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ECONOMIC DIVERSIFICATION AND EMPLOYMENT CREATION IN BOTSWANA

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ABSTRACT

This study explores the relationship between unemployment and the degree of industrial diversity, amongst other variables, in Botswana covering the period from 1980 to 2015. The Botswana economy is primarily mineral-led, and the mining sector is highly capital intensive. That makes the economy to be vulnerable, especially to external shock, such as the 2008 recession. The extent to which that affected unemployment in Botswana is examined. The results show that a link between industrial diversity and unemployment seems to exist, and is found to be negative. This means that an increase in industrial diversity, that is, a fall in the Herfindahl index, seems to lead to increase in unemployment rate. However, the results show that after the financial crisis a reduction in the Herfindahl Index (increase in industrial diversity) led to a reduction in unemployment. From this a conclusion is drawn that industrial diversification is good for an economy because it prepares the economy in case there is an economic shock such as a financial crisis or recession, a view sustained in much of the literature and the expectation of this research.

1. INTRODUCTION

Like in many other developing countries, unemployment remains one of the major problems facing Botswana, and this is especially the case among the youth. Thus employment creation remains among the government's top priorities. The country is dependent on the mining sector, which is highly capital intensive and therefore has limited employment creation potential; the sector contributes less than five percent to total employment. Available data from various sources show that Botswana's unemployment rate is high, ranging between twenty percent and thirty percent ((JEFFERIS K, 2015). These figures however, only apply the 'narrow' interpretation of unemployment which considers individuals who are still actively searching for employment, disregarding those who have been demoralized and discouraged; those who are not looking for employment any more. Needless

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to say, if we apply the 'broad' interpretation of unemployment, that would lead to even higher unemployment figures.

In this regard, the government has taken a step forward through programmes and institutions to create employment; primarily through the promotion of economic diversification. Some of the supporting government programmes and institutions include the Citizen Entrepreneurial Development Agency (CEDA), Local *Enterprise Authority* (LEA), the Integrated Support Programme for Arable Agricultural Development (ISPAAD), the Social Welfare Programmes, the Young Farmers Fund, the Youth Development Fund, the Youth Empowerment Scheme and internship programmes all of which try to expand job opportunities in non-mining sectors, in particular targeting the youth. Hence, job creation is tied to economic diversification and growth of the economy and, particularly, employment creation in the private sector. However, a definite relationship between employment creation and economic diversification has not been concretely established. Hence this paper attempts to establish that relationship in Botswana.

Botswana has been aware of the need to diversify the country's economic base for decades. The assumption here is that a more diversified economy becomes less vulnerable to outside forces and hence is more stable and has a variety of employment opportunities (El-Haimus, 1982). Manufacturing industries have been inspired to widen and discover new plants as part of the diversification strategy on the belief that they will increase employment creation. The manufacturing sector has been designated as one of the prime sectors over which the dual targets of economic diversification and employment creation were to be accomplished (Sekwati, 2010), Hence in Botswana numerous policy actions have also been marked to diversify the economy, notably on the support for the non-mining sectors of the economy. Numerous parastatals have also been prioritized in terms of budget support to promote the export sector because exports formation still continue to be heavily concentrated on diamonds with a sluggish filtration of new viable export activities to boost the revenue profile authoritatively (Tabengwa & Modisaatsone, 2015).

A question can be asked: does a well-diversified economy guarantee a lower rate of unemployment? In other words, if the government succeeds in the adoption of a policy of economic diversification away from the mining sector, does this assure a higher rate of employment or lower rate of unemployment? The focus of this paper is an attempt to provide answers to these questions. Economic diversity can be thought of, at its most fundamental level, as a variety of economic outputs produced by a particular economy. Presently, there is no clear accord as to what constitutes a well-diversified economy.

The specific objective of this paper is to investigate the relationship between unemployment and economic diversification in Botswana. The study also investigates the relationship between total unemployment on the one hand and: inflation, total fixed capital stock and total population.

The following fundamental hypotheses are tested:

- There is an inverse relationship between the level of economic diversification and the unemployment rate;
- There is an inverse relationship between inflation rate and unemployment rate – the so-called Phillips Curve analysis;
- There is a positive relationship between the total population and unemployment rate; positive to indicate that a rise in population means a rise in the labour force, which increases the potential for higher unemployment;
- There is a positive relationship between the proportion of youth and unemployment rate;
- There is an inverse relationship between unemployment rate and total fixed capital stock. This is because a higher level of capital stock means greater investment, and thus employment creation.

2. REVIEW OF LITERATURE

First, we review the literature on the measure of economic/industry diversification. Then we look at literature that discusses the relationship between unemployment and economic diversification.

The Herfindahl index (HHI) is widely used to measure market concentration and therefore economic diversity. It is further used for macroeconomic specialization analyses. It measures the extent to which a particular economy is dominated by a few sectors. Calculation of this index is expressed as (Issues, 2011):

$$DIVt = \Sigma\, sit^2$$

Where sit = $E_{it} / \Sigma E_{it}$ and E_{it} = share of economic activity (gross domestic product) in *i*th sector in year t. The index is the summation of the squares of the market shares of the different economic sectors, and attains a maximum value of one when all economic activity is accounted for by a single sector, that is full specialization, and will attain a minimum value of zero when economic activity is accounted for by a large number of sectors with small and equal GDP shares. Thus, a fall in the index implies less concentration in the dominant industry or greater diversification. A rise signifies more concentration in the dominant sector or greater specialization/lower diversification. GDP data is allocated according to classification by sectors as: Agricultural, Mining, Construction, Manufacturing, Transport and

Communication, Trade, Hotels and Restaurants, Financial and Business services, Water and Electricity, Social and personal services and General Government.

Industry diversity refers to the degree of unevenness in terms of the distribution of employment or value added across different industries in a country, usually measured by the Herfindahl index (Fu, Dong, & Chai, 2009). Industry diversity helps reduce frictional unemployment. In a city or an economy with one or few industries, if random unemployment occurs, the unemployment in that city will increase; however, in a city with many industries, a random unemployment in one industry might be quickly offset by a random hiring in another industry. Based on this theory, Simon (1998) uses the USA metropolitan area industry data from 1977-1981 and finds that unemployment rates are lower in metropolitan areas with a higher degree of industry diversity (measured by the Herfindahl index). Izraeli and Murphy (2003) use the USA state level data and report that industry diversity is negatively related to unemployment rate.

The national average approach to measuring industrial diversity was used in the study by Mason and Howard (2010) to measure and compare the industrial diversity of regional economies (SDists) within Newcastle. The national average approach assumed *Mi,* was found to be equal to the national average employment in the *ith* industry. The calculation of the national averages approach (index) was shown to be:

$$\Sigma(Pi - Mi)^2 / Mi$$

Where: Pi = the percent of employment in the *ith* industry class and Mi = national percent of employment in industry i. The national averages approach determined the nation as completely diverse at 0.00. The further the recorded index was away from 0.00 then the greater was the level of specialization. Rudimentary correlation analysis was used which suggested that industry diversification is associated with lower unemployment rates. Overall the correlation between higher levels of diversification and lower levels of unemployment were found to be positive at 0.48 for 2006 and 0.67 for 2001. Given the higher correlation statistics and the p values, the correlation was stronger in 2001, suggesting the role of diversification in reducing unemployment changes over time.

Other studies, however, found no significant correlation between industry diversity and unemployment rate. For example, Fu et al (2009) used data drawn from the China Urban Statistic Yearbook from 1998 to 2007 and their results from the pooled regression showed that the coefficient of Diversity variable was 6.986 and significant at the 1% level, meaning that if industry diversity increased by 1 percentage point, unemployment rate increased by about 0.07 percentage point. This is in contrast to the

theory that industry diversity reduces frictional unemployment and the empirical evidence from many researchers including Izraeli and Murphy (2003).

3. METHODOLOGY

This section discusses the methodology of the study. This encompasses the conceptual model, the model adopted for this study, definition of variables in the model, type and sources of data and the estimation techniques used for analysis of data.

3.1 Conceptual Model

Industrial diversity, it has been argued, is the key to solving the problem of soaring unemployment rates (Izraeli & Murphy, 2003). This is because a high degree of industrial diversification is often associated with stabilization of the economy. When an economy is diversified, the laid off employees from one industry most likely will be able to find jobs with other industries in the area. The workers will find new employment elsewhere because other industries may not be affected by the cause for the collapsing demand in that particular industry. For example, a global financial crisis would result in a decrease in demand for highly income elastic commodities but would only have a weak effect on demand for goods that are less income elastic.

In order to account for the link between industrial diversity and state unemployment rate in the United States of America, Izraeli & Murphy (2003) proposed the following model:

$$Uit = U\ (DIVit;\ USUt;\ RPICit;\ DENit;\ NWTit;\ TEENit;\ OVER65it;\ POPit;\ POPCHit)$$

Where: U – Is state unemployment rate; DIV – is a measure of the degree of industrial diversity; USU – is the national unemployment rate; RPIC – is state real per capita income (in 1982 dollars), deflated by the national Consumer Price Index; DEN – is population density; NWT – is percent of working-age population that is non-white; TEEN – is percent of working-age population that is 16–19 years of age; OVER65 – is the percent of the population 65 years and older; POP – is the state population; POPCH – is the rate of population growth in a state; RPICUS – is national per capita income (in 1982 dollars); and i and t stand for state i and year t.

For this study the above model by (Izraeli & Murphy, 2003) is adopted and modified hence the following model is proposed in order to suit the current study and also based on the availability of data:

$$Ut = U\ (DIVt,\ INFRt,\ POPt,\ YOUTHt,\ Kt) \quad (1a)$$

$$Ut = \beta_0 + \beta_1 DIVt + \beta_2 D{*}DIV + \beta_3 INFRt + \beta_4 POPt + \beta_5 YOUTHt + \beta_6 Kt \quad (1b)$$

where: U – is unemployment rate, DIV – is a measure of the degree of industrial diversity, INFR- is Inflation rate; POP – is the total population; YOUTH – is percent of working-age population that is 15–24 years of age; K- is the total fixed capital stock; D- is a dummy variable and it takes the value of zero for 1980 to 2008 before the global recession, and one for 2009 to 2015: the post-recession period. Here we use an interactive dummy, to test for the role of industry diversity before and after the global recession.; and t stands for year t.

3.1.Definition of Variables and Hypotheses

DEPENDENT VARIABLE

U: The unemployment rate (U) which is the dependent variable measures the number of people actively looking for a job as a percentage of the labour force in Botswana. The data for this variable is derived from the World Bank Development Indicators.

INDEPENDENT VARIABLES

DIV: the degree of national industrial diversity (DIV) is expected to have a negative reaction on unemployment rate. When a country is more diverse, it will experience lessened total unemployment rates. In order to evaluate the degree of industrial diversity a standard Herfindahl Index is used. Calculation of this index is expressed as stated above.

1. **D*DIV**: An interactive dummy variable D*DIV is included to estimate whether after the financial crisis, the industry diversity affected unemployment more or not. This is because industry diversity is seen as a means to attain economic stability or to cushion the adverse effects of recessions. Therefore economies which are less diversified are expected to experience higher unemployment rates during the post-recession period because the one or few dominant sectors would have highly experienced fluctuations, or worse closed down, leaving the people jobless (Smith & Gibson, 1988). This will show a negative relationship between D*DIV and unemployment.

Although the variable of primary interest is the measure of industrial diversity, but as indicated from Equation (1), a variety of other variables also have an effect on unemployment rate as follows:

INFR: Inflation rate (INFR) is expected to have a negative effect on the unemployment rate. This is according to the Phillips curve analysis, that unemployment and inflation are inversely related; that is, as levels of inflation decrease, unemployment rate increases. This is because when unemployment is high, the number of people willing to work significantly outstrips the number of jobs available, therefore the supply

of labour will be greater than the demand for it. As a result, there is little need for employers to propose for the services of workers by rewarding higher wages. In this case, wages will remain static and wage inflation would actually not take place. On the other hand when unemployment is low, which means that the demand for labour by employers exceeds supply by workers, employers will persist to offer higher wages to attract workers, leading to rising wage inflation. The data for this variable will be derived from Statistics Botswana.

POP: total population (POP) may affect a country's unemployment rate in more than one way. It is possible that this variable serves as a proxy for economies of scale, which make a country more attractive to business because of a large market. In that case, the population variable is expected to be negatively related to unemployment. However, another possibility is that an increase in the population, all things being equal means an increase in the labour force, and that means an increase in unemployment. If this is the case, this variable probably will have a positive effect on unemployment. Because of this uncertainty, the effect of population on unemployment cannot be determined *a priori* and will be left for empirical test. The data for this variable is derived from Statistics Botswana.

YOUTH: The expected effect of the proportion of youth (YOUTH) on unemployment is positive because the youth represent the part of the population that has just come out of school, are less experienced, and therefore tend not to find jobs easily. Unlike the variable proposed by Izraeli & Murphy (2003) which was for ages 15 to 19, for this study ages 15 to 24 are used because of data limitations. The data for this variable is derived from Statistics Botswana.

K: the total fixed capital stock (K) is expected to be inversely correlated with unemployment. This is because increase in stock of capital means increase in investment which will generate employment for the people, thus causing reduction in unemployment. The data for this variable is derived from Statistics Botswana.

3.2 The Data: Type and Sources

This study is based on the use of secondary data. Time series data derived from Statistics Botswana and Bank of Botswana publications are used. The time period covered in this study is 1980-2015. The reason for the observed long time period is because changes and relationships are revealed more clearly for long observed time periods.

Given that this data appeared to have gaps, the following was done: the unemployment data for the periods 1980, 1982-1990, 1992, 1999, 2007, 2012 and 2014-2015 was estimated by taking the averages of data of the years

which appeared before and after the mentioned gaps. [1]For the data of total population for the years 1980 and 2010 the same method used for estimating the unemployment rate gaps was used. On the other hand the data for proportion of youth for the years 1980, 1982-1990, 1992-2000, 2002-2012 and 2012-2015 was estimated by multiplying the total population of the mentioned years by the percentage of the growth rate of the youth in Botswana respectively.

4. ESTIMATION AND ANALYSIS

The analysis begins with the unit root test which is used to test whether the variables are stationary or not and their order of integration. If time series data has constant mean, variance & covariance then it is said to be stationary. It is very necessary to make sure that data is stationary otherwise it will give false results. This study uses Augmented Dicky Fuller (ADF) test to test the stationarity of each variable, and it is also used for order of integration of each variable. The main objective of cointegration is to determine the long run relationship among the variables.

This section is organized into five main sections. Section 4.1 presents the specification of the model; section 4.2 reports the results of the unit root test for stationarity; section 4.3 presents the results of cointegration test and the error correction model respectively; section 4.4 gives results of the residual diagnostics tests for efficiency of the models and lastly section 4.5 gives the conclusion from the analysis..

4.1 Model Specification

The model as stated in equation 1 above, is presented here (for ease of reference):

$$Ut = U\,(DIVt, INFt, POPt, YOUTHt, Kt) \quad (1a)$$

$$Ut = \beta_0 + \beta_1 DIVt + \beta_2 D^{*}DIV + \beta_3 INFt + \beta_4 POPt + \beta_5 Youtht + \beta_6 Kt \quad (1b)$$

Where the variables are as described above.

4.2 Unit Root Test for Stationarity

This section presents preliminary tests performed on the variables to determine their stationarity before the estimation of the model. The fundamental step involving regression analysis is to reveal the stochastic properties of the definite data set, since empirical work based on time series data assumes stationarity of the given time series The tests for stationarity leads to examining whether the variables are integrated or not and to what order. For cointegration tests to be solid and notable they require integration of the different variables to be of the same order. The Augmented Dickey-Fuller (ADF) unit root test is carried out on the variables in this study. The

null hypothesis is H0: the variable has a unit root and it is order I (1) meaning it is non-stationary and the alternative hypothesis H1: the variable has no unit root and it is order I (0), that is to say, it is stationary. Below are the results for the variables in levels and first difference presented in Table 1.

Table 1
Stationarity Tests: Unit Root Test

Order of Integration: ADF TEST IN LEVELS ADF Test with Intercept Only			
Variable	*ADF statistic*	*Probability*	*Order of Integration*
DIVt	-1.869051	0.3424	Not I(0)
INFt	-2.420754	0.1436	Not I(0)
Youth	-1.108826	0.7013	Not I(0)
Kt	3.153833	1.0000	Not I(0)
Popt	0.597725	0.9876	Not I(0)
Ut	-1.997968	0.2864	Not I(0)
Order of Integration: ADF TEST IN FIRST DIFFERENCE ADF Test with Intercept only			
Variable	*ADF statistic*	*Probability*	*Order of Integration*
DIVt	-5.496804	0.0001	I(1)
INFt	-8.455899	0.0000	I(1)
Youth	-4.838751	0.0004	I(1)
Kt	-5.880937	0.0000	I(1)
Popt	-4.088660	0.0032	I(1)
Ut	-5.844774	0.0000	I(1)

The results presented in Table 1 show that all the six variables are integrated of order one, that is to say each variable is of order I(1). This means that all the variables are non-stationary at levels but they all become stationary at first difference.

4.3 Johansen Cointegration Test

Since the unit root results have proved that all the variables in this study are stationary at first difference, the cointegration testing procedure to examine the long run relationship between unemployment rate and the respective independent variables is proceeded. The results of the cointegration test according to the Johansen cointegration test are presented in Table 2.

Table 2
Johansen Cointegration Test Results

Trend assumption: Linear deterministic trend
Series: DIV DUM INFLATION_RATE PROPORTION_OF_YOUTH TOTAL_FIXED_CAPITAL_STOC TOTAL_POPULATION UNEMPLOYMENT
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	*Eigenvalue*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***
None *	0.886593	217.5395	125.6154	0.0000
At most 1 *	0.839097	143.5291	95.75366	0.0000
At most 2 *	0.600582	81.41262	69.81889	0.0045
At most 3 *	0.455460	50.20926	47.85613	0.0295
At most 4	0.374007	29.54361	29.79707	0.0535
At most 5	0.270810	13.61745	15.49471	0.0940
At most 6	0.081205	2.879551	3.841466	0.0897

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	*Eigenvalue*	*Max-Eigen Statistic*	*0.05 Critical Value*	*Prob.***
None *	0.886593	74.01038	46.23142	0.0000
At most 1 *	0.839097	62.11646	40.07757	0.0001
At most 2	0.600582	31.20336	33.87687	0.1009
At most 3	0.455460	20.66565	27.58434	0.2969
At most 4	0.374007	15.92616	21.13162	0.2292
At most 5	0.270810	10.73790	14.26460	0.1678
At most 6	0.081205	2.879551	3.841466	0.0897

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

The joint evidence found from the unrestricted cointegration Rank test (Trace), Maximum Eigen (Max Eigen) value and MacKinnon Haug Mitchelis p value display that the null hypothesis of no cointegration is rejected in favour of the alternative hypothesis at 5% level. In both the trace test and the Max Eigen test, P-value is less than the 0.05 level (i.e. 0.0000 < 0.05 level for both cases respectively). The trace statistic is greater than the critical value (trace statistic 217.5395 > 125.6154). Furthermore, the Max Eigen statistic is greater than the critical value (i.e. Max Eigen statistic 74.01038 > 46.23142). In addition, the trace test reveals the existence of four cointegrating equations at the 0.05% level while the Max Eigenvalue test displays the existence of two cointegrating equations. Therefore this leads to the rejection of the null hypothesis. This means that there exist a long run relationship between unemployment rate and the independent

variables. Johansen cointegration test suggests that these variables tend to move together in the long run.

4.3.1. Estimated Equation using the Error Correction Method (ECM) Approach

As stated by Gujarati and Porter (2009), if variables are cointegrated, the relationship between these variables can be expressed as ECM. Therefore the error correction term is derived and used to generate the error correction model. The ECM corrects the disequilibrium of the model and the coefficient of the ECM gives the speed at which the ECM corrects the equilibrium. The ECM coefficient is negative; -0.798347. This means that the speed at which the ECM is correcting the disequilibrium for unemployment rate is 79.83 percent. The coefficient of the ECM is significant at five percent level indicating that there is a long run relationship between unemployment and the dependent variables. Furthermore, it can be said that there is a long run relationship between unemployment and economic diversification since the coefficient of the degree of economic diversification is insignificant with a probability of 0.6907. Inflation rate, proportion of youth, total population and total fixed capital stock also show a long run relationship between them and unemployment since their respective probabilities are also insignificant given as 0.4460, 0.2785, 0.7290 and 0.2778. The presence of the long run causality has been verified by the negative sign of the coefficient of the ECM and it was significant. It can also be said from the results that the model is not spurious because R-squared (0.559) is less than the Durbin Watson (DW) statistic (1.718). On the other hand, the ECM results show that there is a short run relationship between unemployment and the interactive dummy variable (D*DIV) with a significant probability of 0.0314. It shows that there is a positive relationship between unemployment and D*DIV which means that a unit increase in D*DIV will increase unemployment by 153.61 units. This shows that indeed financial crisis does have a great impact on unemployment in the short run. The ECM results are shown in Table 3, where U is the error correction term.

4.4 Residual Diagnostic Test Results

To ensure that the model used in this study is not spurious and misleading, various diagnostic tests have been undertaken. The purpose of doing that was done to ensure efficiency of the model. The residual (error correction term) was first derived and tested for stability and the results are indicated in Table 4. The analysis is based on the fact that if the probability is less than five percent we can reject the null hypothesis of unit root and accept the alternative hypothesis of no unit root. The probability of the residuals

Table 3
Estimated Equation using the Error Correction Method (ECM) Approach

Dependent Variable: D(UNEMPLOYMENT)
Method: Least Squares
Date: 04/25/17 Time: 21:04
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	0.732350	0.558602	1.311042	0.2009
D(DIV)	-6.071699	15.09490	-0.402235	0.6907
D(DIV)*DUM	153.6107	67.67334	2.269884	0.0314
D(INFLATION_RATE)	0.118616	0.153378	0.773356	0.4460
D(PROPORTION_OF_YOUTH)	-6.89E-05	6.23E-05	-1.105958	0.2785
D(TOTAL_POPULATION)	5.11E-06	1.46E-05	0.350024	0.7290
D(TOTAL_FIXED_ CAPITAL_STOC)	-3.70E-10	3.34E-10	-1.107696	0.2778
U(-1)	-0.798347	0.196670	-4.059315	0.0004

R-squared	0.559379	Mean dependent var	0.280000
Adjusted R-squared	0.445144	S.D. dependent var	2.646063
S.E. of regression	1.971017	Akaike info criterion	4.392608
Sum squared resid	104.8925	Schwarz criterion	4.748116
Log likelihood	-68.87064	Hannan-Quinn criter.	4.515329
F-statistic	4.896735	Durbin-Watson stat	1.718383
Prob(F-statistic)	0.001146		

in this case is 0.0003 which is less than five percent level, therefore it means residuals do not have unit root. Therefore the estimated model is not spurious or misleading.

Table 4
Residual Unit Root Test Results

Order of Integration: ADF TEST IN LEVELS
ADF test with intercept only

Variable	*ADF statistic*	*Probability*	*Order of Integration*
RESID01	-4.980811	0.0003	I(0)

4.4.1 Serial Correlation Test

In this study, to test for autocorrelation the Breusch-Godfrey Serial Correlation LM Test was used. The probability of chi-square was used and the results are indicated in table 4.3a below. The null hypothesis that there is no serial correlation was tested against the alternative hypothesis that the model has serial correlation. Also if the DW statistic lies within the range 1.5-2.5 there is no serial correlation and in this case the DW statistic is 2.046683 which is within the range of no serial correlation.

Table 5
Breusch-Godfrey Serial Correlation LM Test Results

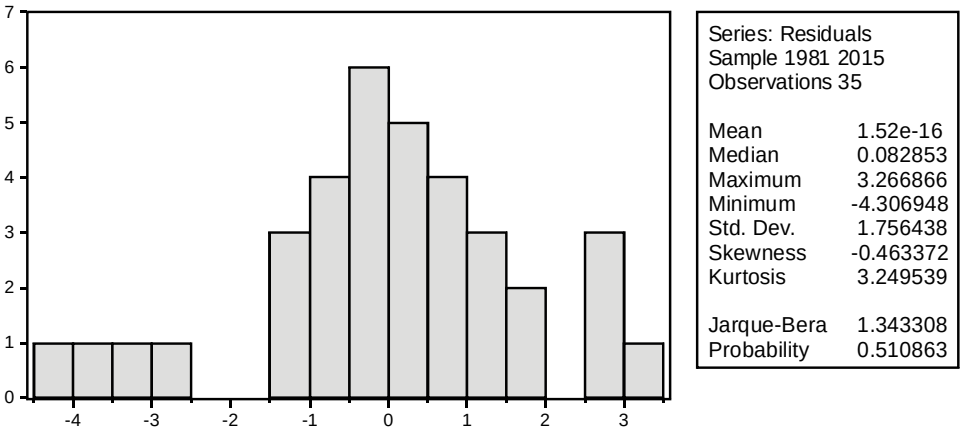
F-statistic	1.502806	Prob. F(2,25)	0.2419
Obs*R-squared	3.756262	Prob. Chi-Square(2)	**0.1529**

Using the Breusch-Godfrey test the results of the serial correlation test show that the model has no serial correlation as confirmed by the value of the chi-square probability 0.1529 which is greater than 5 percent (Table 5). Therefore, we fail to reject the null hypothesis hence the model has no serial correlation.

4.4.2 Normality Test

The Histogram Normality test was used in this study to test for normality. The null hypothesis that the results are normal was tested against the alternative hypothesis that the results are not normal. The results of the normality test using the Histogram Normality test show that the results are normal. This is because the probability is 0.510863 which is greater than 5 percent therefore, we fail to reject the null hypothesis which states that the results are normal as indicated by Table 6.

Table 6
Histogram-Normality Test



4.4.3. Heteroskedasticity Test

Under this test, the Heteroskedasticity Test: Breusch-Pagan-Godfrey test is used. The null hypothesis is that there is no heteroscedasticity and the alternative is that there is heteroscedasticity. A probability of more than 5 percent would mean that there is no heteroscedasticity. The results from Table 7 show that the probability of chi-square is 0.2816 which is greater than 5 percent therefore we fail to reject the null.

Table 7
Heteroskedasticity Test: Breusch-Pagan-Godfrey Results

F-statistic	1.259090	Prob. F(7,27)	0.3070
Obs*R-squared	8.613399	Prob. Chi-Square(7)	**0.2816**
Scaled explained SS	5.765402	Prob. Chi-Square(7)	0.5674

4.5 Analyses of Results

The results of this study can be presented as follows:

a) There exists a long run relationship between unemployment and diversification; however, the link between industrial diversity and unemployment is negative as indicated by the ECM model. This means that an increase in industrial diversity, that is, a fall in the Herfindahl index, will lead to a rise in unemployment rate. This is against expectation that industrial diversity leads to reduced unemployment. The argument for this is given by Barkume (1982) who states that greater industrial diversity will tend to generate a wider, more even distribution of vacancies across industries. A wider dispersion of vacancies across industries will in turn imply a greater variance in the distribution of wages. Since the variance of the wage distribution is likely to be higher in more industrially diverse labour markets, Barkume argues that longer job searches and hence high unemployment rates will exist in labour markets that are more diversified.

b) There however exists a short run positive relationship between unemployment and the interactive dummy variable D*DIV. This shows that after the financial crisis a reduction in the Herfindahl Index (increase in industrial diversity) led to a reduction in unemployment. From this a conclusion can be drawn, that industrial diversification is good for an economy because it prepares the economy in case there is an economic shock such as a financial crisis or recession, a view sustained in much of the literature and the expectation of this research.

c) Even though our interest is mainly on the effect of the industrial diversity measure on unemployment rate, it is nevertheless worthwhile to briefly comment on results obtained for some other explanatory variables. Generally, there also exists a long run relationship between unemployment and total population, unemployment and total fixed capital stock, unemployment and proportion of youth, and lastly unemployment and inflation. The long run link between unemployment and total population is positive which means increase in total population and hence increase in labour force will lead to increased unemployment rate. The effect of total fixed capital on unemployment rate yielded a negative sign, in

line with expectation. Therefore the conclusion is that an increase in stock of capital means increase in investment which generates employment for people causing a reduction in unemployment. On the other hand and against the expectations of this research, the coefficient of inflation rate is positive. This is against the theory of the Phillips curve analysis. This means that an increase in inflation rate leads to increased unemployment rate hence the conclusion is that the Philips curve does not hold for Botswana. Moreover, the proportion of youth yielded a negative effect on unemployment rate against the expectations of the research which means that increase in the proportion of youth will lead to a reduction in unemployment. The reason for this in Botswana may be that most of the youth aged 15 to 19 years are still schooling, therefore, they do not seek employment which means they do not add to the labour force hence the reduction in unemployment rate.

5. CONCLUSION AND RECOMMENDATIONS

This study explored the relationship between unemployment and the respective independent variables, with particular focus on the relationship between unemployment and the degree of industrial diversity in Botswana, covering the period from 1980 to 2015. The independent variables considered were degree of industrial diversity, which was measured in terms of the value of the Herfindahl Index for the period under scrutiny, and its interactive dummy variable for the period after the onset of the 2009 recession; inflation rate, proportion of youth, total population and finally, total fixed capital stock.

Econometric analysis was used particularly the Johansen Cointegration Test and the Error Correction modelling in correcting the disequilibrium of the model and testing the causality between unemployment and the respective independent variables as stated above. The empirical analysis began with the test for stationarity of the variables used in the model. The results showed that all the variables: unemployment rate, degree of industrial diversity, inflation rate, proportion of youth in population, total population and total fixed capital stock were stationary at first difference, that is, I (1). This led to the Cointegration test which was performed using the Johansen Cointegration Test. The Cointegration results confirmed a long run relationship between unemployment and the regressors. The residuals from the cointegrating equations were used to generate the error correction term which was used to construct the error correction model for the regression of the variables. The causality relationships were established thereof. The results of this analysis indicated long run causalities running from Ut to DIV, Ut to Inf, Ut to YOUTH, Ut to POP, and Ut to K. On the other hand, the results indicated a short run causality running from Ut to D*DIV. Therefore,

it is concluded here that the relationship between unemployment and the respective regressors are indicated for the case of Botswana.

Of particular interest is the relationship between industrial diversity and unemployment which is found to be negative as indicated by the ECM model, which means that increase in industrial diversity, that is, a fall in the Herfindahl index, leads to increase in unemployment rate. This is against expectation, as it is expected that a higher diversification should lead to lower unemployment. A short run positive relationship between unemployment and diversification after the financial crisis, is established, which is in line with theory that greater economic diversification (lower Herfindahl Index) leads to lower unemployment.

The results from this study reveal policy implications which may help decision makers who desire to overcome the problem of alarming soaring unemployment rates. It is imperative to Botswana to curb unemployment because not only is unemployment a threat to social cohesion and political stability, it is also a major cause of crime, poverty and ill health. One way to curb this unemployment is through diversifying the economy. Research has shown that the success of a diversified economy can help reduce unemployment in the short run particularly after the effect of an economic shock. This is because a diversified economy ensures a stable economy which does not become susceptible to external shocks, say, the world financial crisis which had an impact on many economies. Therefore government efforts should be based on achieving a high degree of industrial diversity in order to achieve stability so as to protect the economy from external factors. [2]

Since the regression analysis results also show a long run positive relationship between total fixed capital stock and unemployment rate, it can also be recommended that the government and other parastatals should continue their efforts on investment either public or private. Increased capital stock will also be accompanied with improvements in infrastructure which will generate employment and in turn lead to reduction in the unemployment rate. Therefore expenditure changing policies which include expansionary Monetary and Fiscal policies should be geared towards stimulating investment either public or private in order to fight unemployment in Botswana.

Notes

1. To provide an illustration, the data for 2007 was estimated by summing the data for 2006 and 2008 and then dividing by two.

2. The empirical evidence shows that industrial diversity is not a guarantee that unemployment will go down in Botswana. For instance countries like South Africa are considered more diversified than Botswana yet their unemployment rates are higher than that of Botswana.

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