercept	1	-0.948	11.170***
	None	1	1.091	---
First difference	Trend and intercept	0	-3.636**	6.670***
	Intercept	0	-3.690***	13.619***
	None	0	-3.518***	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



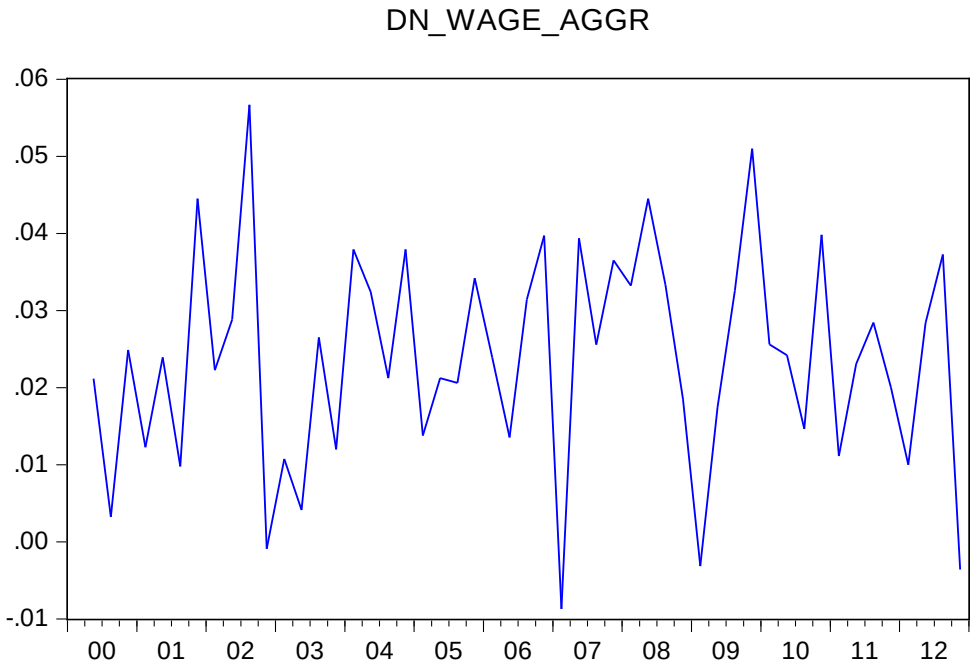
GDP	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	1	-0.910	5.553***
	Intercept	1	-2.126	8.263***
	None	1	3.561	---
First difference	Trend and intercept	0	-4.910***	12.192***
	Intercept	0	-4.380***	19.180***
	None	0	-2.184**	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



N_WAGE_AGGR	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1
levels	Trend and intercept	0	-3.387	5.818***
	Intercept	0	0.213	0.045
	None	0	11.895	---
First difference	Trend and intercept	0	-7.603***	29.042***
	Intercept	0	-7.672***	58.856***
	None	1	-1.536	---

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level



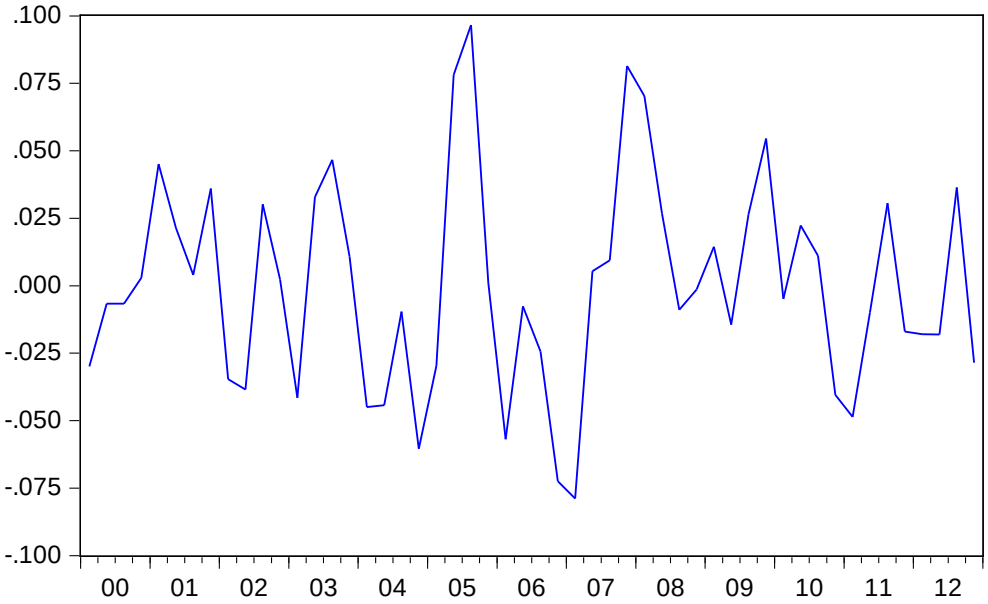
Appendix 2.2: Estimation results of all the co-integrating equations and the summary statistics.

1. Co-integrating equation: Finance and business services.

Dependent variable: LEMP_FIN	Coefficient	Std. Error	t-Statistic	Prob.
Independent variables:				
LN_WAGE_FIN	-0.574311	0.216401	-2.653922	0.0110
R_RATE	0.018442	0.006764	2.726269	0.0091
TREND	0.008406	0.004429	1.898161	0.0641
LGVA_FIN	1.559857	0.250091	6.237150	0.0000
INFL_RATE	0.020810	0.005921	3.514620	0.0010
DUM_V	0.065437	0.030989	2.111659	0.0403
Constant	6.292546	3.409580	1.845549	0.0715

Summary statistics:	
Adjusted R^2:	0.968902
Number of observations:	52
Log likelihood	95.18840
F-statistic	265.8268
Prob(F-statistic)	0.000000
Method:	Least Squares

Graph of the residual series: RES_FINANCE

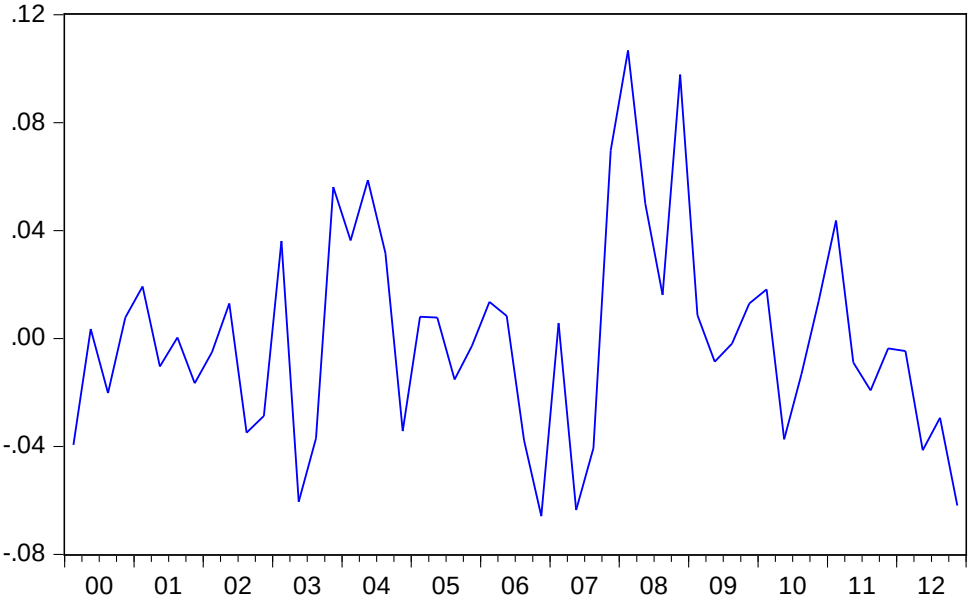


2. Co-integrating equation: Manufacturing.

Dependent variable: LEMP_MAN	Coefficient	Std. Error	t-Statistic	Prob.
Independent variables:				
LN_WAGE_MAN	-0.064579	0.505932	-0.127644	0.8990
R_RATE	-0.007059	0.006273	-1.125166	0.2665
LGVA_MAN	0.458351	0.156883	2.921613	0.0054
INFL_RATE	-0.003311	0.005512	-0.600639	0.5511
TREND	-6.02E-05	0.009116	-0.006608	0.9948
DUM_V	0.105832	0.040728	2.598526	0.0126
Constant	10.42101	9.111432	1.143729	0.2588

Summary statistics:	
Adjusted R^2:	0.624477
Number of observations:	52
Log likelihood	96.87700
F-statistic	15.13512
Prob(F-statistic)	0.000000
Method:	Least Squares

Graph of the residual series: RES_MANUFACTURING

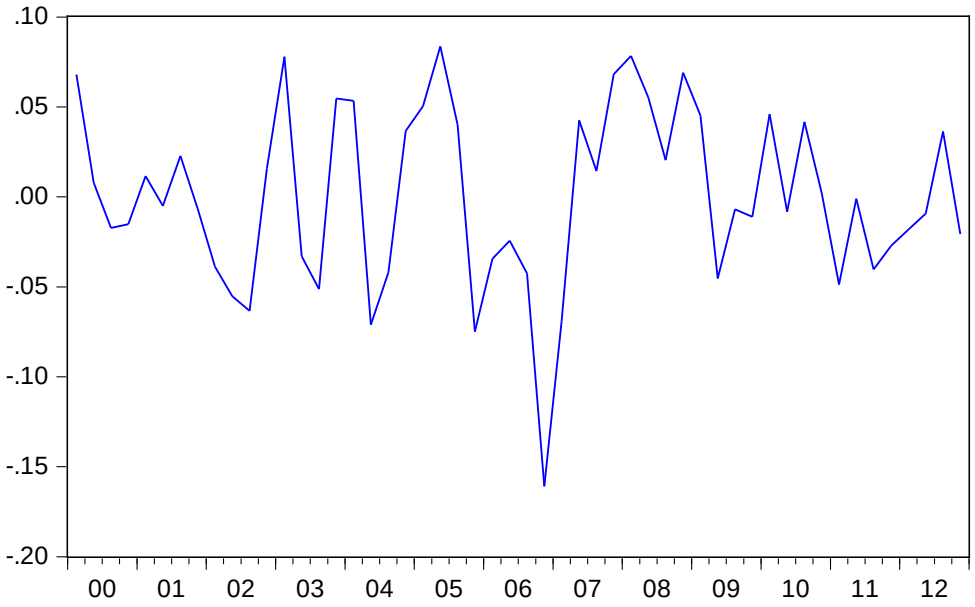


3. Co-integrating equation: Transport.

Dependent variable: LEMP_TRANS	Coefficient	Std. Error	t-Statistic	Prob.
Independent variables				
LN_WAGE_TRANS	-0.275897	0.169774	-1.625083	0.1111
R_RATE	0.028692	0.010317	2.781037	0.0079
LGVA_TRANS	0.472417	0.255812	1.846738	0.0714
TREND	0.014700	0.004772	3.080401	0.0035
INFL_RATE	0.032367	0.009258	3.496246	0.0011
DUM_V	0.035122	0.038926	0.902280	0.3717
Constant	12.06979	3.188293	3.785660	0.0005

Summary statistics:	
Adjusted R^2:	0.878630
Number of observations:	52
Log likelihood	82.86021
F-statistic	62.53382
Prob(F-statistic)	0.000000
Method:	Least Squares

Graph of the residual series: RES_TRANSPORT

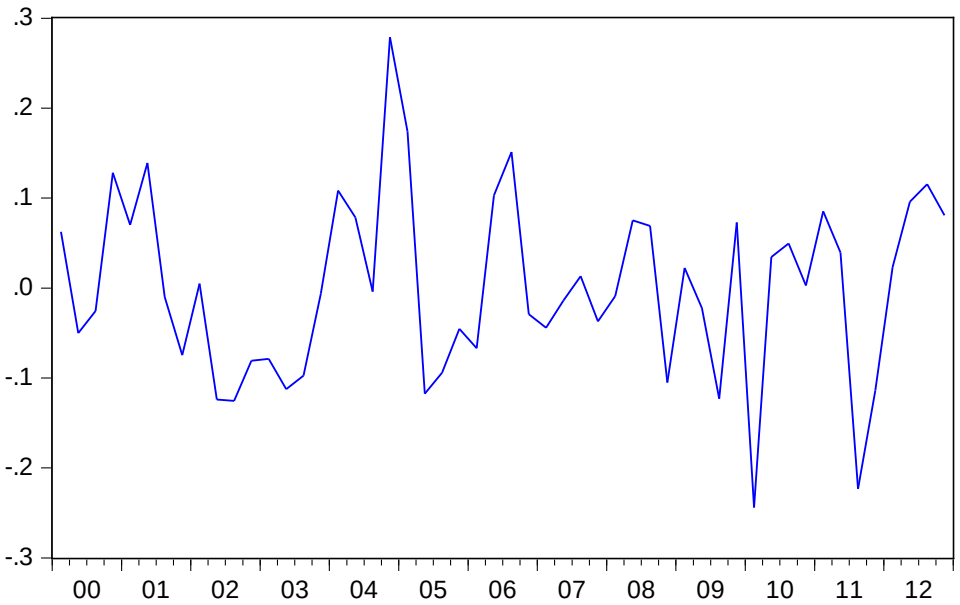


4. Co-integrating equation: Utilities

Dependent variable: LEMP_UTIL	Coefficient	Std. Error	t-Statistic	Prob.
Independent variables				
LN_WAGE_UTIL	-0.187568	0.296168	-0.633316	0.5297
R_RATE	-0.052964	0.018951	-2.794761	0.0076
LGVA_UTIL	0.267867	0.375783	0.712825	0.4796
TREND	-0.000417	0.009888	-0.042155	0.9666
INFL_RATE	-0.054594	0.017099	-3.192871	0.0026
DUM_V	0.034938	0.081199	0.430282	0.6690
Constant	12.34883	5.927860	2.083184	0.0429

Summary statistics:	
Adjusted R^2:	0.284680
Number of observations:	52
Log likelihood	45.94706
F-statistic	4.382795
Prob(F-statistic)	0.000000
Method:	Least Squares

Graph of the residual series: RES_UTILITIES



Appendix 2.3: Diagnostic tests on the error correction model.

SECTOR: FINANCE.

Test	H_0	Test Statistics	p-value*	Conclusion
Jarque-Bera	Normality of residuals	JB = 3.401	0.02	NORMALITY OF RESIDUALS
Ljung-Box Q	No auto-correlation	LBQ = 20.798	0.651	NO AUTOCORRELATION PRESENT
Breusch-Godfrey LM TEST	No auto-correlation	nR^2 = 1.419	0.492	NO AUTOCORRELATION PRESENT
ARCH-LM	No heteroskedasticity	nR^2 = 0.217	0.642	NO HETEROSCEDASTICITY PRESENT
White	No heteroskedasticity	nR^2 = 1.080	0.956	HETEROSCEDASTICITY IS PRESENT
Ramsey RESET	No parameter instability	LR = 0.254	0.614	NO INSTABILITY / NO MISSPECIFICATION

* If $p<\alpha$ (0.05); Reject H_0

SECTOR: MANUFACTURING.

Test	H_0	Test Statistics	p-value*	Conclusion
Jarque-Bera	Normality of residuals	JB = 18.950	0.00	NORMALITY OF RESIDUALS
Ljung-Box Q	No auto-correlation	LBQ = 32.937	0.105	NO AUTOCORRELATION PRESENT
Breusch-Godfrey LM TEST	No auto-correlation	nR^2 = 1.684	0.431	NO AUTOCORRELATION PRESENT
ARCH-LM	No heteroskedasticity	nR^2 = 0.655	0.418	NO HETEROSCEDASTICITY PRESENT
White	No	nR^2 =	0.281	HETEROSCEDASTICITY

Test	H_0	Test Statistics	p-value*	Conclusion
	heteroskedasticity	10.92		IS PRESENT
Ramsey RESET	No parameter instability	LR = 2.203	0.15	NO INSTABILITY / NO MISSPECIFICATION

* If p<α (0.05); Reject H_0

SECTOR: TRANSPORT.

Test	H_0	Test Statistics	p-value*	Conclusion
Jarque-Bera	Normality of residuals	JB = 6.208	0.05	NORMALITY OF RESIDUALS
Ljung-Box Q	No auto-correlation	LBQ = 20.152	0.448	NO AUTOCORRELATION PRESENT
Breusch-Godfrey LM TEST	No auto-correlation	nR^2 = 1.243	0.537	NO AUTOCORRELATION PRESENT
ARCH-LM	No heteroskedasticity	nR^2 = 0.860	0.354	NO HETEROSCEDASTICITY PRESENT
White	No heteroskedasticity	nR^2 = 12.476	0.187	HETEROSCEDASTICITY IS PRESENT
Ramsey RESET	No parameter instability	LR = 0.624	0.42	NO INSTABILITY / NO MISSPECIFICATION

* If p<α (0.05); Reject H_0

SECTOR: UTILITY.

Test	H_0	Test Statistics	p-value *	Conclusion
Jarque-Bera	Normality of residuals	JB = 4.519	0.10	NORMALITY OF RESIDUALS
Ljung-Box Q	No auto-correlation	LBQ = 28.018	0.259	NO AUTOCORRELATION PRESENT
Breusch-Godfrey LM TEST	No auto-correlation	$nR^2 = 1.271$	0.529	NO AUTOCORRELATION PRESENT
ARCH-LM	No heteroskedasticity	$nR^2 = 0.004$	0.951	NO HETEROSCEDASTICITY PRESENT
White	No heteroskedasticity	$nR^2 = 2.004$	0.848	HETEROSCEDASTICITY IS PRESENT
Ramsey RESET	No parameter instability	LR = 0.141	0.70	NO INSTABILITY / NO MISSPECIFICATION

* If $p<\alpha$ (0.05); Reject H_0