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THE ABRAMS CURVE OF GOVERNMENT SIZE AND UNEMPLOYMENT: EVIDENCE FROM 13 AFRICAN OIL EXPORTING COUNTRIES

The study investigates the Abrams curve, which is the relationship between government size and unemployment for 13 African oil exporting countries for the period 1991-2017. Panel unit root tests confirm that all the variables of interest are non-stationary. Using the Johansen panel cointegration test the results suggest that there is a long-run relationship. Finally, the long-run elasticities of government size on unemployment are found to take values close to 0.2.The results find evidence for the validity of the Abrams curve in African oil exporting countries.

Keywords: *panel unit roots; panel cointegration; Abrams curve.*

JEL codes: H50; C33; J60, O11.

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КРИВА АБРАМСА РОЗМІРУ УРЯДУ І БЕЗРОБІТТЯ: ДАНІ З 13 АФРИКАНСЬКИХ КРАЇН-ЕКСПОРТЕРІВ НАФТИ

У дослідженні досліджується крива Абрамса, яка представляє собою взаємозв'язок між розміром уряду і безробіттям для 13 африканських країн-експортерів нафти за період 1991-2017 рр. Панельні тести на одиничний корінь підтверджують, що всі питання, що цікавлять змінні нестаціонарні. Результати тесту коінтеграції панелей Йохансена дозволяють припустити, що існує довгострокова взаємозв'язок. Нарешті, довгострокова еластичність розміру уряду по безробіттю приймає значення, близькі до 0,2. Результати свідчать про можливість застосування кривої Абрамса в африканських країнах-експортерах нафти.

Ключові слова: *коріння панельного елемента; панельна Коінтеграція; Крива Абрамса.*

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КРИВАЯ АБРАМСА РАЗМЕРА ПРАВИТЕЛЬСТВА И БЕЗРАБОТИЦА: ДАННЫЕ ИЗ 13 АФРИКАНСКИХ СТРАН-ЭКСПОРТЕРОВ НЕФТИ

В исследовании исследуется кривая Абрамса, которая представляет собой взаимосвязь между размером правительства и безработицей для 13 африканских стран-экспортеров нефти за период 1991-2017 гг. Панельные тесты на единичный корень подтверждают, что все интересующие переменные нестационарны. Результаты теста коинтеграции панелей Йохансена позволяют предположить, что существует долгосрочная взаимосвязь. Наконец, долгосрочная эластичность размера правительства по безработице принимает значения, близкие к 0,2. Результаты свидетельствуют о применимости кривой Абрамса в африканских странах-экспортерах нефти.

Ключевые слова: *корни панельного элемента; панельная коинтеграция; Кривая Абрамса.*

1. Introduction. Policy makers around the world is concerned achieving four major macroeconomic objectives of incres in gross domestic product, price stability,

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favorable balance of payment and low level of unemployment. Thus, unemployment is clearly one of the issues that most economies of the world face. The labour markets in the world over have been dented recently and the oil exporting countries is not left out. Little wonders that oil exporting countries will not be beset with the evils of unemployment because of the huge revenue from the sales of crude oil. These countries have been faced with high level of unemployment well above single digit, this is not unconnected with the volatility of the oil prices in the world market and the mono-cultural state of this economies.

The pioneer work on the relationship between government size and unemployment is the study by Abram (1999) for OECD countries; using OLS he found a positive and significant relationship between government size and unemployment. Other studies have also examined this relationship in country specific and particularly for developed countries (see Christopoulos and Tsionas 2001; Feldmann 2006 and 2010; Wang and Abram 2007) amongst other. The novelty of this paper is several fold. First, to the best of our knowledge, the paper focuses on a country group for which the topic has not been studied up to now. Second, for virtually all countries, including the countries under consideration in this unemployment and inflation are two major macroeconomic problems. Third, the paper employs a panel cointegration and causality approach, contrary to most previous studies that applied time series models, to determine the existence of possible causal linkages among the variables considered. Overall, our results suggest that the government size is positively associated with unemployment. The Granger causality revealed that there is evidence of bi-directional causality between government size and unemployment.

Asides from the introduction, the paper is organized as follows. Section 2 briefly reviews the literature on the linkage between government size and unemployment. Section 3 describes the data set and the variables used, the empirical methodologies applied (panel unit root tests and panel cointegration tests). Section 4 presents and discusses the results while Section 5 concludes.

2. Theory and Evidence. In examining the theoretical linkage between government size and unemployment, it is imperative to determine how the government size is measured in the literature; this is because different measures of government size have varying impact on unemployment. In the literature there are four ways in measuring government size. First, the ratio of government consumption to the gross domestic product (see Landau 1986; & Yamamura 2011); second, the ratio of total or central government expenditures to the gross domestic product (see Chao and Grubel 1998; & Chen and Lee (2005). Third, the ratio of the central government or general government's tax revenue to the gross domestic product (see de Mendonза and Cacicedo 2015). Fourth, the ratio of general government's spending to gross domestic product (see, Afonso and Furceri, 2010; Afonso and Jalles, 2016) and it is the most the commonest measure for government size.

The relationship between government size and unemployment was first examined empirically by Abram (1999) and he found that a positive and substantial significant relationship for seven OECD countries. Thus, the relationship is widely referred to as the Abram's curve. He provided four theoretical linkage for the adverse and direct relationship between government size and unemployment and they are; first, government expenditure increase spent on public health insurance and expensive unemployment insurance schemes will reduce the apparent cost of unemployment to

the unemployed workers. Second, the increase in government expenditure connotes higher tax rates, which invariably affect the work -leisure decisions, leading to increased search activity and longer spells. Third, increases in government expenditure will lead to the crowding out effect on private investment and which is likely to lead to unemployment in the economy. Fourth, the expansion of the state may be accompanied by intensive regulations which reduce the informational content of price signals in the labour market, decreasing the ability of labour market to operate in an efficient way. Given the above transmission mechanism, he emphasized that the relationship between government size and unemployment will be positive. Thus, the parameter associated with government size will be positive.

There are plethora of empirical work on the nexus between government size and unemployment among which are; Abram (1999), Christopoulos, Loizides, and Tsionas (2005), Christopoulos and Tsionas (2001), Feldmann (2006), Feldmann (2010), Wang and Abram (2007), Aysu and Dokmen (2011), Nwosa (2014) and Holden and Sparrman (2018)

Abram (1999) examined the relationship between government size and unemployment for 22 OECD countries for the period 1984-1993, using the ordinary least squares, findings the hypothesis that increases in government size, generally provide expenditure and tax effects that raise reported unemployment . Wang and Abram (2007) examined the relationship between government size and unemployment for twenty OECD countries for the period 1970-1999. Using error correction model, the results shows that government size has a positive significant relationship with unemployment. Christopoulos, Loizides, and Tsionas (2005) investigates the long run relationship between government size and unemployment rate for ten European countries for the period 1961-1999. Using panel cointegration techniques, there is evidence in support of the Abrams curve and the relation between government size and the unemployment rate is positive.

Feldmann (2006) examined the nexus between government size and unemployment in 19 industrial countries for the period 1985 to 2002, Using static panel, the results show that large government sector is likely to increase unemployment. Feldmann (2010) used data from 52 developing countries to examine the relationship between government size and unemployment. Using random effect model, there is evidence that a large government sector is likely to increase the unemployment rate.

Christopoulos and Tsionas (2002) also investigates the causal relationship between unemployment and government size for ten European countries over the period 1961-1999.The results support the idea that there is an Abrams curve but the relation between government size and the unemployment rate is not likely to be simple. They found evidence of unidirectional causality from government size to unemployment.

Also, Aysu and Dokmen (2011) investigate the relationship between government size and unemployment for seventeen OECD countries for the period 1990-2007. Using panel cointegration test, the results show that there is evidence of a long-run cointegrating relationship between the size of government and unemployment rates.

Nwosa (2014) examines the impact of government expenditure on unemployment and poverty rates in Nigeria for the period 1981 to 2011. Using an Ordinary Least square (OLS) estimation technique, the study observes that government expenditure has positive and significant impact on unemployment rate while it has a negative and insignificant impact on poverty rate.

Holden and Sparrman (2018) examined the effect of government purchases on unemployment in 20 OECD countries, for the period 1980-2007. Result shows that the effect on unemployment reflects a corresponding positive effect of increased government purchases on the employment to population rate.

3. Data and Methodology

3.1. Data. The variables used in this study are government expenditure, unemployment rates, population, inflation rates, oil price and GDP per capita. Government expenditure and unemployment were sourced from the Central Banks and Bureau of Statistics of various countries that were sampled in the study. Population, inflation rates and the GDP per capita were sourced from the World Development Indicators (WDI), the World Bank for the period 1991-2017 and the oil price was sourced from the United States Energy Information Administration website. The choice of this variables from 1991-2017 was based on the availability of data and they were all balanced panel. The countries included in the study are, Algeria, Angola, Equatorial Guinea, Egypt, Congo, Gabon, Cameroon, Ivory Coast, Nigeria, Chad, Tunisia, Mauritania and Papua New Guinea.

Table 1. **Correlation Matrix,** *author's*

Variables	UNEMP	GEGDP	LGDPPC	INF	LPOP	LOILP
UNEMP	1					
GEGDP	**0.342**	1				
LGDPPC	**0.121**	**0.180**	1			
INF	-0.084	-0.056	**0.133**	1		
LPOP	-0.023	**-0.311**	**-0.465**	0.059	1	
LOILP	**-0.149**	**0.114**	0.086	**0.337**	**0.118**	1

Notes: LSP is the stock returns and LUN is the unemployment rate.

Table 1 reports the correlation coefficient and there is evidence of a positive association between unemployment rates and government size. This suggests that that increases in the government size will lead to increases in the unemployment rates. It was also discovered that inflation rate, population and oil price have a negative association with unemployment rates. The positive relation between government size and unemployment is also confirmed with the scatter plot of government size and unemployment presented in Figure 1.

3.2. Methodology. To test for the existence of a relationship between government size and unemployment in oil exporting African countries, the following equation were estimated:

$$UNEMP_{it} = \propto_1 + \propto_2 GEGDP_{it} + \propto_3 LGDPPC_{it} + \propto_4 INF_{it} + \propto_5 LPOP_{it} + \propto_6 LOILP_{it} + \varepsilon_{it} \quad (1)$$

where $UNEMP_{it}$ is the unemployment rate in country i and year t. $GEGDP_{it}$ is the ratio of total government expenditure to the gross domestic product, $GDPPC_{it}$ represents the GDP per capita, INF_{it} is the consumer price index, POP_{it} stands for the total population, $OILP_{it}$ is the oil prices. All variables are expressed in their logarithms terms. The methodology employed in this study is divided into four. First, the panel unit root tests were examined to test for the presence of panel unit roots in the series.

Second, the panel long run cointegrating relationship was examined. Third, is the estimation of causal relationship between government size and unemployment and fourth, estimation of the long-run relationship is carried out with panel least squares.

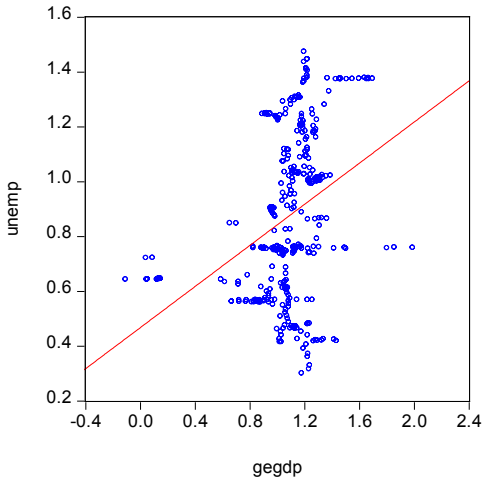

Fig. 1. **Scatter plot between logs of Unemployment and Government Size,** *author's*

3.2.1. Panel Unit root and stationarity tests. The six variables are tested for the existence of unit roots in levels and in first differences. Specifically, two types of unit root were used and they are, first, the panel unit roots that are aimed at checking the existence of a common unit root for all the cross sections (Common Unit root tests) and second, the panel unit root tests aimed at investigating the existence of an individual unit root for each cross-section of the panel. (Individual Unit root tests). The Common Unit root tests are the LLC test (Levin, Lin, Chu, 2002) and the Breitung test (2001). The Individual Unit root tests are the IPS test (Im, Pesaran, Shin, 2003), the Fisher-Augmented Dickey Fuller (Fisher ADF) test and the Fisher-Phillips Peron (Fisher PP) test.

3.2.2. Panel Cointegration tests. The Panel Cointegration tests, which examine the existence of a long-run relationship, are classified into two types: tests based on the Engle-Granger (1987) methodology and tests based on the Johansen-Fisher methodology. The Engle-Granger based tests used in this paper are the Kao (1999) test and the Johansen-Fisher based test proposed by Maddala and Wu (1999).

3.2.3. Causality Test. If the series are first difference stationary, the study also examined the pairwise panel causality tests of Dumitrescu Hurlin (2012).

3.2.4. Long-Run Models. If there is presence of long-run cointegrating relationship based on the specified equation (1), then the panel least squares are estimated. This sub-section presents and discusses the regression results based on pooled OLS, fixed effect models, random effect models and the Park's Feasible Generalized Least Square (FGLS). This section starts with the estimation of the ordinary least square (OLS) because it serves as the basis for empirical economics literature and that it serves as the link between traditional approaches to econometrics and the modern

approach to econometrics. However, a major weakness of this approach is that it do not account for firm specific effects and presence of endogeneity, thus estimates derived from the OLS are biased and unreliable. To salvage this problem, we also estimate the static model- fixed and random effect models that take care of the specific firm effects. For the static model, the Hausman's test is conducted to determine a more efficient model. A significance of the test implies fixed effect, otherwise we used the random effect. However, to use random effect model, the Bresuch-Pagan Langragian multiplier for random effect is conducted, if it is significant we use the random effect for the purpose of our analysis, otherwise we use the pooled OLS.

It should be noted also that the fixed effect model is also fraught with a lot of weaknesses. If there is present of serial correlation and heteroscedasticity in the fixed effect model, it shows that the model has unequal finite variance and that the successive error term of the estimated model is correlated. To salvage the fixed effect model problem the study used the Park's Feasible Generalized Least Square (FGLS) that solve the problems of serial correlation and unequal finite variance. To ascertain the use of the Park's Feasible Generalized Least Square (FGLS), the Hausman test must prefer the fixed effect model over the random effect model.

4. Presentation and Discussion of Results. This section presents and discusses the results based on the strategy discussed in section 3. Thus, this section discusses the following; first the panel unit root tests, second, panel cointegration tests, third, panel causality test and lastly, long-run models based on panel least squares(PLS).

4.1. Panel unit root tests. All the six variables, unemployment rates, government size, GDP per capita, inflation rate, population and oil prices were tested for the presence of unit roots both at levels and in first differences. From Table 2, it was discovered form the panel unit root tests that all the variables were stationary in their first differences I(1). The stationarity of the all the variables are first differences paves way for examining the panel cointegration test.

Table 2. **Panel Unit Root Tests,** *author's*

Variables	LLC	IPS	ADF	PP
UNEMP	0.863	0.418	23.896	18.549
ΔUNEMP	-15.121***	-7.536***	329.830***	220.209***
GEGDP	-1.025	1.927	22.263	19.061
ΔGEGDP	-7.305***	-9.536***	127.932***	420.943***
LGDPPC	-0.477	0.052	24.012	34.169
ΔLGDPPC	-8.188***	-5.913***	77.397***	70.604***
LPOP	5.569	1.264	22.754	20.387
ΔLPOP	-14.165***	-13.626***	195.293***	114.011***
INF	-1.616	0.010	14.993	10.283
ΔINF	-4.653***	-5.525***	88.064***	99.657***
LOILP	3.779	2.253	7.341	6.941
ΔLOILP	-8.537***	-8.149***	107.554***	131.620***

Source: Author computation (2020). * 10% level of significance, ** 5% level of significance, ***1% level of significance.

4.2. Panel cointegration tests. The next empirical strategy is the panel cointegration tests to investigate the existence of a long-run panel cointegrating relationship.

Table 3 presents the panel cointegration tests for examining the Abrams curve in oil exporting African countries. The result shows that there is evidence of long run cointegrating relationship for the Abrams curve in oil exporting African countries. The next sub-section is devoted to panel causality test.

Table 3. **Panel Cointegration Test,** *author's*

Panel A:Kao Residual Cointegration Test				
Test		**t-stat**		**Prob**
ADF		-2.073**		0.019
Panel B: Johansen Fisher Panel Cointegration Test				
Hypothesized	**Fisher Stat.**		**Fisher Stat.**	
No. of CE(s)	**(from trace test)**	**Prob.**	**(from max-eigen test)**	**Prob.**
None	713.9***	0.0000	365.6***	0.0000
At most 1	451.5***	0.0000	223.7***	0.0000
At most 2	285.5***	0.0000	137.5***	0.0000
At most 3	174.5***	0.0000	110.7***	0.0000
At most 4	96.94***	0.0000	57.18***	0.0004
At most 5	98.33***	0.0000	98.33***	0.0000

Source: Author computation (2020). * 10% level of significance, ** 5% level of significance, ***1% level of significance.

4.3. Panel Causality Test. This section discusses panel causality test between unemployment and government size. In also examines the causal relationship between unemployment and the control variables such as; GDP per capita, inflation, population and oil prices. The results in Table 4, shows that there is evidence of bi-directional causality between unemployment and government size. The only exception is when unemployment does not Ganger cause inflation and oil prices.

Table 4. **Panel Causality Test,** *author's*

Null Hypothesis:	**W-Stat.**	**Zbar-Stat.**	**Prob.**
GEGDP does not homogeneously cause UNEMP	4.79877	3.73910	0.000
UNEMP does not homogeneously cause GEGDP	3.93672	2.48808	0.013
LGDPPC does not homogeneously cause UNEMP	5.91258	5.35548	0.000
UNEMP does not homogeneously cause LGDPPC	3.58568	1.97865	0.048
INF does not homogeneously cause UNEMP	5.30546	4.47441	0.000
UNEMP does not homogeneously cause INF	1.42131	-1.16229	0.245
LPOP does not homogeneously cause UNEMP	8.52893	9.15234	0.000
UNEMP does not homogeneously cause LPOP	13.4579	16.3053	0.000
LOILP does not homogeneously cause UNEMP	6.91317	6.80753	0.000
UNEMP does not homogeneously cause LOILP	2.95674	1.06593	0.287

Note: 2 lags was used.

4.4. Panel Least Square. Finally, given that the panel cointegration tests reveal the existence of a long-run relationship between government size and unemployment, the study also performed the panel least squares so as to determine size of the long-run relationship between government size and unemployment. Following the procedure discussed in sub-section 3.2.4, it was discovered that the random effect model is the appropriate and thus all interpretation are based on the random effect model. The

main variable which the impact of government size on unemployment, it was discovered that increases in government size will lead to increases in the level of unemployment in the oil exporting countries in Africa. This result is in conformity with the scatter plot in Figure 1. In addition, it was also discovered that government size is a significant factor influencing changes in the unemployment level, as this is statistically significant at 1 per cent. Concerning the magnitude of the estimated parameter, a 1 per cent increase in government size will lead to 0.137 per cent increase in the unemployment rate. Thus, the study concludes that the Abrams curve holds in the case of the oil exporting countries in Africa.

Also, another significant variable which is common to all the sampled countries is the oil price. The study revealed that oil price has a significant negative relationship with unemployment. This implies that, if the oil price increases by 1 per cent, unemployment will reduce by 0.164 per cent. The GDP per capita has a positive weak significant relationship with unemployment. This implies that increases in GDP per capita will lead to increase in the unemployment level. This suggest that the increase in the GDP per capita which is a measure of standard of living is skewed to some selected few, thus the increase in the unemployment level. Concerning, the magnitude of the parameter estimates, if GDP per capita increases by 1 per cent, unemployment rate will increase by 0.063 per cent.

Furthermore, it was discovered that inflation rate and population have a positive but insignificant relationship with unemployment. This implies that if inflation and population increases, the level of unemployment will also increase. This results is somewhat rational, this is because growth in the total population will lead to increases in the labour force and which consequently leads to increase in unemployment rate.

5. Conclusion. This study employed the validity of the Abrams curve for 13 oil exporting African countries. The period considered for the study is from 1991-2017 and the choice of the sample is based on the availability of data. The study examined the Abrams curve validity and the following results were discovered. To examine the presence of unit roots in the series, a battery of panel unit root test revealed that all the variables of interest were first difference stationary. The second empirical strategy is to examine the presence of long-run cointegrating relationship between government size and unemployment and it was discovered that there is presence of a long-run relationship among the variables. Third, the causality test revealed that there is evidence of bi-directional causality between government size and unemployment. Fourth, the panel least square estimates is in favour of the random effect models, and it was discovered that government size has a positive significant relation with unemployment rates in the oil exporting African countries. The average long-run elasticity was found to be 0.14.

Overall the study provided evidence in favour of the long-run Abrams curve, thus increases in government expenditure tends to increase the unemployment rates in the oil exporting African countries. The policy implication is that the reduction of government sector can be considered as an additional channel through which employment growth could grow faster. Thus, a successful realization of such economic policy is expected to create a strong base to foster real economic convergence in Africa. Secondly, there is no business of government in business, thus there should be promotion of the private-public partnership arrangement which can in a way reduce the level of unemployment.

Table 5. **Government Size and Unemployment for Africa's Oil Exporting Countries,** *author's*

Variables	Pooled OLS	Random Effect	Fixed Effect	FGLS
PANEL A GEGDP	0.440***	0.137***	0.145***	0.010
	(7.720)	(3.846)	(3.880)	(0.578)
LGDPPC	0.053***	0.063*	0.084**	0.007
	(2.969)	(1.826)	(2.070)	(0.438)
INF	-0.004	0.007	-0.005	0.005
	(-0.367)	(1.372)	(-0.966)	(0.988)
LPOP	0.097***	0.067	-0.147	-0.046
	(3.553)	(0.856)	(-1.436)	(-1.346)
LOILP	-0.242***	-0.164***	-0.152***	-0.007
	(-4.280)	(-5.976)	(-5.240)	(-0.583)
Constant	-0.073	1.247**	1.703***	1.113***
	(-0.302)	(2.458)	(2.739)	(4.323)
Panel B:Diagnostic Test *Adjusted* R^2	0.176	0.241	0.243	-
F	15.976(0.000)	-	21.352(0.000)	-
Wald Test	-	106.74(0.000)	-	-
Hausman Test	-	-	2.23 (0.817)	-
Bresuch-Pagan RE Test	-	3353.62(0.000)	-	-
Heteroscedasticity Test	-	-	2360.28 (0.000)	-
Serial Correlation Test	-	-	42.463(0.000)	-
Pesaran CD Test	-	-	0.540(0.589)	-
Observations	351	351	351	351

Notes: Table 5 reports Pooled OLS, fixed effects, random effects and the FGLS regression results of the effects of government size on unemployment. The dependent variable is unemployment rate (UNEMP). The independent variables are government size defined as the ratio of government expenditure to gross domestic product (GEGDP), the logarithm of GDP per capita (LGDPDPC), inflation rate (INF), logarithm of population (LPOP) and logarithm of oil price (LOILP). The t statistics are in parentheses in Panel A and the probability values are in parenthesis in Panel B. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

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