Effect of Local Revenue Deficit on Gross County Product of Devolved Governments in Kenya

Habil O. Onyango[1], Evans O. Kiganda[2], Scholastica A. Odhiambo[1]
[1]*Department of Economics, Maseno University, Private Bag, Maseno, Kenya*
[2]*Department of Economics, Kaimosi Friends University, P.O. Box 385-50309, Kaimosi, Kenya*

Abstract: **The performance of any economy is determined by resources available to support its needs. Low resource base, which cannot adequately meet the needs of any economy, contribute to economic instability. This is a major concern for economists and policy makers in many countries. Since Kenya established devolved governments in 2013, there has been a worrying trend on how local revenue deficits and Gross County Product have been interacting. From 2013 to 2017 the average local revenue deficits decreased from 593.86 million shillings to 349.52 million shillings. Over the same period, despite the average Gross County Product increasing from 90.721 billion shillings to 163.259 billion shillings, the increase has not been as much in some devolved governments. Literature shows no consensus whether local revenue deficits have negative, positive or neutral effect on economic growth, with most studies being limited to use of national level data set. The objective of this study was to determine the effect of local revenue deficit on Gross County Product of devolved governments in Kenya. The study was modelled on Solow-Swan's Neoclassical Economic Growth Theory and used secondary panel data set from 2013 to 2017 for all the 47 devolved governments. The data was sourced from Kenya National Bureau of Statistics and Controller of Budget Reports. Random Effects model was used to estimate and interpret results of autoregressive distributed lag (ARDL) model. Findings revealed that local revenue deficit had a coefficient of -0.45 with a p-value of 0.013, while its lagged value had the coefficient of -1.03 with a p-value of 0.003. This means that growth of local revenue deficit in the past as well as in the present period had a negative effect on Gross County Product. These findings led to the conclusion that growth of local revenue deficit both in the past and present period was detrimental to the economies of devolved governments in Kenya. As such, the study recommended for an improvement in local revenue collection to reduce local revenue deficit.**

Keywords: **Local revenue deficit, Gross County Product, Devolved governments, Autoregressive distributed lags model, Neoclassical Growth Theory**

I. INTRODUCTION

Economic instability has become an issue of concern for many countries in the world, with budget deficit blamed as the main issue causing economic instability, (Osoro, 2016). Fischer (1993), Ramu, *et.al* (2016) and Eminer, (2015) emphasize that budget deficit is one of the most important variables that influence economic growth. In Kenya, since inception of the devolved governments in 2013, each government has been registering its contribution to the national Gross Domestic Product (GDP). This contribution is measured by Gross County Product (GCP), which according to Kenya National Bureau of Statistics (KNBS, 2019), may be interpreted as the County GDP, since it measurers how much each devolved government contributes to Kenya's GDP.

Local revenue deficit stems from the inability by a devolved government to collect enough revenue, as projected in their annual budgets. It is possible therefore, to conclude that local revenue deficit occurs due to devolved government fiscal policy. Moraa (2013) observe that the increasing revenue deficit in Kenya, has resulted to weak economic performance. This situation forces the economy to generate inadequate resources for the public budget, thereby resulting to debt accumulation, associated with high interest rate. This argument was supported by Eli (2010), who argued that mismatch between public expenditure and revenue stagnates growth. Karnik (2002), while conducting a study between 1980-81 to 1996-97, proved that revenue deficit had an adverse effect on the growth rate of state domestic product in India. Ramu, *et al* (2016) also found that revenue deficit had an adverse relationship with GDP of India. The negative impact was explained by Rangarajan and Srivastava, (2005) who observed that when revenue deficit rises, the government savings and capital expenditures fall, causing a fall in growth rate.

II. MATERIALS AND METHODS

The study adopted correlational research design, which according to Simon, *et.al* (2011), is used to establish relationships between variables. All the 47 devolved governments formed the population for the study. Since data was available for all the 47 devolved governments over the period 2013 to 2017, a census sampling was applied. This provided a total of 235 observations for the local revenue deficit, Gross County Product, with population, development expenditure, development budget deficit and recurrent budget deficit as control variables. Random Effects model as used to estimate and interpret results of the autoregressive distributed lag (ARDL) model.

2.1. Model Specification

The study was based on the Solow-Swan Neoclassical Economic Growth model. To determine the effect of local revenue deficit on Gross County Product of devolved governments in Kenya, the model below was specified.

$$lnY_{it} = ß_0 + \beta_1 lnLR_{it} + \beta_2 lnD_{it} + \beta_3 lnR_{it} + \beta_4 lnL_{it} + \beta_5 lnK_{it} + e_{it}$$

Where,

Y_{it} denoted Gross County Product (GCP)

LR_{it} represented local revenue deficit (LRD)

D_{it} represented development budget deficit (DBD)

R_{it} represented recurrent budget deficit (RBD)

L_{it} denoted labor force, which was represented by the population within a devolved government

K_{it} denoted capital stock, which was represented by development expenditure

i = 1, 2, ... and represented the number of observations which were the 47 devolved governments in Kenya

t = 1, 2, ... was the time, which in this study was five years from 2013 to 2017.

$ß_0$ - Constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ were the coefficients

e_{it} was the error term, assumed to be independent for all individual observations at all time periods and was distributed normally with zero mean and a constant variance.

2.2. *Results for Diagnostic Tests*

Diagnostic tests were conducted to determine if study variables satisfied the assumptions of the regression analysis. These tests determined the distribution of random variable, relationship between error terms, the relationship between explanatory variables themselves and the constant variance of the residuals. Specific tests included the Hausman test, multicollinearity test, autocorrelation test, heteroscedasticity test and normality test. Each of these tests were highlighted below.

2.2.1. *Hausman Test*

The test developed by Hausman (1978) was used to select between Fixed Effects model and Random Effects model. According to Hausman (1978), the Fixed Effects model controls for all time-invariant differences between the variables and as such, its estimated coefficients cannot be biased. Hausman further argues that Random Effects model give better p-value, since they are more efficient. The Hausman test, was therefore useful in identifying the most efficient estimator that give consistent results. The null hypothesis of this test suggests that Random Effects model should be preferred, against alternative hypothesis which prefer Fixed Effects model.

Table 1: Hausman Test Results

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B)
	Fixed Effect	Random Effect	Difference	S.E
LNGCP_L1	0.0155752	0.0828113	0.0983865	0.020918
LNLRD	-0.0573946	-0.4453892	-0.3879946	0.2254501
LNLRD_L1	-1.101585	-1.026672	-0.0749133	0.1897163
LNDBD	0.0541718	0.2143817	0.1602099	0.0628195
LNDBD_L1	0.0896839	0.0623029	0.0273811	0.1517045
LNRBD	-1.012593	-0.1296037	-1.142197	.
LNRBD_L4	-0.3754145	-0.0682958	-0.4437103	0.122332
LNPOP	0.0129376	0.0055082	0.0074295	0.0034366
LNPOP_L2	0.0043551	0.0001515	0.0045067	0.0032946
LNGDE	0.9572931	0.8019373	0.1553558	0.1453393
LNGDE_L4	1.763347	1.374379	-0.388968	0.1401861
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 5.20 Prob>chi2 = 0.9209				
(V_b-V_B is not positive definite)				

Source: Research Data

Hausman test results were displayed in Table 1, with reported chi square statistic of 5.20 at 9 degrees of freedom, with a probability value being 0.9209. Since the value of probability (0.9209) was greater than 0.05, the null hypothesis could not be rejected at 5 percent level of significance. The Random Effect model was therefore the most consistent model.

2.2.2. *Test for Multicollinearity*

According to Gujarati (2004), multicollinearity arises when there is a perfect linear relationship among some or all of the independent variables in a regression model. Multicollinearity makes it difficult to determine the effect of individual regressors on the dependent variable. In this research, the Variance Inflation Factor (VIF) was used to detect multicollinearity. The null hypothesis was no multicollinearity, against the alternative hypothesis of multicollinearity. Gujarati (2004), state that when VIF exceeds 10, as a rule of thumb, such a variable is said to be highly collinear. The VIF in this research was estimated by

$$VIF = \frac{1}{1 - r^2 x_{it}}$$

Where $r^2 x_{it}$ was the coefficient of correlation between explanatory variables, Xi.

Table 2: Variance Inflation Factors Results

Variable	VIF	1/VIF
LNGCP_L1	1.86	0.537607
LNLRD	2.61	0.382479
LNLRD_L1	2.02	0.494628
LNDBD	1.20	0.834484
LNDBD_L1	1.23	0.813970
LNRBD	2.17	0.460581

LNRBD_L4	1.04	0.959552
LNPOP	1.41	0.711612
LNPOP_L2	1.14	0.879055
LNGDE	1.07	0.932819
LNGDE_L4	1.03	0.969858
Mean VIF	1.53	

Source: Research Data

VIF test results for the regression variables, as displayed in Table 2 show a mean VIF of 1.53. This value being less than 10, means the null hypothesis of no multicollinearity could not be rejected. As such, there was no multicollinearity among the regression variables.

2.2.3. *Test for Autocorrelation*

Kurt, *et.al* (2012) appreciates that autocorrelation (serial correlations) is a major problem, in both time series and panel data analysis. According to him, one of the basic assumptions of regression analysis is that the error terms for different observations are not correlated. However, autocorrelation or serial correlation exists if error terms are associated with each other. Wooldridge test for autocorrelation in panel data was used in this study. The null hypothesis of the test assumes absence of autocorrelation, while the alternative hypothesis assumes presence of autocorrelation.

Table 3: Results for Wooldridge Test for Autocorrelation

H0: no first order autocorrelation	
F (1, 45) = 0.511	Prob > F = 0.4784

Source: Research Data

Results in Table 3 reported F statistic of 0.511, with a probability value of 0.4784. Since this probability was greater than 0.05, the null hypothesis of no first order autocorrelation could not be rejected at 5% level of significance. The residuals did not suffer from autocorrelation.

2.2.4. *Test for Heteroscedasticity*

Kurt, *et.al* (2012) states that in panel data analysis, homoscedasticity is one of the basic assumptions that must be tested. Breusch-Pagan test for heteroscedasticity was employed, as it is one of the most popular tests for heteroscedasticity. The null hypothesis of the test is that residuals are homoscedastic, against the alternative hypothesis that residuals are heteroscedastic.

Table: 4 Results of Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity

Ho: Constant variance	
Variables: Residuals	
chi2(1) = 0.73	Prob > chi2 = 0.3918

Source: Research Data

The test results in Table 4 indicated a chi square test statistic of 0.73 at one degree of freedom, with a probability value of 0.3918. The probability value being greater than 0.05, meant that at 5% level of significance, the null hypothesis could not be rejected. The findings proved absence of heteroscedasticity among residuals.

2.2.5. *Test for Residual Normality*

The study used Shapiro-Wilk test for testing normality of the error term. Razali and Wah, (2011), argue that among all the tests for normality, the Shapiro-Wilk test has the highest power. The null hypothesis of this test is that residuals are normally distributed. This is important, as error term is usually assumed to be normally distributed.

Table 5: Results for Shapiro Wilk test for Normality

Variable	Obs	W	V	z	Prob>z
Residuals	231	0.98495	2.547	2.167	0.15103

Source: Research Data

The results in Table 5 with a probability value of 0.15103 > 0.05 implied that the null hypothesis of residuals being normally distributed could not be rejected at 5% level of significance. This implied that residuals were normally distributed.

III. RESULTS AND DISCUSSIONS

3.1. *Test for Unit Root*

This research used Fisher type test for unit root. The test was conducted with the null hypothesis that all panels contain unit root, against the alternative hypothesis that at least one panel is stationary. The test uses four methods, proposed by Choi (2001), who further recommends use of inverse normal (Z) statistic. Choi (2001) argues that the Z statistic provides the best trade-off between size and power, among the other three Fisher-type test statistics. In addition, he argues that both inverse-normal and inverse-logit transformations can be used whether the sample size is finite or infinite. The unit root test results were displayed in Table 6.

Table 6: Unit Root Test Results

Variable	Test in	Fisher ADF test	Conclusion
		Z statistic	
LNGCP	Level	-15.8466 ***(0.0000)	I (0)
LNLRD	Level	-13.2600 ***(0.0000)	I (0)
LNDBD	Level	-1.7292 ***(0.0419)	I (0)
LNRBD	Level	-6.3523 ***(0.0000)	I (0)
LNPOP	Level	-7.8873 ***(0.0000)	I (0)
LNGDE	Level	4.9037(1.0000)	
	First difference	-9.0815 ***(0.0000)	I (1)

Source: Research Data

The test results in Table 6 revealed that Gross County Product, local revenue deficit, development budget deficit, recurrent budget deficit and population were stationary at level, an indication of integration of order zero. This was expected and may be a pointer to the effectiveness of policies put in place by the various the devolved governments. Development expenditure was stationary after first differencing, an indication that the variable was integrated of order one. The existence of unit root in this variable was expected since development expenditure always grow and therefore has trend. These results supported the choice of autoregressive distributed lag (ARDL) model, developed by Pesaran, *et. al.* (1999), as an estimation method for this study. Cinar, *et.al* (2014) argue that ARDL model is useful when series have different cointegration levels, mainly I (0) and I (1), but not I (2). According to Olubiyi, *et.al* (2018), ARDL is a standard least squares regression, which include lags of both the dependent variable and explanatory variables as regressors. Cinar, *et.al* (2014), argue that ARDL involves the use of a single-equation set-up, is simple to implement and interpret, making it better than the cointegration analyses developed by Engle and Granger (1988) and Johansen (1995). Pesaran, *et al*. (1999), also note that ARDL is a reliable model in both big and small samples.

3.2. Lag Determination

The Akaike Information Criterion (AIC) was used to select the lags for study variables. According to Raza, *et. al.* (2015) this is the mostly used information criterion in panel estimation. The results are presented in Table 7.

Table 7: Selected Lags for Study Variables

No	Name of Variable	Selected Lags	AIC
1.	GCP	1	1.322257
2.	LRD	1	-1.769081
3.	DBD	1	0.599372
4.	RBD	4	-1.667454
5.	POP	2	5.279382
6.	GDE	4	-2.539842

Source: Research Data

3.3. Autoregressive Distributed Lag Model

3.3.1. Effect of Local Revenue Deficit on Gross County Product

Table 8: Random Effects GLS Regression Results

Random effects GLS regression Number of obs = 231
Group variable: ID Number of groups = 47
R-sq: within = 0.0731 Obs per group: min = 1
between = 0.8716 avg = 4.9
overall = 0.7060 max = 5
Wald chi2(11) = 287.31
corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

LNGCP	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
LNGCP_1	0.082811	0.048465	9.43	0.000	0.361881	0.551863
LNLRD	-0.445389	0.648818	-2.48	0.013	-2.88284	-0.339520
LNLRD_1	-1.026672	0.536963	-2.98	0.003	-2.65121	-0.546354
LNDBD	0.214381	0.162452	1.91	0.056	-0.00767	0.629126
LNDBD_1	0.062302	0.240868	3.38	0.001	0.341755	1.285942
LNRBD	-0.129603	0.336582	-2.30	0.022	-1.43307	-0.113696
LNRBD_4	-0.068295	0.550067	-1.60	0.110	-1.95811	0.198108
LNPOP	0.005508	0.007625	2.27	0.023	0.002377	0.032269
LNPOP_2	0.000151	.0075864	1.25	0.210	-0.00534	0.024389
LNGDE	0.8019373	.337429	4.38	0.000	0.815125	2.137822
LNGDE_4	1.374379	0.3349669	-4.45	0.000	-2.14653	-0.833487
_cons	100.1561	18.86813	5.31	0.000	63.17528	137.137
sigma_ u	0.13133191					
sigma_ e	0.25204242					
Rho	0.21353637 (fraction of variance due to u_i)					

Source: Research Data

The objective of this study was to determine the effect of local revenue deficit on Gross County Product of devolved governments in Kenya. This was based on the null hypothesis that there was no effect of local revenue deficit on Gross County Product of devolved governments in Kenya. Random Effects results in Table 8 showed that lagged Gross County Product had a positive coefficient (0.08) and a probability value (0.000). The significant positive effect means that growth in Gross County Product of the previous year, translate to higher growth in Gross County Product of the current year. Thus, 1% growth in the previous year's GCP causes a 0.08% growth in the current year's GCP. The finding supports the empirical work by Odhiambo, *et. al*. (2013), who found that past economic growth positively, influenced the future growth in Kenya.

Local revenue deficit had a negative coefficient (-0.45), with a probability value (0.013). The statistically significant effect implies that growth in the present level of local revenue deficit reduces present growth of Gross County Product. An increase in current local revenue deficit by 1% reduces Gross County Product of the current year by 0.45% and vice versa. Growth in local revenue deficit is attributed to low revenue collection by devolved governments in Kenya. This reduces budgetary allocation to development projects, which would contribute to growth. The negative effect conforms to the a priori expectation and was consistent with findings by Ramu, *et.al* (2016) and Karnik, (2002), who found a statistically significant negative effect in India.

Lagged local revenue deficit had a negative coefficient (-1.03), with a probability value of (0.003). This finding reveals a significant negative effect which implies that growth in local revenue deficit of the previous year reduces growth of Gross

County Product in the current year. As such, when local revenue deficit grows by 1% in the past year, the growth in Gross County Product of the present year drops by 1.03% and vice versa.

IV. SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1. Summary

The objective of this study was to determine the effect of local revenue deficit on Gross County Product of devolved governments in Kenya. Results showed that growth of local revenue deficit in the past as well as in the current period each had a negative effect on Gross County Product of devolved governments in Kenya. The findings imply that an increase in the level of local revenue deficit whether in the past and current period, reduces economic growth level of devolved governments in Kenya.

4.2. Recommendations

Given the findings, the following policy recommendations were proposed to enable devolved governments in Kenya achieve their mandate. First, the devolved governments need to formulate policies that help in diversifying their local revenue base. Secondly these governments need to prioritize reduction of pilferage and finally build capacity to strengthen their local revenue collection systems. These will reduce local revenue deficits through diversification of revenue sources and closing possible gaps that may aide revenue loss and realize increased revenue collection.

4.3. Limitations of the Study

The main limitation of this study was that it covered a shorter time span. This was because data was only available from 2013, when the devolved governments set up their operations in Kenya.

4.4. Conclusion

With these findings, the study concluded that an increase in local revenue deficit, both in the past and present period was detrimental to the economy of devolved governments in Kenya.

REFERENCES

[1] Cinar, M., Eroğlu, I. and Demirel, B. (2014). The role of budget deficit policies in economic growth from a Keynesian perspective. *International Journal of Economics and Finance*, Vol. 6, No. 10; 2014

[2] Controller of Budget. (2018). Annual county governments budget implementation review report for FY 2017/18, *Nairobi*

[3] Choi, I. (2001) Testing for stationarity in heterogenous panel data. *Econometrics Journal* 3:148-161

[4] Eli, R. H. (2010). Financing the budget deficit in the Philippines, *Philippines Institute for Development Studies, pp* 37-40.

[5] Eminer, F. (2015). The impact of budget deficit on economic growth in North Cyprus. *West East Institute International Academic Conference Proceedings*, Vienna, Austria.

[6] Fischer, S. (1993). The role of macroeconomic factors in growth. *NBER Working Papers No 4565*

[7] Gujarati, D.N. (2004) *Basic Econometrics*, *4th ed*. New Delhi, India: The McGraw-Hill

[8] Hausman, J. A. (1978). *Specification Tests in Econometrics.* Econometrica, Vol. 46, No. 6 (Nov. 1978), pp. 1251-1271

[9] Karnik, A. (2002). Fiscal policy and growth. *Economic and Political Weekly*, 37, 829- 831.

[10] Kenya National Bureau of Statistics (2019). Gross county product, Nairobi, Kenya

[11] Kurt, S, *et.al*. (2012). The effect of global financial crisis on budget deficits in European Countries: Panel data analysis. *Econometrics and Statistics* Issue no 17 of 2012 pp 1-22

[12] Moraa, W. (2014). Relationship between budget deficit financing and economic growth in Kenya. *Unpublished Master's Thesis*. University of Nairobi, Kenya.

[13] Odhiambo, S.O., Momanyi, G., Othuon L. and Aila, F.O. (2013). The relationship between fiscal deficits and economic growth in Kenya: an empirical investigation. *Greener Journal of Social Sciences*, Vol. 3 (6), pp. 306-323, July 2013.

[14] Olubiyi, E.A. and Bolarinwa, M. A. (2018). Fiscal deficit and inflation rate in selected African Regional Blocs: A comparative analysis, *Turkish Economic Review*, Issue 1, vol 5 p89-101

[15] Osoro, S. (2016). Effects of budget deficit on economic growth in Kenya. *Unpublished Master's Thesis*, University of Nairobi, Kenya.

[16] Pesaran, *et. al*. (1999) "An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis" in *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium,* ed. S. Strom, Cambridge, U.K.: Cambridge University Press.

[17] Ramu, A. M. R. and Gayithri, K. (2016). Fiscal deficit composition and economic growth relation in India: A time series econometric analysis, *Munich Personal RePEc Archive*

[18] Rangarajan, C. and Srivastava, D.K. (2005). Fiscal deficits and government debt: implications for growth and stabilisation. *Economic and Political Weekly* Vol. 40, No. 27 (Jul. 2-8, 2005), pp. 2919-2934,

[19] Razali, N. M. and Wah Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modelling and Analysis*, 2(1): 21-33

[20] Simon, M.K. and Goes, J. (2011). *Correlational Research, Dissertation and Scholarly Research*: Recipes for Success. Seattle, WA