Empirical Analysis of Employment Elasticity of Growth in Botswana.

Temitope L.A. Leshoro

Senior Lecturer in the Department of Economics,
University of South Africa (UNISA), Pretoria, 0003, South Africa
E-mail: lesholat@unisa.ac.za

Doi:10.5901/mjss.2014.v5n2p171

Abstract

Botswana experienced increased economic output growth and performance in the past decades due to the discovery of diamonds along with its major contribution to Gross Domestic Product (GDP), as well as improved per capita GDP. However, growth which does not result into employment, but rather with increased levels of unemployment coupled with poverty, is a concern in this country. This study therefore examined the employment elasticity of growth for Botswana using data over the period 1980 to 2011. The error correction mechanism (ECM), which is the short-run dynamic of the effect of changes in total and sectoral GDP on employment, gives the speed of adjustment to equilibrium given a shock in the long-run equation. The employment elasticity of growth of total GDP was found to be negatively related to employment growth, but the sectoral employment elasticity of growth was positive and quite low. Based on the results obtained, this paper thus recommended policies that encourage labour-intensive job creation rather than labour-replacing job creation, as well as employment subsidy, especially in the major sectors considered.

Keywords: *Economic Growth, Employment, Labour-intensive, Labour-replacing, Poverty.*

1. Introduction

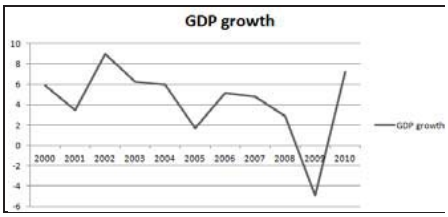
Botswana is one of the countries with increased unemployment alongside increased economic output. Botswana remains one of Africa's success stories, especially within three decades after its independence in the mid-1960s, where it changed from a least-developed to a middle-income economy. This change was mostly due to the discovery of diamonds which is its major export commodity, coupled with sound macroeconomic policies and governance. Further effect of this change was seen in the Gross Domestic Product (GDP) per capita which increased by almost 100 times over these decades to come to US$6,500 in 2012 (AEO, 2013). The first diamond mine was opened in 1971 and then a nickel-copper mine in 1973. However, more diamond mines were later opened, which transformed the country into the largest exporter of diamonds. The GDP of the country increased three-fold over the two-year period 1985 – 1986. This increased growth was maintained throughout the 1980s and 1990s.

While GDP averaged 8% over the period 1974 – 1975 and 2005 – 2006, growth in the non-mining economy was 6.8% (Siphambe, 2007). In 2011, there was an increased global demand for diamonds and this boosted the economic growth of Botswana (AEO, 2013). This shows the major contribution of the mining sector to total GDP. However, the growth in the mining sector was not spread across the whole population in terms of employment and growth without employment is a major concern in many countries, including Botswana, where the increases in economic output do not translate into increased employment (Biyase and Bonga-Bonga, 2007; BMR, 2011). The following major sectors; mining, services, construction and manufacturing, were the main contributors to growth in the economy after the 2009 economic downturn.

Despite the fact that the GDP of Botswana, on average, is encouraging, this variable suffers from a high volatility. There was a fall in GDP growth from 2000 to 2001, after which it increased to 8.9% in 2002, as shown in figure 1, from where it decreased until 2005 when it stood at 1.73% (AEO, 2007). Botswana experienced negative economic growth in 2009, when GDP fell by 4.9%, but this changed into a positive growth in the following year and grew by 7.2%. Year-on-year, the economy has experienced a positive real GDP, especially after the 2009 recession (Stats Brief, 2012). Some of the major sectors in the economy also contributed to the changes in GDP. For instance, the value added (GDP contributions) of the mining sector was the highest with 34.7% in 2011, followed by the services sector with 14.4%, then manufacturing with 4.2% and, lastly, agriculture with 2.6% (AEO, 2013). Despite all the high sectoral GDP contributions as well as the overall improvement and positive GDP growth, Botswana suffers from high levels of poverty, inequality and

unemployment[1]. Unemployment was as low as 13.9% in December 1991 and reached a record high of 23.8% in December 2006. However, it fell to 17.5% in 2009 after which it increased to 17.8% in the following year (CSO, 2012).

Figure 1: Botswana GDP growth rate: 2000 – 2010.



The contradiction in the performance of Botswana's economy is of great concern, that is, there is increased growth in various sectors as well as the whole economy, yet the level of unemployment is high. It is therefore important to empirically measure the effect of economic output on the employment levels of Botswana. This study thus estimates the overall employment elasticity of growth as well as the sectoral employment elasticity of growth in Botswana. The sectors considered are the agriculture, industrial (or mining) and services sectors. This is to provide information about the trend in economic output and employment in these sectors in Botswana. The rationale behind choosing these three sectors is their encouraging trend over the past decade and, especially, their recent contributions to total GDP. The industrial sector is the mining sector for diamonds while the services sector includes the financial services sector (banks, business and insurance services) as well as trade, hotels and restaurants.

Table 1 shows the average growth rate of GDP and employment. It is clear from the table that the growth rate of employment was not even half the growth rate of GDP, especially between the periods 1980 to 1989. Although the average growth rate of employment increased to 4.2% from 1990 to 2000, this was somewhat low, and the average GDP growth rate declined to 6.4%. The rate of decline in the average employment growth rate was higher compared to the fall in the average GDP growth rate from 1990 – 2000 and 2000 – 2005. However, the country has since experienced a decrease in the average growth rate of both GDP and employment until 2010.

Table 1: GDP and employment growth rate: 1980 – 2010.

Periods	Average GDP growth rate (%)	Average employment growth rate (%)
1980 – 1989	11.334	3.096
1990 – 2000	6.350	4.216
2000 – 2005	5.750	2.633
2000 – 2010	4.077	2.486

Source: UNCTAD

Furthermore, the majority of the unemployed total labour force in 2005 constituted youth unemployment of 63.4%, where youths were between the ages 12 and 29 (AEO, 2013). In 2012, the unemployment rate was 17.6%, with the poverty level as high as 20.7%. The contribution of this study to knowledge is to investigate whether Botswana is experiencing jobless growth by estimating point employment elasticities of the aggregate output. In addition, the sectoral elasticities measured through the value added of the three selected sectors in this study will provide information concerning the rate of employment in the sectors. The next section discusses previous studies that were carried out to examine the employment-growth nexus, section 3 provides the data source and methodology followed by the discussion of results in section 4. Section 5 concludes the study, providing policy recommendations.

2. Literature Review

This section outlines different studies that examined the relationship between employment and GDP as well as studies that measured the employment elasticities of different economies. Okun's law is based on the existence of an inverse

[1] *The unemployment rate in Botswana measures the number of people actively looking for a job as a percentage of the labour force.*

relationship between changes in real output (GDP) and changes in the rate of unemployment, where GDP is regressed on unemployment; that is, real output growth was the exogenous (independent) variable and unemployment was the endogenous (dependent) variable (Okun, 1962, 1970). According to Okun's law, for every 1% increase in GDP, there is a corresponding 2% increase in employment.

Villaverde & Maza (2009) analysed Okun's law in their study on the Spanish regions. They found that there was a negative relationship between output and unemployment, with a difference in the value of the coefficient compared to the value suggested by Okun. In another study carried out by Baker & Schmitt (1999), the result showed a higher employment elasticity for some OECD countries when they estimated Okun's coefficients. On the other hand, Pini (1997) estimated the employment elasticities of growth for a number of countries and the results showed an increase in the employment elasticities of growth for Germany and Japan, while France and Sweden experienced low elasticities. Negative employment elasticities were found in the case of Italy and Sweden.

In the same line of the estimation for employment elasticity, Osmani (2006) considered the employment elasticity in the manufacturing sector in Asia, and the result obtained showed a decline. This was mainly as a result of the fact that Asia as a whole experienced negative employment growth in the manufacturing sector; although countries like China and India experienced positive employment growth. Ajilore & Yinusa (2011) measured the employment intensity of output growth in all the sectors in Botswana, using annual data from 1990 to 2008. Their results showed that sectoral employment intensity was quite low over this period.

In estimating the relationship between unemployment and GDP, Eita & Ashipala (2010) examined the determinants of unemployment in Namibia. They found that there was a positive relationship between unemployment and output gap, with unemployment and GDP of the manufacturing sector also exhibiting a positive relationship. Meanwhile, Marelli & Signorelli (2010) performed a study in the European Union (EU) area and found a negative relationship between employment and GDP. That is, high employment growth led to a slower economic growth. In addition, Rad (2011) found that high growth rates had little effect on job creation in Jordan. Despite the high rates of output growth, the level of employment was still quite low and they concluded that the government should rather consider the move from low value-added productions to a more sustainable sector, with better wages and quality.

3. Data and Methodology

Annual data over the period 1980 to 2011 was used in this study. This study differs from Ajilore & Yinusa's (2011) study through data extension; secondly this study considered only the three major sectors in Botswana and lastly in addition to the sectoral employment elasticity, this study also measured the general effect of the country's GDP, which were not the case in the study by Ajilore & Yinusa (2011). Employment was measured in absolute values in thousands of workers, real GDP at 2005 prices was measured in millions of dollars, and values added of the agricultural sector, mining sector and the services sector were measured in millions of dollars (2005 prices). The data for all these variables was sourced from the database of the United Nations Conference on Trade and Development (UNCTAD).

The results obtained from employment elasticity will give the history of the relationship between employment and growth in Botswana, and it is interpreted as correlation, rather than causality. Also, given the different ways of measuring unemployment across countries, employment elasticity is not ideal for comparison purposes. However, one of the advantages of using the employment elasticities (also known as employment intensity) is that, although it is used less, it provides important information concerning the labour market as it is a key labour market indicator. This measure is also important because of its usefulness in examining how employment growth and economic growth move hand in hand over time.

It can also be used to measure different employment elasticities among different sectors or demographic groups. There is no ideal figure of employment elasticity to which countries can compare as this depends on country-specific variables such as the unemployment rates, economic growth, poverty rate, labour productivity and so on. However, developing countries require higher employment intensities than developed countries as a result of excess labour, but the intensity of employment is expected to fall steadily as the country becomes more developed with less labour. The idea of employment elasticity focuses on the demand side of the relationship between GDP and employment. Despite the criticisms, this method is the ideal way to summarize employment intensity and to identify threshold levels of growth (Islam & Nazara, 2000).

Employment elasticity is calculated as a change in the number of employed persons with respect to a change in GDP. There are two ways of estimating the employment elasticity. The first and basic technique is the arc elasticity of employment estimated as:

$$\varepsilon_t = \left(\frac{(E_1 - E_0)/E_0}{(GDP_1 - GDP_0)/GDP_0} \right) \quad [1]$$

The numerator simply gives the change in employment, while the denominator gives the change in GDP; ε_t is the elasticity. This method, although simple, is not ideal for country comparisons. The second technique is point elasticity of employment, which uses econometric technique and this is the focus of this study. It is presented as a double-log multivariate model and it is presented in equation 2 below:

$$\log E_t = \alpha_{0t} + \alpha_{1t} \log GDP + \alpha_{2t} \log GDP_{IND} + \alpha_{3t} \log GDP_{SERV} + \alpha_{3t} \log GDP_{AGRIC} + \mu_t \quad [2]$$

where, E is employment; GDP is the output growth measured using total GDP, GDP_{IND} is the value added (or contribution) of the industrial sector to total GDP, GDP_{SERV} is the value added (or contribution) of the services sector to total GDP, GDP_{AGRIC} is the value added (or contribution) of the agricultural sector to total GDP, α's are the coefficients, which are interpreted as elasticities because the results of logarithms are normally interpreted as elasticities, and μ_t is the error term. Table 2 gives the different ways of interpreting the coefficients of employment elasticity.

Table 2: Interpretation of employment elasticities

	GDP Growth	
Employment elasticity	Positive GDP growth	Negative GDP growth
ε < 0	(-) employment growth (+) productivity growth	(+) employment growth (-) productivity growth
0 ≤ ε ≤1	(+) employment growth (+) productivity growth	(-) employment growth (-) productivity growth
ε > 1	(+) employment growth (-) productivity growth	(-) employment growth (+) productivity growth

Source: Kapsos, 2005.

The table shows that in an economy with a positive GDP growth, negative employment elasticity means that the economy is experiencing negative employment growth and positive productivity growth. On the other hand, in an economy with a negative GDP growth, negative employment elasticity corresponds with positive employment growth and negative productivity growth. The inverse is true for an economy with a positive and a negative GDP growth, respectively, when employment elasticity is greater than one. However, if the employment elasticity lies between zero and one, an economy with positive GDP growth will experience positive employment and productivity growth. This is an ideal position for any economy with an increase in employment together with productivity gains. It is important to note that both employment elasticity growth and productivity growth are necessary in any economy in order to reduce poverty. The reason for this is that, while employment elasticity growth gives the quantitative part of employment growth, the latter is the qualitative characteristic of employment growth and therefore one aspect should not be stressed more than the other (Khan, 2001; Kapsos, 2005).

3.1 Test of stationarity

Stationarity of a time-series means that its mean and variance are constant over time and the null hypothesis states that the series has a unit root. This test is required in order to avoid spurious regression results.

Given: $Y_t = Y_{t-1} + U_t$ [3]

Where, U_t is stochastic error term

Y_{t-1} is one period lag of the dependent variable

If the coefficient of Y_{t-1} is 1, then either

$Y_t = \rho Y_{t-1} + U_t$

or

$\Delta Y_t = \delta Y_{t-1} + U_t$ where $\delta = (\rho - 1)$ [4]

is used to confirm the stationarity or non-stationarity of the variables.

If the coefficient of Y_{t-1}, $\rho = 1$, or $\delta = 0$, then the time-series is non-stationary, otherwise it is stationary.

3.2 Cointegration and Error Correction Model (ECM)

Cointegration is a linear combination of two or more time-series that have the same order of integration but are not stationary. If two or more variables are cointegrated, it shows that there is a long-run relationship between them. The long-run equation is therefore as shown in equation [2], while the ECM formulation of the dynamic model is presented in equations [5] and [6].

$$\log E_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \log GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \log GDP_{IND(t-i)} + \sum_{i=0}^{n} \alpha_{3i} \log GDP_{SERV(t-i)} + \sum_{i=0}^{n} \alpha_{4i} \log GDP_{AGRIC(t-i)} + \sum_{i=1}^{n} \alpha_{5i} \log E_{t-i} + \mu_t \quad [5]$$

ECM corrects for dis-equilibrium between the short-run and the long-run among the variables.

$$\Delta \log E_t = \varphi_0 \varepsilon_{t-1} + \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \Delta \log GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta \log GDP_{IND(t-i)} + \sum_{i=0}^{n} \alpha_{3i} \Delta \log GDP_{SERV(t-i)} + \sum_{i=0}^{n} \alpha_{4i} \Delta \log GDP_{AGRIC(t-i)} + \sum_{i=1}^{n} \alpha_{5i} \Delta \log E_{t-i} + \mu_t \quad [6]$$

where, Δ denotes the first difference of the variables, μ_t is the error term, ε_{t-1} is one period lag of the error term obtained from the cointegration model in equation [2] above and all the other variables are as earlier defined.

4. Results and Discussions

The results of the stationarity test are reported in table 3. The stationarity of the variables was tested using the "trend and intercept" at a 5% level of significance. None of the variables was found to be stationary at level. The dependent variable, employment, was stationary after the second difference, as well as the value added of the services sector variable; while the rest of the variables were stationary after the first difference. This means that employment and the value added (or contribution) of the services sector to total GDP are integrated of order 2, I(2) and the other variables are integrated of order 1, I(1). Although there is a mix of orders of integrations, that is I(1) and I(2), these variables can break down such that there is still cointegration. Therefore, the test of cointegration was carried out and the result, as shown in the appendix, confirms this; showing that there are two cointegrating equations at a 5% level of significance according to the Maximum Eigenvalue and trace tests.

Table 3: Test of Stationarity: Phillips Perron

Variables	Levels	First difference	Second difference	Decision
logEMP	0.563	-3.482	-19.096***	I(2)
logGDP	-0.691	-5.597***	N/A	I(1)
$\log GDP_{IND}$	-1.961	-4.166**	N/A	I(1)
$\log GDP_{SERV}$	-1.640	-3.076	-6.928***	I(2)
$\log GDP_{AGRIC}$	-2.223	-4.538***	N/A	I(1)

**5%, ***1%. Eviews 7 was used for all computations.
Critical values: Trend and Intercept: 1% = -4.273; 5% = -3.558
Analysis: By author.

A general-to-specific method was adopted where the parsimonious model of ECM was first performed with four lag lengths as selected by the entire lag length criteria, except the sequential modified LR test statistic (See appendix). This lag length was not surprising because real economic variables take long to adjust to changes in the economy. The insignificant variables were gradually dropped while noting the increase or decrease in the Akaike information criterion in order to determine the importance of the dropped variables. The results of the specific model of the error correction model, which is the short-run dynamics of the long-run relationship among the variables, are reported in table 4.

Generally, the results support low levels of labour-absorption in Botswana, where a 1% increase in GDP two years ago resulted in a drop in employment by more than 25%. The aggregate output produced negative employment elasticities, as shown in table 4. This means that the increase in Botswana's total GDP negatively affected employment growth but positively affected productivity growth as shown in table 2. In a country with a positive GDP growth, negative employment elasticity means that the country has a negative employment growth and a positive productivity growth (See table 2). GDP is the only variable that has a negative impact on employment. The negative relationship shows that output growth does not feed into increasing job creation in Botswana.

Furthermore, with respect to the sectoral GDP contribution, industry contributed the most to employment, with a lag of two years. That means that a 1% increase in the GDP contribution of the mining sector, in for instance 2009, will increase employment by 16% in 2011. However, the current year's increase of 1% in the GDP contribution of the mining sector will increase employment by a mere 9% in the same year. Unfortunately, the significant positive sectoral employment elasticities do not mean that Botswana is coping with unemployment. The positive employment elasticities only show that the country has positive employment and productivity growth. Nevertheless, the fact that the size of these coefficients is very small indicates that Botswana needs to increase its output growth in each sector in order to significantly reduce unemployment.

Table 4: Result of the employment elasticity of Botswana: 1980 - 2011 (Dependent variable – Employment).

Variables	Coefficients	SE	t-stat
e_{t-1}	-0.251	0.040	-6.306***
$\Delta logGDP$	-0.114	0.036	-3.207***
$\Delta logGDP_{IND}$	0.091	0.024	3.768***
$\Delta logEMP_{t-1}$	0.412	0.122	3.389***
$\Delta logGDP_{IND(t-1)}$	0.043	0.010	4.152***
$\Delta logGDP_{SERV(t-1)}$	0.028	0.015	1.905*
$\Delta logGDP_{AGRIC(t-1)}$	0.033	0.010	3.368***
$\Delta logGDP_{t-2}$	-0.255	0.061	-4.183***
$\Delta logGDP_{IND(t-2)}$	0.160	0.036	4.514***
$\Delta logGDP_{SERV(t-2)}$	0.036	0.018	2.073**
$\Delta logGDP_{AGRIC(t-2)}$	0.021	0.010	2.108**
Constant	0.020	0.003	6.413***
Adj R^2 = 0.89 Prob F-stat. = 0.000			

* 10%, **5%, ***1%. Eviews 7 was used for all computations.
Analysis: By author.

In addition, all the variables are highly significant, except for the one and two periods' lag of the services sector, which is significant at 10% and 5%, respectively. All the coefficients of the sectoral GDP contribution show positive effects on employment in terms of which, with a lag period of one year, the mining/industry sector had the largest contribution of 4%, followed by the agricultural sector of 3%, and then the services sector of 2%. On the other hand, given a lag period of two years, the mining/industry sector still has the largest contribution of 16%, followed by the services sector with just over 3%, and then the agricultural sector with 2%. These results also show that the effect of any of the contributions from these sectors will only have a bigger effect on the level of employment after approximately two years; this is especially the case for the mining (industry) sector and the services sector.

However, the contribution of the agricultural sector has an immediate effect on improving employment; which effect becomes smaller as time passes. These low employment elasticities could be associated with the low employment growth experienced in Botswana. More notably is the highly statistically significant error correction term, together with the expected negative sign. The coefficient of the error correction term of -0.25 indicates that once the long-run equation model is shocked, there will be a fast convergence to equilibrium with about 25% adjustment in the first year. Furthermore, a set of diagnostic tests was carried out to establish the robustness of the results obtained, and all the null hypotheses for all the tests could not be rejected, as shown in table 5. This means that the error term is normally distributed and there is no evidence of multicollinearity and heteroskedasticity in the model. A further test of the stability of the parameters, which is based on the cumulative sum of the recursive residuals, was carried out as shown in figure 2.

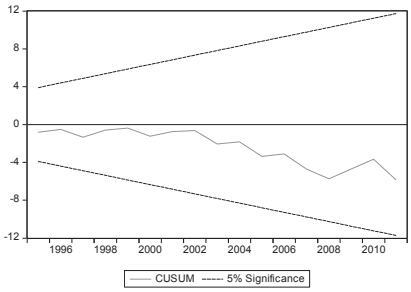
Table 5: Results of the diagnostic tests

Test	F-stat
Normality test: Jarque-Bera	1.391 (0.499)
Serial Correlation: Breusch-Godfrey LM Test	2.246 (0.128)
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.936 (0.532)
Parameter Stability test: CUSUM	Stable

Figures in parentheses indicate P-value.
Analysis: By author

A parameter or residual variance is said to be stable if the cumulative sum of squares lies within the 5% significance lines. If there is a movement outside the critical lines, it means the parameter or variance is unstable. Figure 2 shows the result of the CUSUM test confirming the stability of the parameters; this is because the cumulative sum lies within the 5% significance lines.

Figure 2: Test of Stability – CUSUM



5. Conclusion and Policy Recommendations

Botswana has experienced an applauding increased economic output growth and performance in the past decades. However, growth without employment, as well as increased levels of poverty, is a concern in this country where the increases in economic output do not translate into increased employment. This study therefore examined the employment elasticity of growth for Botswana using data spanning over the period 1980 to 2011. The employment elasticity of growth, which is the history of the correlation between employment and growth, was found to be negative for total GDP and employment growth. This means that not only does output growth not feed into creating new jobs, but there was also actually a decline in employment. The reason could be due to the possibility of the capital-intensive process and the labour-replacing process.

Furthermore, the sectoral employment elasticity of growth was quite low and it could be inferred that the growth in each of these sectors has not been labour-employment driven, but rather labour-productivity driven. All the coefficients of the sectoral GDP contribution show positive effects on employment in terms of which, with a lag of one year, the mining/industry sector had the largest contribution of 4%, followed by the agricultural sector of 3%, and then the services sector of 2%. These results also showed that the effect of any of the contributions from these sectors only had a bigger effect on the level of employment after approximately two years; this is especially the case for the mining (industry) sector and the services sector. The robustness of these results was tested and the model passed a battery of diagnostic tests.

In order to improve employment placement, government policy should consider employment subsidies with more focus on youth employment subsidy. Other policies could be the creation of jobs which are more labour-intensive rather than labour-replacing in the major sectors. Further studies can consider estimating the productivity elasticity (or productivity) and examining to what extent this improves employment in Botswana.

References

African Economic Outlook (AEO). (2013), [Online] Available: http://www.africaneconomicoutlook.org/en/countries/ (January 29 2013).

African Economic Outlook (AEO). (2007). AFDB/OECD. Botswana.

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

Baker, D., & Schmitt J, (1999). The macroeconomic roots of high unemployment: The impact of foreign growth Economic Policy Institute, [Online] Available: http://www.epinet.org (March 3 2013).

Biyase, M., & Bonga-Bonga L. (2007). South Africa's growth paradox. DEGIT Conference Papers, [Online] Available: www.degit.ifw-kiel.de/papers/degit_12/C012_043.pdf (February 3 2013).

Bureau of Market Research (BMR), 2011, 'A broad review of the new growth path framework with a specific emphasis on the feasibility of its proposed targets', [Online] Available: http://www.unisa.ac.za/contents/faculties/ems/docs/Press413.pdf (February 1 2013).

Caporale, G.M., & Škare M. (2011). Short- and Long-Run Linkages between Employment Growth, Inflation and Output Growth: Evidence from a Large Panel. Economics and Finance Working Paper Series, No. 11-17.

Central Statistics Office (CSO). (2012) [Online] Available: http://www.cso.gov.bw/index.php?option=com_keyindicators&id=115 (January 29 2013).
Eita, J.H., & Ashipala, J.M. (2010). Determinants of Unemployment in Namibia. International Journal of Business and Management 5(10), 92 – 104.
Islam, I., & Nazara S. (2000). Estimating employment elasticity for the Indonesian economy. International Labour Office – Jakarta Indonesia, International Labour Organization.
Kapsos, S. (2005). The employment intensity of growth: Trends and macroeconomic determinants. Employment Strategy Paper, No. 12 (Geneva, ILO, 2005).
Khan, A.R. (2001). Employment policies for poverty reduction. IEPDP No. 1. ILO, Geneva.
Marelli, E., & Signorelli M. (2010). Employment, productivity and models of growth in the EU. International Journal of Manpower, 31 (7), 732-754.
Okun, A. (1970). Potential GDP: Its Measurement and Significance. In: Okun, A. (ed.), The Political Economy of Prosperity. Washington D.C.
Okun, A. (1962). Potential output: Its measurement and significance. Proceedings of the Business and Economic Statistics Section of the American Statistical Society.
Osmani, S. R. (2006). Employment Intensity of Asian Manufacturing: An Examination of Recent Trends. Paper prepared for the Asian Regional Bureau of the United Nations Development Programme (UNDP), New York, March.
Pini, P. (1997). Occupazione, tecnologia e crescita: modelli interpretativi ed eevidenze empiriche a livello macroeconomico. Paper presented at Conference of Accademia Nazionale dei Lincei on 'Sviluppo tecnologico e disoccupazione: trasformazione della societa', Rome, 16–18 January 1997.
Rad, S.T. (2011). Jordan's Paradox of Growth without Employment: A Microcosm of the Middle East?. Centre for development policy and research, Development Viewpoint, 65.
Siphambe, H.K. (2007). Growth and Employment Dynamics in Botswana: A case study of policy coherence. Policy Integration and Statistics Department, International Labour Office Working Paper, 82. October 2007
Stats Brief. (2012). Statistics Botswana Gross Domestic Product: Third quarter of 2012. No: 2012/22.]Online] Available: http://*www.cso.gov.bw* (February 8 2013)
Villaverde, J., & Maza A. (2009). The robustness of Okun's law in Spain, 1980 – 2004: Regional Evidence. Journal of Policy Modeling, 31(2), March – April, 289 – 297.

Appendix

Table 1: Lag length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	148.1180	NA	2.50e-11	-10.22271	-9.984821	-10.14999
1	329.6006	285.1869	3.62e-16	-21.40004	-19.97268	-20.96368
2	365.1753	43.19787*	2.05e-16	-22.15538	-19.53855	-21.35539
3	403.0889	32.49738	1.43e-16	-23.07778	-19.27148	-21.91415
4	458.4496	27.68034	6.94e-17*	-25.24640*	-20.25063*	-23.71914*

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 2a: Johansen Co-integration (Trace and Maximum Eigenvalue Tests)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.732135	97.31946	69.81889	0.0001
At most 1 *	0.649949	57.80132	47.85613	0.0044
At most 2	0.381283	26.31105	29.79707	0.1196
At most 3	0.278207	11.90784	15.49471	0.1614
At most 4	0.068455	2.127338	3.841466	0.1447

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 2b: Johansen Co-integration (Trace and Maximum Eigenvalue Tests)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value
None *	0.732135	39.51814	33.87687
At most 1 *	0.649949	31.49028	27.58434
At most 2	0.381283	14.40321	21.13162
At most 3	0.278207	9.780501	14.26460
At most 4	0.068455	2.127338	3.841466

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values