Determinants of Economic Growth in ECOWAS Countries: An Empirical Investigation

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Abstract
The Economic Community of West Africa States (ECOWAS) is a regional group consisting of 15 countries which was founded 1975 with the goal to promote economic trade, national cooperation, and the creation of a monetary union throughout West Africa. This paper empirically assesses the determinants of the economic development from 1996-2016 in ECOWAS using panel unit root tests, panel cointegration tests, and the estimation of the dynamic panel data regression via the Arellano–Bond estimator and Arellano–Bover and Blundell–Bond estimator. The empirical results show total factor productivity (TFP), law, and somewhat corruption are indicative of economic growth under the Arellano–Bond estimator. Under the Arellano–Bover and Blundell–Bond estimator, the results revealed that inflation, gross domestic saving (GDS), and TFP have a significant impact on economic growth in the ECOWAS. From these empirical results, improving economic growth in ECOWAS countries improves the quality of life of people and the government of each ECOWAS country become cognizant of the benefits in the implementation of pro-growth policies. The policy implication is that the governments of the ECOWAS countries should give policy priority to promote pro-growth economic policies and enhance institutions to enable economic growth.

Keywords: Economic Growth, Governance, Panel Data, Cointegration, ECOWAS

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1. Introduction

The Economic Community of West African States (ECOWAS)[1] was established by the Treaty of Lagos on 28 May 1975 with the mandate to promote cooperation and integration, which led to the establishment of an economic union in West Africa. The goals for ECOWAS are to raise the living standards of its citizens and to promote economic stability, foster relations among member states and contribute to the progress and development of the African continent.[1]

ECOWAS was founded to achieve collective self-sufficiency for the member states by means of economic and monetary union. It was designated one of the five regional pillars of the African Economic Community (AEC). Together with COMESA, ECCAS, IGAD, and SADC, ECOWAS signed the Protocol on Relations between the AEC and Regional Economic Communities (RECs) in 1998. The goals were to establish a common economic market, a single currency, the creation of a West African parliament, economic and social councils, and a court of justice. The ECOWAS Secretariat and the Fund for Cooperation, Compensation and Development are its two main institutions to implement ECOWAS policies.

In 2000, five ECOWAS members formed the West African Monetary Zone (WAMZ) with the goal to establish a stable currency whose exchange rate is tied to the euro and guaranteed by the French Treasury. The eventual goal was for the CFA franc and Eco to merge, giving all West and Central Africa a single currency. The purpose of this paper is to empirically assess the determinants of the economic growth in ECOWAS via the panel unit root tests, panel cointegration tests, and the estimation of the dynamic panel data regression via the Arellano–Bond estimator and Arellano–Bover and Blundell–Bond estimator.

This paper adds to the literature by showing the importance of pursuing pro-growth economic policies and the strengthening of institutions by governments of each ECOWAS country to improve the quality of life of people throughout ECOWAS. The paper is organized as follows. Section 2 provides a review of some previous studies followed by Section 3 which provides some background information about Sub-Saharan Africa and ECOWAS countries. Section 4 discusses the data sources and the methodology of this paper. Section 5 analyzes the empirical results, and the last section concludes by providing some useful policy implications.

2. Literature Review

The review of the existing literature presented an overview of the determinants that affect economic growth in ECOWAS countries. Adamu (2013) investigated the impact of foreign aid on economic growth in the ECOWAS states via a three-equation simultaneous-equations model and panel data from 1990 to 2009. From this paper, it was concluded that the effect of foreign aid on economic growth is positive and strong. Other important drivers of economic growth are interest rate, FDI, and level of international reserves. A policy implication of this study is that member countries of the ECOWAS should seek foreign aid as it would greatly accelerate their economic growth. Przeworski and Limongi (1993) start with some arguments in favor of or against democracy. They concluded that political institutions do matter for growth but thinking in terms of regimes does not seem to capture the relevant differences. On the other hand, Chen (1997)

[1] ECOWAS is comprised of fifteen countries: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

examined the recent studies of technological change or total faster productivity as a source of growth in East Asian countries. His findings showed that even if East Asian economic growth was largely input-driven in the past two decades, one cannot preclude the possibility that this will change when their economies become more mature. Input-driven economic growth can be sustainable.

Boozer *et al*. (2010) investigated the two-way relationship between economic growth and human development. The work consists of integrating economic growth as well as human development; it considers reverse causality between the two as well as the simultaneity. They find that human development plays an essential role in determining economic growth. Successful policy requires an early focus on human development, not only because of its direct impact, but also because of its feedback effect on sustaining economic growth. Gabriel (2013) examined the relations between private investment and sustainable economic growth in ECOWAS from 1986 to 2011 using panel data cointegration technique. The empirical results showed that private investment does not significantly impact economic growth to ensure sustainability in ECOWAS countries. Borrmann et al. (2007) performed an empirical analysis of the linkages between institutions, trade, and income levels in the ECOWAS countries. The results suggested that institutional quality, an important prerequisite for a successful trade liberalization, might help explain why some countries observe positive welfare effects of an increase in trade openness, whereas other countries do not benefit from trade. A limited number of sub-components of good governance and regulatory quality are most important for successful trade liberalization.

Esso (2010) reexamined the cointegrating and causal relationship between financial development and economic growth in the ECOWAS countries from 1960 to 2005. He found that there is a positive long-run relationship between financial development and economic growth in most of the ECOWAS countries and financial reform should promote economic growth. As for governance, the FDI, and economic growth in ECOWAS, Raheem (2013) explored the interactive impact of governance on FDI in seven ECOWAS countries using OLS and Threshold Auto Regressive (TAR) techniques. Using panel data for the period 1970-2010, the findings suggested that FDI is positively related to growth in both normal and dynamic effect in the OLS models. Moreover, government consumption, balance of payment (BOP), and governance contribute significantly to the economic growth in seven ECOWAS countries. Anyanwu and Yameogo (2015) also analyzed (FDI) to West Africa using a panel dataset from the same period as Raheem (2013). Their results showed that there is a U-shaped relationship between economic growth and FDI inflows to West Africa while domestic investment, trade openness, first year lag of FDI, natural resources (oil and metals) endowment and exports, and monetary integration have a positive and significant effect on FDI inflows to region. On the other hand, there is a negative relationship between FDI inflows to the sub-region and loan component of ODA, economic growth, life expectancy, and domestic credit to the private sector. Zannou (2009) focused to apprehend factors affecting the importance of the ECOWAS intra-community trade flows from 1980 to 2000 using a gravity model. He concluded that remoteness and enclosure reduce the volume of intra-community trade while proximity (geographical, linguistic, and monetary) increases it. Economic and demographic dynamics are sources of increased trade within ECOWAS.

In a broader analysis of the economic growth in Africa, Anyanwu (2014) examined the factors that affect economic growth in 53 African nations. The analysis applied a cross-country panel data for African countries between 1996-2010. The results from this study indicated that higher domestic investment, net official aid, secondary school enrollment, metal price index, government effectiveness, and urban population were positively and significantly associated with Africa's economic growth. Chiwa and Odhambo (2016) investigated the literature bout the determinants of economic growth in both developed and developing countries. They concluded that the key macroeconomic determinants of economic growth in developed countries include physical capital, fiscal policy, human capital, trade, demographics, monetary policy and financial and technological factors while in developing countries include foreign aid, foreign direct investment, fiscal policy, investment, trade, human capital development, demographics, monetary policy, natural resources, reforms and geographic, regional, political, and financial factors.

While the reviewed papers carefully examined some specific issues affecting economic growth of ECOWAS countries, none of them provided an assessment of the determinants of economic growth in ECOWAS. A careful assessment of these determinants of economic growth has important policy lessons for African policy-makers because the policy-makers need to know what policies would result in economic growth in ECOWAS countries. This paper contributed to the existing literature by examining the determinants of economic growth in ECOWAS countries by looking at economic and institutional variables.

2.1 Rational and Theoretical Underpinning in the Determination of Economic Growth of ECOWAS Countries

Using a dynamic panel regression, we would examine the determinants of economic growth on ECOWAS countries that includes both economic and institutional variables. The empirical analysis is based on sound theoretical framework based on the growth theory and augment the classical growth model.

Consider the standard neoclassical production function: Y= f(A, K.L) where A is the level of technology, K is capital stock, L is the quantity of labor and Y is output. Assume that the production function is twice differentiable and subject to constant returns to scale which indicates that technical change is Hicks-neutral. Differentiation of the production with respect to time, dividing by Y and rearranging the terms shows.

$$\frac{\acute{Y}}{Y} = \frac{\acute{A}}{A} + \frac{f_k K}{Y} + \frac{\acute{K}}{K} + \frac{f_L L}{Y} + \frac{\acute{L}}{L}$$

where: Ý/Y is the continuous time rate of growth of output, Ḱ/K is the growth rate of capital stock and Ĺ/L is the growth rate of labor force; f_K and f_L are the factors (social) marginal products of capital and labor, respectively; and Á/A is the Hicks-neutral rate of change of technological progress. Thus, the basic Solow growth model gives the growth rate of output or income, depending on the growth rate of technical change, labor or population and capital stock.

This basic Solow model has been modified empirically to obtain the augmented Solow growth model where the growth rate of income for a given country depends not only on technical change, labor and capital but also on policy variables, e.g., trade, fiscal policy, and monetary policy.
Even though the theoretical model underlying modern economic growth work has moved beyond the Harrod-Domar model, determinants of economic still has an impact on growth via capital accumulation. To analyze whether economic and institutional variables works through the investment link it is necessary to show that economic and institutional variables have an impact on economic growth in ECOWAS countries. Accordingly, we formulate a growth regression in which real GDP is driven by GDP per capita, trade, total factor productivity and other economic variables. In addition, institutional variables also have an impact on economic growth of ECOWAS countries and are included in this paper.

3. Some Stylized Facts about Economic Growth of ECOWAS

ECOWAS is the largest region in Sub-Saharan Africa (SSA). Table 1 displays some economic indicators of SSA with an average growth rate of 4-5% for the period of 2000-2010 and an annual growth rate of about 5% between 2010 and 2015. However, the net exports contribution to growth is negative for the same period except for 2010, and almost zero in 2014 and 2015. Moreover, the Current Account Balance (CAB) and Fiscal Balance (FB) as a percentage of GDP are negative to up to -3.3 in 2014 for the CAB and up to -3.9% in 2010. The recent global recession might have negatively impacted the CAB and FB of the ECOWAS countries. Table 2 shows that most ECOWAS countries experience a growth rate of GDP between 3% and 25.0% for the 2010-2015 period except the period of civil war where it was negative in Cote d'Ivoire and the Gambia in 2011 and in Guinea-Bissau as well as Mali in 2012. Sierra Leone records the highest growth rate with 25.0% in 2012 followed by Ghana with 14.4% in 2011 and Niger with 12.0% in 2012. Table 3 displays the negative CAB as a percentage of GDP for all the ECOWAS countries and confirms the results from Table 1 for SSA. Table 4 displays the different regional communities in Sub-Saharan Africa. ECOWAS is the largest region with 15 countries and 340 million people and $1322 billion in 2013.

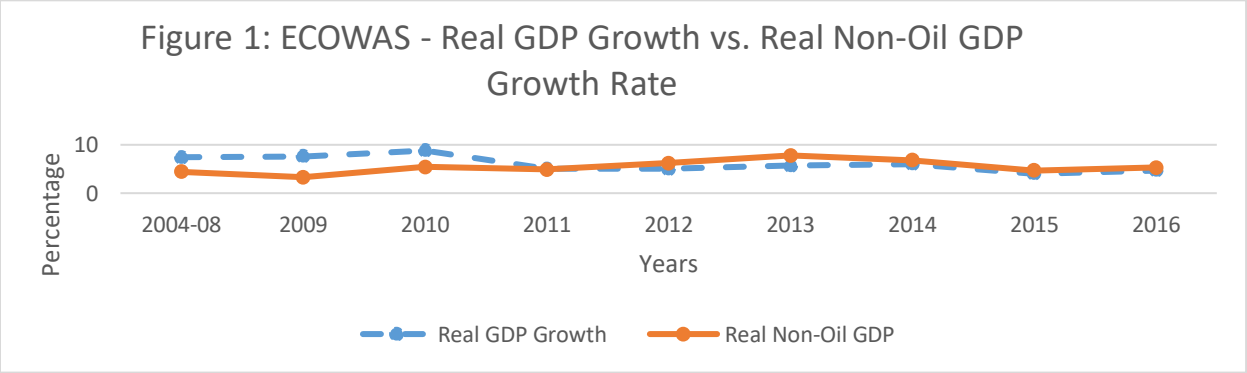


Figure 2: ECOWAS - Real GDP Growth, Trade Balance, and External Current Account
Percentage of GDP
20
0
-20
2004-08
2009
2010
2011
2012
2013
2014
2015
2016
Years
Real GDP Growth
Trade Balance
External Current Account

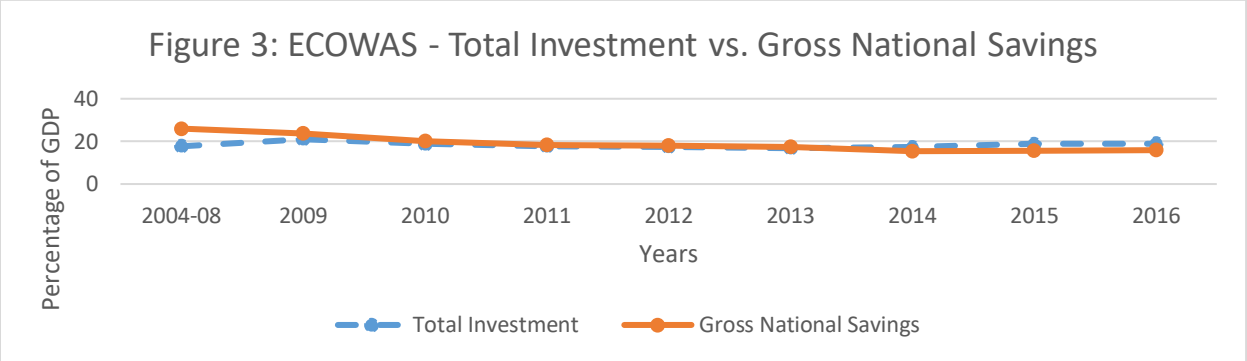
Figure 3: ECOWAS - Total Investment vs. Gross National Savings
Percentage of GDP
40
20
0
2004-08
2009
2010
2011
2012
2013
2014
2015
2016
Years
Total Investment
Gross National Savings

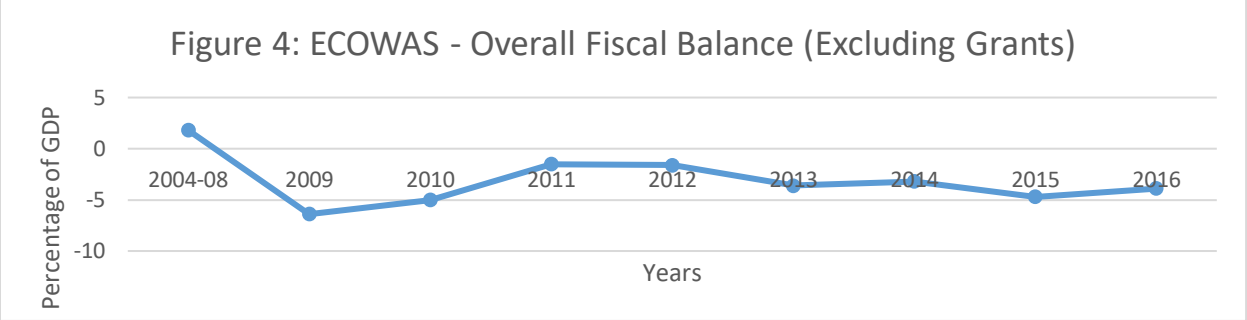
Figure 4: ECOWAS - Overall Fiscal Balance (Excluding Grants)
Percentage of GDP
5
0
-5
-10
2004-08
2009
2010
2011
2012
2013
2014
2015
2016
Years

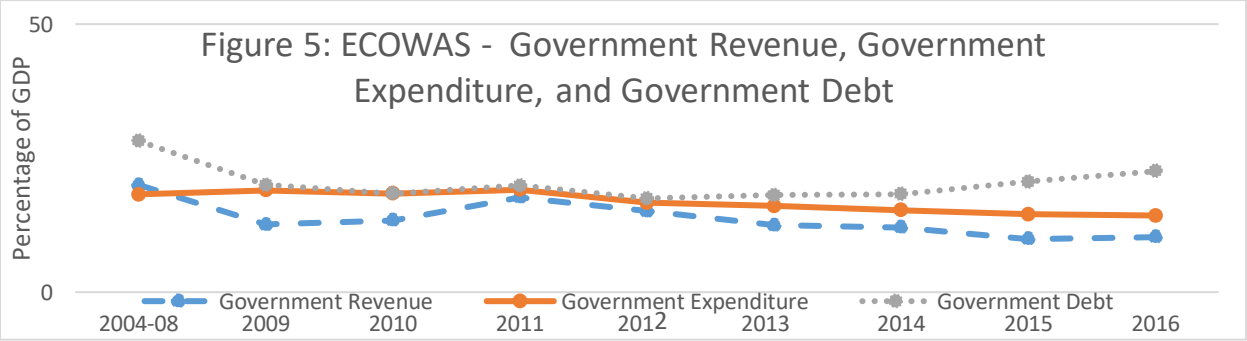
Figure 5: ECOWAS - Government Revenue, Government Expenditure, and Government Debt
Percentage of GDP
50
0
Government Revenue
Government Expenditure
Government Debt
2004-08
2009
2010
2011
2012
2013
2014
2015
2016

Figure 1 shows strong growth of real GDP 4-8% for the ECOWAS countries over the 2009-2016 period. The real GDP growth rate for non-oil ECOWAS countries has been even higher since 2011 with the drop of crude oil prices below $30 a barrel. The trade balance and external current account as a percentage of GDP have been decreasing for the entire period between 2004-2008 and 2009-2016, and even negative in 2015 and 2016 as shown in Figure 2. The 2007-2008 global recession impacted several of the ECOWAS countries which mainly export primary commodities. Figure 3 displays a decreasing trend for both total investment and gross national savings as a percentage of GDP in ECOWAS countries from 2009 to 2014. The trend reverses after 2014 with total investment being higher than gross national savings. However, the overall fiscal balance as a percentage of GDP has been negative up to -6% in 2009 to finally stabilize around -4% in 2016 as shown in Figure 4. Figure 5 shows the government revenue, government expenditure, and government debt as a percentage of GDP with a fall trending for all three variables for the period of 2004-2008.The government revenue and government expenditure still fall to stabilize around 10% and 15%, respectively, from 2009 to 2016. The government debt starts to rise in 2012.

4. Method and Data

4.1 Data Sources

The data source is from the World Development Indicators from the World Bank covering the years 1996-2016, inclusive. The variable of total factor productivity index is from the Penn World tables. Table 1a summarizes the economic variables used in this study. As for the variables related to the indicators of governance and institutional quality, these data are obtained from the World Governance Indicators which are summarized in Table 1b.

Table 1a: Economic Variables Used in the Study

Variable	Description	Unit
Real GDP	Using national-accounts growth rates, for studies comparing (output-based) growth rates across countries	Constant US Dollars
Inflation	Measured by the consumer price index (CPI) that reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services. The Laspeyres index is generally used.	Percent
Gross Domestic Savings (GDS)	Calculated as GDP less final consumption expenditure (total consumption).	Percent of GDP
Gross Domestic Savings, current dollars (GDS$)	Calculated as GDP less final consumption expenditure (total consumption). Data are in current U.S. dollars.	Current US dollars
Gross Fixed Capital Formation (Capital)	Includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential	Current US Dollars

	dwellings, and commercial and industrial buildings. Data are in current U.S. dollars.	
GDP per Capita	The GDP divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources	Current US dollars
Trade	The sum of exports and imports of goods and services measured as a share of gross domestic product (GDP).	Percent of GDP
Total Factor Productivity (TFP)	Measured total factor productivity (TFP) series for each country relative to the U.S. (TFP level at current purchasing power parity (PPPs))	Current PPPs

Table 1b: Indicators of Governance and Institutional Quality from the World Governance Indicators[1]

Variable Name (Variable in Paper)	Description	Unit
A Process in which Governments are Selected Monitored, and Replaced		
Political Stability (Political)	This measure shows perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.	Percentile rank term, ranging from 0 (lowest rank) to 100 (highest rank).
Voice and Accountability (Voice)	This measure captures perceptions, which the citizens in a country can participate in selecting their government as freedom of expression, the press.	Percentile rank term, ranging from 0 (lowest rank) to 100 (highest rank).
The Ability of Government to Formulate and Implement Sound Policies		
Government Effectiveness (Government)	This variable measures the perceptions of the quality of public services, the quality of the civil service, the quality of policy formulation, and the credibility of the government's commitment to implement these policies.	Percentile rank term, ranging from 0 (lowest rank) to 100 (highest rank).
Regulatory Quality (Regulatory)	This variable captures perceptions of the ability of the government to formulate and implement the appropriate regulations that promote the development of the private sector.	Percentile rank term, ranging from 0 (lowest rank) to 100 (highest rank).
Variables Respecting Citizens and the State for the Institutions that Govern Economic and Social Interactions		
Rule of Law (Law)	This variable shows the perceptions in which people have confidence in and abide by the	Percentile rank term, ranging from 0 (lowest

	rules of society, e.g., contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	rank) to 100 (highest rank).
Control of Corruption (Corruption)	This variable measures the perceptions which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	Percentile rank term, ranging from 0 (lowest rank) to 100 (highest rank).

Source: [1]http://info.worldbank.org/governance/WGI/#doc.

4.2 Method

Economic growth entails a dynamic process rather than the static panel data model. Ignoring the dynamics in a model is an omitted variables problem, and careful attention needs to be made to the number of lags to include. Before estimating the dynamic panel model, panel unit root tests of Levin, Linm Chu (2002) (hereafter, LLC) test and Im, Pesaran, and Shin (1997) (hereafter, IPS) are applied to test if unit roots in these panel data sets are present. After the panel unit root tests are applied, Kao's (1999), Pedroni's (1999), and Westerlund's (2007) panel cointegration test are used to examine the cointegrating relationships that may exist. Then, the estimation of the dynamic panel regression model would commence.

4.2.1 Panel Unit Root Tests

The LLC assumes that each individual unit in the panel shares the same AR (1) coefficient but allows for individual effects, time effects, and perhaps a time trend. Lags of the dependent variable may be introduced to allow for serial correlation in the errors. The LLC would be considered a pooled Dickey-Fuller test, or an Augmented Dickey-Fuller (ADF) test if lags are included, with the null hypothesis of nonstationarity. After transformation via the LLC, the t-statistic is distributed as a standard normal under nonstationarity, the null hypothesis.

Im, Pesaran, and Shin (1997) propose an alternative testing procedure which uses a standardized t-test statistic based on the augmented Dickey-Fuller (ADF) test statistics averaged across the panels. The t statistic is then formed by an average of the individual ADF statistics, it gained by running ADF regressions on each individual time series. Stated differently, IPS is viewed as a way of combining the evidence of several independent unit root tests of the variables.

4.2.2 Panel Tests of Cointegration

After the determination unit roots, we tested for cointegration to determine if there is a long-run relationship in the econometric specification. Pedroni (1999, 2004) developed a test for no cointegration in dynamic panel allowing for heterogeneity among the individual regions is adopted. In line with the two-step strategy proposed by Engle and Granger (1987), Pedroni extends the approach to panels and uses the augmented Dickey-Fuller and Phillips-Perron principles. As for the Kao panel cointegration test, this test follows the same basic approach as implemented by Pedroni and is also in line with the approach by Engle and Granger (1987); however, it specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. The

final panel cointegration test to be used will be Westerlund (2007). In the approach by Westerlund (2007), the Error-Correction Model is applied in which all variables are assumed to be I(1). Then this test examines whether cointegration is present or not by determining whether error-correction is present for individual panel members and for the panel.

4.2.3 Dynamic Panel Regression

A lagged GDP as an explanatory variable in a panel regression would cause the fixed effects (FE) and the random effects (RE) estimators to be biased. As a remedy for the biased FE and RE, the first difference can be applied to the panel data as well as the use of the instrumental variables (IV). If a lagged dependent variable is used in a static panel data, there is a correlation between the error term, ε_{it}, and the lag of GDP. That is, additional lags would need to be used that do not pose a problem in the use of a first difference model (FD). Arellano and Bond (1991) start by transforming all regressors, usually by differencing to remove the fixed effects, and use the generalized method of moments (GMM) as developed by (Hansen, 1982). The contribution of Arellano and Bond (1991) is that it is a test for autocorrelation which is appropriate for linear GMM regressions on panels, which is especially important when lags are used as instruments. The Arellano–Bover and Blundell–Bond estimator as introduced by Arellano and Bover (1995) and Blundell and Bond (1998), respectively, augments the Arellano–Bond estimator by making an additional assumption that the first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments that can dramatically improve efficiency. More specifically, it builds a system of two equations—the original equation and the transformed one—and is known as system GMM. The general specification for dynamic panel data is

$$GDP_{it} = \beta' x_{it} + \theta \gamma_{i,t-1} + \varepsilon_{i,t} + u_i \qquad (1)$$

where GDP_{it} is the dependent variable observed for individual i at time t, x_{it} is the time-variant 1xk regressor matrix, θ is the matrix of the first differences, $\varepsilon_{i,t}$ is the unobserved time-invariant individual effect and u_i is the error term. OLS cannot be used to estimate (1) because it is not consistent.

A typical complication of panel data would be the presence of heteroscedasticity and autocorrelation. Given the dynamics of the panel regression, the presence of autocorrelation cannot be ignored. As the sample size grows, the probability of cross correlations (contemporaneous and time varying) also grows.[2]

[2] The old view to address this problem is to apply the FGLS (feasible generalized least squares), but the application of FGLS underestimated the standard errors (Beck & Katz, 2001). Beck and Katz (2009) also ran the panel using OLS with a lagged y variable and a fixed effects (FE). It was a good approach, but they never compared their results with the GMM suggested by Arellano and Bond.

5. Empirical Results

We checked stationarity of data through panel unit root tests. Table 2 presents the results from these panel unit root tests for the LLC and IPS as discussed in the preceding section.

Table 2: Results from the Panel Unit Root Tests

Variables log (levels)	Included In Regression	Test Statistic	p-value	Lags	Conclusion
RGDP	**Levin, Lin and Chu[1]**				
	Intercept	0.4683	0.6802	1	Unit Root
	Intercept and Trend	-4.0972	0.0000	1	Stationary
	Im, Pesaran and Shin W-stat				
	Intercept	5.121	.9999	0	Unit Root
	Intercept and Trend	0.0244	0.5097	1	Unit Root
Inflation	**Levin, Lin and Chu**				
	Intercept	-4.0609	0.0000	1	Stationary
	Intercept and Trend	-3.3320	0.0004	1	Stationary
	Im, Pesaran and Shin W-stat				
	Intercept	-4.4222	0.0000	1	Stationary
	Intercept and Trend	-2.9123	0.0018	1	Stationary
GDS	**Levin, Lin and Chu**				
	Intercept	-5.5406	0.0000	0	Stationary
	Intercept and Trend	-3.0526	0.0011	1	Stationary
	Im, Pesaran and Shin W-stat				
	Intercept	-5.5772	0.0000	0	Stationary
	Intercept and Trend	-6.3552	0.0000	0	Stationary
GDS$	**Levin, Lin and Chu**				
	Intercept	-0.0658	0.4738	2	Unit Root
	Intercept and Trend	0.2063	0.5871	2	Unit Root
	Im, Pesaran and Shin W-stat				
	Intercept	3.1438	0.9991	1	Unit Root

	Intercept and Trend	0.4087	0.6586	1	Unit Root
Capital	**Levin, Lin and Chu**				
	Intercept	0.1798	0.5731	1	Unit Root
	Intercept and Trend	-1.5622	0.0591	1	Unit Root
	Im, Pesaran and Shin W-stat				
	Intercept	2.3613	.9909	1	Unit Root
	Intercept and Trend	-0.3548	0.3614	1	Unit Root
Trade	**Levin, Lin and Chu**				
	Intercept	-0.0021	0.4992	2	Unit Root
	Intercept and Trend	1.0160	0.8452	1	Unit Root
	Im, Pesaran and Shin W-stat				
	Intercept	1.4844	0.9321	1	Unit Root
	Intercept and Trend	2.3358	0.9902	1	Unit Root
TFP	**Levin, Lin and Chu**				
	Intercept	-1.5124	0.0652	2	Unit Root
	Intercept and Trend	-1.8889	0.0295	2	Stationary
	Im, Pesaran and Shin W-stat				
	Intercept	0.5060	0.6934	2	Unit Root
	Intercept and Trend	0.7745	0.7807	2	Unit Root

[1]For the Levin, Lin, and Chu, there are two test statistics reported: The Unadjusted t and the biased Adjusted t statistics. The Unadjusted t is a conventional t statistic for testing H_0: $\varphi = 0$. When the model does not include panel-specific means or trends, this test statistic has a standard normal limiting distribution and its p-value is shown in the output; the unadjusted statistic, t_δ, diverges to negative infinity if trends or panel-specific constants are included. The adjusted biased t statistic along with its p value is reported here.
[2]The results were generated using STATA 15. From these results, these tests failed to reject the null of a unit root at ($p<.05$).

5.1 Tests of Cointegration

For cointegration, we applied the Kao test, the Pedroni test, and the Westerlund test. Initially, we conducted the Kao test. We, then, applied the Pedroni and the Westerlund tests of cointegration as a robustness check to the Kao tests in order to determine if our results are sensitive to assumption of cross-sectional dependence. Recall that the Pedroni test is residual-based but assumes cross-sectional dependence. On the other hand, Westerlund addressed cross-sectional dependence through bootstrapping which is an ad-hoc way and not a complete solution to take care of cross-sectional dependence. Table 3 summarizes the results from these cointegration tests.

Table 3: Results from the Cointegration Tests

	Test Statistic	p-value
Kao Test for Cointegration		
Modified Dickey-Fuller test	-5.7016	0.0000
Dickey-Fuller test	-5.1614	0.0000
Augmented Dickey-Fuller test	-2.1213	0.0169
Unadjusted modified Dickey-Fuller test	-4.8566	0.0000
Unadjusted Dickey-Fuller test	-4.951	0.0000
Pedroni Test for Cointegration		
Modified variance ratio	-5.4788	0.0000
Modified Phillips-Perron test	4.5728	0.0000
Phillips-Perron test	-2.367	0.0090
Augmented Dickey-Fuller test	-2.2256	0.0130
Westerlund Test for Cointegration		
Variance ratio	2.0298	0.0212

Note: The number of cross sections used in the estimation of these cointegration tests is 15. Also, the number of time periods is 19 for the Kao Test, 20 for the Pedroni Test, and 21 for the Westerlund Test. These estimates were generated via STATA 15.

Table of the 3 Kao Test of Cointegration presented the results for the entire panel. The null hypothesis of no cointegration is rejected. This is true for the five tests statistics reported in Table 3 and provided strong evidence that all panels in the data are cointegrated. We wanted to check for the robustness of the results from the Kao test, so we estimated cointegration using the Pedroni test of cointegration. The Kao and Pedroni tests of cointegration work differently but allow us to come to the same conclusion that the panels are cointegrated. Finally, we also applied the Westerlund test which uses another approach and one that imposes fewer restrictions. It tests the same null hypothesis, but the alternative hypothesis is different, namely that some of the panels are cointegrated. The results from the Westerlund test also rejected the null hypothesis of cointegration.

5.2 Estimation of the Dynamic Panel Regression

Table 4 shows the results from the dynamic panel data model using the Arellano-Bond estimator with a first difference transformation as the instrumental variable (IV).

Table 4: Results from the Arellano-Bond Estimator

Variable	Model 1	Model 2	Model 3
$RGDP_{t-1}$	0.9097* (0.0341)	0.9071* (.0346)	0.9290* (0.0406)
Inflation	-0.0087 (0.0066)	-0.0081 (0.0063)	
GDS	-0.01309 (0.0091)		
GDS$	0.0015 (0.0035)	0.0041 (0.0034)	
Capital	0.0011 (0.0019)	0.0008 (0.0026)	0.0006 (0.0011)
Per Capita GDP	0.0150 (0.0149)		
Trade	0.0043 (0.0728)	0.0109 (0.0739)	
Political	-0.0128 (0.0089)	-0.0133 (0.0092)	-0.0144 (0.0099)
Government Efficiency	0.0044 (0.0052)	0.0042 (0.0045)	0.0050 (0.0039)
Regulatory	0.0035 (0.0075)	0.0013 (0.0068)	-0.0007 (0.0067)
Law	-0.0136* (0.0037)	-0.0138* (0.0038)	-0.0135* (0.0042)
Corruption	-0.0062 (0.0044)	-0.0069* (0.0029)	-0.0060 (0.0038)
Voice	0.0034 (0.0081)	0.0553 (0.0091)	0.0008 (0.0091)
TFP	0.7273* (0.2747	0.7655* (0.2877)	0.7408* (0.2993)
Intercept	1.4507 (0.6400)	1.4555* (0.6595)	1.1245 (0.6956)

Results in parentheses are the robust standard errors, and a * indicates statistical significance at 5 percent)

Table 4 presented several different variations of this model. Model 1 showed that the one-year period lagged GDP is positively related to the contemporaneous GDP which suggested some inertia response of GDP to its lag. Consequently, the economic growth of the preceding year could significantly and systematically impact the economic growth of the subsequent year. The coefficient of 0.91 implied that a one percent increase in the preceding year GDP would lead to a 0.91 per cent increase in GDP in the subsequent year. For the variable, Gross Domestic Savings

(GDS$), which has a negative sign, indicated that there is a high level of poverty within the ECOWAS countries that culminated in low aggregate savings. In addition, the inflation variable has a negative sign but is not statistically significant, which probably indicated the tendency for inflation to nominally decrease the value of GDP. For the capital variable, this variable depicted the amount of physical capital accumulated because capital would be a driver to improve national wealth of a nation. The coefficient has a positive sign and is not significant at the 5 percent level. The magnitude of the coefficient is quite small and suggested that a one percent increase in capital would lead to a small increase in GDP. The law variable represents one of the institutional variables that affected economic growth. The sign for this variable is negative and is statistically significant at 5 percent, which indicated that as law and order diminishes, then this economic growth is hindered. Total factor productivity (TFP) was also added to the model since the literature often reveals that TFP serves as an impetus to economic growth (Grosskopf and Self, 2006). The TFP has a positive sign and a large magnitude which suggested that a one percent increase in productivity would lead to large increase in GDP. The key for the instrument set in Arellano–Bond to work is that the differenced unobserved time-invariant component should be unrelated to the second lag of the dependent variable and any lags beyond two. If the latter condition is not met, then we have a problem of endogeneity. Table 5 summarized this test of serial correlation under the null hypothesis of no autocorrelation.

Table 5: Test of Serial Correlation

Order	Test Statistic	p value
1	-2.3052	0.0212
2	0.01074	0.9914

Note: This test of serial correlation was estimated via STATA 15.

Based on the results in Table 5, we rejected the null hypothesis no autocorrelation of order 1 and cannot reject no autocorrelation of order 2. Consequently, there is evidence that the Arellano–Bond model assumptions are satisfied. If the order 2 led to the rejection of the null hypothesis, a different dynamic panel regression must be estimated.

In Table 4, model 2 estimated the model without the variables capital/GDP and GDS because these variables were embedded into other variables in the model. The omission of these variables yielded similar results as model one except for the variable corruption being statistically significant. As the level of corruptions is decreased, this enables the government to function effectively and allows for economic growth to occur. The coefficient of -0.0069 implied that a one percent decrease in the corruption would lead to 0.0069 per cent increase in GDP. As concluded in model 1, Arellano-Bond AR tests also indicate that there are no problems relating to serial correlation. That is, we rejected the null hypothesis no autocorrelation of order 1 and cannot reject no autocorrelation of order 2. Model 2 did adhere to the assumptions of the Arellano–Bond model.

Model 3 as presented in Table 4 removed inflation, GDS, and trade. As indicated in Table 4, the variables that were significant in the preceding models are still significant in model 3 except for the corruption variable. Also, we the rejected the null hypothesis no autocorrelation of order 1 and cannot reject no autocorrelation of order 2 which means that model 3 does adhere to the assumptions of the Arellano–Bond model.

The results from Table 4 used the Arellano-Bond estimator in which the GMM on the differenced model is using a full set of valid lags as instruments. As an improvement of the Arellano-Bond estimator, the Arellano-Bover/Blundell-Bond estimator was developed. The Arellano–Bover-Blundell–Bond estimator made an additional assumption that the first differences of IV are uncorrelated with the fixed effects (FE). Consequently, this approach allowed for the use of more instruments which could lead to improved efficiency. As part of this estimator, it created two equations: the original equation and the transformed equation. This system of equations is known as a system GMM. Table 6 provides the results.

Table 6: Results from Arellano-Bover/Blundell-Bond Estimator

Variable	Model 1	Model 2
$RGDP_{t-1}$	0.984* (0. 0113)	0.985* (0.011354
Inflation	-0. 008* (0. 003)	-0.007* (0.003)
GDS	-0. 0064 (0.008)	
GDS$	-0.008* (0.0036)	-0.0071* (0.0026)
Capital	-0.0016 (0.002)	-0.0039 (0.0026)
Per Capita GDP	0.040* (0.011)	0.0387* (0.0113)
Trade	-0.0289 (0.027)	
Political	0.0086 (0.0081)	0.0084 (0.008)
Government Efficiency	0.0085 (0.007)	0.0082 (0.0078)
Regulatory	0.0138* (0.0052)	0.0129 (0.0071)
Law	-0.0144* (0.0052)	--0.0119* (0.0080)
Corruption	0.0054 (0.0061)	0.0054 (0.0061)
Voice	0.0074 (0.0074)	0.0065 (0.0073
TFP	0.6230* (0.1553)	0.6249* (0.1541)
Intercept	0.3836* (0.2066)	0.2844 (0.1859)

Results in parentheses are the robust standard errors and a * indicates statistical significance at 5 percent)

Table 6 presented several different variations of the use of the Arellano-Bover/Blundell-Bond estimator. Model 1 showed that the one-year period lagged GDP is positively related to the contemporaneous GDP suggesting some inertia response of GDP to its lag. Consequently, the economic growth of the preceding year could significantly and systematically impact the economic growth of the subsequent year. The coefficient of 0.98 implied that a one percent increase in the preceding year GDP would lead to 0.98 percent increase in GDP in the subsequent year. The variable of Gross Domestic Savings (GDS$), which has a negative sign, indicated that there is a high level of poverty within the ECOWAS countries that culminated in low aggregate savings. In addition, the inflation variable has a negative sign but is not statistically significant which probably indicates the tendency for inflation to nominally decrease the value of GDP. For the capital variable, this variable depicted the amount of physical capital accumulated because capital would be a driver to improve national wealth of a nation. The coefficient has a negative sign, which was not expected. In addition, it is not significant at the 5 percent level. The magnitude of the coefficient is quite small and suggests that a one percent decrease in capital leads to a small decrease in GDP. The law variable represents one of the institutional variables that affects economic growth. This sign for this variable is negative and statistically significant at 5 percent which indicates that as law and order diminishes, then economic growth is hindered. In addition, the regulatory variable shows a positive sign, which indicates that increasing the regulatory requirements will increase economic growth. However, the magnitude of the coefficient is small, so the effects of the regulations on economic growth would be small. The TFP has a positive sign and a large magnitude, and this suggested that a one percent increase in productivity would lead to large increase in economic growth.

Table 6, model 2 estimated the model without the variables GDS and trade because these variables were embedded into other variables in the model. The omission of these variables yielded similar results as model one except regulatory is no longer statistically significant as in model 1. As with model 1, model 2 showed that the one-year period lagged GDP is positively related to the contemporaneous GDP which suggests some inertia response of GDP to its lag. Consequently, the economic growth of the preceding year could significantly and systematically impact the economic growth of the subsequent year. As for law, it remains statistically significant. The coefficient of -0.0011 implied that a one percent decrease in the application of law would lead to a 0.0011 percent increase in GDP. As with model 1, the TFP has a positive sign and a large magnitude, and this suggested that a one percent increase in productivity would lead to large increase in economic growth.

6. Conclusion and Policy Implications

In this paper, we have combined cross-sectional and time series data to examine the relationship between the economic growth and institutional/quality of governance variables in ECOWAS countries via a dynamic panel regression. The use of cross-sectional data leaves opens the question of spurious correlation arising from non-stationarity and does not permit an examination of the direction of causality. On the other hand, the exclusive use of the time series model may yield unreliable results due to short time spans of typical data sets. In the first part of the analysis, we used panel unit root tests and panel cointegration analysis to conclude that there is fairly strong

evidence in favor of the hypothesis that long-run causality runs from the economic variables and institutional and quality of governance variables. Once the latter was confirmed, we estimated the models via the Arellano and Bond estimator and the Arellano-Bover/Blundell-Bond estimator. A policy implication which may be drawn from this study is that ECOWAS countries can improve their economic growth performance not only by investing in the traditional sources of growth, e.g., investments in physical and human capital, trade and FDI (i.e., Foreign Direct Investment) but also by improving their governance performance. More importantly, ECOWAS countries should build more schools and hire more teachers in rural areas. They should also use less rules and regulations to attract more foreigners to conduct business in West Africa. This will boost more FDI and promote more intra and inter trade within and outside the region. In addition, eliminating the taxes on imports and exports (i.e., import/export-oriented policy) will promote free trade and hence economic growth in West Africa.

Another policy implication is to improve the quality of the institutions in the ECOWAS countries by substantially reducing corruption and misuses of public funds. We believe that a 'true' democracy with balance of power among the executive, the legislative and the judiciary, 'free' elections, and alternance in power (e.g., two term limits) will promote the rule of law and better governance performance in the ECOWAS countries. Consequently, this can enhance economic growth through a very stable political regime with less conflicts and civil wars while encouraging more domestic savings and FDI.

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Appendix

Table 1: Sub-Saharan Africa (SSA) Forecast Summary (Annual percent change unless indicated otherwise)

	Est. Forecast						
	00-09[a]	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
GDP at market prices[b]	4.3	5.0	4.5	4.6	4.9	5.1	5.2
	(sub-region totals—countries with full NIA + BOP data)[c]						
Net exports, contribution to growth	-0.3	1.3	-2.9	-0.9	-0.4	0.0	0.4
Current account bal/GDP (%)	0.1	-1.2	-1.2	-2.9	-3.1	-3.3	-3.0
GDP deflator (median, LCU)	6.7	6.1	8.0	4.1	6.7	5.9	6.0
Fiscal balance/GDP (%)	-0.4	-3.9	-1.0	-2.8	-2.4	-2.1	-1.7
Memo items: GDP							
SSA excluding South Africa	4.9	6.2	5.3	5.8	6.1	6.0	6.1
Oil exporters[e]	5.5	6.1	4.9	6.0	6.2	6.0	6.2
CFA countries[f]	3.8	4.5	2.7	5.2	5.2	4.7	4.3
South Africa	3.2	2.9	3.1	2.4	2.7	3.2	3.3
Nigeria	5.6	7.8	6.7	6.5	6.6	6.4	6.3
Angola	10.7	3.4	3.4	8.1	7.2	7.5	7.8

a. Growth rates over intervals are compound weighted averages; average growth contributions, ratios and deflators are calculated as simple averages of the annual weighted averages for the region.

b. GDP at market prices and expenditure components are measured in constant U.S. dollars.

c. Oil Exporters: Angola, Cote d'Ivoire, Cameroon, Congo, Rep., Gabon, Nigeria, Sudan, Chad, Congo, Dem. Rep.

d. CFA Countries: Benin, Burkina Faso, Central African Republic, Cote d'Ivoire, Cameroon, Congo, Rep., Gabon, Equatorial Guinea, Niger, Senegal, Chad, Togo.

Source: World Bank.

TABLE 2: ECOWAS Countries Forecasts – GDP at Market Prices (2005 $)
(Annual percent change unless indicated otherwise)

	'00-09	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**
Benin	3.7	3.0	3.1	3.5	3.8	4.5	5.0
Burkina Faso	5.2	7.9	4.2	6.4	6.7	7.0	6.3
Cape Verde	5.5	5.2	5.0	4.8	4.9	5.0	5.1
Cote d'Ivoire	0.8	2.4	-4.7	8.2	7.0	6.0	5.5
The Gambia	3.8	6.1	-4.3	3.9	10.7	5.5	5.8
Ghana	5.0	8.0	14.4	7.5	7.8	7.4	7.5
Guinea	2.6	1.9	3.9	4.8	5.0	6.0	6.5
Guinea-Bissau	0.9	3.5	5.3	-2.8	3.0	4.6	5.1
Mali	5.1	5.8	2.7	-1.5	3.5	5.9	6.0
Mauritania	4.5	5.2	3.9	4.8	5.2	4.9	4.9
Niger	3.7	8.0	2.3	12.0	6.8	6.1	5.0
Nigeria	5.6	7.8	6.7	6.5	6.6	6.4	6.3
Senegal	3.6	4.1	2.6	3.7	4.8	4.8	5.0
Sierra Leone	9.0	4.9	6.0	25.0	11.1	7.6	7.6
Togo	1.7	3.7	3.9	4.0	4.4	4.6	4.6

Source: World Bank

Table 3: ECOWAS Countries Forecasts – Current Account Balance/GDP (%)
(Annual percent change unless indicated otherwise)

	'00-09	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**
Benin	-8.4	-9.4	-9.8	-9.8	-9.0	-7.6	-6.4
Burkina Faso	-13.1	-7.0	-0.7	-8.9	-8.3	-7.7	-7.1
Cape Verde	-11.3	-12.8	-11.1	-9.9	-8.3	-6.4	-6.4
Cote d'Ivoire	1.9	2.0	0.3	-3.7	-3.9	-4.5	-4.7
The Gambia	-3.5	2.0	-16.8	-17.9	-17.1	-15.0	-13.2
Ghana	-6.5	-7.5	-9.9	-11.8	-9.7	-9.7	-8.1
Guinea	-7.1	-7.0	-23.8	-39.6	-46.7	-52.5	-53.9
Guinea-Bissau	-14.9	-23.8	-7.2	-6.5	-6.5	-6.7	-6.6
Mali	-8.1	-12.6	-4.9	-5.1	-4.8	-7.6	-7.2
Mauritania	-11.2	-2.9	2.9	-18.4	-15.4	-15.3	-13.2
Niger	-9.7	-32.5	-21.6	-22.6	-18.9	-18.6	-19.1
Nigeria	14.4	6.8	3.6	3.5	2.0	1.2	0.4
Senegal	-8.0	-4.7	-6.9	-8.6	-8.2	-7.8	-7.5
Sierra Leone	-14.1	-34.2	-55.4	-15.6	-8.8	-7.5	-6.3
Togo	-9.2	-6.3	-6.5	-8.9	-8.7	-8.8	-9.3

Source: World Bank

Table 4: Sub-Saharan Africa: Member Countries of Regional Groupings						
The West African Economic Monetary Union (WAEMU)	Economic and Monetary Community of Central African States (CEMAC)	Common Market for Eastern and Southern Africa (COMESA)	East Africa Community (EAC-5)	Southern African Development Community (SADC)	Southern Africa Customs Union (SACU)	Economic Community of West African States (ECOWAS)
Benin	Cameroon	Burundi	Burundi	Angola	Botswana	Benin
Burkina Faso	Central African Republic	Comoros	Kenya	Botswana	Lesotho	Burkina Faso
Côte d'Ivoire	Chad	Dem. Rep. of Congo	Rwanda	Dem. Rep. of Congo	Namibia	Cabo Verde
Guinea-Bissau	Rep. of Congo	Eritrea	Tanzania	Lesotho	South Africa	Côte d'Ivoire
Mali	Equatorial Guinea	Ethiopia	Uganda	Madagascar	Swaziland	Gambia
Niger	Gabon	Kenya		Malawi		Ghana
Senegal		Madagascar		Mauritius		Guinea
Togo		Malawi		Mozambique		Guinea-Bissau
		Mauritius		Namibia		Liberia
		Rwanda		Seychelles		Mali
		Seychelles		South Africa		Niger
		Swaziland		Swaziland		Nigeria
		Uganda		Tanzania		Senegal
		Zambia		Zambia		Sierra Leone
		Zimbabwe		Zimbabwe		Togo