

Econometric Estimation of Linkage between Economic Growth and Unemployment in Democratic Republic of the Congo

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Abstract

The purpose of this study was to estimate the long run relationship between unemployment and economic growth in Democratic Republic of the Congo (DRC) according to Okun's Law model. The time series statistics from World Bank, covering the period from 2002 to 2018 were transformed in quarterly data. By checking data with the Augmented Dickey-Fuller (ADF) test, the result indicated that all variables are stationary in second difference except economic growth, which is stationary at first difference. The co-integration test realized after revealed that there are two long run relationships between variables. The assessment by vector error correction (VEC) model leads to results following that, unemployment has a negative long run relationship with economic growth. The augmentation of economic growth to 1% decreases unemployment to 2, 85%. This result supports the Okun's Law in DRC around certain measure. This implies that government must conjugate many efforts to decrease unemployment firstly, by allocation of an important part of economic growth to investment. It cans allow the hiring and by consequence, decreasing of unemployment. The enterprises must be numerous and sufficiently connected to macroeconomic instruments particularly the interest rate, which permit to create jobs by his fall.

Keywords

Unemployment, Economic Growth, Okun's Law, Econometric Modelling, Congo-Kinshasa

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1. Introduction

Many developing countries adhered to post-consensus Washington, which advocates the inclusion economic growth. This last can allow the sufficient jobs creation, and improving of purchase power in decreasing poverty process. The justification of this view comes from the logic following that, when economic growth increases, it reduces unemployment. The reasoning stays conform to Okun's Law discovered since 1962. This analysis allowed the macroeconomic politics that aim to raise economic growth, and to reduce poverty in growing of purchase power.

However, unemployment remains a major economic problem in all developed or developing countries, and it is the first preoccupation of young in almost all countries in world. In addition, many developing countries do not take it in account in their priorities. Moreover, without creation sufficient jobs, all reducing politics of poverty are utopic. That is why; the priority of responsible governments should be the creation of abundant employments in view to decrease unemployment. In Democratic Republic of Congo (DRC), unemployment represents a foremost problem while economic growth increases. However, Okun's Law states that if the unemployment rate falls to 1%, then the output will be

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increased by 3% [1]. Sure enough, the economy of the DRC is not creating sufficient jobs for its young and rapidly growing workforce. (...) and reducing poverty will require more dynamic job creation [2]. That stands a macroeconomic problem, which must be analyzed deeply to allow some reliable solutions suggested.

The relationship between unemployment and economic growth is central when the policymakers want respectively to decrease, and to spread conforming Okun's Law. However, academic opinion is divided on this question. Some researchers found that the Okun's Law is supported [3-7]. However, others did not confirm it [8-12]. It means that each economy has particular realities, which must be taken account in macroeconomic politics in view to increase their success, when they are applying.

That is why, this article purposes to assess the relationship between economic growth and unemployment in RDC, in view to fill the lack concerning it in the literature by using VEC model to detect long run relationship. It aims to answer this question: does a negative nexus exist between unemployment and economic growth in DRC? It support hypothesis following that, Okun's exists in DRC.

Several studies realized on the relationship between unemployment and economic growth. Diverse results of these studies gave the various explanations too. Sadiku *et al* [8] estimated empirically the relationship between economic growth and unemployment rate in FYR of Macedonia applying the Okun's Law. They used the dynamic model, ECM, and VAR estimation approach, in order to consider both, the short term and the long-term possible relationship. The analysis consisted on quarterly data covering the period 2000-2012. The empirical results from all models did not indicate robust evidence and did not confirm an inverse linkage between unemployment rate and economic growth, as the Okun's law suggests. Based on the VAR methodology and Engel-Granger cointegration test, a causal relationship between these two variables does not exist and a change in the growth rate of real GDP does not cause a change in the rate of unemployment and vice-versa.

Qamar *et al* [3] presented the new regression estimates of the relationship between unemployment and economic growth for 13 selected European Union member countries over the period 1993-2012. Pooled Ordinary Least Square (OLS) and fixed effect techniques are used to analyze the panel data for measuring group effects, individual country effects, and time effects while exploring the relationship between unemployment rate and economic growth. Results demonstrate that higher unemployment rate has significant negative impact on GDP per capita (a proxy for economic growth).

Banda *et al* [9] analyzed the impact of economic growth on unemployment, using quarterly South African time series data from 1994 to 2012. The results of Johansen cointegration reflected that a long run equilibrium or relationship exists among the variables. In ascertaining the effects of macroeconomic variables thus real effective exchange rate (REER), labor productivity (LP), gross domestic product (GDP) and budget deficit (BUG) on unemployment in South Africa, the study utilized VEC model. The results indicated that GDP, BUG and REER have positive long run impact on unemployment, while LP negatively affects unemployment. Chand *et al* [5] attempted to find out the effect of economic growth on unemployment rate in India. Gross Domestic Product considered as an indicator of economic growth for the study. The data regarding GDP and unemployment rate collected from secondary sources like World Bank database. Correlation and Regression analysis used to study the nature and degree of effect of economic growth on unemployment rate. It found that there is a strong negative correlation between economic growth and unemployment rate. In addition, it found that GDP accounts for 48% of cause of change in unemployment rate. The findings are in line with the Okun's law and the conclusions of studies conducted in the past.

Mucuk *et al* [10] investigates the relationship between unemployment rate and economic growth rate cover the period from 2002 to 2014 for Turkey. They used the Johansen cointegration test and VEC model to determine this relationship. Empirical findings show that the variables are not cointegrated so; there is no causal link between the two variables. This result does not support the Okun Law. However, on the one hand, growth shock has a negative impact on unemployment rate. On the other hand, shocks in unemployment have positive impact on the growth. It means only, turkey economy has others realities, which do not allow the existence of Okun law.

Salim *et al* [13] examined the impact of unemployment on economic growth in Tanzania. They utilized cointegration and Dynamic Ordinary Least Square (DOLS) approach to test the relationship between unemployment and economic growth, and granger causality test, to examine the causal relationship between variables. The unit root tests showed that the all variables were integrated after taking first difference, the Johansen cointegration result showed that the variables were cointegrated. The DOLS estimate showed that unemployment rate has positive impact on economic growth in Tanzania but insignificant influence over the study period. In addition, granger causality test revealed that, there is a unidirectional causal relationship between unemployment and economic growth with direction from economic growth to unemployment.

Alotaibi [14] assessed the relationship between unemployment and economic growth in Saudi Arabia for the period from 2000 to 2015. The results obtained show that, there are positive relationships between the employment and real income, real investment, real government expenditure and real value of exports. In addition, there are negative relationships between employment and the real value of imports. The economic growth was not adequate in reducing the unemployment rate among Saudi. There is a reversal relationship between unemployment rates and the economic growth, which does not effectively work in the Saudi economy. Banda *et al* [9] analyzed the impact of economic growth on unemployment, using quarterly South African time series data from 1994-2012. The results of Johansen cointegration reflected that a long run equilibrium or relationship exists among the variables. In ascertaining the effects of macroeconomic variables thus REER, LP, GDP and BUG on unemployment in South Africa, the study utilized vector error correction model (VECM). The results of VECM indicated that GDP, BUG and REER have positive long run impact on unemployment while LP negatively affects unemployment.

Eshun [15] tested the validity of Okun's Law in West Africa by employing fixed effect regressions to control for inconsistencies of the OLS estimates due to omitted variable bias. He used the World Bank Dataset. The random and time-fixed effect regressions confirm the validity of the Okun's Law in West Africa. The time-fixed effect regression shows that, economic growth will decline by 0.311 annually for every unit increase in the rate of unemployment.

Only for Nigeria, the results from studies using different models generally cover the period from 1980 to 2017 contrasted. Some authors found no long run relationship between unemployment and economic growth [12, 16, 17]. However, Dankumo *et al* [18] found a negative and no significant long run relationship between unemployment and growth. Michael *et al* [4] by versus, found a long run significant relationship between these variables. In addition, Kenny [19] found a unidirectional VAR causal relationship between unemployment and economic growth.

Abraham *et al* [11] examined this relationship using Panel Least Squares and OLS estimation techniques based on annual series data from 1991 to 2017. The various statistical as well as empirical results indicated the inverse relationship between output growth rate and unemployment rate variables in the Panel Least Squares result. However, some countries had positive relationships instead of the negative relationships, which further indicated the non-existence of Okun's relationship and applicability within some upper middle -income countries in SSA. Daniel *et al* [20] focused on the relation between the growth of unemployment rate and

the growth of real gross domestic product (both expressed as a percentage) in the case of Romania. Their aim was to valid Okun's rule in Romanian economy from 2000 to 2018. The empirical analysis showed the inverse relationship between them, confirming Okun's findings.

Karikari-Apau *et al* [7] analyzed the impact of unemployment on economic growth in China. The macro-economic secondary and time series data was extracted from the World Development Indicator (WDI) for the period of 1991 to 2018 in China. In conducting the econometric analysis of the study, both the ADF and Phillips Perron tests were employed to confirm the stationary level of the variables of study. The Autoregressive Distributed Lagged (ARDL) cointegration and the ARDL Bounds test were employed to test for the short-run and the long-run cointegration of the variables of study since both variables were stationary at first difference. The finding of the study reveals that there are negative short-run and long run relationship between unemployment and economic growth. However, Granger causality Test also reveals that both unemployment and economic growth do not affect each other.

Dritsakis *et al* [21] investigated the relationship between unemployment rate, economic growth and inflation rate in Greece, using annual data covering the period from 1995 to 2015. The unit root tests results indicated that the variables have different integration order. Subsequently, the bounds testing (ARDL) approach and ECMARDL model are applied in order to examine the long run and the causal relationship between the variables. The empirical results of the study revealed, both in the short and long-run, that there is a unidirectional causal relationship between unemployment and economic growth with direction from unemployment to economic growth, as well as a unidirectional causality running from inflation to economic growth.

We remark that there is not a study realized on this question in DRC, where a major problem of unemployment persists. That is why; this paper aims to assess the relationship between unemployment and economic growth in this country in view to fill this lack in literature, and to suggest some solutions against high unemployment.

2. Data Analysis and Methodology

2.1. Theoretical Bases

Since 1962, Arthur Okun discovered the Law following that, a negative relationship exists between unemployment and economic growth. This reasoning became central into politics options of decreasing unemployment, which stays a major

macroeconomic problem through the world. This acceptance states that when unemployment decreases to 1%, economic growth increases to 3%. Thus, several findings contracted on this question. Some authors found that this Law does not exist [9, 11, 12]. However, others found the existence of this Law [6, 7, 22]. Moreover, since 2000 years, post-consensus Washington advocates that economic growth must be inclusive. That cans allow the decreasing of poverty in creating sufficient jobs, which should lead to amelioration of purchase power.

The choosing of this country can be justified by the lack of study on this question concerning it. In addition, the selecting of period justified by access of DRC to post-Washington consensus. However, the relationship between unemployment and economic growth is not known there until now. That cannot allow good politic options in this country. In relying on idea following that, falling of unemployment policies adopted in each country depend on its particularities; a lack merits to be underlined in the literature, explicitly the absence of an established relationship between unemployment and economic growth in DRC. That is why; this study aims to fill it especially.

2.2. Econometric Modelling

The time series data of this study from World Bank concerning the period from 2002 to 2018, and cover DRC. These yearly data was converted into quarterly data using cubic spline interpolation. This article used ADF and Johansen tests; respectively to identify, if the variables are stationary and to detect the relation of long term between variables. The VEC model is employed to assess the long run relationship between these variables by using E-views 9 analysis software. Unemployment is the dependent variable and the main explanatory variable is the economic growth. Moreover, the growth of population serves us to control the effect of economic growth on unemployment. Following the co-integration method, letter Z_t represents a vector that includes different variables. The VAR is represented as:

$$Z_t = \mu + \sum_{i=1}^{n-1} \Pi_i Z_{t-i} + \varepsilon_t \tag{1}$$

where Π_i is a $n \times n$ matrix of parameters, μ is a constant term and $\varepsilon_t \approx iid(0, \Omega)$. The VAR system of expression (1) can be rewritten as a vector error correction (VEC) model

$$\Delta Z_t = \mu + \Pi Z_{t-1} + \sum_{i=1}^{n-1} \Gamma_i \Delta Z_{t-i} + \varepsilon_t \tag{2}$$

where Γ_i is the parameter of short-term coefficients and Δ is an expression for first difference series. The rank of Π, r , determines how many linear combinations of Z_t are stationary. If $r > 1$, one is able to show the indirect relationship that exists between variables given a proper economic identification. For the sake of this paper, the vector Z_t contains the gross domestic product rate (GDPR_t), the unemployment rate (UNEMPR_t) and the population growth rate (POPGR_t). The possible cointegrating relation, when normalised by UNEMPR_t, is expressed as:

$$UNEMPR_t = c + \alpha GDPR_t + \beta POPGR_t + \varepsilon_t \tag{3}$$

with the cointegrating vector given by $(1, -\alpha, -\beta)$ in this case.

3. Results and Discussion

The figure 1 below gives the graph of variables showing a tendency of co-integration.

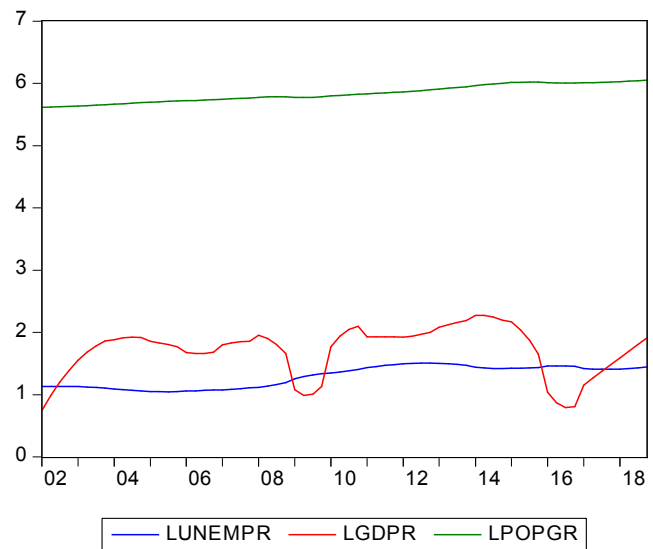


Figure 1. Tendency of co-integration.

The first phase is to use Johansen co-integration technique, before to evaluate the possible relationship between variables by co-integrating VAR. For recall, Johansen co-integration applied when variables are non-stationary i.e. integrated at level one. Below in Table 1, is shown that the Augmented Dickey Fuller (ADF) test did not reject the null hypothesis of unit root at level but at difference for all the variables. This shows that a co-integration between variables at second difference and only one at first difference.

The table 1 gives the results of computer fitting using Augmented Dickey-Fuller (ADF) Test.

Table 1. Results of ADF test.

Variables	ADF test stat* level	Critical value** 5%	ADF test stat* 1st diff.	Critical value* 5%	Second diff	Critical value* 5%	Order of integration
LUNEMPR	-2.385690	-2.912631	-2.953572	-2.912631	-4.965544	-2.912631	I(2)
LGDP	-0.461687	-2.906210	-3.467953	-2.906210	-10.32593	-2.906923	I(1)
LPOGPR	-0.980021	-2.906210	-2.756614	-2.906210	-10.22148	-2.906923	I(2)

The table 1 revealed that all variables are stationary in difference. The economic growth is stationary at first difference and two others to second difference. That allows us to realize the co-integration test, which results are in the table 2.

Table 2. Results of co-integration test of Johansen.

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.562195	73.83221	29.79707	0.0000
At most 1 *	0.266305	20.14343	15.49471	0.0092
At most 2	0.000237	0.015393	3.841466	0.9011

Trace test indicates 2 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized	Max-Eigen	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.562195	53.68878	21.13162	0.0000
At most 1 *	0.266305	20.12804	14.26460	0.0053
At most 2	0.000237	0.015393	3.841466	0.9011

Max-eigenvalue test indicates 2 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

From these results, it is found that two co-integrations exist between variables that the estimation by VEC model provides the result in the table 3 below, when UNEMPR is normalized (table 3).

Table 3. Output of estimation by VEC.

Cointegrating Eq:	Coit Eq1		
LUNEMP(-1)	1.000000		
LGDP(-1)	2.857726		
	(0.32159)		
	[8.88630]		
LPOPG(-1)	-0.800683		
	(0.36225)		
	[-2.21032]		
C	-1.561747		
Error Correction:	D(LUNEMP)	D(LGDP)	D(LPOPG)

These elements can be written: $\varepsilon t = 1LUNEMPR + 2,85 LGDPR - 0,80 LPOGPR$ or again:

$$LUNEMPR = 1,56 - 2,85 LGDPR + 0,80 LPOGPR \quad (4)$$

Following this expression, when economic growth increases to 1%, unemployment decreases at 2,85%. This result supports the Okun's Law in some measure. In addition, when population spreads to 1%, the unemployment increases to 0,8%. It means that the linkage between unemployment and population growth is very weak.

The impulse responses are interesting for this analyse. That is why; this article seeks to see the reactions of unemployment and economic growth to some shocks. The results are given in figure 2 below:

Response to Cholesky One S.D. Innovations ± 2 S.E.

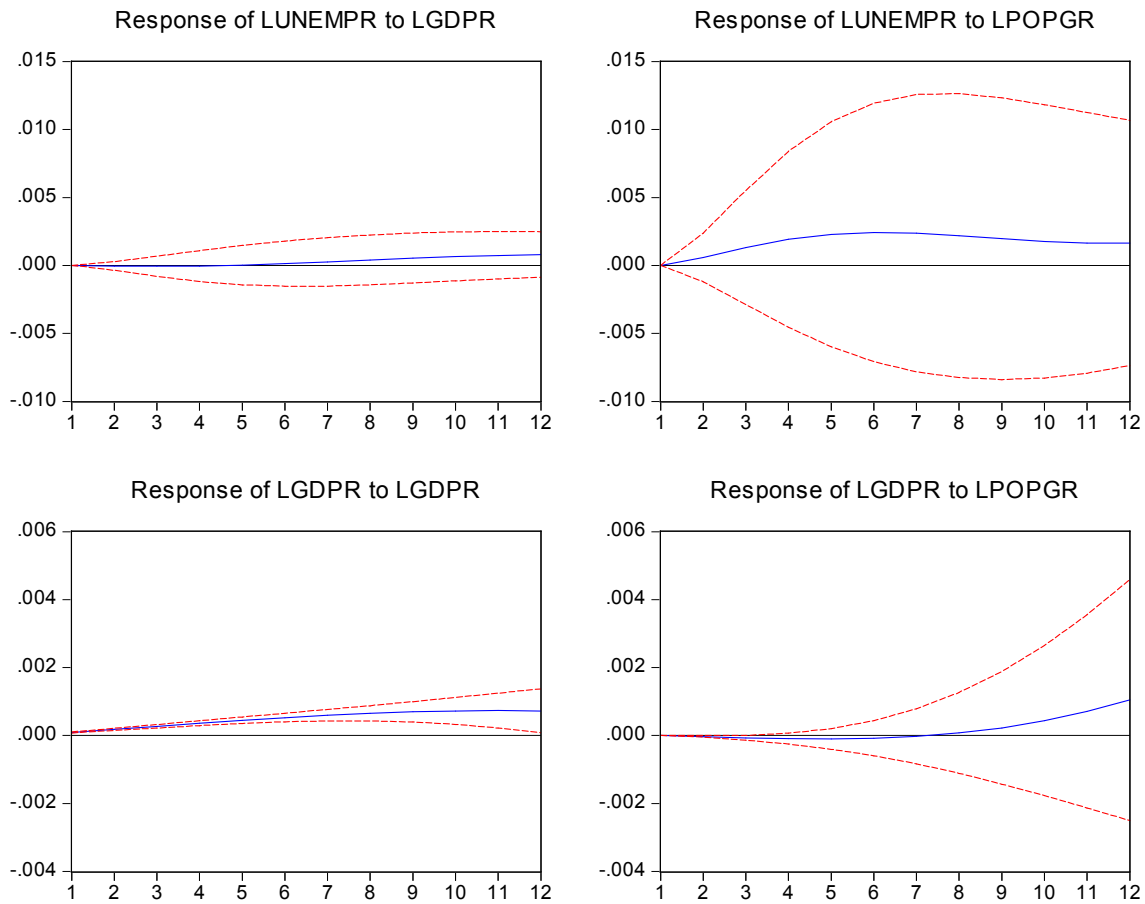


Figure 2. Reactions of unemployment and economic growth to some shocks.

Obeying these graphs, unemployment does not react greatly to economic growth. This situation is clarified easily in DRC, where economic growth is not sufficiently invested in the productive sector, in view to cause creation of abundant jobs. In addition, economy has not much firms, which can generate sufficient jobs.

The productive system remains rudimentary, and it is not able to take hold of the given occasions. Unemployment reacts lightly high to population growth because the labor force growing caused by population expansion is not hired relatively to his rising. Concerning the response of economic growth to population growth, it is too weak, because this population has not quality to create or to innovate, and to yield many goods for economy. This situation is caused by weak quality of human capital supported by the bad quality of education and scientific systems of formation in DRC.

The main result of this study support Okun's Law for the concerned period. It corroborates the results of some researchers [3-7]. However, this key result inverses the findings of other scientists [8-12]. It supports too the view of Karikari-Apau *et al* [7], who come to find the negative relationship between unemployment and economic growth in

China. Even if it does not confirm the results of Abraham *et al* [11] who found in some Sub-Saharan Africa countries that Okun's Law does not exist. These contradictions justify the particularities of economies. This study corroborates some results from studies realized in Nigeria [4, 19]. Nevertheless, it does not corroborate others [12, 16, 17]. The difference between these results found in Nigeria can be justified by the differences between used models or reliability of certain data. The light gap between the major result of this study concerning the percentage of increasing economic growth and the Okun's Law can be justified by the weak capacity of sufficient jobs creation in DRC. This situation is explained by sporadic presence of firms through the country, and their weak connected to macroeconomics instruments particularly the interest rate, which permit the jobs creation. In addition, it can be explained by weak will of government to create enough jobs by helping firms.

4. Conclusion

This article aims to assess the long run relationship between unemployment and economic growth in DRC in the framework of Okun's Law. The time series data come from

World Bank concerning the period from 2002 to 2018. These statistics were transformed in quarterly data for to allow a good econometric estimation. After using ADF test, the results showed that all variables are stationary to second difference, except economic growth, which is stationary to first difference. The co-integration Johansen test revealed that there are two long run relationships between variables. The estimation of one of them by VEC model leads to results following that there exists a negative relationship between unemployment and economic growth. That supports the Okun's Law in certain measure in DRC for this period. In addition, population growth has a weak long run relationship with unemployment.

5. Recommendations

The macroeconomic situation of DRC following Okun's Law is dark. Following the evidence detected in the period of this study, government must conjugate many efforts to decrease unemployment firstly. Moreover, it must allocate an important part of economic growth to investment, which can allow hiring and by consequence, decreasing of unemployment. The firms must be sufficiently connected to macroeconomic instruments particularly the interest rate, which permit to create jobs by his fall in the framework of monetary politic.

Government must incite entrepreneurship in view to increase the number of firms with capacity to create sufficient jobs. It must also stimulate the installation of a bank network through the country, and incite firms to be connected to this system in view to facilitate the creation of employment by using macroeconomic politics.

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