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Fiscal decentralization and economic growth in Kenya: A vector error correction model (VECM) approach

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Abstract

This study investigates the relationship between economic growth and fiscal decentralization considering the expenditure perspective using the vector error correction model (ECM) framework. The study also accounts for domestic credit, public debt, manufacturing output, and money supply. Unit root test is performed to determine the variable's integration order. Fiscal decentralization, domestic credit and economic growth are variables of integrated order one. A cointegration test is then performed to test for cointegration relationship. There exist a cointegration relation among economic growth, domestic credit and fiscal decentralization. There is a significant error correction term that is relatively low in the short term. In the long run, fiscal decentralization has a significant positive effect on economic growth. Finally, the Granger causality test is performed to determine the direction of the causal link. There exists a unidirectional causal flow from fiscal decentralization to economic growth. The introduction of devolved government unit as established by Kenya's 2010 constitution has led to significant growth in economy development. There is therefore need to strengthen tax and monetary policies that will strengthen the new two-tier government structure.

Keywords: Fiscal decentralization, economic growth, ECM, Granger causality

Introduction

Government role in society is to provide its citizens with goods and services effectively and efficiently. To achieve this function, there are challenges faced by different government depending on its structure, institutions, economic development among other factors. Government structure can have different tiers with centralized government and decentralized units' governments such as states, regions, county and municipalities. Fiscal decentralization is the process of redefining various level of government level roles and responsibilities in implementing fiscal policy (Fedelino, 2010) [10]. Fiscal decentralization takes two aspects; revenue decentralization and expenditure decentralization. Revenue decentralization is where revenue collection is decentralized to decentralized unit while expenditure decentralization is where public expenditure is decentralized to devolved unit. Decentralization is important as it helps to distribute responsibilities across level of government. The federal government takes roles that have local, small scale as well as social development as compared to central government. Decentralization also helps in achieving the Pareto efficiency as decision making is based on local resident preference as well as needs. The impact of fiscal decentralization economic growth and development as there faster rate of market development, and increased democracy for participation in public administration.

Fiscal decentralization theories base the framework of assigning roles based on three fiscal functions, namely; resources allocation, redistribution and stabilization (Musgrave, 1958; Tiebout, 1956; Oates, 1972; Oates, 2005) [22, 31, 25, 26]. While considering resources allocation, this takes in to account the role of government in delivery of goods and services as provided by the economy across level of government. In terms of distribution function, this involves considering how more equitable is the distribution of income as well as other economic well-being indicators would be in different government structure. In terms of the stability function, this involves defining the role of spending and tax policies as well as other economic policies that govern the overall economic activities.

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In Kenya, the idea of decentralized of fiscal expenditure has been there for decades, taking different dimensions. The first phase of decentralized unit was the establishment of municipality at district level to run the affairs of towns. These municipalities formed municipal council that regulated the operation of the local municipal area. The municipalities obtained funding from national government on program-based approach as well as own source funding. They were headed by a mayor with the over-sight role being local ward representative. In the year 2003, the was the enactment of the constituency development fund (CDF), that introduced decentralized planning and development at constituency level. The CDF is run by committee, were they are allocated fund per year by the CDF board. However, the vote head of CDF money in National government expenditure books are not clear, thus not considered in this analysis. In the year 2010, Kenya promulgated a new constitution that introduced two distinct government level; the national government headed by the president and devolved government headed by governor. A total of 47 devolved units were created. The devolved governments are allocated money by national government as distributed in the revenue allocation bill approved each financial year. The devolved unit are also allowed to mobile resources through own source funding by regulating economic activities within its jurisdiction. The devolved government has a bigger and well laid out government structure as compared to municipalities. Another change was increase of revenue allocation from the central government with the new structure minimum allocation defined as 15% of total revenue collected. The introduction of devolved government structure was a milestone in public governance in Kenya.

There exist several empirical evidence of fiscal decentralization impact on economic growth. Gemmeil *et al.* (2013) [13] did a comparative analysis of revenue decentralization and expenditure decentralization on economic growth in twenty-three OCED countries. The study proved that expenditure decentralization is highly associated with low economic growth while revenue decentralization associated with high economic growth. Slavinskaite (2017) [29] analyzed the effect of fiscal decentralization on economic growth for selected European Union members. The study proved that fiscal decentralization has a significant positive effect on economic growth in low economic level countries and no relation in developed countries. Jin and Rider (2022) [26] studied fiscal decentralization policy in China and India, and it's effect on economic growth using two-step generalized method of moment (GMM) and long run analysis. The study provided evidence of a significant negative effect on fiscal decentralization on economic growth in short-run in both countries. However, accounting for other macroeconomic variables, fiscal decentralization has no significant effect on economic growth in both countries. Arif and Chishti (2022) [3] analyzed the fiscal decentralization effectiveness in economic growth particularly the role played by institution for cross countries for data ranging from 1990 to 2018. The study provided evidence of complementary role between fiscal decentralization and institution on improving economic growth.

To account for covariates in the economic growth and fiscal decentralization nexus, other determinants of economic growth are considered. Public debt is a major macroeconomic indicator that has a significant effect on economic growth. Public debt may have a negative effect on economic growth in normal OLS regression and in long run equilibrium analysis (Panizza and Presbitero, 2014; Lee and Ng, 2015; Ajayi and Edewusi, 2020; Njenga and Kipchichir, 2022) [28, 14, 2, 2]. Manufacturing sector is key engine in economic growth and development especially in the middle-class countries. Manufacturing increase result to increase in service sector, promote use of saving incentives, higher rate of human capital utilization and accelerated rate of technology adoption (Su and Yao, 2017; Gabriel and de Santana Ribeiro, 2019) [30, 11]. Another determinant of economic growth is domestic credit that exist a non-linear relationship. Increase in domestic credit results to economic growth up to a certain country specific threshold where negative effects are felt (Mbate, 2013; Bui, 2020) [21, 6]. Money supply is also associated with economic growth under normal linear regression and long run analysis (Denbel *et al.*, 2016; Doan, 2020) [8, 9]. The aim of this study is to investigate the nexus between fiscal decentralization and economic growth in Kenya following the establishment of two-tier government in 2010 and close to eleven years of implementation.

Methodology

Data: This study utilizes yearly data from 1990 to 2022 compiled from the annual economic survey reports by the Kenya Bureau of statistic. The response variable is economic growth (GDP), while the explanatory variables are public debt (PD), domestic credit (DCR), manufacturing output (MOPT), fiscal decentralization (FD), and money supply (M3). A log transformation is performed on the variables to remove the effect of outliers. The variables economic growth, public debt, domestic credit and manufacturing output are expressed in Kenya shillings million. Fiscal decentralization (Expenditure), is the proportion of decentralized unit expenditure over the overall expenditure expressed as;

$$FD_{\text{expenditure}} = \frac{\text{decentralized unit expenditure}}{\text{decentralized unit expenditure} + \text{national government expenditure}} \tag{1}$$

The descriptive statistic is shown in table 1 and figure 1. The mean value for public debt, domestic credit, money supply and manufacturing output are relatively within the range of 13. GDP has the highest mean value of 14.37 while fiscal decentralization and trade openness being proportions have the least mean of approximately 0.42. The highest variability over the years is in domestic credit with a standard deviation of 1.4553 and the least variability over the years is in fiscal decentralization with standard deviation value of 0.02. Economic growth in Kenya has had a continuous linear increase from 1990 to date, though the rate is relatively low.

Table 1: Descriptive statistic results

Variable	Minimum	Maximum	Mean	SD	No of observation
GDP	12.18	16.41	14.37	1.2685	33
FD	0.4114	0.4677	0.4346	0.0200	33
M3	10.99	15.43	13.49	1.2719	33
PD	11.59	16.03	13.84	1.2162	33
DCR	10.27	15.65	13.45	1.4553	33
MOPT	12.0	16.67	13.67	0.9555	33

The performance of public debt is linear increase with stagnation points during the mid-1990s and around 2005 period. From year 2010, public debt has sharply increased. Domestic credit experienced a drastic change around 1992, followed by linear continuous increase. The value of domestic credit was approximately equal to public debt around 1996 and from 2011 to 2013 period. The manufacturing output closely followed GDP as from 1990 to 2000, followed by a shape decline after 2000. In the year 2013, there was a sharp positive fluctuation in manufacturing output that stabilized immediately.

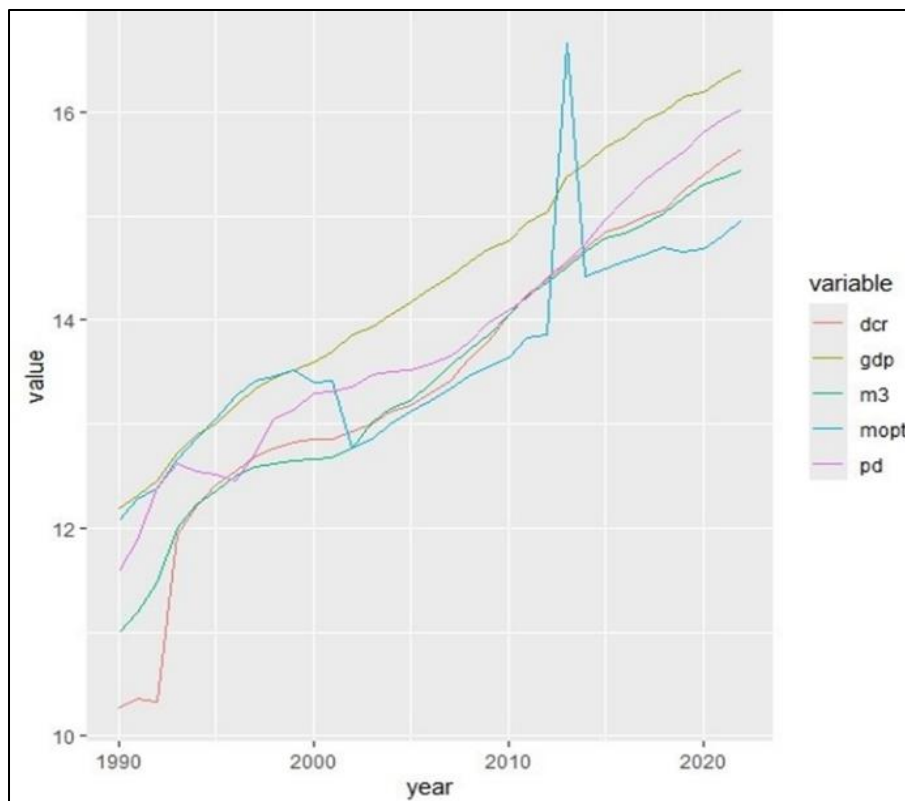


Fig 1: Variables plot

Model

This study uses the ECM framework to analyze the effect of fiscal decentralization on economic growth. This framework entails first determining the integration order of the variable by conducting unit root test. Variables that are integrated order one may exhibit a cointegration relation where the combine to form a stationary combination. Cointegration test is performed to test the presence of a long run equilibrium relation. In the presence of a cointegration relation (s), there exist along run relation and short-term dynamic. The presence of cointegration relation implies causality, there is need to test for causality to determine the causal flow direction.

Unit root test

Unit root test is used to determine the integration order of the variable. A variable is of integration order one if its stationary. A stationary variable is characterized by a constant variance and mean over time. Otherwise, a non-stationary variable has a varying variance and mean, which may be as a result of trend component in the time series. The order of a variables is defined as the number of times a time series variable is differenced to make it stationary by removing the trend component. The unit root test whether in level in difference form is used to determine if the presence of root in the unit circle of the model. The unit root model is expressed as (Banerjee *et al.*, 1993) [5]:

$$\Delta Y_t = \delta_0 + \delta_1 t + \delta_2 Y_{t-1} + \sum_{i=1}^k \alpha_i \Delta Y_{t-1} + \varepsilon_t \tag{2}$$

Where Δ - is the first difference of the variable; δ_0 is the constant term, $\delta_1 t$ - is the trend component(linear), and ε - is the error term. The null hypothesis of the test assumes there is existence of unit roots within the model where $\delta_2 = 0$. This study utilizes the Philips-Perron (1988) [27] test statistics.

The unit root test results in table 2 indicates that annual manufacturing output is stationary variable at 5% significance level. It's therefore characterized by a constant mean and variable over the sample period. GDP, fiscal decentralization (expenditure), and domestic credit are no-stationary in level but become stationary after the first difference. They are therefore variables of integrated order one at 5% significance level. Public debt is non-stationary in level but becomes stationary after first difference at 10% level of significance.

Table 2: P-P unit root test results

Variable	Statistic (In level)	P-Value	Statistic (1 st Δ)	P-Value
GDP	-8.4847	0.5861	-32.839	0.01
FD	-5.1455	0.804	-35.785	0.01
M3	-10.294	0.4681	-14.574	0.186
DCR	-8.7629	0.568	-32.186	0.01
PD	-9.2758	0.5345	-16.074	0.0962
MOPT	-25.483	0.01	-	-

Money supply p-value in level and at first difference is greater than the critical value of 0.05, thus it may have integration order greater than one. The variables GDP as the response variable and response variables namely fiscal decentralization (Expenditure), domestic credit and trade openness are considered for analysis for cointegration for having the same integration order.

Vector Error correction Model (VECM)

An VECM model is vector autoregression model that has an error correction feature. It contains both the short-term dynamic relation given by the error correction model (ECM) and the long run equilibrium relation. A VECM model is expressed as (Johansen, 1988; Johansen, 1991) [17, 19];

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \beta_i \Delta X_{t-i} + \pi X_{t-p} + \varepsilon_t \tag{3}$$

where X is a set of variables, Δ is the first difference, p is the number of lags and ε_t is the error term. The VECM is used to test for cointegration relation as guided by Johansen framework on trend restrictions (Johansen *et al.*, 1990). The cointegration test uses likelihood ratio test based on either trace statistic or the Eigen value statistics. The hypothesis is tested step-wise starting from no cointegration relation (r = 0). Reject the null hypothesis if the calculated test statistic is greater than the critical value, and proceed to the next hypothesis. Otherwise, if the calculate test statistic is smaller than the critical value, fail to reject the null hypothesis. The number of cointegration relation is equal to the null hypothesis that has not been rejected. In the presence of a cointegration relation, the long run relation from the VECM model in equation (3) is expressed as;

$$X_{1t} = \sum_{j=2}^k \pi_j X_{j,t-p} + \mu_t \tag{4}$$

The long run equation expressed how the variables being non-stationary, become stationary by linearly combining the variables. In a long run equilibrium relation, any deviations from the equilibrium are stationary with finite mean and variance as described by Engle *et al.* (1978) [7]. There exist a force described by the error correction term (ECT) in the error correction model (ECM) that counters any deviation from equilibrium. The ECM model is expressed as (Alogoskoufis and Smith, 1991; Johansen, 1995; Lütkepohl, 2006) [1, 19, 15]

$$\Delta X_{1t} = \sum_{i=1}^{p-1} \sum_{j=1}^k \beta_{i,j} \Delta X_{j,t-i} + \lambda ECT_{t-1} + \varepsilon_t \tag{5}$$

The error correction term (ECT) that must be negative and significant to support the presence long run relation, otherwise there is no cointegration. ECT while expressed as percentage indicated the rate of adjustment to equilibrium state when the equilibrium experiences a shock.

Table 3: Cointegration test results

Null	Alternative	Eigen value statistic	95%	Trace statistic	95%
r=0	r=1	28.64	22.00	47.02	34.91
r=1	r=2	15.05	15.67	18.37	19.96
r=2	r=3	3.33	9.24	3.33	9.24

The cointegration test results are shown in table 4 for both Eigen values and trace statistics. At 5% level of significance, the null hypothesis for r = 1 under Eigen values statistic (15.05) is less than critical value of 15.67. The number of cointegration relation is there equal to one. The trace statistic for the null hypothesis r = 1 supports the Eigen value test statistic as the calculated statistic (18.37) is less than the critical value (19.96) at 5% level. GDP has one cointegration relation with domestic credit and fiscal decentralization (expenditure). The long run relation is expressed as;

$$GDP_t = -128.9523 - 242.651FD_t + 9.1813DCR_t \tag{6}$$

In the long run, fiscal decentralization has a significant positive effect on economic growth. Accounting for domestic credit, a unit increase in fiscal decentralization results to approximately two times fold increase in economic growth in the long run. Domestic credit has a positive effect on economic growth in the long run. For a cointegration relation, the observed variables exist in an equilibrium state.

Table 4: ECM model results

Variable	Coefficient	P-Value
λ	-0.0014	0.0001
ΔGDP_{t-1}	-0.0085	0.967
ΔFD_{t-1}	1.3186	0.289
ΔDCR_{t-1}	-0.0022	0.958
Overall model		
F-statistic	43.53	
Degree of Freedom	(4,27)	
R^2	0.8658	
Adjusted R^2	0.8459	
p-value	0.0001	

The short-term dynamic model (ECM) results are shown in table 4, the overall model is significant at 5% level. The ECT term is negative and significant thus support the presence of cointegration relation. The rate of adjustment to equilibrium is 0.14%, which is relatively low. The ECM equation for the relation in the short term is given as;

$$\Delta GDP_t = -0.0085\Delta GDP_{t-1} + 1.3186\Delta FD_{t-1} - 0.0022\Delta DCR_{t-1} - 0.0014ECT_{t-1} \tag{7}$$

In the short run, the first lag of GDP and domestic credit have a negative effect on GDP while fiscal decentralization has positive effect, though their effect are not significant.

The VECM approach provide evidence of one cointegration relation in the fiscal decentralization and economic growth nexus accounting for domestic credit. In the long run, fiscal decentralization has a negative effect on economic growth and a positive effect in the short term.

Granger causality

For two variables that are in a relation, then causality is defined as the ability of one variable to cause significant effect on the other variable. Granger (1969) causality test state that an observed variable Y_t granger-cause the other variable X_t if

$$\sigma^2(X|\mu) < \sigma^2(X|\mu - Y) \tag{8}$$

The causality mode for uni-variate variable is expressed as;

$$X_t = c_t + \kappa(L)X_{t-1} + \eta(L)Y_{t-1} + v_t \tag{9}$$

The test statistic for the model is F test statistic, with a null hypothesis that assumes that the variable Y_t does not granger-cause variable X_t that's $\eta_i = 0$ for all i. Reject the null hypothesis if the p-value is less than 0.05. The causal link is defined to be from Y_t to X_t only. This is referred to unidirectional causal link from Y_t to X_t . If the variable X_t also granger-cause variable Y_t , then there exists a bidirectional causal flow between these two variables.

Table 5: Granger causality test

	GDP	FD	M3	PD	DCR	MOPT
GDP		0.0473 (0.8294)	2.0608 (0.1618)	0.125 (0.7262)	0.7131 (0.4053)	0.0185 (0.8928)
FD	5.2358 (0.0296)	-	4.2416 (0.0485)	4.9452 (0.0341)	2.5958 (0.118)	22.519 (0.0001)
M3	1.4437 (0.2393)	1.2487 (0.273)	-	1.6265 (0.2123)	40.942 (0.0001)	0.6116 (0.4405)
PD	3.4278 (0.0743)	2.2985 (0.1403)	0.0851 (0.7726)	-	2.4935 (0.1252)	0.6106 (0.4409)
DCR	6.2605 (0.0182)	1.391 (0.2478)	16.714 (0.0003)	11.204 (0.0023)	-	0.4933 (0.4880)
MOPT	11.419 (0.0021)	1.9817 (0.1698)	15.908 (0.0004)	10.896 (0.0026)	12.785 (0.0012)	-

The Granger (1969) causality test results are shown in Table 5. GDP Granger causality test on the explanatory variables are not significant at 5% level. Economic growth does not granger cause fiscal decentralization, money supply, public debt, domestic credit and manufacturing output. The Granger causality test for fiscal decentralization on GDP, money supply, public debt and manufacturing output is significant at 5% level while for domestic credit it's insignificant. There exists unidirectional causal flow from fiscal decentralization to economic growth, money supply, public debt and manufacturing output. Fiscal decentralization observed variations is attributed to the variations observed in economic growth, money supply, public debt and manufacturing output. Money supply Granger causality test is significant for domestic credit only at 5% level. There exists a unidirectional causal flow from money supply to domestic credit. The variation observed in domestic credit is explained by changes in money supply. Public debt Granger causality test is significant at 10% for GDP only. There exist a unidirectional causal flow from public debt to economic growth. The variations in economic growth are attributed to changes in public debt. Domestic credit exhibit a significant Granger causality with GDP, money supply and public debt. There is a unidirectional causal link from domestic credit to economic growth, money supply and public debt. The variations in domestic credit cause a significant variation in public debt, money supply and economic government. The Granger causality test for manufacturing output with all the other variables are significant at 5% level except for fiscal decentralization. There is a unidirectional causal link from manufacturing output to economic growth, money supply, public debt and domestic credit. Manufacturing output explains the variations observed in public debt, economic growth, money supply and domestic credit.

Discussion and Conclusion

The objective of the study was to analyze the effect of fiscal decentralization (expenditure) on economic growth in Kenya using an ECM approach, by accounting for manufacturing output, public debt, domestic credit and money supply. The framework entails first determining the integration order of the variables, conducting cointegration test and test for causality. The study proved that manufacturing output is stationary while economic growth, fiscal decentralization, domestic credit are variables of integrated order one at 5% level of significance. Public debt is variable of integration order one at 10% level of significance. The integration order of money supply is greater than one. There exist a cointegration relation among economic growth, fiscal decentralization and domestic credit in Kenya. The presence of a cointegration relation is supported by the ECM model where the error term is significant and negative. There exists unidirectional causal flow; from fiscal decentralization to economic growth, fiscal decentralization to money supply, fiscal decentralization to public debt, fiscal decentralization to manufacturing output, public debt to economic growth, money supply to domestic credit, domestic credit to economic growth, domestic credit to money supply, domestic credit to public debt, manufacturing output to economic growth, manufacturing output to money supply, manufacturing output to public debt and manufacturing output to domestic credit.

From the study, there is evidence to conclude that, there is a long run equilibrium relation among economic growth, fiscal decentralization and domestic credit. The rate of adjustment to equilibrium is approximately 0.15%, which is relatively low. In the long run, fiscal decentralization has a positive effect on economic growth. There exist a unidirectional causal flow from fiscal decentralization to economic growth. The benefits of fiscal decentralization are fully realized in Kenya where there are faster market development, alignment of development to local needs and overall increase economic activities. The continuous increase of the proportion of expenditure at decentralized unit as per the defined roles is bearing significant fruits in the economic liberation in Kenya. There is need to strengthen the tax policies especially on own sources funding (OSF) in counties, improvement of county government operational capacity and revenue appropriation.

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