Faculty of Natural and Applied Sciences Journal of Mathematical and Statistical Computing Print ISSN: 3026-8605, e-ISSN 3043-632X www.fnasjournals.com Volume 2; Issue 2; March 2025; Page No. 81-90.



# Structural Reforms and Economic Growth in Africa: A Statistical Approach

\*Inamete, E.N.H., Yakubu, H., & Dappa, J. A.

Department of Mathematics and Statistics, Federal Polytechnic of Oil and Gas, Bonny, Rivers State, Nigeria

#### \*Corresponding author email: ememinamete82@gmail.com

#### Abstract

This research examined the relationship between Structural Reforms and Economic Growth in Africa between 1990 and 2022. Secondary data acquired from World Bank National Accounts data, and OECD National Accounts data files were used. The data was analyzed using multiple regression models. MINITAB 16 and Microsoft Excel 2019 were used for all computations. To find the significant parameters and test for model equality, the Durbin method of estimating multiple regression model was used; this revealed that all of the models' parameter estimates were not significant at 5%, which appears to be skewed. Model (SA), the South Africa Model, was found to be the "best" fit model among the five regression models, with the highest R and R<sup>2</sup> values (R= 0.906; R<sup>2</sup> = 82.2%), the smallest AIC value of 17.10, and the highest F-value of 32.266 calculated. Hence, model (SA) of estimation is the best, as it has the most impact on Africa's total GDP. Based on the findings, we recommend that the federal governments should develop and maintain essential infrastructure; including roads, ports, energy, and telecommunications, as this will not only facilitate trade and reduce the cost of doing business but also, will attract foreign investments.

Keywords: Structural Reforms, Economic Growth, Statistical Approach, Africa, Regression model

#### Introduction

Reform consists of changes and improvements to a law, social system, or institution. Structural reforms are essentially measures that change the fabric of an economy, the institutional and regulatory framework in which businesses and people operate. They are designed to ensure the economy is fit and better able to realize its growth potential in a balanced way. Economic growth is an increase in the production of economic goods and services in one period of time compared with a previous period. Economic activities of any nation in the globe are directly or indirectly influenced by their surrounding location through changes in resources; labour, knowledge and information, inter-regional trade, and flow of capital (Hazrana et al., 2019). These changes affect not only sectoral performance like federal direct investment, inflation and manufacturing but also economic growth. Changes in resources, all things being equal, usually determined by the movement of labour from primary sector to non-primary sector (i.e federal direct investment, inflation and manufacturing sectors) is referred to structural change. Structural reform which is the reallocation of economic activities from traditional sector (agricultural sector) to modern sector (both federal direct investment, inflation and manufacturing) especially as it affects economic growth has become a major concern (Dabús & Delbianco, 2021). Institutions and better-functioning domestic product markets are a key structural determinant of growth. Perception of the quality of government services and policies significantly affects economic growth, mainly through the capital and productivity channels, probably through their impact on investment decisions and reduction of operating costs. Lower taxes and higher regulatory quality contribute to higher growth. The effect of such structural reforms would be transmitted through all three input channels, hence spurring the use of labor and capital and thus promoting productivity. Better educational attainments, which contribute to higher quality of human capital, are associated with both higher employment and productivity, hence higher economic growth. The results show that an increase in the level of educational attainments affects both the use of labor and the efficiency channel, and the result is robust across alternative model specifications. Growth is positively affected by how well-developed a country's financial systems are and by its innovation capability. The higher the share of domestic credits to the private sector as a percent of GDP, the deeper and more efficient its use of capital. Availability of the latest technologies improves the use of both labor and capital inputs. Changes in labor market regulation may have ambiguous effects. A reduction of the extent to which working time conditions are regulated seems to increase overall productivity, hence spurring growth. The result is weak for the other two

81 Cite this article as:

Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. FNAS Journal of Mathematical and Statistical Computing, 2(2), 81-90.

input channels, most importantly for labor. The weakness of the result may however reflect also the inability of the model and/or indicators to properly capture the impact of labor market reforms.

Trade liberalization does not have a straightforward relationship with growth. Once institutions are controlled for, the net effect of greater trade openness, proxied by a decrease in tariffs, customs border procedures, or other nontariff trade barriers, depends on the relative strength of the impact that different degrees of protection have on both capital accumulation and productivity. Other factors, including infrastructure and use of information and communications technology (ICT), also matter for growth. For example, the higher the number of Internet users, the higher the growth, although the effect is relatively small. The results are stronger when the sample is enlarged. Pro-competition reforms may have less impact on real GDP growth if they occur during economic slowdowns. In assessing the impact of structural reforms, the potential endogeneity to the economic environment should be considered. This makes it possible to disentangle the effects of a reform carried out on the verge of a cyclical economic upswing (downswing) from those of the upswing (downswing) itself. The issue is important because often implementation gaps, perhaps because of bad timing, make structural changes less effective. Based on the approach by Bordon et al. (2016), the effect of better regulation may be reduced if the reform occurs during an economic slowdown. De Vries et al. (2015) pointed out that as labor and other resources move to modern economic activities, total productivity increases as well as income. It has been observed that economic growth largely depends on the rate at which resources particularly labor can move from the traditional to modern sector. This is because; most of the world economies are largely characterized by structural dualism. Mcmillan et al. (2017) equally explain that an economy grows when labor and other resources move from less productive to more productive activities. As such, structural change removes constraints from productivity growth. In addition, shift in the sectoral component in respect to whether in employment or value added (output) share in an economy are usually regarded as structural change which on the other hand, are the essential conditions for economic growth (Ahson et al., 2017). It is against this background, that this study seeks to investigate the impact of the structural reforms and economic growth in Africa. This study differs from the empirical evidences for the fact that it examines the dynamic relationship between structural reforms and economic growth in Africa using the federal direct investment, inflation, labour and manufacturing as a proxy for structural reform, while GDP of five selected African countries such as (Nigeria, Ghana, Kenya, Egypt and South Africa) were used as proxy for economic growth. This study thus, can be viewed as additional evidence examining the alternative nature of relationship between structural reform and economic growth in Africa.

#### **Statement of the Problem**

The issue of structural reforms and their impact on economic growth is a critical concern for policymakers, economists, and governments worldwide. The problem at hand revolves around the need to understand and quantify the relationship between structural reforms and economic growth through a statistical approach. Despite the theoretical consensus that structural reforms, such as labor market liberalization, deregulation, and fiscal consolidation, can stimulate economic growth, empirical evidence remains inconclusive and often contradictory. This inconsistency poses a significant challenge for policymakers aiming to design effective reform agendas that promote sustained economic growth. A further aspect of the problem is the variation in the effectiveness of structural reforms across different countries and contexts. Structural reforms that work well in one nation may not yield the same results in another due to variations in economic, political, and institutional factors. This necessitates the development of a nuanced statistical framework that accounts for the heterogeneity among countries and offers more precise insights into the impact of specific reforms on economic growth. Such an approach would enable policymakers to tailor their reform strategies to their nation's unique circumstances and increase the likelihood of success. Moreover, the problem extends to the temporal dimension, as the lag between implementing structural reforms and observing their impact on economic growth can be quite extensive. This makes it challenging to evaluate the long-term consequences of these reforms accurately. Consequently, understanding the dynamics and timing of structural reforms and their influence on economic growth is a pressing issue that demands a comprehensive statistical approach. Addressing these concerns will contribute to more informed policy decisions and ultimately foster sustainable economic growth in a global context.

# Aim and Objectives of the Study

The aim of this study is to determine the relationship between structural reforms and economic growth in Africa using the available data from the year 1990 to 2022. The objectives of the study are to:

1. Compute the model formula and estimation of the model parameters ( $\beta_0$ ,  $\beta_1$ ,  $\beta_2$  and  $\beta_3$ ) of the models.

82 *Cite this article as*:

Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. *FNAS Journal of Mathematical and Statistical Computing*, 2(2), 81-90.

2. Obtain the residuals sum of square (RSS), mean sum of square (MSS), R-square value ( $R^2$ ), adjusted R-square value (Adj.  $R^2$ ), AIC and BIC of the models.

3. Test for the best fitted model and Check for significant variables (i.e. compare the result of the different regression models used).

4. Identify the country with the highest influence of the structural reforms on their economic growth.

#### **Materials and Methods**

This study was limited to the average yearly structural reforms and economic growth in Africa covering the period 1990 to 2022. The data was collected from World Bank National Accounts data, and OECD National Accounts data files for five different African countries such as Nigeria, Ghana, Kenya, Egypt and South Africa (see appendix). The parameters that make up the models are obtained using the following programs, including MINITAB 17 and Microsoft Excel 2019. The researcher used Microsoft Excel 2019 and MINITAB 17 to help with data analysis.

# Method of Data Analysis Model Specification

Suppose we have regression models of the form;

$$y = f(x)$$

$$y = \beta_0 + \beta_1 x + \varepsilon_i = (x'x)^{-1} x'y$$
(1)

Equation (3.1) is a simple linear regression model and

$$y = f(x_1, x_2, x_3, x_4)$$
  

$$y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_k x_k + \varepsilon_i$$
  

$$= (x'x)^{-1} x'y$$
(2)

where,

 $y_i = \text{Response}$  (Nigerian GDP)

 $x_i = k^{th}$  predictor (some series expenditures) or independent variables

 $\beta_k = k^{th}$  population regression coefficient

Then, X<sub>i</sub> is the matrix of the explanatory variables and is of the form:

$$X = \begin{bmatrix} 1 & x_{11} & x_{12} & x_{13} & \dots & x_{1k} \\ 1 & x_{21} & x_{22} & x_{23} & \dots & x_{2k} \\ 1 & x_{31} & x_{32} & x_{33} & x_{2k} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & x_{n1} & x_{n2} & x_{n3} & \dots & x_{nk} \end{bmatrix}$$
(3)

Y and  $\beta$  are of the form:

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_n \end{bmatrix}, \qquad \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix}$$

Where

$$x'x = \begin{bmatrix} n & \Sigma x_{1} & \Sigma x_{2} & \Sigma x_{3} & \Sigma x_{4} \\ \Sigma x_{1} & \Sigma x_{1}^{2} & \Sigma x_{1}x_{2} & \Sigma x_{1}x_{3} & \Sigma x_{1}x_{4} \\ \Sigma x_{2} & \Sigma x_{1}x_{2} & \Sigma x_{2}^{2} & \Sigma x_{2}x_{3} & \Sigma x_{2}x_{4} \\ \Sigma x_{3} & \Sigma x_{1}x_{3} & \Sigma x_{2}x_{3} & \Sigma x_{3}^{2} & \Sigma x_{3}x_{4} \\ \Sigma x_{4} & \Sigma x_{1}x_{4} & \Sigma x_{2}x_{4} & \Sigma x_{3}x_{4} & \Sigma x_{4}^{2} \end{bmatrix}$$

$$x'y = \begin{bmatrix} \Sigma y \\ \Sigma x_{1}y \\ \Sigma x_{2}y \\ \Sigma x_{3}y \\ \vdots \\ \vdots \\ \Sigma x_{k}y \end{bmatrix}$$
(5)

The matrix form of the model is giving by:

$$\begin{bmatrix} \Sigma_{y} \\ \Sigma_{x_{1}, y} \\ \Sigma_{x_{2}, y} \\ \vdots \\ \Sigma_{x_{k}, y} \end{bmatrix} = \begin{bmatrix} n & \Sigma x_{1} & \Sigma x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{3} & \dots & \Sigma x_{k} \\ \Sigma x_{1} & \Sigma x_{1}^{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{3} & \dots & \Sigma x_{1} x_{k} \\ \Sigma x_{2} & \Sigma x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{2}^{2} & \Sigma x_{2} x_{3} & \Sigma x_{2} x_{k} \\ \Sigma x_{2} & \Sigma x_{3} & \Sigma x_{1} x_{3} & \Sigma x_{2} x_{3} & \Sigma x_{2} x_{k} \\ \Sigma x_{3} & \Sigma x_{1} x_{3} & \Sigma x_{2} x_{3} & \Sigma x_{3}^{2} & \vdots \\ \Sigma x_{4} & \Sigma x_{1} x_{4} & \Sigma x_{2} & \Sigma x_{3} & \Sigma x_{4}^{2} \end{bmatrix}^{-1} \begin{bmatrix} \beta_{0} \\ \beta_{1} \\ \beta_{2} \\ \beta_{4} \end{bmatrix}$$

$$\begin{bmatrix} \beta_{0} \\ \beta_{1} \\ \beta_{2} \\ \beta_{3} \\ \beta_{4} \end{bmatrix} = (x'x)^{-1} x'y = \begin{bmatrix} n & \Sigma x_{1} & \Sigma x_{2} & \Sigma x_{3} & \Sigma x_{4} \\ \Sigma x_{1} & \Sigma x_{1}^{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{3} & \Sigma x_{1} x_{4} \\ \Sigma x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{3} & \Sigma x_{1} x_{4} \\ \Sigma x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{2} & \Sigma x_{1} x_{3} & \Sigma x_{2} x_{4} \\ \Sigma x_{3} & \Sigma x_{1} x_{3} & \Sigma x_{2} x_{3} & \Sigma x_{2} x_{4} \\ \Sigma x_{4} & \Sigma x_{1} x_{4} & \Sigma x_{2} x_{4} & \Sigma x_{3} x_{4} & \Sigma x_{2} x_{4} \\ \Sigma x_{2} & \Sigma x_{3} & \Sigma x_{1} x_{3} & \Sigma x_{2} x_{3} & \Sigma x_{3} x_{4} \\ \Sigma x_{4} & \Sigma x_{1} x_{4} & \Sigma x_{2} x_{4} & \Sigma x_{3} x_{4} & \Sigma x_{4}^{2} \end{bmatrix}^{-1} \begin{bmatrix} \Sigma y \\ \Sigma x_{1} y \\ \Sigma x_{2} y \\ \Sigma x_{3} y \\ \Sigma x_{4} & \Sigma x_{1} x_{4} & \Sigma x_{2} x_{4} & \Sigma x_{3} x_{4} \\ \Sigma x_{4} & \Sigma x_{4} & \Sigma x_{3} x_{4} & \Sigma x_{4}^{2} \end{bmatrix}^{-1} \begin{bmatrix} \Sigma y \\ \Sigma x_{1} y \\ \Sigma x_{2} y \\ \Sigma x_{3} y \\ \Sigma x_{4} y \end{bmatrix}$$
and
$$v(\hat{\beta}_{iy}) = MSE(x'x)^{-1} x'y$$

If n is odd, then the middle observation can be deleted. Using this approach, the estimators are constant but likely to have large variance which is the limitation of this method.

 Cite this article as: Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. FNAS Journal of Mathematical and Statistical Computing, 2(2), 81-90.

(6)

#### **Model Selection Criteria**

The model choice criterion is used to determine the optimal manufacturing feature. The excellent model is the one that minimizes the criterion. Several criteria for selecting various models have been developed in recent years, and it takes the form of residual sum of squares errors (SSE) compounded by a penalty factor that relies on the model's complexity. Some of these criteria are mentioned further down:

# Akaike Information Criteria (AIC)

Akaike (1974) devised a method known as Akaike Information Criteria. The format of this data is as follows:

$$AIC = n \ln \left[\frac{SSE}{n}\right] + 2(k)$$
<sup>(7)</sup>

Where;

- $\triangleright$  N = Sample size
- $\blacktriangleright$  K = Number of parameter and
- $\blacktriangleright$  SSE = Sum of square error.

# Coefficient of Determination $(R^2)$

 $R^2$  is one of the most important statistical parameters for decision-making and statistical judgments. It is a method for determining the proportion of one or more variables' outcomes that outnumber the others. This procedure takes the following form::

$$R^2 = \frac{SSR}{SST}$$
(8)

Where;

SSR= Sum of square Residual

SST= Sum of Square Total

# Results Regression AnalysisRegression Model 1 (Nigeria)

Model (N)	Parameter ± SE	t-test	Р	Remark
$eta_0$	$9.025 \pm 3.591$	2.513	0.018**	Significant
$eta_1$	$0.404 \pm 0.575$	0.703	0.488*	Not Significant
$eta_2$	$-0.087 \pm 0.047$	-1.873	0.072*	Not Significant
$eta_3$	$-8.55 \times 10^{-8} \pm 0.000$	-1.488	0.148*	Not Significant
$eta_4$	$0.189\pm0.077$	2.460	0.020**	Significant

# Table 1: Descriptive Statistics of the Model (N)

**Footnote**: \*\*= Significant at p< 0.05

The required estimated model is

$$\hat{y}_N = 9.025 + 0.404x_1 - 0.087x_2 - 8.550 \times 10^{-8}x_3 + 0.189x_4$$

(9)

85 *Cite this article as:* 

Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. *FNAS Journal of Mathematical and Statistical Computing*, 2(2), 81-90.

For structural reforms on foreign direct investment (FDI), inflation, labour, manufacturing, and total GDP of Nigeria, table 1 summarized the parameter estimates, t-test, p-value, and standard error of the Durbin method, accordingly. Similarly, the findings of the acquired parameters revealed that only two of the parameters are significant at 5%, whereas three of the parameters were not significant.

# 2: Regression Model 2 (Ghana)

Table 2: Descriptive Statistics of the Model (G)	Table 2:	Descriptive	Statistics of	the Model (G)
--	----------	-------------	---------------	---------------

Model (G)	Parameter ± SE	t-test	Р	Remark
$eta_0$	$6.220 \pm 1.820$	3.418	0.002**	Significant
$oldsymbol{eta}_1$	$0.507\pm0.140$	3.612	0.001**	Significant
$eta_2$	$-0.024 \pm 0.028$	846	0.405*	Not Significant
$eta_{_3}$	$-3.43 \times 10^{-7} \pm 0.000$	-2.089	0.043**	Significant
$eta_4$	$0.286 \pm 0.073$	3.890	0.001**	Significant

**Footnote**: \*\*= Significant at p< 0.05

# The required estimated model is

$$\hat{y}_G = 6.220 + 0.507 x_1 - 0.024 x_2 - 3.427 \times 10^{-7} x_3 + 0.286 x_4$$
 (10)

For structural reforms on foreign direct investment (FDI), inflation, labour, manufacturing, and total GDP of Ghana, table 2 summarized parameter estimates, t-test, p-value, and standard error of the Durbin method, accordingly. Similarly, the findings of the acquired parameters revealed that four of the parameters are significant at 5%, whereas only one of the parameters was not significant.

# **3: Regression Model 3 (Kenya)**

Model (K)	Parameter ± SE	t-test	Р	Remark
$eta_0$	$2.211 \pm 1.242$	1.780	0.086*	Not Significant
$oldsymbol{eta}_1$	$0.221\pm0.368$	0.602	0.552*	Not Significant
$eta_2$	$0.098 \pm 0.035$	-2.774	0.010**	Significant
$\beta_3$	$6.682 \times 10^{-8} \pm 0.000$	1.017	0.318*	Not Significant
$eta_4$	$0.484 \pm 0.103$	4.708	0.000**	Significant

#### Table 3: Descriptive Statistics of the Model (K)

**Footnote**: \*\*= Significant at p< 0.05

# The required estimated model is

$$\hat{y}_{K} = 2.211 + 0.221x_{1} - 0.098x_{2} + 6.682 \times 10^{-8}x_{3} + 0.484x_{4}$$

For structural reforms on foreign direct investment (FDI), inflation, labour, manufacturing, and total GDP of Kenya, table 3 summarized parameter estimates, t-test, p-value, and standard error of the Durbin method,

accordingly. Similarly, the findings of the acquired parameters revealed that only two of the parameters are significant at 5%, whereas the other three of the parameters were not significant.

0.027

-1.224

1.685

0.979\*

0.231\*

0.103\*

Not Significant

Not Significant

#### **Regression Model 4 (Egypt)**

 $\beta_2$ 

 $\beta_3$ 

 $\beta_{\Lambda}$ 

Model (E)	Parameter ± SE	t-test	Р	Remark
$eta_0$	$4.650 \pm 1.075$	4.325	0.000**	Significant
$oldsymbol{eta}_1$	$0.420 \pm 0.106$	3.960	0.000**	Significant
в.	$0.001 \pm 0.039$	0.027	0.070*	Not Significant

Table 4. Descriptive Statistics of the Model (E)

-5.328x10^-8±0.000

 $0.041 \pm 0.024$ 

**Footnote**: \*\*= Significant at p< 0.05

# The required estimated model is

$$\hat{y}_E = 4.650 + 0.420x_1 + 0.001x_2 - 5.328 \times 10^{-8}x_3 + 0.041x_{4_{(12)}}$$

For structural reforms on foreign direct investment (FDI), inflation, labour, manufacturing, and total GDP of Egypt, table 4 summarized parameter estimates, t-test, p-value, and standard error of the Durbin method, accordingly. Similarly, the findings of the acquired parameters revealed that only two of the parameters are significant at 5%, whereas the other three of the parameters were not significant.

# 5: Regression Model 5 (South Africa)

Model (SA)	Parameter ± SE	t-test	Р	Remark
$eta_0$	$2.949 \pm 2.4438$	1.210	0.236*	Not Significant
$oldsymbol{eta}_1$	$0.088 \pm 0.119$	0.741	0.465*	Not Significant
$oldsymbol{eta}_2$	$-0.078 \pm 0.082$	-0.956	0.347*	Not Significant
$eta_3$	$-5.059 \times 10^{-8} \pm 0.000$	-0.491	0.627*	Not Significant
$eta_4$	$0.469 \pm 0.050$	9.294	0.000**	Significant

# Table 5: Descriptive Statistics of the Model (SA)

**Footnote**: \*\*= Significant at p< 0.05

# The required estimated model is

$$\hat{y}_{SA} = 2.949 + 0.088x_1 - 0.078x_2 - 5.059 \times 10^{-8}x_3 + 0.469x_4$$
(13)

For structural reforms on foreign direct investment (FDI), inflation, labour, manufacturing, and total GDP of South Africa, table 5 summarized parameter estimates, t-test, p-value, and standard error of the Durbin method, accordingly. Similarly, the findings of the acquired parameters revealed that only one of the parameters is significant at 5%, whereas the other four of the parameters were not significant.

#### 87 Cite this article as:

Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. FNAS Journal of Mathematical and Statistical Computing, 2(2), 81-90.

Models
Regression
Identified
the Five
omparison of
0

MODELS											
	Я	β	$\beta_{2}$	В	$\beta_4$	MSE	$R^{2}$	AIC	R	ы	ዋ
	(p-value) t-test	(p-value) t-test	(p-value) t-test	(p-value) t-test	(p-value) t-test						
Model (N)	$9.025 \pm 3.591$ (0.018**) 2.513	0.404 ±0.575 (0.488*) 0.703	-0.087± 0.047(0.072*) -1.873	8.55x10^-8±0.000 (0.148*) -1.488	0.189 ± 0.077 (0.020**) 2.460	10.764	39.9%	88.41	0.632	4.645	0.005
Model (G)	6.220±1.820 (0.002**) 3.418	0.507±0.140 (0.001**) 3.612	-0.024 土 0.028 (0.405*) 846	-3.43x10∿-7±0.000 (0.043**) -2.089	0.286±0.073 (0.001**) 3.890	3.199	54.6%	48.37	0.739	8.418	0.000
Model (K)	2.211土1.242 (0.086*) 1.780	0.221±0.368 (0.552*) 0.602	0.098士 0.035 (0.010**) -2.774	<pre>\$ 6.682x10^-8 ± 0.000 (0.318*) 1.017</pre>	0.484±0.103 (0.000**) 4.708	2.429	60.3%	39.29	0.777	10.633	0.000
Model (E)	4.650±1.075 (0.000**) 4.325	0.420 ± 0.106 (0.000**) 3.960	0.001土 0.039 (0.979*) 0.027	9 -5.32&x10^-8±0.000 (0.231*) -1.224	0.041±0.024 (0.103*) 1.685	1.585	44.4%	25.20	0.667	5.596	0.002
Model (SA)	2.949土2.4438 (0.236*) 1.210	0.088 ± 0.119 (0.465*) 0.741	-0.078土 0.082 (0.347*) -0.956	2 -5.059×10^-8±0.000 (0.627*) -0.491	0.469±0.050 (0.000**) 9.294	1.240	82.2%	17.10	0.906	32.266	0.000

ŏŏ

Cite uns arucie as.
Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. FNAS Journal of Mathematical and Statistical Computing, 2(2), 81-90.

We compared the five identified regression models for the structural reforms of the various African countries to determine the best fitted model that has more effect on the total GDP of each of their respective African countries as shown in table 6 above. A summary regression analysis of parameter estimates, AIC, MSE, standard error, t-test, p-values, R, R<sup>2</sup> and F-values for the models is shown in Table 6 above for (model N, G, K, E and SA). It is important to note that all of the model parameters' estimations are not significant at 5%, which appears to be skewed. The South Africa Model (SA), which has the highest R and R<sup>2</sup> values (R= 0.906; R<sup>2</sup>= 82.2%), the smallest AIC value of 17.10, and the highest F-value of 32.266 calculated, is the "best" fit model among the five regression models in table 6. As a result, model (SA) of estimation is the best, as it has the most impact on Africa's total GDP. The result also revealed that only structural reform in manufacturing (X<sub>4</sub>) is significant for the South Africa model. However, only reform in manufacturing (X<sub>4</sub>) and the constant parameter

 $\beta_0$  are significant for Nigeria model. For the Ghana model, all the estimated parameters performed well and

were also significant and adequate except the inflation  $(X_2)$  parameter. Similarly, only reform in inflation  $(X_2)$  and the reform in manufacturing  $(X_4)$  are significant for Kenya model. Finally, only reform in Federal Direct

Investment (X<sub>1</sub>) and the constant parameter  $\beta_0$  are significant for Egypt model.

#### Conclusion

African countries can work towards achieving sustainable economic growth through structural reforms that address federal direct investment, inflation management, and the development of labour and manufacturing sectors. These reforms can help create a more conducive environment for investment, economic stability, and job creation, ultimately contributing to improved economic growth on the continent. To select the significant parameters and test for model equality, the Durbin method of estimating multiple regression model was used. Following that, data on five sub-variables under structural reforms and economic growth such as foreign direct investment (FDI), inflation, labour, manufacturing and total GDP for five different African countries were split into five models: Nigeria, Ghana, Kenya, Egypt and South Africa. All of the model parameter estimates were not significant at 5%, which appears to be skewed. Structural reform in manufacturing (X<sub>4</sub>), inflation (X<sub>2</sub>), Federal Direct Investment (X<sub>1</sub>) and other factors not included in the model which is represented by the constant parameter  $\beta_0$ , were the only four variables that were significant. The South Africa Model, which has the highest R and R<sup>2</sup> values (R= 0.906; R<sup>2</sup> = 82.2%), the smallest AIC value of 17.10, and the highest F-value of 32.266 calculated, is the "best" fit model among the five regression models in table 6. As a result, model (SA) of estimation is the best, as it has the most impact on Africa's total GDP.

#### Recommendations

Based on the findings, this study is recommending the following:

- 1. Federal governments should develop and maintain essential infrastructure, including roads, ports, energy, and telecommunications. This will not only facilitate trade and reduce the cost of doing business but also, will attract foreign investment. They should establish investment promotion agencies to actively market opportunities and provide support for investors.
- 2. Ensure the independence of central banks to pursue sound monetary policy. Central banks should have the ability to control inflation and maintain price stability. Implement policies that promote inclusive growth, as this can help alleviate social and economic disparities that may worsen inflation.
- 3. Invest in education and skills development to create a highly skilled labour force that can drive productivity and innovation in the manufacturing sector. Encourage export-oriented manufacturing by providing incentives, reducing trade barriers, and facilitating access to global markets. This can boost foreign exchange earnings and create jobs.

#### References

- Ahson, U. S., Muhammad, W., &Sarwar, S. (2017). Structural transformation and economic growth: A fresh empirical assessment of SAARC countries. *The Pakistan Journal of Social Issues*, 8, 21-31.
- Bordon, A. R., Ebeke, C., & Shirono, K. (2016). When do structural reforms work? On the role of business cycle and macroeconomic policies. *IMF working paper* 16/62.
- Dabús, C., & Delbianco, F. (2021). Economic development and structural change: The role of services. *Journal* of Economic Development, 46(3), 65-84.
- De Vries, G., Timmer, M., & De Vries, K. (2015). Structural transformation in Africa: Static gains, dynamic losses. *The Journal of Development Studies*, *51*(6), 674-688.

#### 89 Cite this article as:

Inamete, E. N. H., Yakubu, H., & Dappa, J. A. (2025). Structural reforms and economic growth in Africa: A statistical approach. *FNAS Journal of Mathematical and Statistical Computing*, 2(2), 81-90.

- Hazrana, J., Birthal, P. S., Negi, D. S., Mani, G., & Pandey, G. (2019). Spatial spill-overs, structural transformation and economic growth in India. Agricultural Economics Research Review, 32(2), 145-158.
- McMillan, M., Rodrik, D., & Sepulveda, C. (2017). Structural change, fundamentals and growth: A framework and case studies (No. w23378). National Bureau of Economic Research.