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INFLUENCE OF SELECTED ECONOMIC, DEMOGRAPHIC AND POLITICAL CHARACTERISTICS ON GROWTH IN AFRICA

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INFLUENCE OF SELECTED ECONOMIC, DEMOGRAPHIC AND POLITICAL
CHARACTERISTICS ON GROWTH IN AFRICA

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Applied Economics and Statistics

by
Richard Ogwal-Omara
August 2008

Accepted by:
Prof. William C. Bridges, Jr, Committee Chair
Prof. James C.O. Nyankori
Prof. Webb M. Smathers
Dr. Kenneth L. Robinson

ABSTRACT

Despite their common sources of development funds, African countries have had varying rates of growth. This study assesses the influence of selected social and economic variables on economic growth in Africa using data from 45 African countries for the year 2005. Regression results show that literacy rate, property rights, net budget surplus and inflation rate significantly influenced on growth in Africa. Judicial independence, number of days to start business and reliability of financial institutions did not show significant influence on growth in Africa. To promote growth, African governments need to redesign their education systems in order to be able to cope with the rapid socio-economic as well as technological changes and pursue policies that promote property rights, control inflation rates and increase net budget surpluses.

Key words: Africa, Economic growth, regression model, regions.

DEDICATION

To my parents Mr. and Mrs. Omara

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to the Chair, Department of Applied Economics and Statistics Prof. Hoke Hill, Jr for giving me the opportunity to come and study at Clemson. I also thank my committee members; Professors William Bridges, Jr, James C.O Nyankori, Webb Smathers and Kenneth L. Robinson for their invaluable guidance during the write up of this thesis. My appreciation goes to all the Professors who taught me in the program, from the Departments of Applied Economics and Statistics and Economics. Many thanks to all the staff in the Department of Applied Economics, especially Ms. Lynn Fowler, Ms. Ellen Reneke and Ms. Vickie Greene who kept me updated and helped me go through the program.

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TABLE OF CONTENTS

	Page
TITLE PAGE	i
ABSTRACT	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER	
1 INTRODUCTION	1
Background	2
Research Problem	24
2 LITERATURE REVIEW	25
Empirical Growth Studies	25
Human Capital	25
Economic Factors	26
Institutional Factors	27
3 METHODOLOGY	29
Model Specification	29
Variables and Variable Measurements	30
Growth Rate (GDPG)	30
Adult Literacy (LIT)	30
Net budget Surplus (SUR)	30
Reliability of Financial Institutions (FIN)	31
Number of Days to start a Business (DAYS)	31
Judicial Independence (JUD)	31
Property Rights (PRT)	32
Inflation Rate (INF)	32
Descriptive Statistics of the Variables	33

Table of Contents (continued)

	Page
Regression Diagnostics.....	34
4 RESULTS, DISCUSSION AND POLICY IMPLICATIONS	36
Results.....	36
Discussion and Policy Implications.....	38
Conclusions.....	41
Areas for Further Studies.....	42
APPENDICES	43
1: List of Countries used in the Study.....	43
2: Tests for Normality (Residual plots)	44
3: Regression Model with Regional Dummies	45
4: Individual Region Regressions	47
REFERENCES	51

LIST OF TABLES

Table		Page
1	Regional composition of African Countries	4
2	Descriptive Statistics of Selected Characteristics for Africa by Region.....	5
3	Descriptive Statistics of Variables used in the Growth Regression Model for Africa	34
4	Regression Results for GDP Growth Rate as Dependent Variable and Selected Socio-economic Variables in African countries	37

LIST OF FIGURES

Figure		Page
1	Map of Africa Showing the Regions	3
2	Regional Distribution of African countries.....	2
3	Area Distribution by Region in Africa, 2005.....	6
4	Area Distribution in Eastern Africa, 2005	7
5	Area Distribution in Western Africa, 2005.....	7
6	Area Distribution in Northern Africa, 2005.....	8
7	Area Distribution in Southern Africa, 2005.....	8
8	Area Distribution in Central Africa, 2005	9
9	Regional Population Distribution in Africa, 2005	10
10	Population Distribution in Eastern Africa, 2005.....	11
11	Population Distribution in Western Africa, 2005	11
12	Population Distribution in Northern Africa, 2005	12
13	Population Distribution in Southern Africa, 2005	12
14	Population Distribution in Central Africa, 2005.....	13
15	Regional Literacy Rates in Africa, 2005.....	14
16	Literacy Rates in Eastern Africa, 2005.....	14
17	Literacy Rates in Western Africa, 2005.....	15
18	Literacy Rates in Northern Africa, 2005.....	15
19	Literacy Rates in Southern Africa, 2005.....	16
20	Literacy Rates in Central Africa, 2005	16

List of Figures (continued)

List of Figures (continued)

Figure		Page
21	Regional Life Expectancy in Africa, 2005	17
22	Life Expectancy in Eastern Africa, 2005	18
23	Life Expectancy in Western Africa, 2005.....	18
24	Life Expectancy in Northern Africa, 2005	19
25	Life Expectancy in Southern Africa, 2005	19
26	Life Expectancy in Central Africa, 2005	20
27	Regional revenue Distribution in Africa, 2005.....	21
28	Revenue Share of GDP in Eastern Africa, 2005.....	21
29	Revenue Share of GDP in Western Africa, 2005	22
30	Revenue Share of GDP in Northern Africa, 2005	22
31	Revenue Share of GDP in Southern Africa, 2005	23
32	Revenue Share of GDP in Central Africa, 2005	23

CHAPTER ONE

INTRODUCTION

Economic development strategy in Africa in the last twenty years has been characterized by several common key features that include market and institutional reforms as well as investments in infrastructure and human resources. Similarly, African countries had common sources and conditions of development assistance, foreign direct investments, international development partnerships as well as export market destinations.

However, economic growth patterns have not reflected the similarities in development strategies as the annual national growth rates have been variable ranging from -5.1% in Zimbabwe to 14.9% in Angola in 2006 (African Development Bank, 2007). Country level differences in annual growth are attributable to country specific factors including responses to development policy formulation and new programs (The World Bank, 2008 and African Development Bank, 2007).

This study evaluates annual growth rates in African countries in terms of selected economic and social variables. The objective of this study is to explain economic growth rates of African countries in terms of selected socio-economic characteristics including human capital, government revenue, financial markets, bureaucracy, justice, property rights and inflation.

Background

The five regions of Africa (Central, Eastern, Northern, Western and Southern) consist of fifty three countries, including forty- seven continental nations and six island nations of Cape Verde and Sao Tome and Principe in the Atlantic Ocean and Comoros, Seychelles, Madagascar as well as Mauritius in the Indian Ocean (Fig.1).

The regional composition and distribution of the African countries are shown in Figure 2 and Table 1.

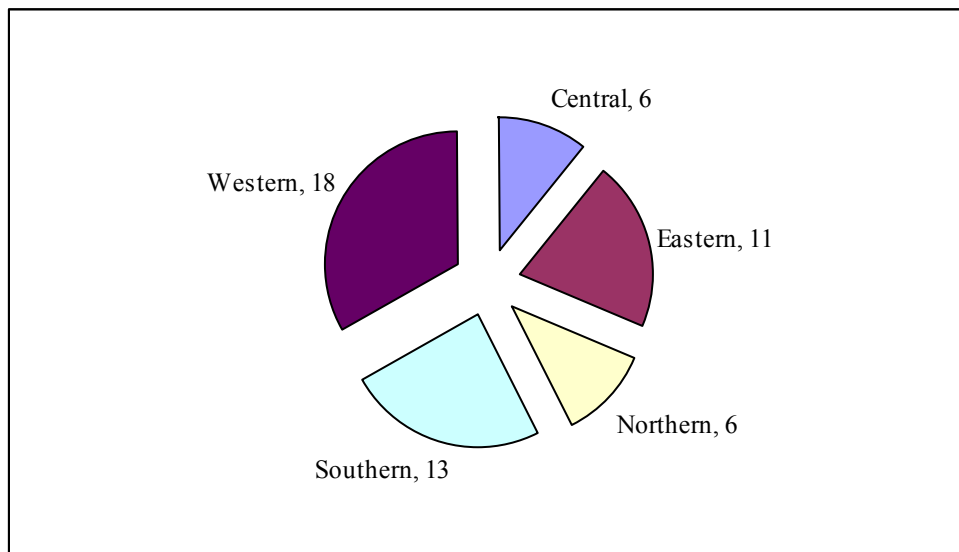


Fig. 2: Regional Distribution of African countries

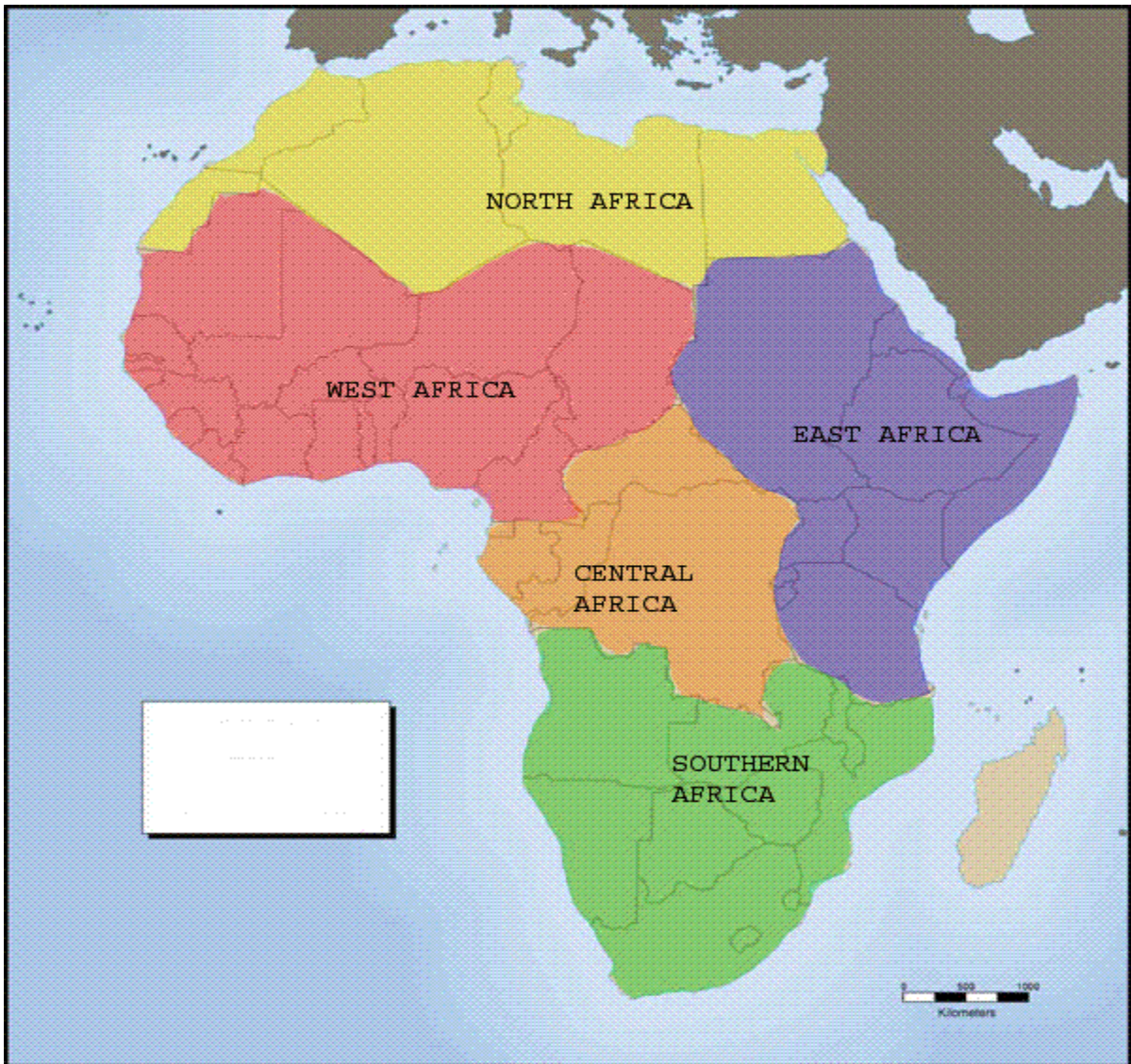


Fig.1: Map of Africa showing the Regions

Source: <http://exploringafrica.matrix.msu.edu/images/allregions.jpg>

Table 1: Regional Composition of African Countries

Central Region	Northern Region	Western Region
Central African Republic	Algeria	Benin
Chad	Egypt	Burkina Faso
Congo Republic	Libya	Cameroon
Democratic Republic of Congo	Morocco	Cape Verde
Equatorial Guinea	Tunisia	Cote d'Ivoire
Sao Tome and Principe	Western Sahara	Gabon
		Gambia
Eastern Region	Southern Region	Ghana
Burundi	Comoros	Guinea
Djibouti	Swaziland	Guinea-Bissau
Eritrea	Mauritius	Liberia
Ethiopia	Botswana	Mali
Kenya	Lesotho	Mauritania
Rwanda	Namibia	Niger
Seychelles	Zimbabwe	Nigeria
Somalia	Zambia	Senegal
Tanzania	Malawi	Sierra Leone
Uganda	Angola	Togo
Sudan	Madagascar	
	Mozambique	
	South Africa	

Descriptive statistics of area, population, literacy rate, life expectancy and revenue¹ for the five regions of Africa are presented in Table 2, followed by brief discussions of these statistics.

Table 2: Descriptive Statistics of Selected Characteristics for Africa by Region, 2005

Variable	Region	Mean	Standard deviation	Minimum	Maximum	Coefficient of variation
Area ('000 km ²)	Eastern	564.5	755.3	0.5	2,506.0	133.8
	Western	382.3	426.0	4.0	1,267.0	111.4
	Northern	1,203.6	875.0	164.0	2,382.0	72.7
	Southern	505.8	452.8	2.0	1,247.0	89.5
	Central	770.5	904.6	1.0	2,345.0	117.4
	Africa		571.9	640.6	0.5	2,506.0
Population ('000)	Eastern	22,286.7	23,545.7	81.0	77,431.0	105.7
	Western	15,629.8	29,636.4	507.0	131,530.0	189.6
	Northern	30,863.2	2,739.3	5,853.0	74,033.0	87.6
	Southern	11,384.5	13,044.9	798.0	47,432.0	114.6
	Central	12,666.0	22,257.3	157.0	57,549.0	175.7
	Africa	17,071.7	23,916.3	81.0	131,530.0	140.1
Literacy (%)	Eastern	60.95	13.3	42.1	80.1	21.9
	Western	50.0	17.5	18.7	78.0	35.0
	Northern	69.1	12.4	53.5	84.1	18.0
	Southern	73.3	18.6	28.5	91.9	25.3
	Central	64.6	18.9	42.1	87.1	29.2
	Africa	61.5	18.6	18.7	91.9	30.3
Life expectancy (years)	Eastern	48.7	4.8	41.0	57.0	9.9
	Western	51.1	7.4	41.0	71.0	14.4
	Northern	72.2	1.8	70.0	74.0	2.5
	Southern	45.0	12.3	31.0	73.0	27.3
	Central	47.7	9.3	39.0	64.0	19.4
	Africa	50.7	11.0	31.0	74.0	21.6
Revenue (% of GDP)	Eastern	29.1	11.3	19.2	51.3	38.8
	Western	23.3	7.7	13.3	45.9	33.2
	Northern	34.8	18.9	19.0	65.2	54.4
	Southern	29.2	9.9	18.8	46.8	33.8
	Central	38.0	41.1	10.1	127.9	107.9
	Africa	29.1	17.6	10.1	127.9	60.7

Source: African Development Bank, 2006.

¹ Revenue in this study is defined as the total government revenue from taxes including grants from development partners.

Three of the five regions, Eastern, Southern and Western, accounted for 65% of the total land area (Fig.3). At the regional level, distribution of land area is skewed. The number of countries occupying at least seventy percent of the regional area range from one, the Democratic Republic of the Congo in the Central region to five in the Western (Nigeria, Chad, Mali, Niger and Mauritania) with two in the North (Libya and Algeria), three in the East (Ethiopia, Sudan and Tanzania) and four in the Southern region (Angola, Mozambique, Namibia and South Africa) (Fig 4-13).

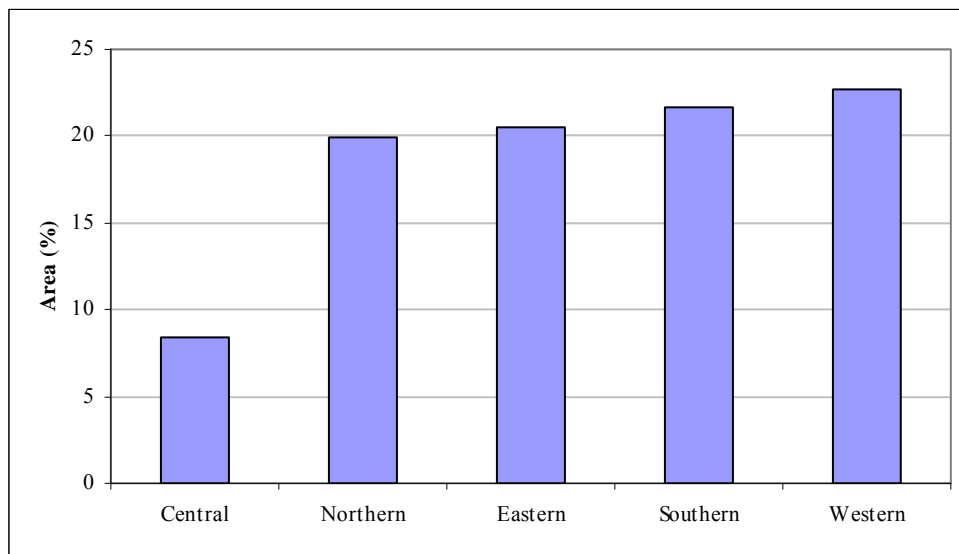


Fig. 3: Area Distribution by Region in Africa, 2005

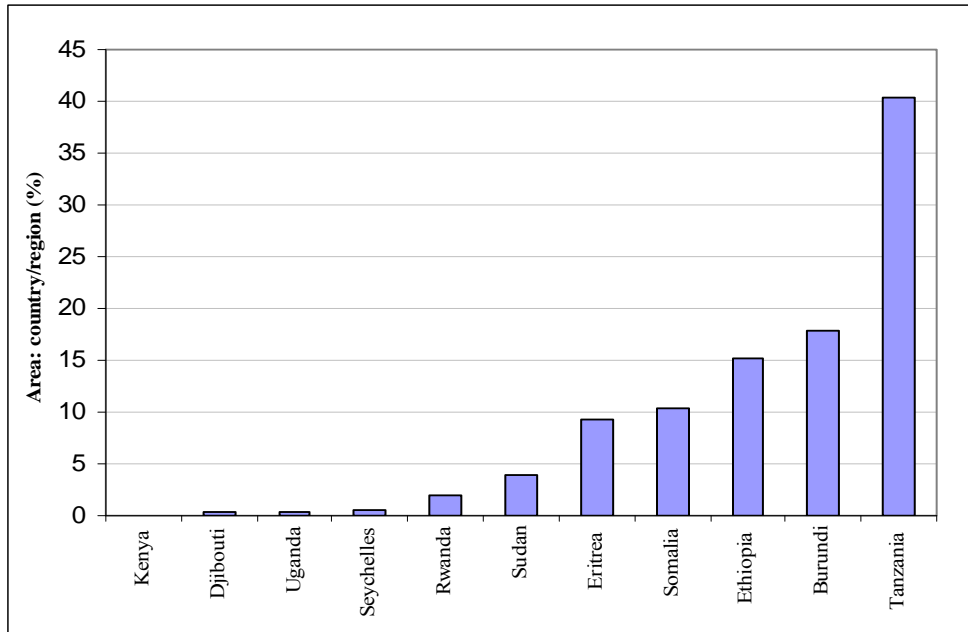


Fig. 4: Area Distribution in Eastern Africa, 2005

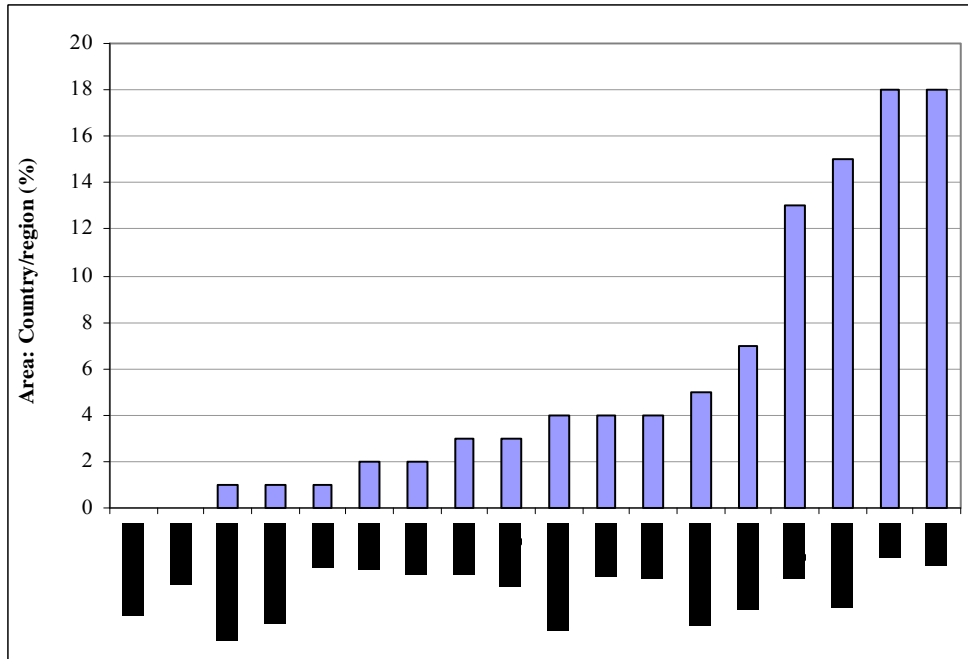


Fig.5: Area Distribution in Western Africa, 2005

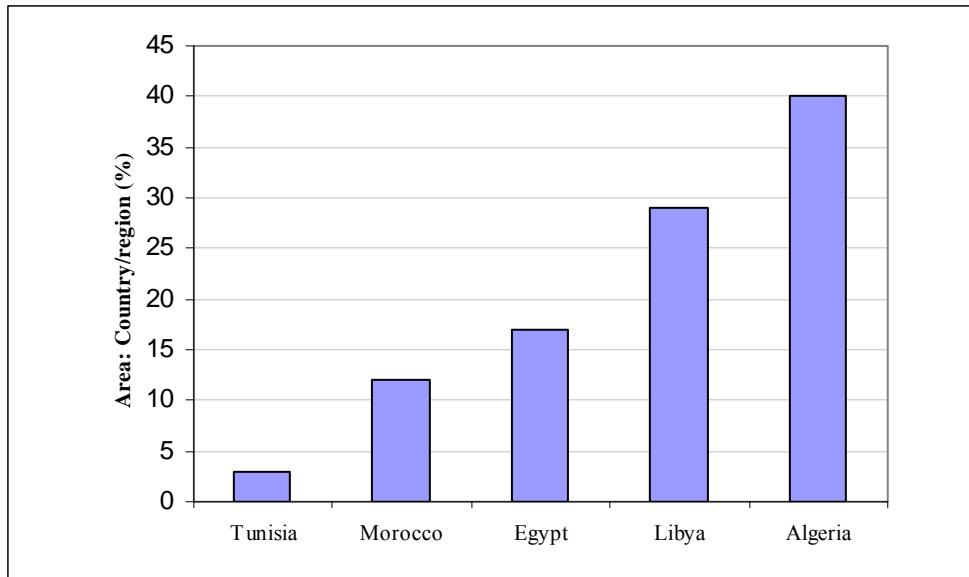


Fig. 6: Area Distribution in Northern Africa, 2005

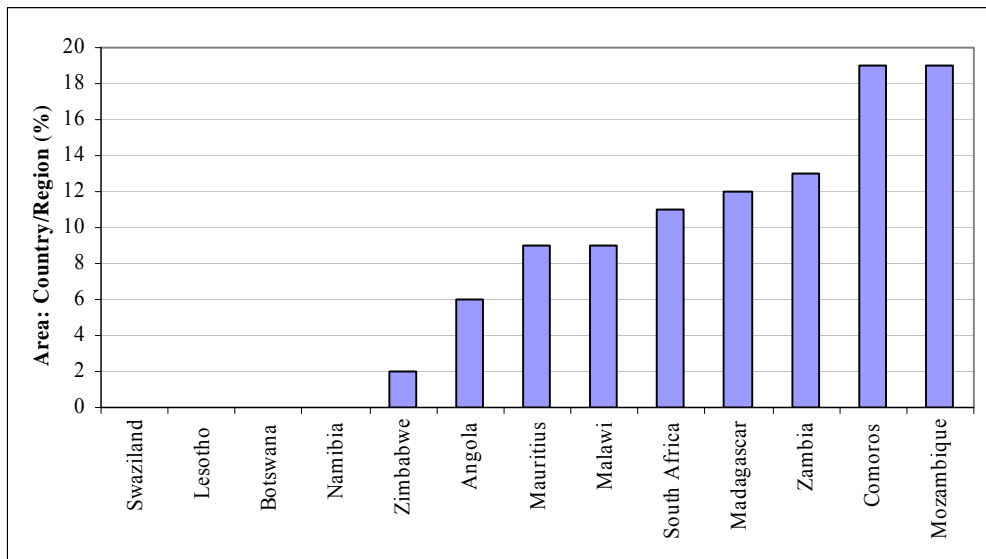


Fig. 7: Area Distribution in Southern Africa, 2005

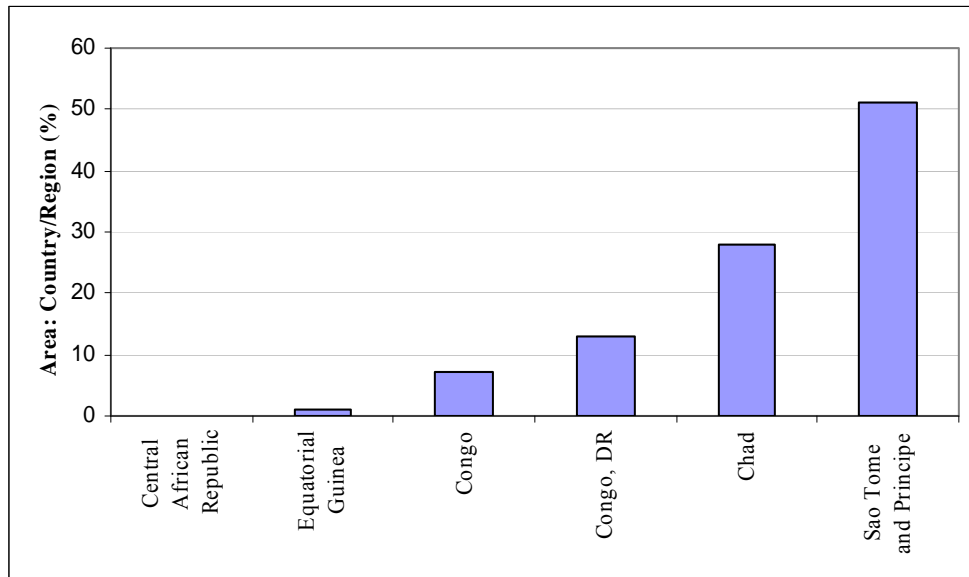


Fig. 8: Area Distribution in Central Africa, 2005

The total population of African countries in 2005 was 904.8 million and non-uniformly distributed across regions (Fig.9). Over half of the total population were in Eastern and Western regions and the regional shares of total population in descending order were, Western (31%), Eastern (27%), Northern (17%), Southern (16%) and Central (15%).

Population distribution at the regional level was non-uniform but uniquely distributed. Using a two-country ratio² to measure regional population concentration, the two most highly populated countries in Central Africa had 89% of the regional population. Similarly, population concentrations in the other regions were, in descending order, Northern Africa (69%), Western Africa (56%), Eastern Africa (48%) and Southern Africa (45%) (Fig.10-14).

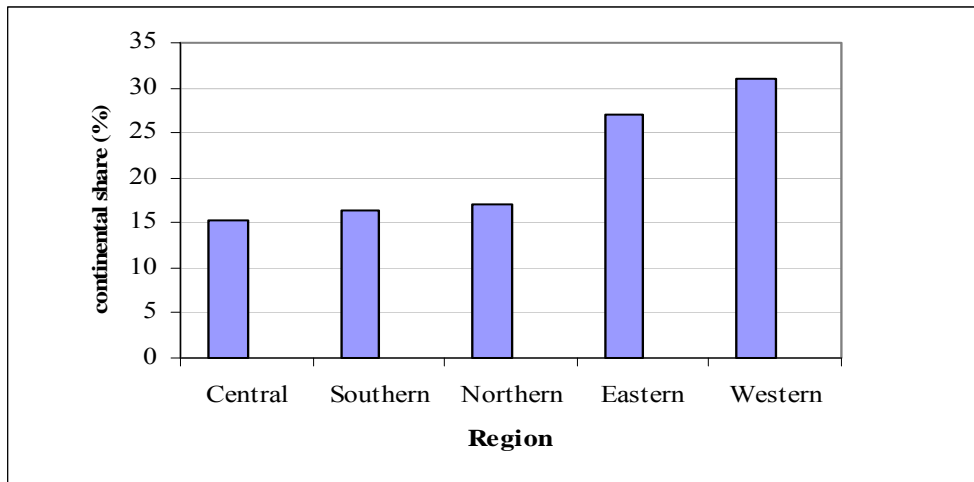


Fig. 9: Regional Population Distribution in Africa, 2005

² The two-country ratio is a measure derived by computing the proportion of the regional population accounted for by the populations of two most highly populated countries in a region.

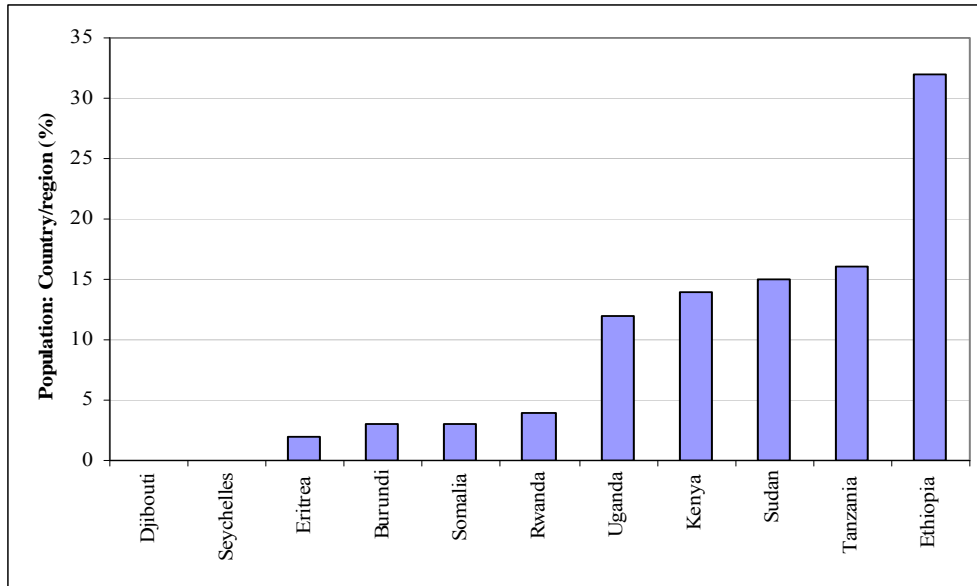


Fig 10: Population Distribution in Eastern Africa, 2005

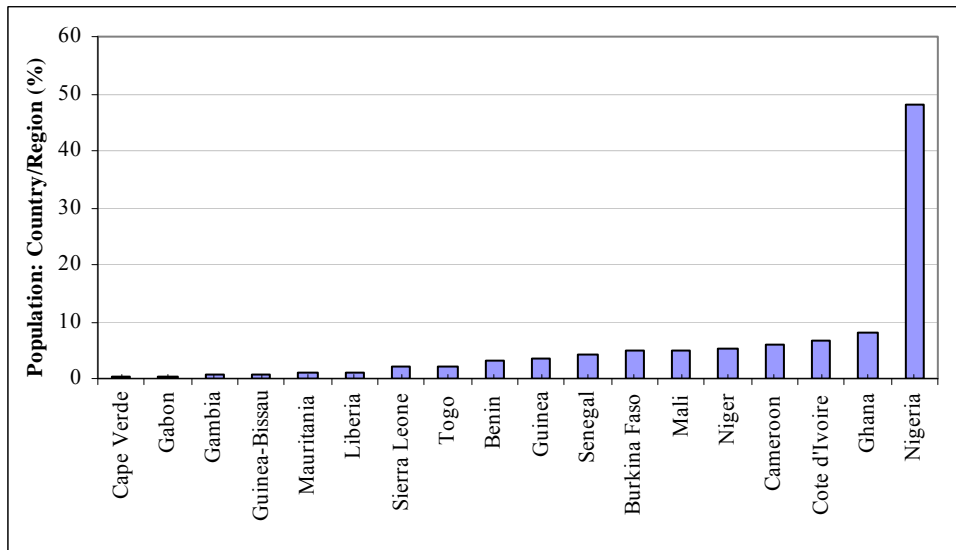


Fig. 11: Population Distribution in Western Africa, 2005

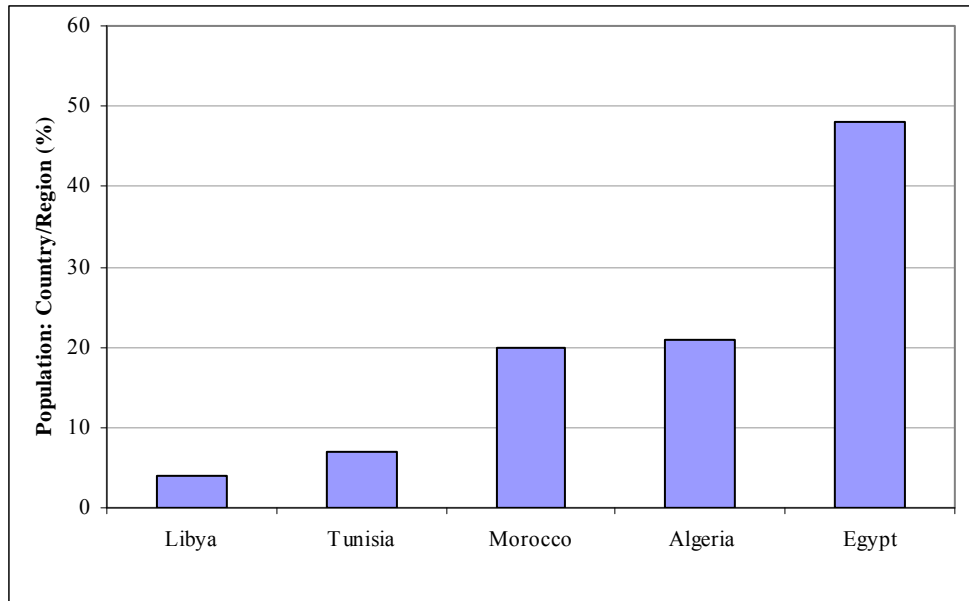


Fig.12: Population Distribution in Northern Africa, 2005

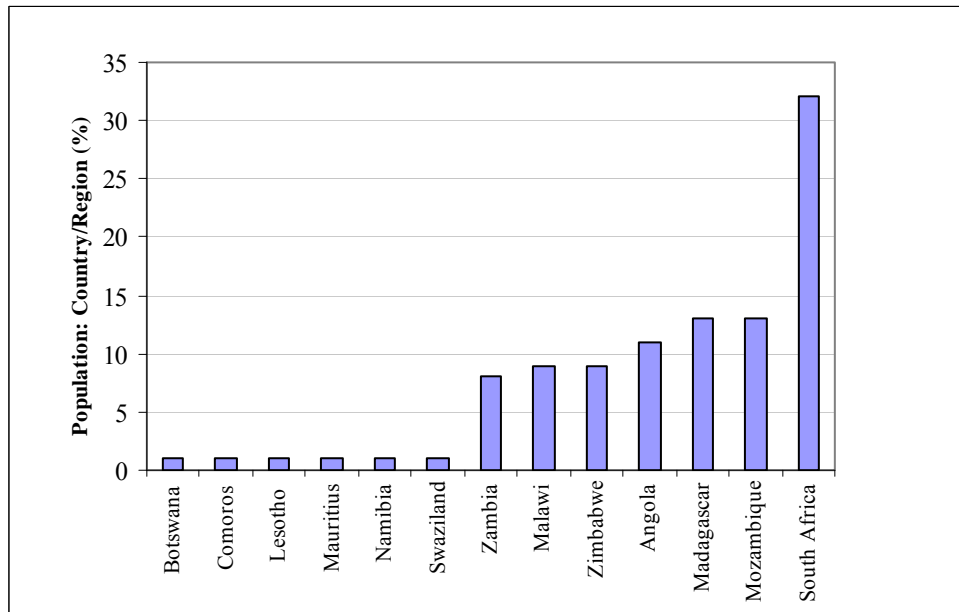


Fig. 13: Population Distribution in Southern Africa, 2005

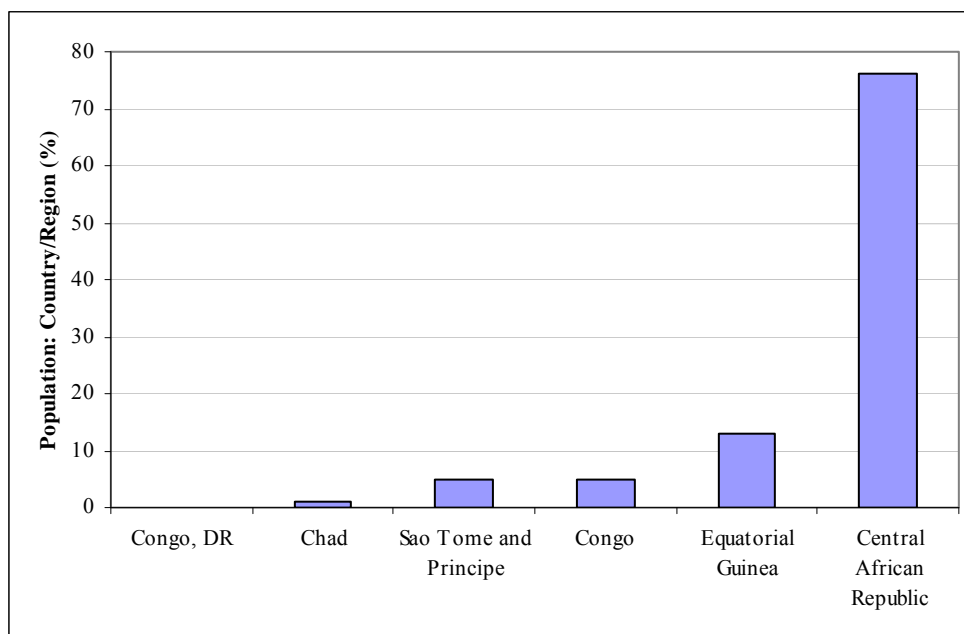


Fig. 14: Population Distribution in Central Africa, 2005

Average literacy rate in Africa in 2005 was 61.5% but there were regional variations (Fig. 15). Four of the five regions had literacy rates greater than 60% and the regional literacy rates in descending order were; Southern (73%), Northern (69%), Central (65%), Eastern (61%) and Western (50%).

The number of countries with 70% literacy rate or more ranged from two in Central to eight in Southern and in between were Northern (3), Eastern (4) and Western (4) (Fig 16-20).

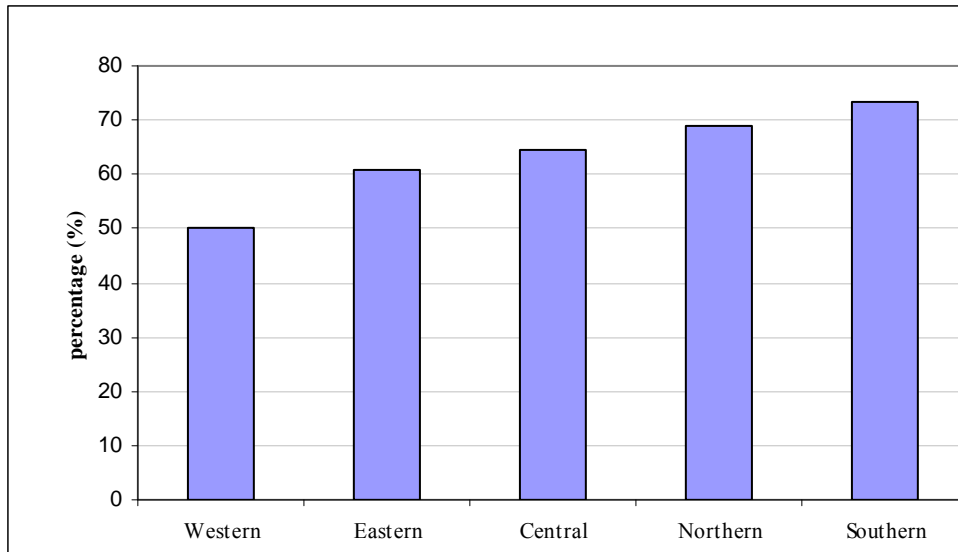


Fig. 15: Regional Literacy Rates in Africa, 2005

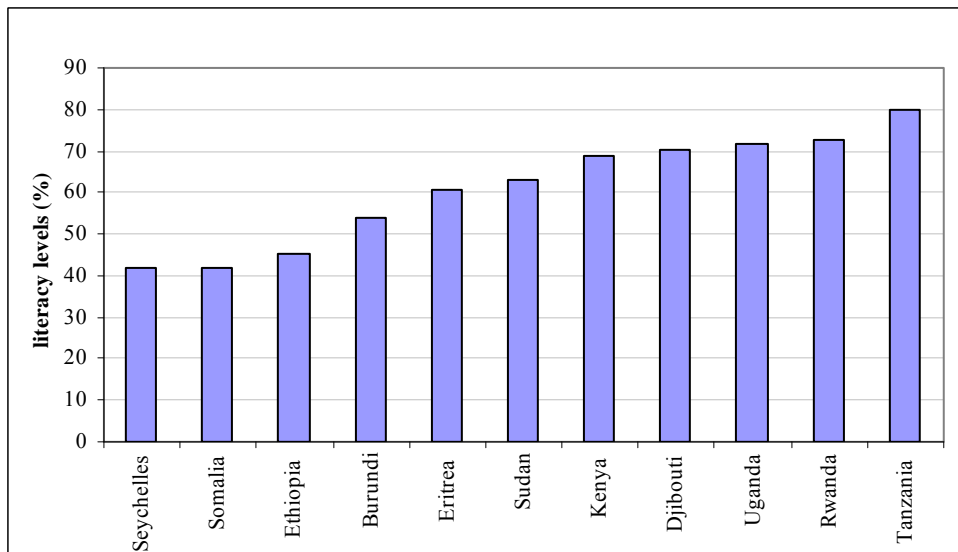


Fig. 16: Literacy Rates in Eastern Africa, 2005

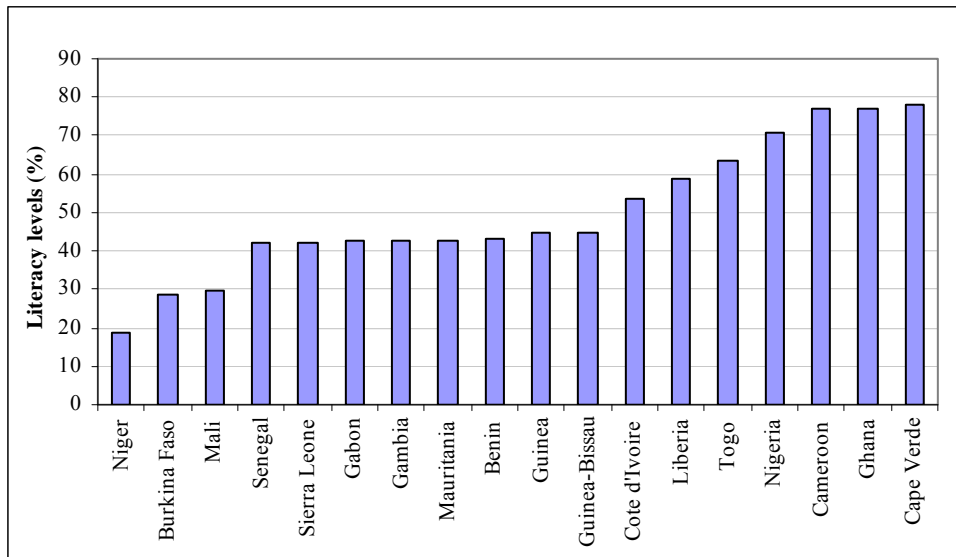


Fig. 17: Literacy Rates in Western Africa, 2005

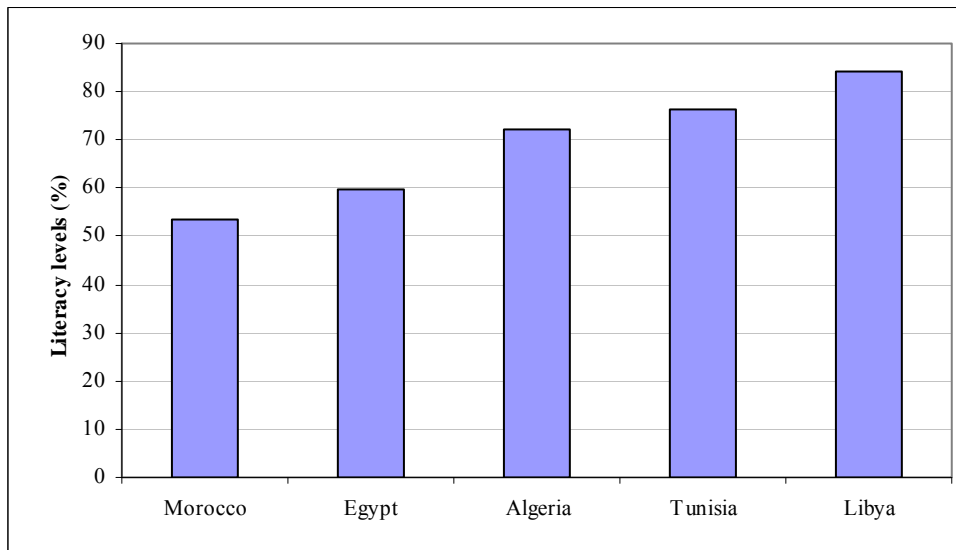


Fig. 18: Literacy Rates in Northern Africa, 2005

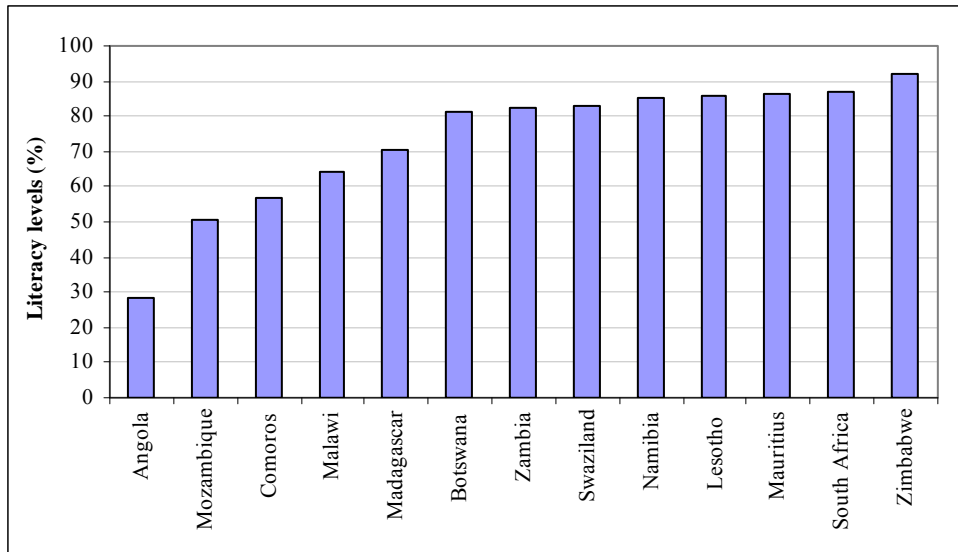


Fig. 19: Literacy Rates in Southern Africa, 2005

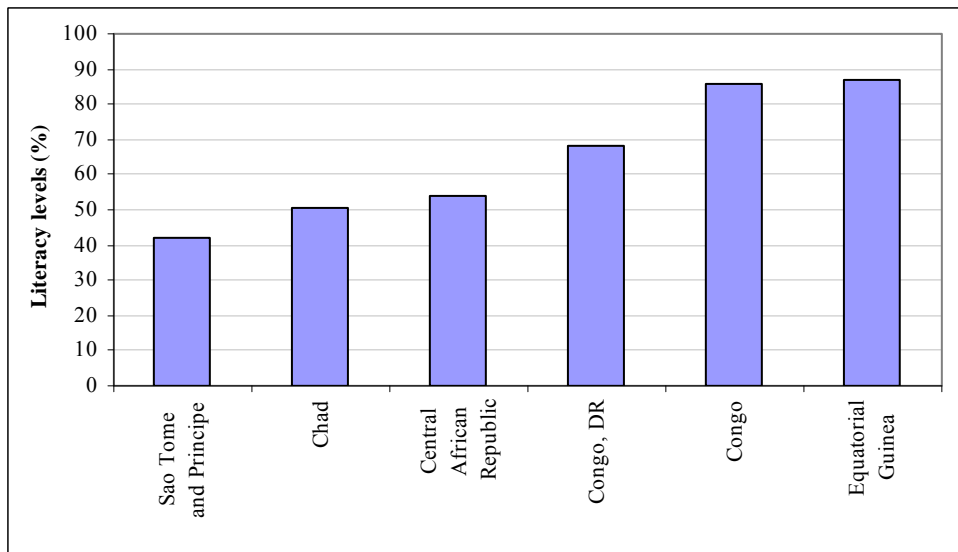


Fig. 20: Literacy Rates in Central Africa, 2005

Average life expectancy in Africa in 2005 was 51 years. At the regional level, Northern Africa had the highest life expectancy at 72 years while in the other regions life expectancies were in descending order; Western (51), Eastern (49), Central (48) and Southern (45) (Fig. 21).

The number of countries in each region with life expectancy of at least fifty years varied from two in Central to nine in Western Africa and in between were Southern Africa (3), Eastern (4) and Northern (5) (Fig.22-26).

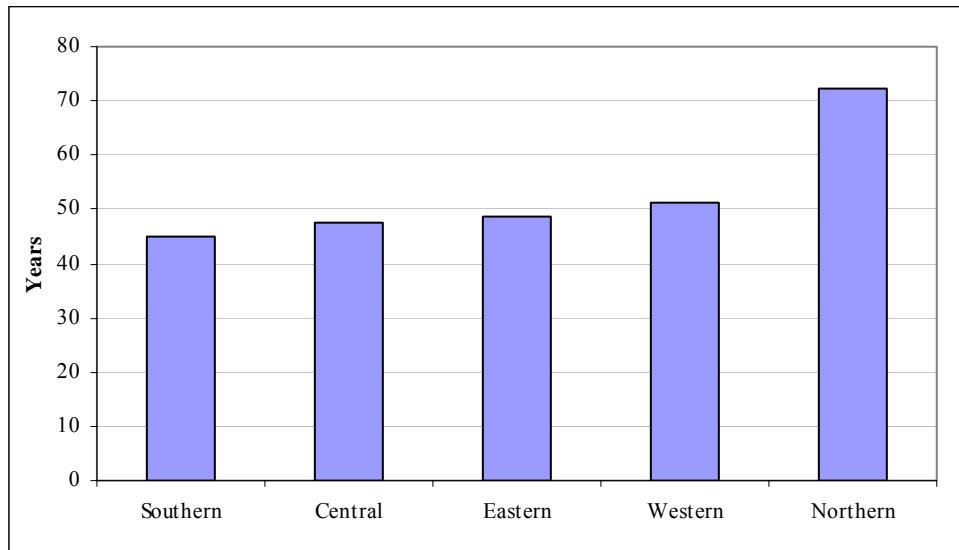


Fig. 21: Regional Life Expectancy in Africa, 2005

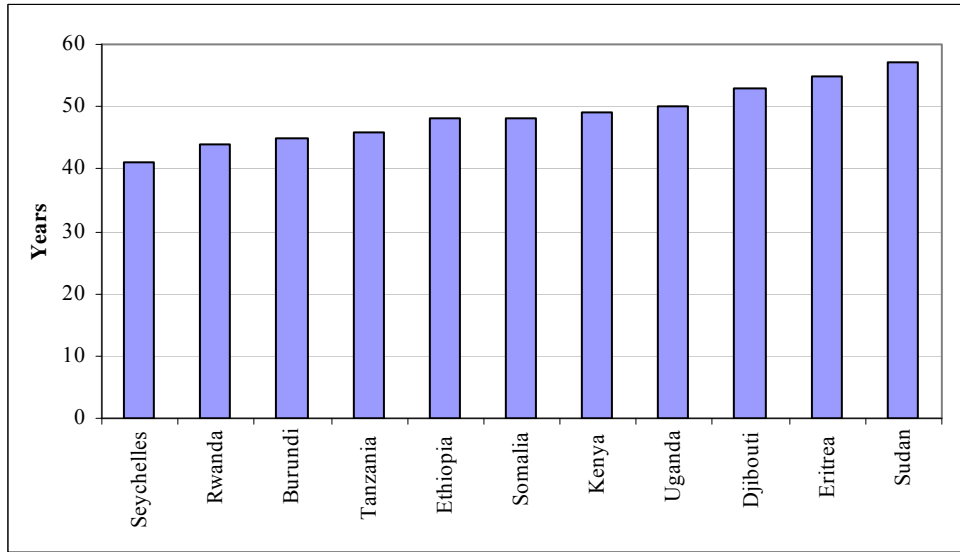


Fig. 22: Life Expectancy in Eastern Africa, 2005

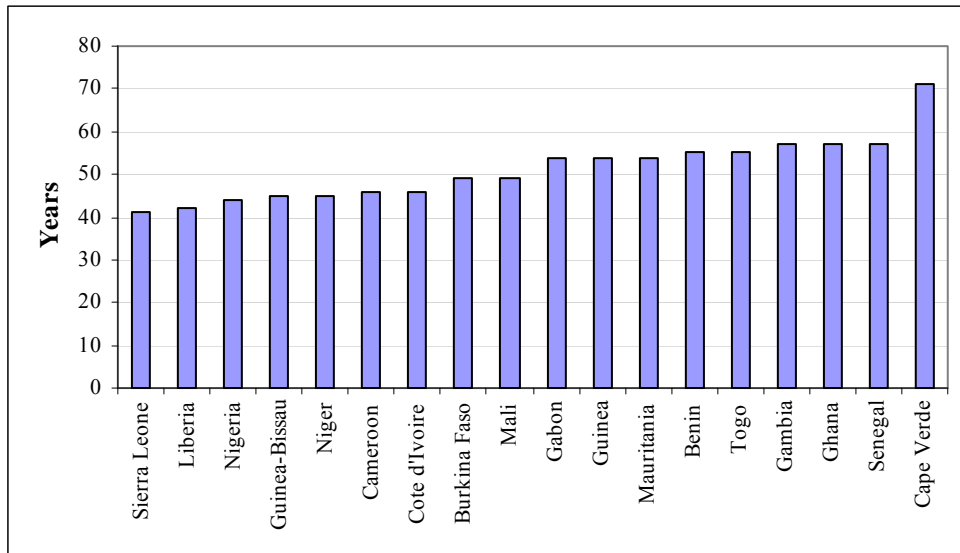


Fig. 23: Life Expectancy in Western Africa, 2005

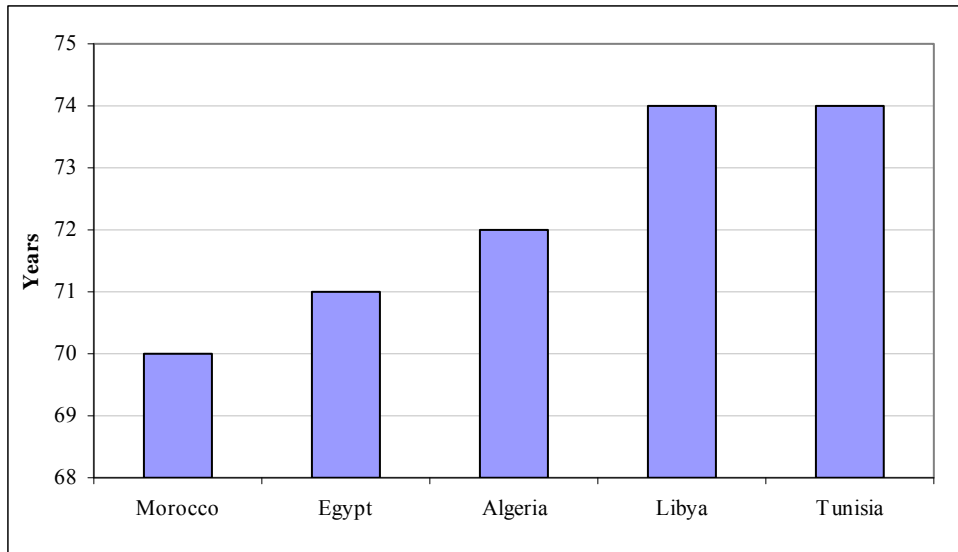


Fig. 24: Life Expectancy in Northern Africa, 2005

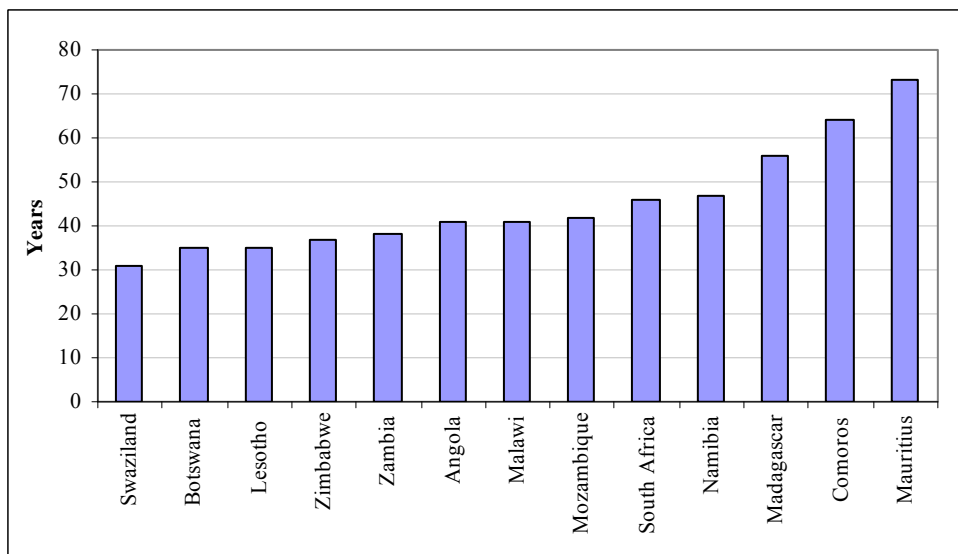


Fig. 25: Life Expectancy in Southern Africa, 2005

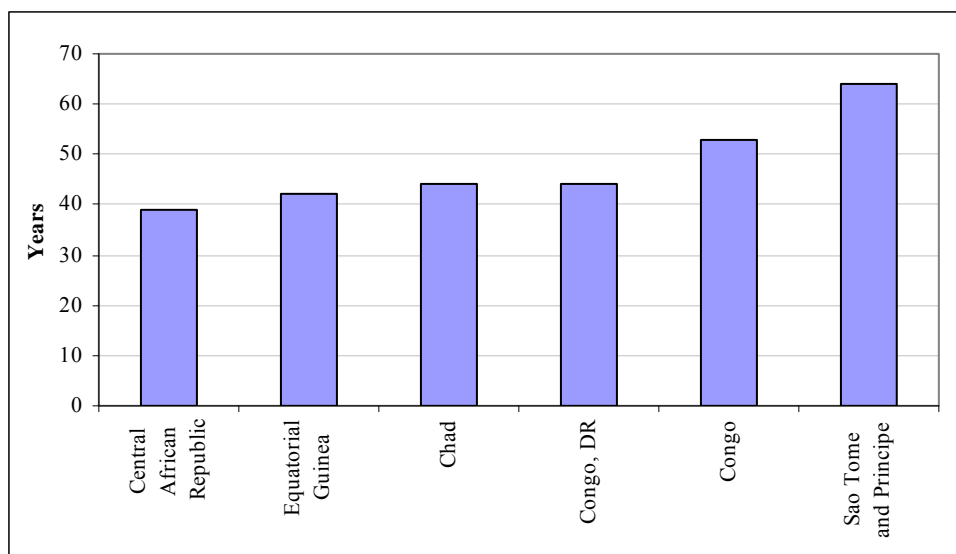


Fig. 26: Life Expectancy in Central Africa, 2005

Average government revenue which also included grants in Africa in 2005 was 29% of Gross Domestic Product (GDP). Revenues were variable across regions ranging from 23% in Western to 38% in Central with the Eastern having 29%, Northern (35%) and Southern (29%) (Fig. 27).

Revenues in most countries were below 50% of GDP. In three countries, Seychelles in Eastern, Libya in Northern and Sao Tome and Principe in Central region, revenues exceeded 50% of their GDPs in 2005 (Fig. 28-32).

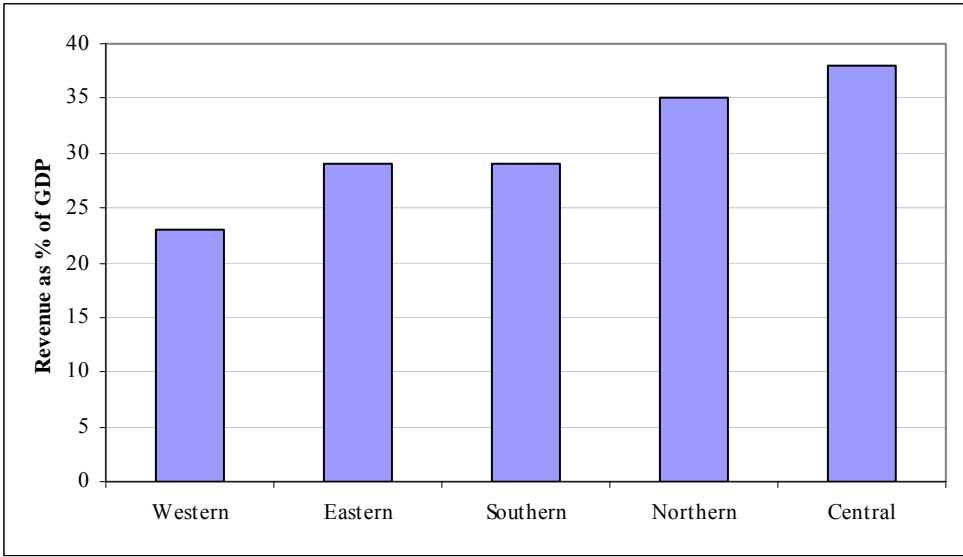


Fig. 27: Regional Revenue Distribution in Africa, 2005

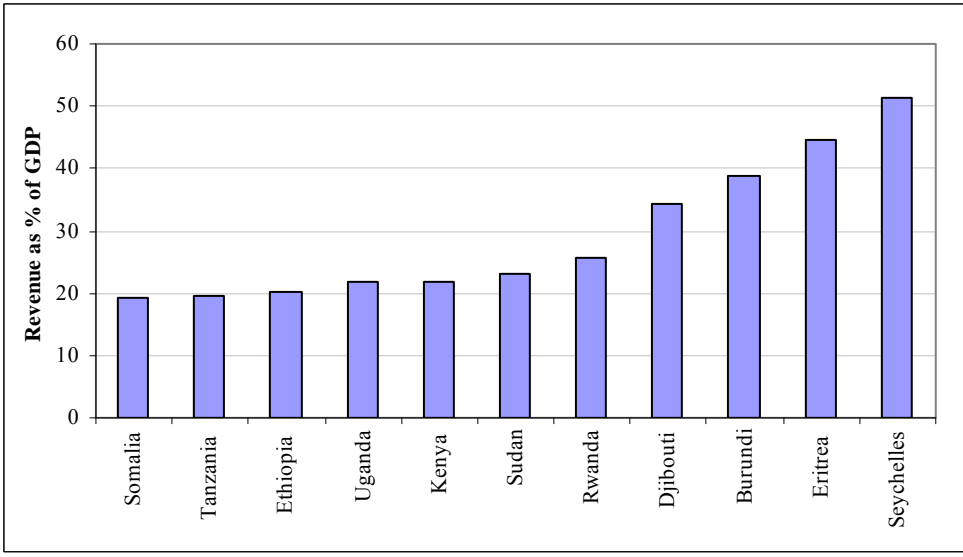


Fig. 28: Revenue Share of GDP in Eastern Africa, 2005

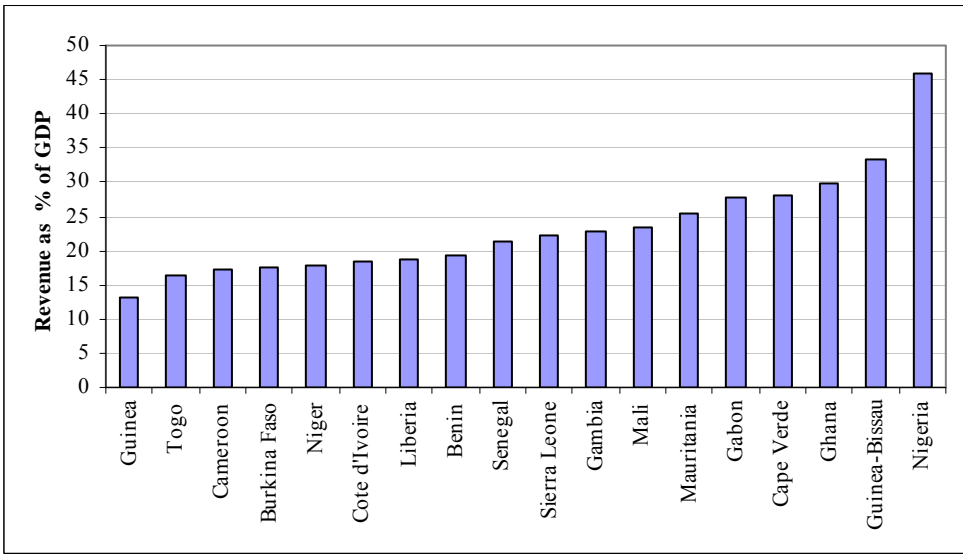


Fig. 29: Revenue Share of GDP in Western Africa, 2005

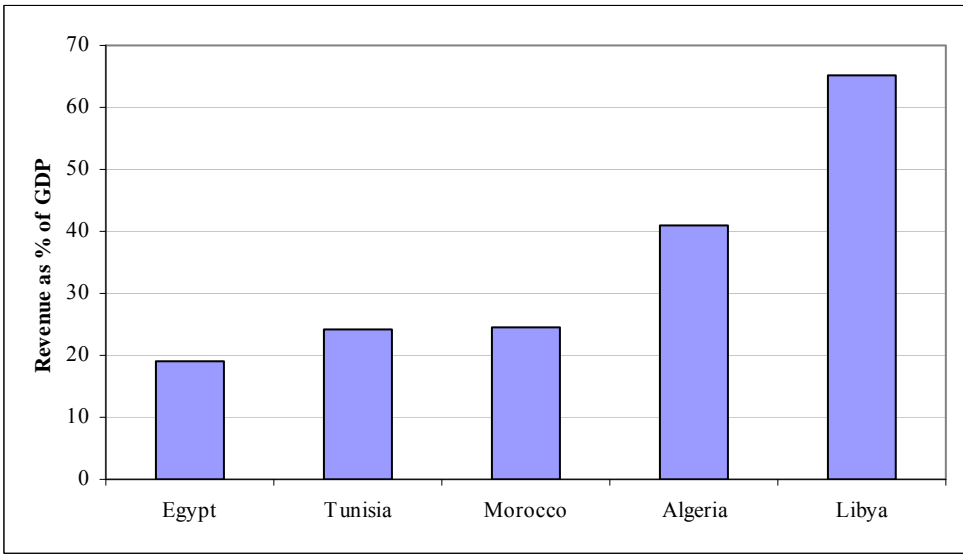


Fig. 30: Revenue Share of GDP in Northern Africa, 2005

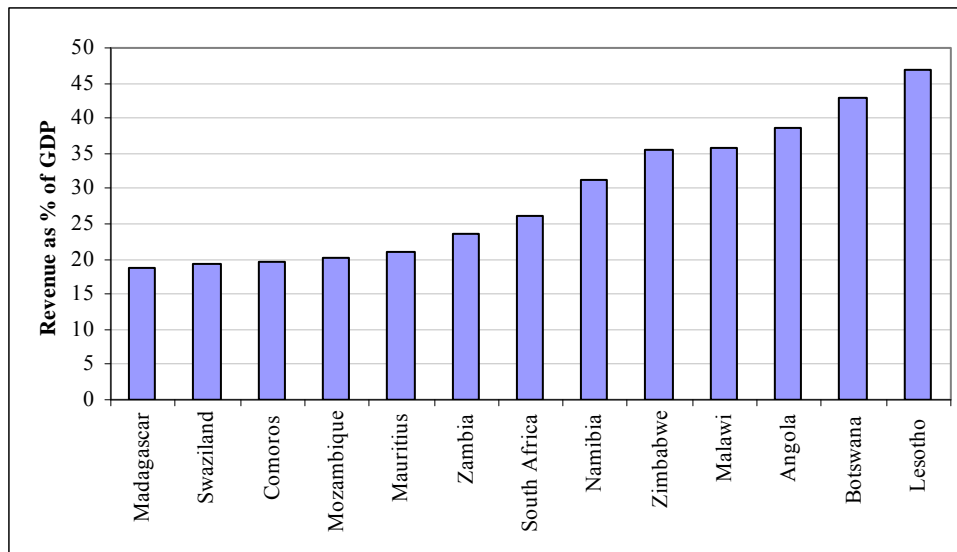


Fig. 31: Revenue Share of GDP in Southern Africa, 2005

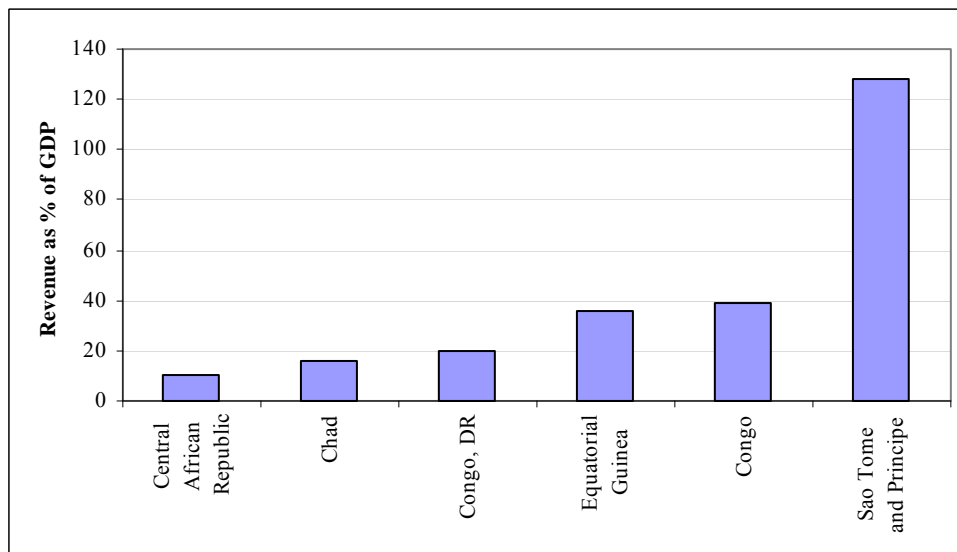


Fig. 32: Revenue Share of GDP in Central Africa, 2005

Research Problem

Structural Adjustment Reforms of the International Monetary Fund/World Bank and export-led growth policy orientation have been the two major economic development initiatives in many African countries in the last twenty years. Despite this common background, annual economic growth rates have varied considerably among African countries which, nevertheless, face similar export and financial market conditions. Such variation raises questions about the underlying factors behind the growth pattern and has important implications for policy reformulation and institutional reforms.

CHAPTER TWO

LITERATURE REVIEW

Empirical Growth Studies

Previous studies provide evidence of the importance of human capital, government spending, property rights, judicial independence, infrastructure, inflation, finance and investment on economic development. The following sections are review of these studies.

Human Capital

The economic growth effect of human capital expressed in terms of education is through accumulation of knowledge which leads to higher productivity and, hence, positive association between education and economic growth (Becker, *et al.*, 1999; Islam *et al.*, 2007; Levin and Raut, 1997 and Bassanini and Scarpetta, 2001).

Health is another human capital factor that influences economic growth. Artadi and Sala-i-Martin (2003) in a study of Africa pointed out that life expectancy was positively related to growth while malaria prevalence had a negative impact on growth in the continent. They further argued that AIDS was responsible for the decline in life expectancy. In a related study Bhargava and Jamison (2001) used panel data from several countries and found that adult survival rate was positively related to economic growth. The growth effect of increased life expectancy is associated with reduced fertility, increased human capital investment and savings (Zhang and Zhang, 2001).

Economic Factors

Economic factors influencing growth are government spending, inflation, investment and finance. Government spending can affect growth negatively or positively. For example, spending on defense has a negative impact on economic growth by reducing spending on education, health and investments (Grobar and Gnanaselvam, 1993). Nelson and Singh (1998) used data from 1970 to 1989 for sixty-seven LDCs with a regression model and found a positive relationship between defense expenditure and growth. They concluded that the composition of spending is a more important growth determinant than the overall size of government.

Savvides (1995) using a fixed effects model on data from 1960-1987 for 28 African countries found that a ten percent increase in annual average inflation decreased growth by 0.4%, with high inflation rates having detrimental effects on growth across Africa. In a related study, Mallik and Chowdhury (2001) used the co-integration and error correction models in four South Asian countries and found positive and significant short run and long run relationship between inflation and economic growth. This study concluded that attempts to reduce inflation rates would adversely affect economic growth, while that to achieve faster economic growth would result in unstable inflation rate. Ahmed and Mortaza (2005) on the other hand used data from 1980 to 2005 with the co-integration and error correction models and found a negative long-run relationship between inflation and growth in Bangladesh, with inflation rates above six percent having adverse effects on economic growth.

Investment leads to capital accumulation and productivity growth, thus, stimulating economic development (Feld and Voigt, 2003). Public and private investments complement each other, with public investment providing the necessary infrastructure for private capital formation, thereby, promoting economic growth (Khan and Reinhart, 1990).

Financial studies link economic growth to the availability of credit and the importance of financial markets and banks (King and Levine, 2001). Koivu and Korhonen (2002) used a fixed effects panel model on data from 1993 to 2000 for 25 transition countries and found that the amount of credit in the private sector did not accelerate economic growth. A related study by Levine (2003) concludes that better developed financial systems promote growth and financial intermediaries and markets enable businesses to access external funds for expansion.

Budget surpluses result in lower interest rates, higher investment and consumption spending and encourage governments to hold assets, thereby, promoting economic growth (Economics Resource Center, 2002; Kliesen and Thornton, 2001), and are associated with more rapid growth through greater productivity growth and capital accumulation (Fischer, 1993).

Institutional Factors

Two institutional factors that affect economic growth are property rights and judicial independence. Property rights studies show that personal freedom to engage in economic activities which collectively lead to community, regional or national economic growth show the positive influence of property rights on economic growth (Demsetz,

1967; Alchian and Demsetz, 1973). Economic growth can be retarded by the absence of property rights (Nelson and Singh, 1998; Horst , 2007) and the absence of property rights encourages informal market activities while reducing investor confidence and straining relations among nations (Horst, 2007).

Judicial independence enhances political stability and a sense of equity and is, consequently, critical for the development of healthy and sound economies. By protecting human rights and maintaining neutrality between the government and the business community, judicial independence provides a liberating environment for personal, economic and social growth (Klerman, 2006; Sherif and Brown, undated).

Another factor influencing growth is road quality. Dercon et al. (2007) used a generalized method of moments-instrumental variable-fixed effects model on household data from 1989 to 1994 for fifteen areas in Ethiopia and found that access to all-weather roads increased consumption by 16% and reduced poverty by seven percent. Better roads lead to lower unit costs of transportation consequently promoting economic and social activities (The Canadian Automobile Association, 2006), while bad roads increase transportation costs, uncertainty and transaction costs (Minten and Kyle, 1999).

CHAPTER THREE

METHODOLOGY

This study is based on 45 African countries (Appendix 1), and uses data from the Mo Ibrahim Foundation website which provided a comprehensive data set for the year 2005, with the variables that were necessary for the study. Inflation data was an average for the year, while data on the rest of the variables were annual data³. Choice of variables was based on economic theory, empirical studies and policy implications.

Model Specification

The linear regression model was used to determine the influence of selected economic, institutional and demographic factors on economic growth rate. Following Mendenhall and Sincich (2003), the model was specified as;

$$(1) \text{ GDPG} = \beta_0 + \beta X + \varepsilon$$

Where GDPG is the dependent variable

β_0 = constant term

β = a vector of parameters to be estimated

X = a vector of independent variables

ε = the error term

³ Differences in scale of measurement among variables may cause some variation in results and thus one has to pay careful attention to this when using data from any source.

Variables and Variable Measurements

Variables used in the study and their measurements are described in the following sections. The economic variables are net budget surplus, reliability of financial institutions, number of days to start business and inflation rate. Adult literacy is a demographic variable, whereas judicial independence and property rights are political/institutional variables.

Growth Rate (GDPG)

National growth rate is the dependent variable in this study and was measured as the percentage growth in real per capita GDP in 2005. Most growth studies including those by Barro (1995) and Temple (1999) have used real per capita GDP growth as a measure of economic growth.

Adult Literacy Rate (LIT)

Adult literacy rate is defined as the percentage of persons aged 15 and over, who can with understanding read and write short simple statements in their everyday life (UNESCO, 2007). Since literacy is associated with increased productivity and employment opportunities, it was hypothesized to positively influence growth.

$$H_0: \beta_1 = 0; H_a: \beta_1 > 0$$

Net Budget Surplus (SUR)

Net budget surplus measures the budget surplus/deficit (total revenues and grants received minus total expenditure and net lending), as a percentage of GDP. Thus net budget surplus was hypothesized to have a positive influence on economic growth.

$$H_0: \beta_2 = 0; H_a: \beta_2 > 0$$

Reliability of Financial Institutions (FIN)

Financial institutions provide capital for business start up or expansion and act as safety custodians for business earnings. Reliability of Financial Institutions was measured as contract intensive money, which is the ratio of non currency money to the total money supply. A ratio close to 1 signifies more faith by people in financial institutions and vice versa. This variable was hypothesized to have a positive influence on growth.

$$H_0: \beta_3 = 0; H_a: \beta_3 > 0$$

Number of Days to Start a Business (DAYS)

This is the number of days it takes to complete all the legal and bureaucratic procedures required to commence a commercial or industrial business that had up to 50 employees and start-up capital of ten times the country's per capita gross national income. It is an economic variable and this study hypothesized a negative association between increased number of days to start business and growth.

$$H_0: \beta_4 = 0; H_a: \beta_4 < 0$$

Judicial Independence (JUD)

Judicial independence is an index indicating the degree to which the judiciary is independent of manipulation or influence by government or politicians in its decisions in a country. It was measured on a scale of 0 to 1. The higher figure indicates more independence in the judiciary and vice versa. It was hypothesized that a more independent judiciary influenced growth positively.

$$H_0: \beta_5 = 0 ; H_a: \beta_5 > 0$$

Property Rights (PRT)

Property rights was measured as an index on a scale of 0 to 100 and it indicates the degree to which a country's laws protect and protect private property rights. The higher the figure the greater the rights individuals/businesses had to their property. Because property rights encourage investment, it was hypothesized to have a positive influence on growth.

$$H_0: \beta_6 = 0; H_a: \beta_6 > 0$$

Inflation Rate (INF)

Inflation rate is a measure of the annual percentage changes in consumer prices in a country and the figures were averages for the year. It was hypothesized that higher inflation rates had negative influence on growth.

$$H_0: \beta_7 = 0; H_a: \beta_7 < 0$$

The linear regression model used in this study was specified as;

$$2. \quad \text{GDPG}_i = \beta_0 + \beta_1 \text{LIT}_i + \beta_2 \text{SUR}_i + \beta_3 \text{FIN}_i + \beta_4 \text{DAYS}_i + \beta_5 \text{JUD}_i + \beta_6 \text{PRT}_i + \beta_7 \text{INF}_i + \varepsilon_i$$

Where GDPG is the per capita growth rate of GDP (%), LIT is the adult literacy rate, SUR is net government surplus, FIN is the reliability of financial institutions, DAYS is the number of days it takes to start business, JUD is the index of judicial independence, PRT is the index of property rights, and INF is the inflation rate while i denotes country, and $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ are parameters to be estimated and ε is the error term. The hypotheses were tested at the 10% significance level ($\alpha=0.10$) so as to minimize the chances of making a type II error which would have worse consequences in this study.

Descriptive Statistics of the Variables

Table 3 is a statistical description of the variables used in the regression model with variable name in column 1, variable label in column 2, the mean in column 3 and the minimum, maximum, standard deviation and coefficient of variation in columns 4, 5, 6 and 7 respectively. Of the variables used, the number of days to start business showed the greatest variation (Standard deviation = 43.81) followed by inflation rate, judicial independence reliability of financial institutions and literacy rate, while growth rate showed the least variation (std. dev = 3.5). Because of the variation in the independent variables, they were standardized with a mean equal to zero and standard deviation of 1. The model t and p-values were the same for regression models using the standardized and unstandardized variables. Draper and Smith(1981) and Echambadi and Hess (2004) have shown that similar results can be obtained in regression models using standardized and unstandardized variables because mean centering reduces the off diagonal elements and the main diagonal elements but has no effect on the determinant. Thus, either model could be used for predicting growth in Africa but the model with unstandardized variables was chosen for this study because of the ease of making economic interpretations with it.

**Table 3: Descriptive Statistics of Variables used in the Growth Regression Model
for Africa**

Variable	Variable Label	Mean	Minimum	Maximum	SD	Coefficient of Variation
GDPG	Growth Rate	2.17	-7.03	7.50	2.80	128.35
LIT	Literacy Rate	60.84	23.60	91.80	20.19	33.18
SUR	Net surplus	-0.14	-19.70	59.30	11.20	42,714
FIN	Reliability of Financial Institutions	73.03	5.6	100	21.41	29.32
DAYS	Number of days to start Business	62.67	14	233	43.81	69.92
PROP	Property Rights	38.51	0	100	25.59	66.46
JUD	Judicial Independence	49.20	0	100	28.82	58.59
INF	Inflation Rate	13.20	0.4	237.8	34.83	263.86
	N	45				

Regression Diagnostics

During data cleaning, observations with missing data were deleted. Tests for regression model assumptions were conducted. Since the data used were cross sectional, the assumption of independence of observations was met. For the normality assumption, the model was run with the selected independent variables. On plotting the residuals against the growth rate, Angola was an outlier. Using the DFBETAS and DFFITS, Angola was confirmed to be influential and therefore deleted from the data set. Also, there was an improvement in the resulting model further confirming that the deleted observation was highly influential. The Shapiro-Wilk test for normality, normal probability plot and box plot provided no evidence of non normality in the data. The

White test for homogeneity of variances gave a high p-value ($p=0.53$) leading to the conclusion of homogeneity of variances among the variables.

In addition, a test for multicollinearity using the SAS procedure to generate variance inflation factors (VIFs) was conducted and for all the variables in the model, the VIFs were less than 10 implying that multicollinearity was not an issue in this model. Multicollinearity is usually a serious problem because it can result in insignificant variables or wrong signs on the estimated coefficients (Mendenhall and Sincich, 2003). Some tests for interactions were significant but when the interactive terms were included in the model, they either did not make economic sense or resulted in coefficients which were previously significant becoming non significant.

To determine the predictive ability of the model, a model validation test with 31 runs was carried out using 25 randomly selected observations. The 31 iterations were got using the model specified in equation 2 and a different set of observations were randomly selected each time the model was run. The mean predictive R^2 and mean actual R^2 from the iterations were close and the standard deviations were similar implying that the model was suitable for predicting economic growth in Africa. The predictive R^2 measures how well the model can predict growth with a selected subset of the observations from the data set. When the predicted R^2 is close to the actual R^2 then we have more confidence in the specified model. The findings and discussions are presented in the following section.

CHAPTER FOUR

RESULTS, DISCUSSION AND POLICY IMPLICATIONS

Results

The regression⁴ estimates of the economic growth model of African countries are reported in table 4. The names and descriptions of the variables are in columns 1 and 2, respectively, parameter estimates are in column 3 and the t-ratios are in column 4. Results of statistical tests of significance for the estimated coefficients are indicated as ‘*’ for 10% level of significance. The model R^2 is 0.40 and the estimated coefficients of four out of the seven independent variables were statistically significant, with all but one having the expected sign.

The estimated coefficients of net budget surplus and property rights were positive, while those of literacy rate and inflation rate were negative and statistically significant. The estimated coefficients of the reliability of financial institutions and number of days to start business were positive as expected but not statistically significant whereas that of judicial independence was negative and not statistically significant.

⁴ A regression with regional dummies for Eastern, Western and Central regions changed the results slightly. Net surplus became insignificant while literacy rate, property rights and inflation rate remained significant. All the regional dummies were insignificant. Thus the model used in this study stood the test of significance. Regressions for individual regions were only possible for three of the regions due to limited observations (see Appendices 3 and 4 for details)

Table 4: Regression Results for GDP Growth Rate as the Dependent Variable and Selected Socio-economic Variables in African Countries.

Variable Name	Variable Description	Coefficient	t-value
Intercept		2.19*	1.40 (0.0854)
LIT	Literacy Rate	-0.036*	-1.42 (0.0823)
SUR	Net Budget Surplus	0.067*	1.82 (0.0381)
FIN	Reliability of Financial Institutions	0.015	0.63 (0.2665)
DAYS	Days to Start Business	0.010	1.15 (0.1283)
PRT	Property Rights	0.045*	2.61 (0.0065)
JUD	Judicial Independence	-0.017	-1.18 (0.1229)
INF	Inflation Rate	-0.032*	-2.84 (0.0037)

$R^2 = 0.40$ ‘*’ indicates significance at 10%. Figures in parentheses are the p-values

Discussion and Policy Implications

The positive sign on the estimated coefficient for net budget surplus suggested a positive association with growth. Thus a one unit change in net budget surplus was associated with a 0.067 percentage increase in growth. This finding corroborates previous studies including those of Fischer (1993) and Agarawal (2005) in which growth was positively related to budget surplus⁵. A possible explanation is that high net budget surpluses free some money for investment in productive sectors like agriculture, technology and education, thus promoting growth. This finding alludes to an important policy implication for African countries requiring them to pursue policies that create budget surplus and widen their tax bases.

Property rights index had a positive sign on the estimated coefficient as expected and a one unit change in the index of property rights was associated with a 0.045 percentage increase in growth. Schneider (2005) and O'Driscoll and Hoskins (2003) too found a positive association between property rights and economic growth. Property rights are a form of security on investments, which encourages investment by both local and foreign firms in a country. Intellectual property rights on the other hand encourage innovations. Thus, countries which guarantee rights to private and intellectual property are more likely to attract investments than those which do not. For example, seizure of white owned farms and property by the government of Zimbabwe was an abuse of property rights which caused capital flight to countries where property rights could be guaranteed. Since then, Zimbabwe's economy has been characterized by hyper inflation

⁵ When a government does not take inflation into account during its planning, it is likely to collect more revenue than anticipated which will show up as a surplus and this can be misleading.

and negative growth (Richardson, 2005). The example cited above suggests that if African countries are to attract investments, they ought to have policies that guarantee property rights.

The negative sign on the coefficient for inflation was as expected. Studies by Burdekin et al. (2004), Fisher (1993), Barro (1991, 1995) and Jung and Marshall (1986) have also found negative relationships between growth and inflation. The data showed that African countries had varying inflation rates and countries with high inflation rates experienced reduced growth. Inflation not only lowers the value of an investment but also creates uncertainty, thereby discouraging further investment (Fisher, 1993). Low inflation rate is associated with less frequent price volatility, making it easier for firms and households to estimate future relative prices. While stable prices which act as signals for decision making are associated with low inflation rates, high inflation rates lead to uncertainty and high price volatility which may result in collapse of markets (Farmer, 2002). This implies that to promote growth, African countries should try to minimize inflation by adopting adopt policies such having independent central banks and currency boards. However, adoption of such policies should be guided by careful evaluation of the merits and demerits of each (de Haan *et al.*, 2001).

The negative sign on the estimated coefficient for literacy rate was contrary to the expectation and a one percent increase in literacy rate was associated with a reduction of 0.036 percent in growth. This finding deviates from those in studies by Becker et al. (1996), Easterly and Levine (1997) and Temple (1999) which found positive relationships between education and growth. This is attributable to the relatively slow

response of the education system to fast changing economic and social environment and a high rate of brain drain in the technical, professional and entrepreneurial skills areas. This finding seems to suggest that African countries ought to make their education systems responsive to the fast changing socio-economic environment.

Reliability of financial institutions had a positive but non significant influence on growth and a unit change in the index of reliability of financial institutions was associated with a 0.015% increase in growth. The non significant finding could be explained by the inability of the private sector to access funds from commercial banks, resulting in low levels of business development. Also, the positive sign on the estimated coefficient on the number of days to start business meant that a one day increase in the number of days to start a business was associated with a 0.01 percent increase in growth, which was contrary to the expectation. Other studies such as that by Djankov, et al. (2006) found that countries with less burdensome business regulations grew faster. A possible explanation for this finding is that African countries are a target for people without adequate capital to establish businesses such as small retail shops which contribute little to growth. Thus longer periods enable African countries to scrutinize investors.

Contrary to the expectation, judicial independence was negatively related to growth as shown by the negative sign on the estimated coefficient, meaning that a one unit increase in the index of judicial independence was associated with a 0.017 percent decrease in growth. Other studies such as those by Sherif and Brown (undated) and Feld and Voigt (2003) have found judicial independence to positively influence growth. This

is attributable to part of the relationship being captured by other variables such as property rights.

Conclusions

From this study, it can be concluded that African countries are growing at varying rates. Part of the growth in Africa can be explained by literacy rates, property rights, inflation rates and net budget surplus. While reliability of financial institutions, judicial independence and number of days to start business did not significantly influence growth in Africa, it cannot be safely concluded that these factors do not influence growth as their effects may be long term. The study recommends that African countries should redesign their education systems so as to respond to the rapidly changing socioeconomic conditions. In addition, there is need to control brain drain through better remuneration, reduce public expenditure by downsizing their governments, and widen their tax bases using appropriate consumption taxes and property taxes so as to increase net budget surpluses in African countries. In regard to property rights, African governments ought to have laws as well as constitutional provisions that protect assets of individuals and firms from confiscation because this will encourage investments and thus growth. Finally, African governments should strive to control inflation rates in order to encourage investments as well as consumption which will in turn promote growth.

Areas for Further Studies

Since the Mo Ibrahim Foundation is compiling data on an annual basis, there is need for a study to use time series data model the long run determinants of growth in Africa using additional variables such as road density, mobile phone density and physician density. Also, analyzing the long term impact of internal displacement on Africa's gross domestic product would serve as a guide to development agencies in crafting policies for African countries affected by conflict.

APPENDICES

Appendix 1: List of Countries used in the Study

Central Region: Central African Republic, Chad, Congo Republic, Democratic Republic of Congo, Equatorial Guinea, Sao Tome and Principe

Eastern Region: Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Seychelles, Tanzania, Uganda, Sudan

Southern Region: Comoros, Swaziland, Mauritius, Botswana, Lesotho, Namibia, Zimbabwe, Zambia, Malawi, Madagascar, Mozambique, South Africa.

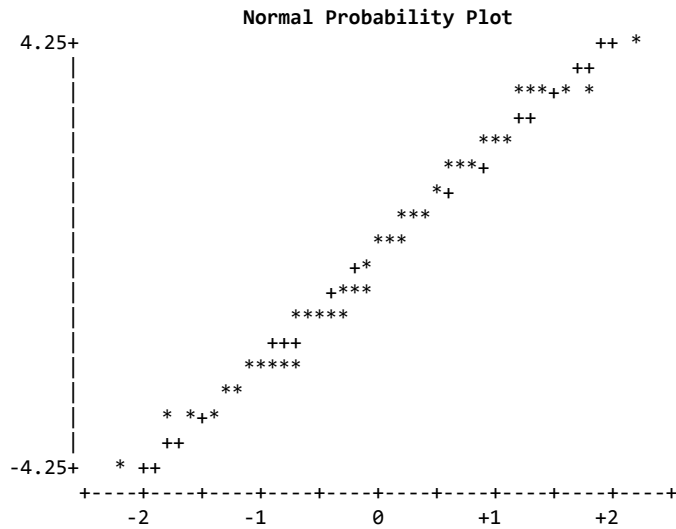
Western Region: Benin, Burkina -Faso, Cameroon, Cape Verde, Cote d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

Note: Somalia and Liberia were deleted from the data set due to missing observations. There was no data on Northern African. Angola was an outlier and thus deleted from the data set.

Appendix 2: Tests for Normality (Residual plots)

The UNIVARIATE Procedure
Variable: resid1 (Residual)

Stem Leaf	#	Boxplot
4 0	1	
3		
3 22234	5	
2		
2 0124	4	
1 588	3	
1 034	3	
0 778	3	
0 0334	4	
-0 0	1	
-0 8866	4	
-1 33210	5	
-1 5	1	
-2 4430	4	
-2 775	3	
-3 400	3	
-3		
-4 3	1	



Appendix 3: Regression Model with Regional Dummies

The REG Procedure
 Model: MODEL1
 Dependent Variable: X2 Growth rate

Number of Observations Read 45
 Number of Observations Used 45

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	150.83371	15.08337	2.65	0.0165
Error	34	193.50768	5.69140		
Corrected Total	44	344.34139			

Root MSE 2.38567 R-Square 0.4380
 Dependent Mean 2.17956 Adj R-Sq 0.2728
 Coeff Var 109.45654

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	1.29528	2.03927	0.64	0.5296
X3	Literacy rate	1	-0.05286	0.02820	-1.87	0.0694
X4	net surplus	1	0.04879	0.04903	1.00	0.3267
X5	Reliability of financial Institutions	1	0.02647	0.02986	0.89	0.3816
X6	Days to start business	1	0.01044	0.00952	1.10	0.2806
X11	property rights	1	0.04594	0.01831	2.51	0.0170
X12	Judicial independence	1	-0.01103	0.01573	-0.70	0.4881
X14	inflation	1	-0.02989	0.01207	-2.48	0.0184
X55	Eastern region	1	0.98160	1.09674	0.90	0.3771
X57	Southern region	1	0.67198	1.13005	0.59	0.5560
X58	Central region	1	2.13682	1.75350	1.22	0.2314

Parameter Estimates

Variable	Label	DF	Variance Inflation
Intercept	Intercept	1	0
X3	Literacy rate	1	2.50513

X4	net surplus	1	2.33331
X5	Reliability of financial Institutions	1	3.15957
X6	Days to start business	1	1.34536
X11	property rights	1	1.69692
X12	Judicial independence	1	1.59038
X14	inflation	1	1.36705
X55	Eastern region	1	1.75650
X57	Southern region	1	1.86480
X58	Central region	1	2.80929

Appendix 4: Individual Region Regressions

Region = Eastern

The REG Procedure

Model: MODEL1

Dependent Variable: X2 Growth rate

Number of Observations Read 11
 Number of Observations Used 11

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	106.15253	15.16465	1.55	0.3897
Error	3	29.34674	9.78225		
Corrected Total	10	135.49927			

Root MSE 3.12766 R-Square 0.7834
 Dependent Mean 2.17455 Adj R-Sq 0.2781
 Coeff Var 143.83044

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	13.76281	14.58821	0.94	0.4151
X3	Literacy rate	1	-0.14964	0.12351	-1.21	0.3124
X4	net surplus	1	0.14471	0.39760	0.36	0.7400
X5	Reliability of financial Institutions	1	0.00641	0.22216	0.03	0.9788
X6	Days to start business	1	-0.03227	0.16715	-0.19	0.8593
X11	property rights	1	0.08831	0.05028	1.76	0.1773
X12	Judicial independence	1	-0.02891	0.07034	-0.41	0.7086
X14	inflation	1	-0.30566	0.46977	-0.65	0.5617

Region = Western

The REG Procedure

Model: MODEL1

Dependent Variable: X2 Growth rate

Number of Observations Read 17
Number of Observations Used 17

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	20.17313	2.88188	1.87	0.1881
Error	9	13.87727	1.54192		
Corrected Total	16	34.05040			

Root MSE 1.24174 R-Square 0.5924
Dependent Mean 1.89000 Adj R-Sq 0.2755
Coeff Var 65.70055

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-4.31765	2.36480	-1.83	0.1012
X3	Literacy rate	1	-0.01519	0.03548	-0.43	0.6785
X4	net surplus	1	0.10574	0.10274	1.03	0.3303
X5	Reliability of financial Institutions	1	0.06867	0.03937	1.74	0.1151
X6	Days to start business	1	0.01499	0.01561	0.96	0.3622
X11	property rights	1	-0.03311	0.02388	-1.39	0.1990
X12	Judicial independence	1	0.04505	0.01547	2.91	0.0172
X14	inflation	1	0.07193	0.04541	1.58	0.1476

Region = Southern
The REG Procedure
Model: MODEL1
Dependent Variable: X2 Growth rate

Number of Observations Read 11
Number of Observations Used 11

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	115.57814	16.51116	5.47	0.0953
Error	3	9.05707	3.01902		
Corrected Total	10	124.63522			

Root MSE	1.73753	R-Square	0.9273
Dependent Mean	1.91727	Adj R-Sq	0.7578
Coeff Var	90.62529		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-1.00384	4.96251	-0.20	0.8526
X3	Literacy rate	1	-0.22567	0.11871	-1.90	0.1535
X4	net surplus	1	0.10753	0.32415	0.33	0.7619
X5	Reliability of financial Institutions	1	0.19052	0.12630	1.51	0.2285
X6	Days to start business	1	-0.00787	0.02713	-0.29	0.7906
X11	property rights	1	-0.00126	0.02817	-0.04	0.9672
X12	Judicial independence	1	0.06264	0.04321	1.45	0.2430
X14	inflation	1	-0.00308	0.02051	-0.15	0.8901

Region= Central

The REG Procedure

Model: MODEL1

Dependent Variable: X2 Growth rate

Number of Observations Read 6
 Number of Observations Used 6

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	37.67060	7.53412	.	.
Error	0	0	.	.	.
Corrected Total	5	37.67060			

Root MSE . R-Square 1.0000
 Dependent Mean 3.49000 Adj R-Sq .
 Coeff Var .

NOTE: Model is not full rank. Least-squares solutions for the parameters are not unique. Some statistics will be misleading. A reported DF of 0 or B means that the estimate is biased.
 NOTE: The following parameters have been set to 0, since the variables are a linear combination of other variables as shown.

$$X12 = 87.1823 * \text{Intercept} - 0.55419 * X3 + 1.05418 * X4 + 0.59993 * X5 - 0.48846 * X6 - 1.08048 * X11$$

$$X14 = 17.2525 * \text{Intercept} - 0.07236 * X3 - 0.04866 * X4 - 0.00385 * X5 + 0.05847 * X6 - 0.35501 * X11$$

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	B	-10.49416	.	.	.
X3	Literacy rate	B	0.11221	.	.	.
X4	net surplus	B	0.04178	.	.	.
X5	Reliability of financial Institutions	B	-0.14839	.	.	.
X6	Days to start business	B	0.08713	.	.	.
X11	property rights	B	0.21275	.	.	.
X12	Judicial independence	0	0	.	.	.
X14	inflation	0	0	.	.	.

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