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Economic Growth and Unemployment Rate in SADC: An Empirical Study

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Abstract: One major challenge facing developing countries include intolerable unemployment rate and lower economic growth. This high unemployment rate directly means that available labour resources are not being utilized efficiently to their most productive use. Nonetheless, achieving the macroeconomic goals of any country involves maintaining price stability, achieving full employment and reaching the high level of economic growth. Therefore, for a nation to achieve high economic growth it must aim at lowering unemployment. Unemployment is a crucial factor which ascertains a countries economic growth and development which it can attain. Most of the studies conducted in the context of developed countries or panel of developed studies have validated the relationship between unemployment rate and economic growth. The main purpose of this study is based on the period of 1991-2014 the Okun's law is validated for a panel of South African Development Community comprising of only for some countries.

Keywords: Okun's law, unemployment, GDP growth
JEL-codes: J64, C2, E2

INTRODUCTION

Economic growth and unemployment rate nexus first proposed by Okun (1962) subsequently known as Okun's law has been endorsed for both developed and developing economies using data for individual countries

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and for panel of countries. In a macroeconomic framework, the Okun's law is a key popular relationship which posits that there exists a negative relationship between the unemployment rate and Gross Domestic Product (GDP) (Noor *et al.*, 2007). In its statistical original form, the relationship implies that GDP growth by 3% leads to a 1% decline in unemployment (Elshamy, 2013). Barring a few exceptions, the Okun's law has been universally accepted as an empirical regularity in macroeconomics (Huang & Chang, 2005). As noted it is generally accepted that the growth rate of the GDP reduces unemployment and result in an increase in employment. Therefore, the aforementioned relationship implies that to reduce unemployment GDP growth must be kept above the potential output, because unemployment can be viewed as the cause of poverty and income dispersion (Elshamy, 2013; Dritsaki & Dritsakis, 2009).

An organisation of the countries in southern Africa that aim to further the socio-economic, political and security cooperation to achieve peace, stability and wealth; the Southern African Development Community (SADC) comprises of Angola, Botswana, Union of Comoros, the Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic of Tanzania, Zambia and Zimbabwe. The main aim of this paper is to examine the relationship between economic growth and the unemployment rate known as the Okun's law in the Southern African Development Community (SADC). The Okun's law has a practical ability to be used as a forecasting tool (Knotek, 2007). The Okun's law coefficient (OLC) is helpful for the policy-makers in quantifying the causal relationship between economic growth and unemployment and consequently devise specific regional policies that are targeted at reducing unemployment rates in the region.

The structure of the paper is organized as follows: Section two provides a brief literature overview regarding empirical evidence of the applicability of the Okun's law. Section three describes the methodology. Section four includes data set description. Section five focuses on the discussions of empirical results. Then section six concludes the paper and offer recommendations.

SOUTHERN AFRICAN DEVELOPMENT COMMUNITY

This section mainly focuses on the overview of SADC and examination of unemployment and economic growth trends for thirteen out of the sixteen member states. The crux of the study is to determine OLC for SADC member states and offer recommendations that will enable the member states to incorporate inclusive and cohesive regional policies that will perpetuate economic growth while simultaneously curbing unemployment rate. The

unification of policies is apt in order to reduce economic dispersions caused by unemployment in the region. There has been a recent trend of persistently increasing unemployment levels in developing countries which aggravate poverty levels, it is therefore pertinent to try and model the relationship between growth and unemployment for efficient regional integration outlook.

Overview of SADC: As the successor to the Southern African Development Coordination Conference (SADCC), was initiated by the then front runner states namely Angola, Botswana, Mozambique, Tanzania and Zambia (Mupimpila & Funjika, 2010). The SADCC organ had an initiative of embarking more on political liberation in the region. The main purpose of transforming SADCC to SADC was to promote deeper economic collaboration and integration with the ultimate hope for sustained economic growth and socio-economic development(SADC, 2004). The successor is now an inter-governmental organization with a vision to further socio-economic cooperation and integration not forgetting political and security cooperation among the 16 member states which are a follows; Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Malawi, Madagascar, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe.

Economic characteristics: The Southern African region is characterized by intolerable high levels of unemployment, poverty, and inequality (SADC, 2004). SADC comprises of member states at different stages of development, mostly underdeveloped. Thus, this is attributable to heterogeneous social and economic growth and development across the region. The macroeconomic convergence target for real GDP for this community growth is 7%. Nonetheless, economic growth in the region was slow owing to the 2008/09 financial crunches which have globally affected many countries. This slow economic growth was mainly influenced by the slow and fragile recovery of the global economy, which adversely affected the global demand.

However, South Africa, Namibia, and Angola have been able to reduce wealth gaps and rates of poverty as well as unemployment as it shall be noted later on. Figure 1 shows that almost 25% of SADC member states have an unemployment rate which is above an average of 15% on an annual basis. Thus, the range of unemployment in the region is 34.4 % which indicates a need to develop more resourceful policies and programs targeted to curbing unemployment in the region. A closer inspection on the figure shows that Lesotho is adversely affected by unemployment (average of 30%), which is largely on the youth as it is a regional and global problem. On contradistinction, Madagascar and Tanzania are amongst the

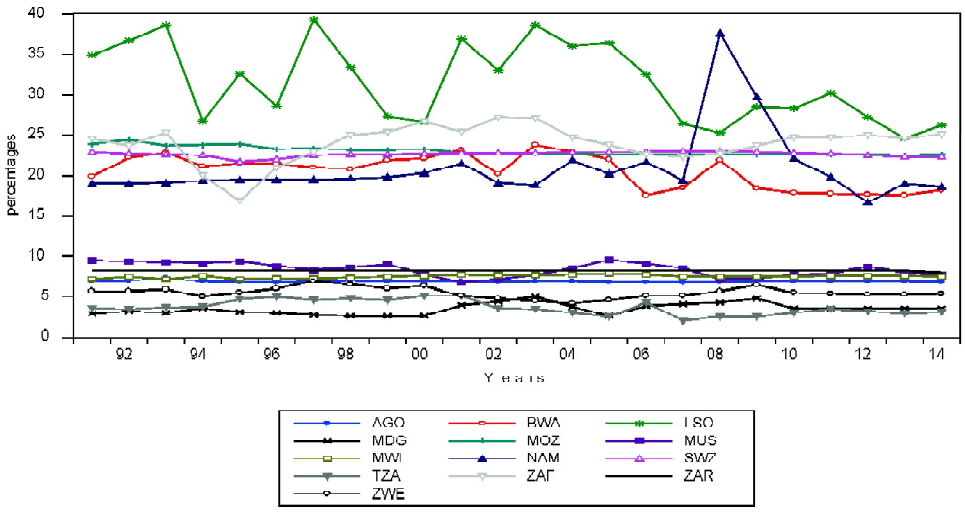
countries that relish more benefits of reduced unemployment level. As noted before, the economic environment pertaining to each country is likely to influence its growth and labour market.

Unemployment Rate and Economic Growth in SADC: Trends in unemployment rate for SADC members' states are shown in figure 1. Almost seven countries have unemployment rate above 15 %, whereas six countries have below 10%.These countries are Angola, Zimbabwe, Mauritius, Malawi, Tanzania, and Madagascar.

Trends in economic growth along with unemployment rate for individual countries in SADC are is given in A.1 (appendix A). Except for Tanzanian, the unemployment rate for SADC member states has been higher than their respective economic growth for the period under consideration. Tanzania experiences an average of 3.7% unemployment rate which is lower than the average of 5.2% growth in GDP over the period except from 2000 to 2014 when the GDP growth has been significantly above the unemployment rate. Due to the global economic crisis, Tanzania's economic growth fell from 8.5% to 5.4% in 2009 while unemployment remained at 3.5% in 2008/09.

Angola, Malawi, and Madagascar also depicted similar trend however, for these countries there is no significant variation between the variables.

Figure 1: Unemployment rate amongst SADC member states, 1991 – 2014



Source: author's computation.

*Angola (AGO), Botswana (BWA), Lesotho (LSO), Madagascar (MDG), Mozambique (MOZ), Mauritius (MUS), Malawi (MWI), Namibia (NAM), Eswatini (SWZ), Tanzania (TZA), South Africa (ZAF), Zambia (ZAR), and Zimbabwe (ZWE)

*DRC and Seychelles had no data reported from World Bank Development Indicators sources.

Botswana has on several occasions been labelled as an African model for economic growth which peaked at almost 10 % rate of growth. The country, however, experiences notoriously high unemployment that averaged 21% as seen from the graph. The economy was greatly affected due to recession as shown by a sharp decline in its growth which bred a negative (-7.6%) growth in 2009. Namibia was hard hit during the period of recession as it experienced an unemployment rate of 37.6% and 29.7% in 2008/09 respectively. Lesotho experiences the highest unemployment in the region averaged at 31.5% while the economic growth at 4.1%. South Africa as an economic powerhouse of SADC has problems similar to Botswana, experiencing impressive but jobless economic growth. Despite these facts, the region is faced with serious challenges, emanating from both external and internal factors such as abject poverty, misappropriation of government funds, HIV/AIDS and political issues among others. The macroeconomic variables show a fluctuating trend over the years.

However, for the case of Zimbabwe, the situation on the ground may not be as promising as reflected in the graph above and due to the introduction of the multicurrency system in 2009 unemployment rocketed to figures above 80%. This may question data credibility for that country since the country is exposed to unfavourable social and political environments which adversely led to massive disinvestments especially on the private sector. Therefore, the data may be under-reported. There is a general consensus that unemployment amongst member states is driven by structural rigidity in the labour market matched with unresponsive institutional systems which fail to connect the supply of vacancies to the demand for labour. For this reason, youth and graduate unemployment persistently take a larger share of total unemployment in the region.

Sector's Contribution to GDP: Agriculture sector contributes a higher percentage to GDP in Mozambique (29.25%), Madagascar (29.11%), Tanzania (27.00%), and Malawi (26.96%) as compared to other SADC member states. Angola shows an impressive dominance of 56.98% in the industry sector. In the service sector, Mauritius dominates followed by South Africa by recording 73.66%, 70.03% respectively as revealed in Table 1. It can be observed that for countries that perform better in the agriculture sector has also a balanced effect on the service sector. Since these sectors are labour intensive in nature they advance chances of curbing unemployment (Malawi, Madagascar, Tanzania, Mozambique, and Mauritius). Angola (47.9%) and Botswana's sectorial dominance is felt on mining and quarrying as compared to other member states.

Table 1: Sector's contribution to GDP (%) - 2013

Country	*Agriculture*	*Industry*	*Services*	*Mining & Quarrying*	*Unemployment rate*	*Growth rate*
Angola	10.8	56.98	32.18	47.9	6.9	5.4
Botswana	2.54	36.91	60.55	32.7	21.0	10.0
Lesotho	7.83*	36.57*	55.60*	12.6*	31.5	4.1
Madagascar	29.11*	16.00*	54.89*	0.1	3.5	2.3
Mauritius	3.27	23.07	73.66	0.04	8.4	4.6
Malawi	26.96	18.79	54.25	N/A	7.5	4.3
Namibia	7.07	29.64	63.29	10.4	21.0	4.5
Eswatini	7.48*	47.69*	44.83*	0.3	22.6	3.3
Tanzania	27.00	25.18	47.82	3.6	3.7	5.2
South Africa	2.39	27.58	70.03	9.8	23.0	2.6
Zambia	17.68	37.25	45.07	10.25	15.2	4.8
Zimbabwe	12.38	31.29	56.33	11.7	5.5	0.3
Mozambique	29.25	23.66	47.09	1.16*	23.0	7.8
Average	13.93	31.03	55.03	12.68	15.64	6.43

Source: (South African Institute of International Affairs, 2015) with additions

*data based on most recent data which is not 2013, Lesotho (2012), Madagascar (2009), Eswatini (2011).

Data on mining and quarrying (2011) is from SADC database.N/A-not applicable

LITERATURE REVIEW

This section presents a review about the estimation of the Okun's law and some empirical studies that have been undertaken for other countries distinctly from developed nations and developing nations in order to trace out the existence of the law (Prachowny, 1993). A negative relationship between changes in the unemployment rate and real output has been established by Okun using data from the American economy. A statistical relationship between the unemployment rate and gross national product (GNP) showed that for every year is results showed that for every per unit decrease of GNP, the unemployment rate is increasing more than the natural percentage (Dritsaki & Dritsakis, 2009). Furthermore, 1% increase in economic growth (GDP) above the growth in potential output will lead to 3% reduction of unemployment reversing the causality; this implies that 1% increase in unemployment will lead to a 3% decline in GDP growth. "Simply, this implies that GDP growth must be equal to its possible growth just to keep the level of unemployment rate in parity" (Moroke *et al.* 2014).Changes in the unemployment rate cannot be regarded as the basis of change of the real production which is the result of other intermediary factors which link the unemployment rate and real production(Dritsaki & Dritsakis, 2009).

Empirical literature review: After Okun (1962) traced out the statistical relationship between GDP growth and unemployment rate (now Okun's law), many economists, scholars, and policymakers are much interested in finding the applicability of this lawfor developed countries, developing countries, regional analysis, and cross country analysis (Attifield & Silverstone , 1997).In the United States of America since 1948 and 20 advanced economies since 1985, Ball *et al.*(2017), assessed that the Okun's Law fits well to short term unemployment movements. The Okun's law was observed for other advanced economies (Dritsaki & Dritsakis, 2009; Wang & Huang, 2017). For Spanish provinces Cháfer (2015) utilized both time series data and panel data spanning form 1985-2011 found noticeable differences in the unemployment sensitivity to GDP shocks owing to the concentration of economic activity in individual geographical location. Similarly, Soylu *et al.* (2018) used panel data spanning from 1992-2014 for the Eastern European countries and found Okun's law to be valid.In another study, Arshad (2011) adopted the gap version approach of the Okun's law and supported its validity in the Swedish economy. Similarly, Okun's law was valid for Malaysian economy(Noor, Nor, & Ghani, 2007) and Pakistan(Khan, Saboor, & Anwar, 2013). Some studies confirm the validity of Okun's law in the United Kingdom, Pakistan and Canada respectively (Stober, 2015; Huang & Chang, 2005). The Okun's law was valid for a panel of 66 countries for countries under investigation (Huang *et al.*, 2019).

Among the African countries, several studies especially for Nigeria indicated that Okun's law is not valid (Arewa & Nwakanma, 2012; Sodipe & Ogunrinola, 2011; Bankole & Fatai, 2013; Akeju & Olanipekun, 2014). Although, some later studies using annual time series found Okun's law to be valid in Nigeria (Oluyomi, Stephen, & Adeyemi, 2016; Michael, Emeka, & Emmanuel, 2016). Using the quarterly data, Moroke *et al.* (2014), found Okun's law to be invalid, but Madito and Khumalo (2014), using the Vector Error Correction model (VECM) got opposite result and supported the its validity in South Africa. Considering the cyclical unemployment in Kenya using annual time series data indicated that Okun's law partially holds (Mose, 2014). The gross domestic product (GDP) growth has a reducing but insignificant effect on unemployment rate in the Economic Community of West African States (ECOWAS), which indicates low employment elasticity of growth in the region suggesting a 'jobless growth' situation in the region in which employment does not really grow as the economy is growing (Folawewo & Adeboje, 2017). Based on 39 countries in Africa for the period 1995-2000 the Okun's law was found to be valid (Kamgnia, 2009). Using annual time series data of real GDP and unemployment rate the Okun's law is valid for the Egyptian economy (Elshamy, 2013). Using

cointegration and error correction model (ECM) on quarterly data ,Okun's law was valid for Tunisia (Andari & Bouaziz, 2015), but Sinha and Tseladikae (2018) do not support Okun's law for the economy of Botswana. Considering a panel of Middle East and North African (MENA) region for the sample of countries in Africa,for inividual countries the Okun' s law is valid only for six out of seventeen countries namely; Algeria, Egypt, Iran, Jordan, Lebanon, and Turkey (Hamia, 2016). For quarterly data from 1991q1 to 2016q1 using the error correction model and the Okun's law was valid in Congo (Okombi, 2019).

To sum up, numerous studies used different versions of the Okun's law to determine the short run and long run relationship adopted for different time period yielded sometimes contradicting conclusions (Khan, *et al.*, 2013; Akram, *et al.*, 2014). The contradiction tends to be influenced by the specification of the model, frequency of the data and time period. The Okun's law seems to be applicable for developed countries like Sweden and Canada (Arshad, 2011; Huang & Chang, 2005), but in developing countries the results are grossly contradicting (Sodipe & Ogunrinola, 2011; Babalola, Saka, & Adenuga, 2013; Bankole & Fatai, 2013; Akeju & Olanipekun, 2014; Arewa & Nwakanma, 2012) with exceptions from recent studies (Oluyomi, Stephen, & Adeyemi, 2016; Michael, Emeka, & Emmanuel, 2016). Okun's law was found to be invalid for South Africa by Moroke *et al.* (2014) but Madito and Khumalo (2014) supported the Okun's law. Notably studies related with the economies of Kenya, Malaysia, Tunisia, and Egypt supported the law.Empirical validation of the relationship between economic growth and unemployment has resulted in four strands of literature, one strand finding support for a negative and significant Okun coefficient, while in the other the coefficient is negative but not significant. In the third case the coefficient is positive and significant and finally the coefficient is positive and not significant.

METHODOLOGY

The literature on Okun's law reviewed in previous section provides a framework for the present study. This section builds on the reviewed literature which serves as a background to set an analytical structure used in this study. These includes the collection, analysis and interpretation of the data which ultimately leads to meaningful inferences regarding the applicability of Okun's law for the SADC region. In this section, all four versions of Okun's law are presented together with their economic implications which will later on aid interpretation in this study.

Theoretical framework: In macroeconomics theory, there are relatively few models linking the relationship between unemployment rates to GDP

growth (Noor *et al.*, 2007). Okun (1962) focused the discussion on the empirical relationship that emanates between the unemployment rate and GDP fluctuations is treated more statistical rather than [sic] structural economic framework (Javeid, 2012). Negative association between GDP growth and unemployment suggested that a slowdown in economic growth causes unemployment to increase (Mankiw, 1994). More precisely, changes in the aggregate demand will force firms to adjust their output plans and this leads to changes in labour demand as a result unemployment rate changes in response. The first difference version specified by Okun is discussed below.

Model specification: Following Okun (1962) the model specification has two versions namely the first-difference version and the gap version. Subsequently four versions have been considered for estimation these are: first-difference version, gap version, dynamic version, and production function version. These different versions bear with their specific pros and cons and have different interpretations.

First-Difference Version: This version shows changes in the unemployment rate from one time period to the subsequent period. Okun (1962) specified the relationship between change in percentage level of unemployment (U) and growth of output (g) as

$$U = a - b\,(g) + \varepsilon_t \tag{1}$$

Mankiw (1994) and Thirlwall (1969) specified the relationship:

$$(Y_t - Y_{t-1}) = \alpha + \beta\,(U_t - U_{t-1}) + \varepsilon_t \tag{2}$$

In this specification the GDP growth is regressed on the changes in unemployment, and the Okun's coefficient measures the elasticity or the relative sensitivity of output to changes in unemployment. Okun (1962) proposed a negative or inverse relationship between GDP growth and unemployment rate (That is $\beta < 0$). Since the Okun's law is simply a statistical relationship, it does not give a causal link between the said variables(Noor, Nor, & Ghani, 2007). Therefore, it is imperative to carry out the Granger causality test to determine this link. Other specifications have been discussed in the previous literature (Sinha & Tseladikae, 2018; Javeid, 2012; Lee, 2000; Moosa, 1997; Ball *et al.*, 2017).There is an ongoing debate of how to estimate these variables some argue that using statistical filtering technique is the best whereas some advocate for the use of the production function approach(Central Bank of Malta, 2013).

The OLC is expected to have a negative sign which signifies what Okun (1962) postulated on the data of GDP growth and unemployment. When an economy experiences a high rate of unemployment this method suggests that labour resources are underutilized (Moroke, Leballo, & Mello, 2014).

This may again imply that the economy produces under the production possibility curve, therefore, showing inefficient production in the economy. The OLC is likely to be influenced by the number of workers who are marginally attached to the labour force, entering or exiting as employment fluctuates. Due to this reason, the value of the Okun's coefficient is likely to differ across countries (Ball *et al.*, 2017).

Granger Causality Test

Individual Country Causality: Since the Okun's law has two versions, it is necessary to examine causality test. If x and y represent the growth rate and the change in unemployment rate, respectively, both stationary variables observed for an individual country (say i) on T periods. For each individual country $i = 1, ..., N$, at time $t = 1, ..., T$, the linear model for an individual country is considered for applying the Granger causality test for lag orders (K) is expressed as follows

$$Y_{it} = \alpha_i + \Sigma_{k=1}^{K} \gamma_i^{(k)} Y_{i(t-k)} + \Sigma_{k=1}^{K} \beta_i^{(k)} X_{i(t-k)} + \varepsilon_{it} \quad (3)$$

For simplicity, the individual effects á$_i$ are supposed to be fixed for the country in the time dimension; and initial conditions of both individual processes $y_{i,t}$ and $x_{i,t}$ are given and observable. Besides, $\gamma_i^{(k)}$ and $\beta_i^{(k)}$ represent the autoregressive parameters and the regression coefficients slopes, respectively. This simple model with two variables constitutes the basic framework for studying Granger causality in time series context. The standard causality tests consist in testing linear restrictions on the vectors β_i and the null hypothesis that of no-causality that is X does not Granger cause Y is expressed as: $H_0 : \beta_i = 0 \ \forall \ i = 1, ..N$.

Panel Causality: While dealing with the basic framework for studying the Granger causality in a panel data context the issue of heterogeneity between individual panels is crucial. There are two sources of heterogeneity, first source of heterogeneity is standard and comes from the presence of individual effects α_i, while the second source is more crucial and is related to the heterogeneity of the parameters β_i. Assuming lag orders (K) are identical for all cross-section units of the panel and the panel is balanced, the Dumitrescu-Hurlin (2012) test under the null hypothesis of homogenous non-causality (HNC) which takes into consideration heterogeneity of the regression model and that of the causal relation is employed. Under the alternative for a subgroup of individuals for which there is no causality relation and a subgroup of individuals for which the variable x Granger causes y. For two stationary variables x and y, observed for each individual $i = 1, ..., N$, at time $t = 1, ..., T$, following linear model which is a fixed coefficients model with fixed individual effects is considered:

$$Y_{it} = \alpha_i + \Sigma_{k=1}^{K} \gamma_i^{(k)} Y_{i(t-k)} + \Sigma_{k=1}^{K} \beta_i^{(k)} X_{i(t-k)} + \varepsilon_{it} \quad (4)$$

The null hypothesis of HNC is thus defined as: H_0: $\beta_i = 0 \ \forall \ i = 1, ..N$; while under H_1, there are $N_1 < N$ individual processes with no causality from x to y. It follows that our test is not a test of non-causality assumption against causality from x to y for all the individuals (Holtz-Eakin *et al.,* 1988), but it is more general in the sense that the non-causality for some units is considered under the alternative: $H_1 : \beta_i = 0 \ \forall \ i = 1, .., N_1$ and $\beta_i \neq 0 \ \forall \ i = N_1 + 1, N_1 + 2, .., N$; where N_1 is unknown but satisfies the condition $0 \leq N_1/N < 1$, since if $N_1 = N$ there is no causality for any of the individuals in the panel, which is equivalent to the HNC null hypothesis. Conversely, when $N_1 = 0$ there is causality for all the individuals in the sample. The structure of this test is similar to the Im *et al.* (2003). unit root test in heterogenous panels. If the null is not rejected the variable *x* does not Granger cause the variable y for all the units of the panel. By contrast, if the HNC is rejected and $N_1 = 0$, then variable x Granger causes y for all the individuals of the panel: in this case we get a homogenous result as far as causality is concerned. Indeed, the regression model considered may be not homogenous, i.e. the estimators of the parameters differ across groups, but the causality relations are observed for all individuals. On the contrary, if $N_1 > 0$, the causality relationship is heterogeneous: the regression model and the causality relations are different from one individual from the sample to another.

Vector Error Correction Model (VECM)

If the output and unemployment series are individually integrated as I (1), specification based on first difference which can further be extended to an error-correction framework is considered. If output and unemployment are cointegrated, then the Okun regression in the form of Equation (1) is mis-specified and the estimate of the OLC may be over 3% (Attfield & Silverstone , 1998). From this perspective, in this section the robustness of estimates is evaluated with first-differenced data by re-estimating the Okun coefficient within an error-correction framework which considers information about cointegrating relations.

In addition, we have employed the Johansen method to re-estimate the Okun coefficient using the maximum-likelihood method to a vector error-correction model (VECM):

$$\Delta Z_t = M + \Sigma \Gamma_i \Delta Z_{-t} + \Pi Z_{t-1} + \varepsilon_t, \quad (5)$$

where $Z_t = [g_t, u_t]'$, M is a 2 X i vector of intercepts, Γ_i is a 2 X 2 parameter matrix, long-run relations are captured by the matrix $\Pi = a^*b'$ where a and

b are 2 X r matrices of rank $r < 2$, and b is the matrix of cointegration vectors such that ab' Z_t are called cointegrating relations.

The study follows the same analytical framework as for the case of Botswana done by Sinha and Tseladikae (2018). However, to avoid the on-going debate on the proper estimation of potential GDP and the natural rate of unemployment that surrounds the gap version, the study only focuses on the first difference version of the Okun's law. Several studies have been done for regional analysis with no consensus on the results(Kargi, 2016; Ball, Leigh, & Loungani, 2017; Dritsaki & Dritsakis, 2009; Moosa, 1997). The OLC varied across economies (Ball *et al.*; 2017).

4. DATASOURCES

The study used annual time series and panel data of real GDP growth at market prices based on the constant local currency with aggregates based on constant 2010 US dollars and the unemployment rate for the period extending from 1991 to 2014 (World Bank, 2017). The choice of the study period reflects the limitation of the availability of the time series data on the unemployment rate and economic growth for SADC member states. Although it would be necessary to have a longer period of data for analysis, the available data provides a basis for fair comparison since this time period does not have some gaps in between the years as compared to other years. Furthermore, the data covers the period of SADC's establishment in 1992 after being transformed from Southern African Development Coordination Conference (SADCC) let alone the economic recession of 2008/09 that led to a shrink in real GDP growth of many member states. The data was sourced from an online World Bank Indicators database. It is worthy of mention that the Democratic Republic of Congo (DRC) and Seychelles are not included in the analysis due to non-availability of data. Moreover, while there is a problem of data availability and unreliability in the SADC region the data for the countries included in this study are up to date.

5. RESULTS AND DISCUSSIONS

Before estimating the relationship between economic growth and unemployment it is necessary to check the stationarity of the series. To address the stationarity properties of the time series, both individual and panel data unit root tests are performed to determine whether or not the observed country specific time series for the variables exhibit stochastic trends. Next, cointegration analysis is performed to examine whether the variables are cointegrated (i.e. whether there are stable long term equilibrium relationships among them) in order to avoid spurious regressions for each country and for the whole panel.

Stationarity properties: In this section, only the ADF has been used to conduct the tests for each country and the results are presented in Table 2. The growth rate (RGDPG) is stationary at levels in all countries, but the unemployment rate (UNEMPR) is stationary only in six countries.

Table 2: Unit root results and OLS model results (SADC) 1991-2014

Country	*ADF test (5%)*				*Okun's Law (OLS)-DependentVar: ΔY*			
	RGDPG	*Prob**	*UNEMPR*	*Prob*	*constant*	*ΔU*	*Prob**	R^2
Angola	$I(0)_{nc}$	*0.040*	$I(1)_{ct}$	*0.070**	5.53	-26.57	*0.0820**	*0.137*
Botswana	I (0)	*0.007*	I (1)	*0.206*	4.69	0.32	*0.4740*	*0.025*
Lesotho	I (0)	*0.003*	I (1)	*0.053**	4.06	0.04	*0.5660*	*0.016*
Madagascar	I (0)	*0.001*	I (1)	*0.126*	2.69	-0.03	*0.9840*	*0.000*
Mauritius	I (0)	*0.001*	I (1)	*0.050**	4.51	-1.41	*0.0200**	*0.232*
Malawi	I (0)	*0.000*	I (1)	*0.073**	4.45	-26.54	*0.0000**	*0.714*
Namibia	I (0)	*0.003*	I (1)	*0.050**	4.29	0.01	*0.9260*	*0.000*
Eswatini	I (0)	*0.024*	I (1)	*0.275*	3.29	-1.05	*0.2960*	*0.052*
Tanzania	I (1)	*0.001*	I (1)	*0.613*	5.29	-1.06	*0.0770**	*0.142*
South Africa	I (0)	*0.047*	I (1)	*0.194*	2.77	-0.15	*0.4980*	*0.022*
Zambia	I (0)c	*0.013*	I (0)	*0.006**	5.10	0.40	*0.6421*	*0.010*
Zimbabwe	$I(0)_{nc}$	*0.004*	I (1)	*0.546*	0.01	-2.60	*0.4400*	*0.029*
Mozambique	$I(0)_{c}$	*0.012*	I (1)	*0.785*	6.98	-16.27	*0.0000**	*0.554*
Average					4.1277	-5.762		

Source: author's computations

ADF test at levels. ***c****,* ***ct****, and* ***nc*** *implies constant, constant & trend and None models*

I (0) - series is stationary at levels and I (1) series is stationary at first difference.

*OLC is Okun's law coefficient, * represent 10% or lower level of significance*

Regression analysis: The estimation of the Okun's coefficient is performed by using the Ordinary Least Squares (OLS) method and the estimated coefficients for each country is presented in Table 2. A few results are worth noting. First, the point estimates for the slopes appear to vary greatly across the countries and is negative in nine countries only, and second, the size of the coefficient estimating the impact of change in unemployment rate on the growth rate is extremely large and significant for Angola, Malawi and Mozambique. Similar results were obtained in Sumra (2016). Finally, as expected, the number of rejections of null hypothesis based on the individual country is five which is relatively lower than where it is not rejected, so that on this basis alone the evidence does not appear to favour the Okun's law in eight countries. However, for Mauritius and Tanzania it is negative and statistically significant and lies within Okun's 1% and 3% range. For South Africa, Eswatini and Madagascar the coefficient is negative and not but statistically not significant. However, for Botswana, Namibia and Lesotho the coefficient is

positive and not significant hence invalidating the Okun's law reflecting the growth without jobs. According to Sinha and Tseladikae (2018) such jobless economic growth is due to higher share of mining sector which is employment inelastic. Based on the regression output with evidence from figure A.1 (appendix A) it can be noticed that the countries with high OLC are accompanied by low unemployment rate.That is a 1% increase in unemployment rate significantly reduces growth rate especially for Angola, Malawi, and Mozambique.

Another interesting observation is that countries faced with high unemployment rates tend to have a low Okun's law coefficient. The general picture from Table 2 is that countries with the larger Okun's coefficient have a better employment generation capacity. This shed more light on the reason why high unemployment rate is experienced in countries with low OLC. The regression results can be linked to the evidence from Table 1 by indicating that countries that put more emphasis on the service, agriculture and industry sectors have a greater chance of absorbing more of its labour force. These sectors are opportune since they are employment elastic thus labour absorptive capacity is more pronounced as compared to mining and quarrying which is capital intensive.

Cointegration: After determining the order of integration the Johansen cointegration test and error correction are then used to check for the existence of a long run relationship of these macroeconomic variables presented in Table 6 which presents the rank test by Johansen and error correction model. The rank test indicated no cointegrating equation exists for Zimbabwe, Eswatini and Tanzania, since the p-values are (0.1474), (0.1398) and (0.1367) respectively.The error correction model examines the existence of a long run relationship between these variables. The growth and unemployment variables are cointegrated for only for four countries namely Mauritius, Malawi, Mozambique, and Eswatini, where the coefficient is negative and statistically significant.

Vector error correction model (VECM): The results of error correction indicate that all the countries will restore to equilibrium in case of disequilibrium in the long run. This is shown by a negative speed of adjustment for these countries. The speed of adjustment towards equilibrium for Malawi is 98%; Mauritius is 48% and lastly for Mozambique is 25%. For Mozambique, a trend was introduced since the results indicated a positive and insignificant error correction coefficient which is contrary to expectation as noted by (Gujarati & Porter, 2009). Gujarati and Porter indicated that if variables are individually nonstationary this suggested a spurious regression and as such introducing a trend can help solve the problem. The speed of adjustment for Malawi is faster than all the countries

followed by Eswatini with 71%. Table 6 above indicate that any deviation from the equilibrium position in the previous year will be corrected in the current year for all the countries. Therefore, Malawian economy converges to equilibrium quicker than for any other economies.

Test statistics in Table 3 indicate that the null hypothesis of number of cointegration vector (r) is 0 rejected for most countries with I(1) data except for Eswatini and Tanzania. Therefore, it is concluded that with these two exception, output and unemployment share at least one cointegrating relation. The evidence from Table 3 suggests that in the short run the estimates of OLC for Angola, Madagascar, Mauritius, South Africa, and Mozambique is negative and significant except for Mauritius where the p-value is less than 10% level of significance. For Botswana, Lesotho, Malawi, Namibia, Eswatini and Tanzania it is positive but significant except for Tanzania where it is not significant.

Table 3: Cointegration results (SADC) 1991-2014

Country	*Trace stat.*	*Max-Eigen stat.*	*ECM*		
	H_0: r=0 H_1: r>0	H_0: r=0 H_1: r>0	*ECT (-1)*	*Short run*	*Long run*
Angola	22.44	15.92	-0.04	-22.382	537.02
P-value	0.0038*	0.0272*	0.4800	0.2729	[7.1]
Botswana	18.68	17.11	-0.36	0.7375	-6.9
P-value	0.0160*	0.0173*	0.1110	0.5383	[-3.8]
Lesotho	15.71	12.22	-0.02	0.1253	-10.716
P-value	0.0464*	0.1025	0.3500	0.5164	[-4.7]
Madagascar	21.45	15.07	-0.33	-2.8675	6.572
P-value	0.0056*	0.0372*	0.4400	0.1974	[3.4]
Mauritius	25.53	16.91	-0.48	-1.6679	5.228
P-value	0.0011*	0.0187**	0.0020*	0.0470*	[3.4]
Malawi	14.20	10.95	-0.98	13.570	-42.842
P-value	0.0777*	0.1567	0.0400*	0.2791	[-4.5]
Namibia	18.52	13.79	-0.15	0.1398	-3.289
P-value	0.0169*	0.0592*	0.1227	0.5630	[-3.0]
Eswatini	12.37	9.54	-0.71	1.3298	-3.179
P-value	0.1398	0.2442	0.0400*	0.3082	[-1.2]
Tanzania	12.44	9.29	-0.29	1.3551	-4.362
P-value	0.1367	0.2629	0.1800	0.0640*	[-3.4]
South Africa	21.86	16.84	-0.20	-0.0382	-2.057
P-value	0.0048*	0.0191*	0.3400	0.9072	[-3.9]
Mozambique	24.60	13.85	-0.25^{T}	-0.1662	13.510
P-value	0.0016*	0.0580*	0.0200*	0.8926	[3.4]
Zambia	11.10	6.63	-0.105	-0.9304	-3.861
P-value	0.2056	0.5339	0.3962	0.2616	[5.5]
Zimbabwe	12.20	7.95	-0.06	-0.7013	126.45
P-value	0.1474	0.3841	0.2398	0.8904	[-2.5]

Source: author's computations.

* Rejection of the hypothesis at the 0.10 level or better,^{T}with trend

The long run coefficient is significant in all countries in SADC except Eswatini, but in Madagascar, Mauritius, Angola, and Mozambique it is positive while in remaining countries have a negative. As regards policy relevance of the study, it is suggested that sustained long term economic growth that is capable of generating enough employment should be pursued in the region through the implementation of policies that seek to diversify the regional economy away from natural resources (Folawewo & Adeboje, 2017).

Granger causality test was applied for 13 members of the SADC, but it was significant only in four countries and results are presented in Table 4. The p-value was significant only in case four countries. For Botswana and Mauritius, the null hypothesis that unemployment does not Granger cause growth rate is rejected, while for Malawi and Tanzania, the null hypothesis that growth rate does not Granger-cause unemployment is rejected.

Table 4: Granger Causality

Country	*Null Hypothesis*	*F-value*	*P-value*	
Botswana	UNEMPRT does not Granger cause _RGDPG	3.72855	0.0454*	Mankiw/Thirlwall specification
Mauritius	UNEMPRT does not Granger cause _RGDPG	5.41432	0.0152*	Mankiw/Thirlwall specification
Malawi	RGDPG does not Granger cause_ UNEMPRT	2.83948	0.0863*	Okun specification
Tanzania	RGDPG does not Granger cause _UNEMPRT	2.81957	0.0876*	Okun specification

*level of significance 10% and lower

Panel Regression Analysis: For panel estimation the benchmark regression model in difference version relates economic growth to changes in unemployment rates in country i during the period tas follows

$$Y_{it} = \alpha_0 + \beta_i \Delta U_{it} + \alpha_i + \epsilon_{it}$$

Here Y is the growth rate of real GDP and U is the unemployment rate. After determining the order of integration of the series the next task is to determine whether to use the random effect or the fixed effect models.

Table 5: Model determination-Fixed effect /Random effect model

Model specification	*Test type*	*Chi-sq stat.*	*d.f*	*P-value*
Fixed effects are redundant	Likelihood ratio	91.91	34	0.000
Random effect model is appropriate	Hausman test	0.098	1	0.340

Source: author's computations

Considering the p-value the likelihood ratio test resultrejects the null hypothesis that the fixed effects are redundant. The Hausman test does not reject the null hypothesis that the random effect model is appropriate since the p-value is very high (Table 5). The outcome of the tests suggests that the random effect or the fixed effect specification can be used. The study chose to use the fixed effect specification for estimation, because the fixed effect model is conventionally perceived to be a more convincing tool for estimating *ceteris paribus* effects due the fact that it allows arbitrary correlation between unobserved effects and the regressors (Wooldridge, 2013).In light of the results, the study presents the fixed effect[3] panel regression shown in Table 6. Column (3) reports ordinary least squares (OLS) estimate of effect of the (differenced) unemployment rate on the economic growth.

Table 6: Panel OLS regression results 1991-2014

Dependent Variable: RGDP	*Constant*	*Independent Variable DUNEMP*	*R-Squared*	*No. Observations*
coefficient	4.1833	-0.0152	0.265	299
P-value	0.000	0.9086		
Periods: 23	Cross-sections: 13	D-W statistics: 1.63	F-stat (prob): 0.000004	

Source: author's computations

The estimate is 0.0152 is negative but statistically not significant, rejecting the Okun's law for the SADC economies. In that respect, the Okun's law is not valid for the SADC region.Empirical analyses are performed at both individual countries and panel data levels show that unemployment rate has a reducing but insignificant effect on gross domestic product (GDP) growth, which indicates low employment elasticity of growth in the region. For causality at panel data we employ the Dumitrescu-Hurlin (2012) test for heterogeneous panel and the results are given in Table 7. One of the main advantages of this testing procedure is that it is very simple to implement the standardized average Wald statistics are simple to compute and have a standard normal asymptotic distribution (Dumitrescu & Hurlin, 2012). This testing procedure is similar tothe panel unit root tests suggested by Im *et al.* (2003) in terms of both the advantages and drawbacks. The homogeneous non causality (HNC) hypothesis is rejected based on asymptotic moments (Z-bar) for all the three lag orders but in case of semi-asymptotic moments(Z-bar tilde) it is rejected for one lag order only. Hence unemployment Granger cause economic growth in SADC countries.

Table 7: Dumitrescu-HurlinGranger non-causality (Panel) test

H_0: Unemployment does not Granger-cause GDP growth
H_1: Unemployment does Granger-cause GDP growth for at least one panel

Lag order	*W-bar*	*Z-bar*	*Z-bar tilde*
1	2.1476	2.9259	2.1826
	p-value	(0.0034)	(0.0291)
2	3.0221	1.8426	1.0508
	p-value	(0.0654)	(0.2933)
3	5.0261	2.9824	1.5722
	p-value	(0.0029)	(0.1159)

Panel unit root stationarity: After the causality test it is imperative to test for unit root between unemployment rate and economic growth using the Levin *et al.* (LLC), Im *et al.* (IPS), ADF- Fisher Chi-square and PP- Fisher Chi-square tests and results are given in Table 8.

Table 8: Panel unit root tests (level)

Test	*UNEMPRT*	*RGDPG*	*DUNEMPRT*	*DRGDPG*
Levin, Lin & Chu	-5.42174	-11.1003	-16.5332	-18.8433
P-value	0.0000	0.0000	0.0000	0.0000
Im, Pesaran and Shin	-4.69788	-10.6457	-15.3316	-17.2841
P-value	0.0000	0.0000	0.0000	0.0000
ADF- Fisher Chi-square	65.6581	150.208	218.755	260.195
P-value	0.0000	0.0000	0.0000	0.0000
PP- Fisher Chi-square	47.0943	164.797	290.816	1353.13
P-value	0.0069	0.0000	0.0000	0.0000
Cross-sections: 13	Number of Observations: 312			

Source: author's computations

The test summary indicates that UNEMPRT and RGDPG are stationary at level. All the tests reject the null hypothesis of the presence of unit root in the series. The probability value of 0.00 for the entire test implies that the null is rejected at 1%, 5% and 10% respectively. Therefore, RGDPG and UNEMPRT are integrated of order zero I (0) thus stationary at level. As per Okun's model specification of the first difference version, stationarity was determined on the differenced UNEMPRT and RGDPG. Thus, DUNEMPRT and DRGDPG are stationary at level.

Panel Cointegration: The results on cointegration between unemployment and real GDP growth in the SADC region are presented in Table 9. The empirical evidence shown by the Pedroni residual cointegration tests suggest that for most of the test statistics (except panel v-statistic) the

null hypothesis of no cointegration is rejected (Pedroni, 2004). Although, results for individual countries vary greatly among different countries, as expected, the number of rejections based on the individual country tests is relatively low, so that on this basis alone the evidence does not appear to favour the Okun's law (Table 9). By comparison, each of the panel statistics rejects the null of no cointegration, and the group statistics also reject the null for the case when the time means are subtracted. Thus, in contrast to the individual time series tests, both the panel and group statistics appear to provide fairly strong support in favour of the likelihood that the Okun's law holds for at least a significant proportion of countries since the probability value in these cases is less than 5% level of significance. Considering the results for individual countries, the point estimates for the slopes and intercepts appear to vary greatly among different countries. Further, as expected, the number of rejections based on the individual country tests is relatively low, so that on this basis alone the evidence does not appear to favour even weak Okun's law to hold. By comparison, we see that for the annual data the panel rho statistic and the two ADF statistics reject the null for the standard case,whereas all but the group rho reject the null for the case when the time means are subtracted. Thus, in contrast to the individual time series tests, both the panel and group statistics appear to provide fairly strong support in favour of the likelihood that the Okun's law holds for at least a significant portion of countries

Table 9: H_0: No cointegration between unemployment and real GDP growth(Panel)

Pedroni Residual Cointegration Test

Test	*Statistic*	*Test*	*Statistic*
Panel v-Statistic	0.1352		
P-value	0.4462		
Panel rho-Statistic	-9.7733	Group rho-Statistic	-6.9276
P-value	0.0000*	P-value	0.0000*
Panel PP-Statistic	-10.1498	Group PP-Statistic	-11.7048
P-value	0.0000*	P-value	0.0000*
Panel ADF-Statistic	-10.1560	Group ADF Statistic	-11.1436
P-value	0.0000*	P-value	0.0000*

Johansen Fisher Panel Cointegration Test

Hypothesized No. of CE (s)	*Fisher statistics trace test*	*Fisher stat. max-eigen test*
NoneP-value	100.70.0000	66.050.0000

**denote significant at 1% level of significance*

The above results and conclusions drawn are further supported by the Johansen Fisher panel cointegration test. The trace and Max-Eigen test from the Johansen Fisher test both indicate that the null hypothesis of no cointegration is rejected and conclude that there is cointegration.

6. CONCLUSION

This paper examined the empirical relationship between economic growth and the unemployment rate for the SADC region carried on annual time series and panel data for the unemployment rate and real economic growth for the priod 1991 to 2014. The first difference version of Okun's law has been used to determine this relationship. The main results indicate that Okun's law is only valid for Angola, Mauritius, Malawi, Tanzania and Mozambique.However, Okun's law is not valid for the SADC region.

Three countries namely Botswana, Lesotho, and Namibia have a positive relationship but insignificant coefficient. Further, these are the countries with high unemployment rate. It has been indicated earlier that countries with relatively low Okun's coefficients are characterised by intolerable unemployment levels. The unemployment rate for these countries has experienced great variability relative to GDP growth for the considered sample period. This crisis led to large increases in unemployment paired with economic growth expansions. Therefore, in terms of employment generating capacity Malawi serves as a model of success in the region. Thestudy recommends that; the government and policymakers should formulate economic policies that are more tailored to structural changes and labour market reforms, SADC member states should embark more on benchmarking from one another especially on Angola, Malawi, Mauritius, Tanzania and Mozambique where Okun's law seems to be applicable. Lastly, enforce regional diversification programs that support technology whilst promoting intensive use of labour.

References

Akeju, K. F., & Olanipekun, D. B. (2014). Unemployment and Economic Growth in Nigeria. *Journal of Economics and Sustainable Development, 5*(4), 138-144.

Akram, M., Shahzad, H., Syed, H. R., & Masood, S. (2014). An Empirical Estimation of Okun'S Law in Context of Pakistan. *Journal of Finance and Economics, 2*(5), 173-177.

Andari, C. E., & Bouaziz, R. (2015). Is the Okun's Law Valid in Tunisia? *Munich personal RePEc Archive*, pp. 1-10.

Arewa, A., & Nwakanma, P. C. (2012). Potential-Real GDP Relationship and Growth Process of Nigerian Economy: An Empirical Re-evaluation of Okun's Law. *European Scientific Journal, 8*(9), 25-33.

Attfield, C. F., & Silverstone , B. (1998). Okun's Law, Cointegrafi on and Gap Variables. *Journal of Macroeconomics, 20*(Summer), 625-37.

Attifield, C., & Silverstone , B. (1997). Okun's Coefficient: A comment. *The Review of Economics and Statistics, 79*(2), 326-329.

Babalola, S. J., Saka, J. O., & Adenuga, I. A. (2013). The Validity of Okun's Law In Nigeria: A Difference Model Approach. *Asian Economic and Financial Review, 3*(12), 1598-1608.

Ball, L., Leigh, D., & Loungani, P. (2017). Okun's Law: Fit at 50? *Journal of Money, Credit and Banking, 49*(7), 1413-1441.

Bankole, A. S., & Fatai, B. O. (2013). Empirical Test of Okun's Law in Nigeria. *International Journal of Economic Practices and Theories, 3*(3), 227-231.

Central Bank of Malta. (2013). *Estimating Okun's Law for Malta.* Malta: Central Bank of Malta.

Cháfer, M. C. (2015). "An Analysis of the Okun's Law for the Spanish provinces". Barcelona: working Paper 2015/01 1/37,University of Barcelona,Research Institute of Applied Economics.

Dritsaki, C., & Dritsakis, N. (2009). Okun's Coefficient for Four Mediterranean Member Countries of EU: An Empirical Study. *International Journal of Business and Mangement, 4*(5), 18-26.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic modelling, 29*(4), 1450-1460.

Elshamy, H. (2013). The Relationship Between Unemployment and Output in Egypt. *Procedia - Social and Behavioral Sciences, 81*, 22-26.

Folawewo, A. O., & Adeboje, O. M. (2017). Macroeconomic Determinants of Unemployment: Empirical Evidence from Economic Community of West African states. *African Development Review, 29*(2), 197-210.

Gordon, R. J. (1984). Unemployment and Potential Output in the 1980s. *Brookings on Economic Activity, 2*, 537-564.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). New York: McGraw-Hill International.

Hamia, M. A. (2016). Jobless Growth: Empirical Evidences from the Middle East and North Africa region. *Journal for Labour Market Research, 49*(3), 239–251.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregressions with panel data. *Econometrica, 56*(6), 1371-1395.

Huang, G., Huang, H. C., Liu, X., & Zhang. (2020). Endogeneity in Okun's Law. *Applied Economics Letters, 27*(11), 910-914.

Huang, R. H.-C., & Chang, Y.-K. (2005). Investigating Okun's Law by the Structural Break With Threshold Approach: Evidence From Canada. *The Manchester School, 73*(5), 599-611.

Javeid, U. (2012). *Validity of Okun's Law Empirical Evidence from Pakistan 1981-2005.* Master Thesis, Soderton University, School of Social Sciences, Sweden.

Kamgnia, D. B. (2009). Growth Intensity Of Employment In Africa: A Panel Data Approach. *Applied Econometrics and International Development, 9*(2), 161-174.

Kargi, B. (2016). Okun's Law and Long Term Co-Integration Analysis for OECD Countries(1987-2012). *Emerging Markets Journal, 6*(1), 1-9.

Khan, M., Saboor, A., & Anwar, A. (2013). Modeling the Relationship Between GDP and Unemployment for Okun's Law Specific to Pakistan During 1976-2010. *Theoretical and Applied Economics, 20*(10), 71-78.

Knotek, E. S. (2007). "How Useful is Okun`s Law?". *Federal Reserve Bank of Kansas City,Economic Review, 92*(4), 73-103.

Lee, J. (2000). The Robustness of Okun's Law: Evidence from OECD Countries. *Journal of Macroeconomics , 22*(2), 331-356.

Leshoro, T. (2014). Empirical Analysis of Employment Elasticity of Growth in Botswana. *Mediterranean Journal of Social Sciences, 5*(2), 171-180.

Madito, O., & Khumalo, J. (2014). Economic Growth-Unemployment Nexus in South Africa: VECM Approach. *Mediterranean Journal of Social Sciences, 5*(20), 79-84.

Mankiw, N. G. (1994). *Macroeconomics .* New York: Worth Publishers .

Michael, E. O., Emeka, A., & Emmanuel, E. N. (2016). The Relationship Between Unemployment and Economic Growth in Nigeria: Granger Causality Approach. *Research Journal of Finance and Accounting, 7*(24), 153-162.

Moosa, I. A. (1997). A Cross-Country Comparison of Okun's Coefficient. *Journal of Comparative Economics, 24*(3), 335-356.

Moroke, N., Leballo, G. P., & Mello, D. M. (2014). An Empirical Robustness of Okun's Law in South Africa: An Error Correction Modelling approach. *Mediterranean Journal of Social Sciences, 5*(23), 435-436.

Mose, V. (2014). Does Okun's Law on Cyclical Unemployment Apply in Kenya? *Centre for Research on Economic and Social Growth of Africa (CRESGA)*, 1.

Mupimpila, C., & Funjika, P. (2010). Growth and Regional Integration: The Case of the Southern African Development Community. *Zambia Social Science Journal, 1*(2), 158-174.

Noor, Z. M., Nor, N. M., & Ghani, J. A. (2007). The Relationship Between Output and Unemployment in Malaysia: Does Okun's Law exist? *International Journal of Economics and Management, 1*(3), 377-344.

Okombi, I. F. (2019). Relationship Between Growth and Unemployment in Petroleum Exporting Countries: Case of Congo. *Jurnal Ekonomi dan Studi Pembangunan, 11*(1), 2502-7115.

Okun, A. (1962). Potential GDP: Its Measurement and Significance. *American Statistical Society,Proceedings of the Business and Economic Statistics Section* , 98-103.

Oluyomi, O.-D., Stephen, O., & Adeyemi, O. (2016). Output and Unemployment Relationship: How Applicable is the Okun's Law to Nigeria? *The Social Sciences, 11*(8), 1422-1427.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory, 20*(3), 597-625.

Prachowny, M. F. (1993). Okun's Law: Theoretical Foundations and Revised Estimates. *The Review of Economics and Statistics, 75*(2), 331-336.

SADC. (2004). *Regional Indicative Strategic Development Plan.* Gaborone: Southern African Development Community.

Sinha, N., & Tseladikae, K. (2018). Economic Growth and Unemployment Rate for the Economy of Botswana: An Empirical Study. *Journal of International Business, 5*(2), 1-25.

Sodipe, O., & Ogunrinola. (2011). Employment and Economic Growth Nexus in Nigeria. *International Journal of Business and Social Science, 2*(11), 232-239.

South African Institute of International Affairs . (2015). *Regional Economic Integration in SADC Current Status of Key Economic Indicators-Regional Economic Trends.* South Africa: Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH.

Stober, E. O. (2015). The Validity of Okun's Law: An Assessment of United Kingdom's Unemployment-Output Relationship. *International Journal of Economic Practices and Theories, 5*(1), 10-15.

Sumra, S. (2016). *The natural rate of growth and the relevance of aggregate demand in low income countries: the case of Sub-Saharan Africa.* University of Greenwich, Greenwich Political Economy Research Centre (GPERC), London.

Thirlwall, A. P. (1969). Okun's law and the natural rate of growth. *Southern Economic Journal, 36*(1), 87-89.

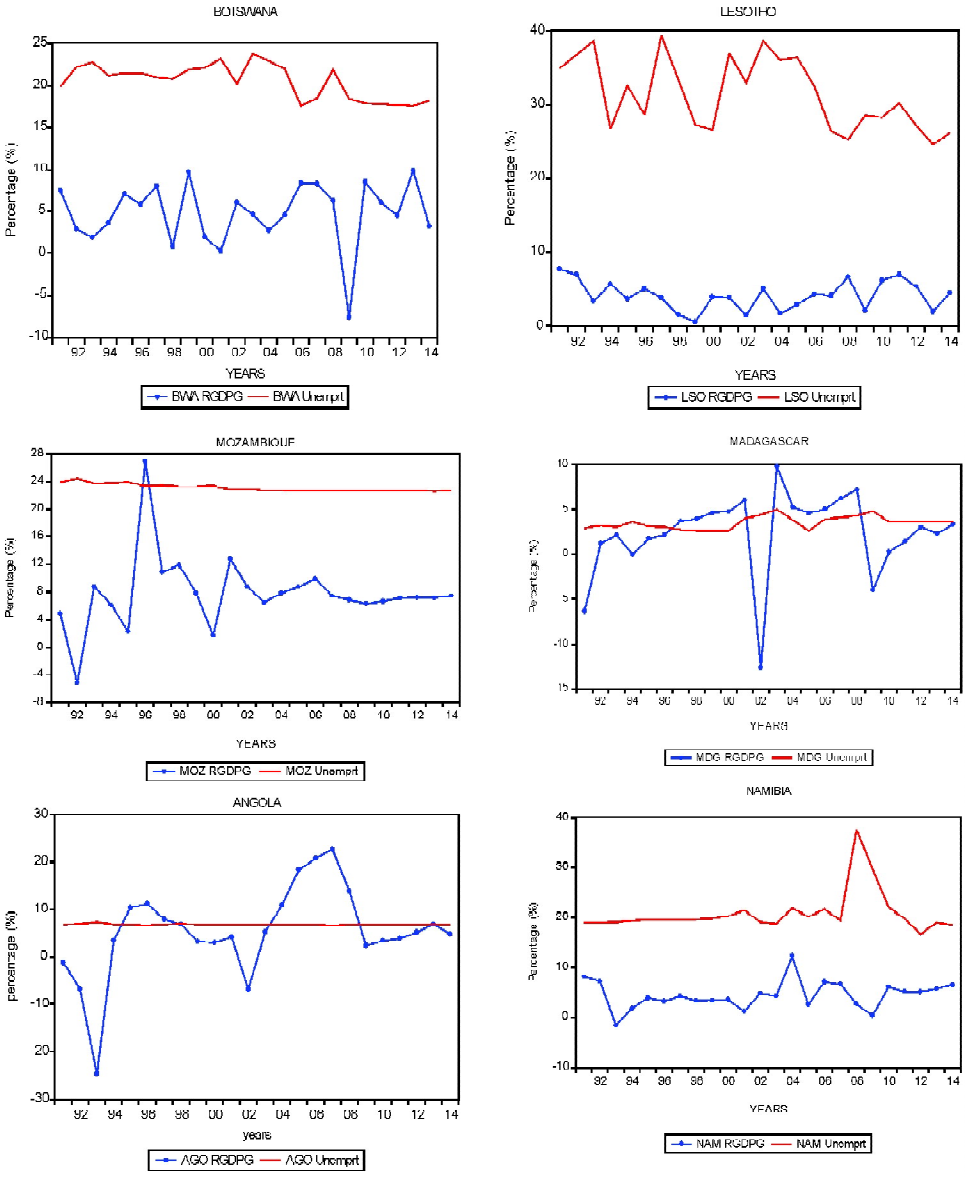
Wang, X., & Huang, H.-C. (2017). Okun's Law Revisited: A Threshold in Regression Quantiles Approach. *Applied Economics Letters, 24*(21), 1533–1541.

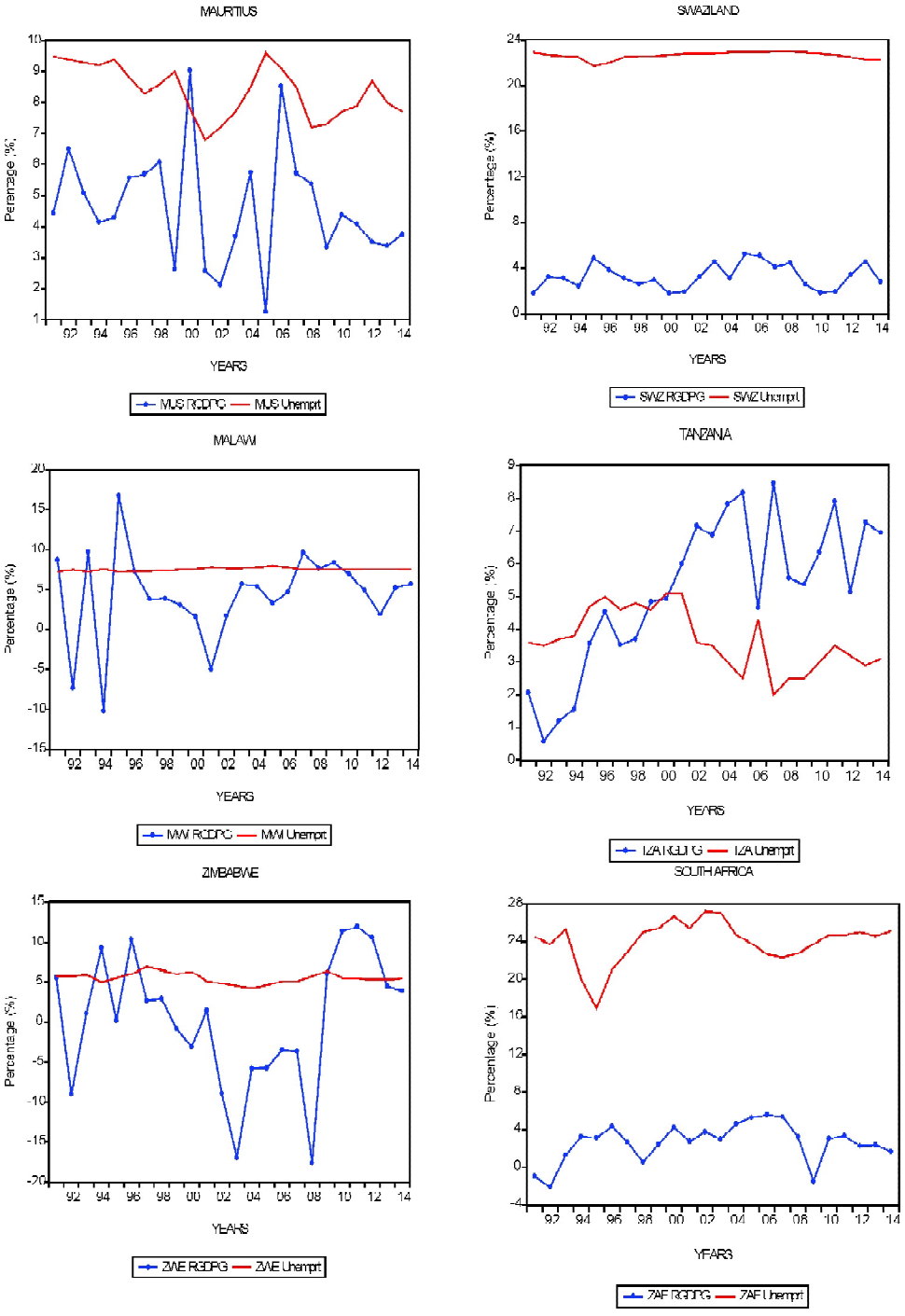
Wooldridge, J. M. (2013). *Introductory Econometrics: A Modern Approach* (5 ed.). Mason: South-Western.

World Bank. (2017). *Indicators*. Retrieved january 25, 2017, from http://data.worldbank.org/Indicator

APPENDIX A

Figure 1: Unemployment Rate and Economic growth trends in the SADC region, 1991 - 2014





Source: author's computations