

# WEST AFRICAN MONETARY AGENCY (WAMA)



## TAX EFFORT IN ECOWAS COUNTRIES

*Freetown, Dec 2011*

## **LIST OF ABBREVIATIONS AND ACRONYMS**

ECOWAS	ECONOMIC COMMUNITY OF WEST AFRICAN STATES
EMCP	ECOWAS MONETARY COOPERATION PROGRAMME
UEMOA	UNION ECONOMIQUE ET MONETAIRE OUEST AFRICAINE
WAMA	WEST AFRICAN MONETARY AGENCY
WAMZ	WEST AFRICAN MONETARY ZONE

## CONTENTS

	Page
<b>EXECUTIVE SUMMARY</b> .....	4
<b>1. INTRODUCTION</b> .....	6
<b>2. LITERATURE REVIEW</b> .....	9
2.1 Theoretical Concept.....	9
2.2 Empirical Literature.....	10
<b>3. METHODOLOGY</b> .....	12
3.1 The Stochastic Frontier Tax Function The Model .....	12
3.2 Estimation Technique.....	14
3.3 Data Sources and Description.....	15
<b>4. EMPIRICAL RESULTS</b> .....	16
4.1 Descriptive Statistics of variables.....	16
4.2 Determinants of Tax Revenue.....	22
4.3 Estimated Tax Efforts of Countries.....	31
4.3.1 Tax Effort of Countries over the period 2000-2010.....	31
4.3.2 Tax Effort of Countries in2010.....	34
<b>5. CONCLUSION AND RECOMMENDATIONS</b> .....	38
5.1 Conclusion.....	38
5.2 Recommendations.....	40
References.....	43
Appendix.....	45

## **EXECUTIVE SUMMARY**

Tax revenue mobilization is essential in the fiscal operations of every economy. The Economic Community of West African States (ECOWAS) therefore has a criterion on tax revenue under the convergence criteria of the ECOWAS Monetary Cooperation Programme (EMCP), which states that tax ratio (as a percentage of GDP) should be at least 20 percent. Despite the different tax reforms in the various member states the satisfaction of this criterion remains a challenging one. The objective of this study is therefore to investigate the determinants of tax revenue and construct an index of tax effort in the various economies of the ECOWAS region. Such investigation provides information on those countries that are operating their tax systems below capacity and those that are operating above their tax potential given the nature of the economies, with a view to providing guiding principles for fiscal policy operations.

The methodology involved the estimation of stochastic frontier tax functions for direct tax, indirect tax, trade tax and total tax (with and without natural resource related tax) for all the ECOWAS countries with the inclusion of five non-ECOWAS sub-Saharan African countries in the estimation, over the period 2000 to 2010. The tax efforts of these countries were determined from the stochastic frontier estimations over the period 2000 to 2010.

The results of the stochastic frontier tax functions show that literacy rate has a positive effect on all the categories of tax considered, financial depth has a positive effect on indirect tax and trade tax, agricultural share of GDP has a negative effect on direct and indirect tax, and openness of the economies to import and GDP per capita have positive effects on trade tax.

The results of the tax effort estimation show that all the ECOWAS countries are below their tax capacities though with differences in magnitude across tax type and countries. Tax efforts on direct taxes in 2010 were more than 70 percent for most of the countries,

with the exception of Guinea Bissau, Togo and Nigeria, with tax efforts on direct tax being 21, 50 and 55 percents respectively. Tax efforts are higher on direct taxes than on trade and indirect taxes while tax efforts on indirect taxes are higher than efforts on trade taxes for most of the ECOWAS countries. Moreover, with the exception of Burkina Faso and Senegal from UEMOA and Ghana from WAMZ, all the ECOWAS countries are below their tax potential on indirect tax by more than 30 percent.

With the exception of Benin, Mali and Niger in the UEMOA and Liberia in the WAMZ all the ECOWAS countries were operating more than 40 percent below their trade tax potential. This is more acute in Nigeria, Senegal, Burkina Faso, Guinea Bissau, Guinea, Ghana and Cape Verde which were below their trade tax potentials by about 70 percent or more over the period 2000 to 2010.

Guinea Bissau in the UEMOA and Nigeria in WAMZ had high tax efforts (more than 75 percent in 2010 and over the period 2000 to 2010), when natural resource related taxes are included in total tax revenue but the exclusion of natural resource related taxes from total tax revenue reduced the tax efforts of these countries to 24 and 35 percents respectively for Nigeria and Guinea Bissau in 2010, and 25 and 7 percent respectively for Nigeria and Guinea Bissau over the period 2000 to 2010. Other countries which were high tax effort countries with the inclusion of natural resource related taxes remained high tax effort countries with the exclusion of natural resource related taxes.

## 1. INTRODUCTION

Countries focus on domestic resource mobilization with a view to spending for development purpose and a key component of domestic resource mobilization is tax revenue generation. The tax performance of a country is therefore an important issue for consideration in both developed and developing economies. With this recognition, tax reforms have been undertaken by many developing economies in the last decade, with a view to enhancing tax revenue, among others. These reforms are also common in the ECOWAS region.

In the ECOWAS region, tax revenue occupies an important aspect of revenue generation. Hence, among the secondary convergence criteria of the ECOWAS Monetary Cooperation Programme (EMCP) is the criterion on Tax Revenue performance, which states that member countries should have tax-GDP ratio to be at least 20 percent. Despite the different tax reforms in the various member countries<sup>1</sup>, the satisfaction of this criterion remains a challenging issue<sup>2</sup>. Over the period 2001 to 2004 only Gambia and Ghana met this criterion (Both countries met it with 22.4 % in 2004) before the rebasing of Ghana's GDP. After the rebasing of Ghana's GDP only Gambia met this criterion<sup>3</sup>. Over the period 2005 to 2009 only Cape Verde and Ghana consistently met the criterion, with an average of 22.7 % for Cape Verde and 24.4 % for Ghana (before the rebasing of Ghana's GDP). After the rebasing of Ghana's GDP, only Cape Verde satisfied this criterion during this period. During this period, Liberia satisfied the criterion in 2009 with 23.2 percent. Over the period 2001 to 2009, UEMOA's best performance on this criterion was 16.1 % (in 2009) and the best performance of WAMZ was 19.1 % ( in 2001) while the best performance of ECOWAS was 17.3 % ( in 2001).

---

<sup>1</sup> Appendix I gives tax reforms in the ECOWAS member countries

<sup>2</sup> Appendix Table I shows the trend of performance on the ECOWAS convergence criterion on tax revenue.

<sup>3</sup> In 2010, Ghana re-based its GDP to 2006, and the report of that activity revealed that Ghana's GDP was underestimated from 2006 to 2010. Based on the new figures, Ghana is classified as a lower middle income country instead of a low income country.

In 2010, tax performance in ECOWAS countries was weak, only Cape Verde and Liberia satisfied the ECOWAS convergence criterion in respect of tax revenue performance with tax-GDP ratio of 20.9 percent and 24.7 percent respectively. At the zone level, the performance in 2010 was similar to the country scenarios. Performance in the UEMOA zone was 16.2 percent while in the WAMZ it was lower at 10.5 percent. ECOWAS registered 12.5 percent. The lowest levels of tax revenue performance in 2010 were registered in Guinea Bissau (6.1 percent of GDP), Sierra Leone (11.1 percent of GDP) and Burkina Faso (12.0 percent of GDP). Apart from Cape Verde, a relatively high performance was recorded in Senegal (19.4 percent of GDP), Gambia (18.6 percent of GDP) and Benin (18.4 percent of GDP).

There is a heavy reliance on international trade taxes in ECOWAS countries, which erodes long term external competitiveness. User charges and property and income taxes contribute an infinitesimal proportion of total revenues in most of the countries. Taxes on wealth, bequest, land and property exist in theory but have been rendered ineffective by design problems or lack of interest in its administration or a combination of both while personal income and corporate taxes are levied on narrow bases at high rates which are often sub-optimal. Direct taxes represent a small proportion of tax revenue (about 30 percent) and international trade taxes constitute the largest proportion of total tax less direct tax.

The poor performance on the tax revenue criterion implies that ECOWAS countries have limitations in their revenue collection mechanisms. But it remains unclear whether this limitation is predicated on low capacity to generate tax revenue (below maximum capacity) or by unwillingness to use already-achieved maximum tax capacity to fund public investments that can generate more revenue. An understanding of this issue can guide the various countries with respect to the appropriate mix of fiscal policy measures, particularly in countries with high fiscal deficit. If a country experiences fiscal deficit and is making maximum use of its taxable capacity, fiscal deficit has to be reduced for such an economy through expenditure rationalization. However, if a country is operating

below its taxable capacity, it would require the country to undertake tax reforms that would increase tax revenue in an effort to scale down budget deficit. Moreover, under these scenarios, knowledge of the determinants of tax revenue is important for revenue mobilisation.

The tax performance of a country is measured in both the static and dynamic approaches (Begun 2007). The static approach gives the potential for a given country to increase its tax revenue at a given point in time (which could be compared with other countries). This is referred to as tax effort while the tax buoyancy provides the idea of a dynamic index, which measures the response of the tax system with respect to the base, which is typically taken to be GDP, although other bases could also be used, (as in consumption for sales taxes and imports for tariff). In order to determine how close a country is to its tax potential, the idea of tax effort, the static concept is singled out for attention. The objective of the study is therefore to investigate the determinants of tax ratio (percentage of GDP) and construct an index of tax effort in the various economies of the ECOWAS region. This would provide information on those countries that are operating their tax system below their capacity and those that are operating above the maximum capacity, with a view to providing recommendations in respect of the appropriate fiscal policy drive.

The document is organized as follows: Following the introductory chapter is section two which deals with literature review. Section three is methodology, section four is empirical results and section five is conclusion and recommendations.



## **2. LITTERATURE REVIEW**

### **2.1 Theoretical Concept**

The concept of tax effort was first introduced by Lotz and Morss (1967) with interest in studying international tax ratio and was also applied empirically by Bahl (1971). It has gone through some amendments following the works of Stostky and WoldeMariam (1997).

Tax effort measures the extent to which a country has utilised its taxable capacity and it is a static measure of tax performance since it reveals information on the taxable capacity of a country in relation to actual tax performance at every point in time ( for example, every year). It is obtained from a model based concept, whereby the actual tax ratio is divided by a predicted value of tax ratio. Thus, the predicted tax ratio is the measure of taxable capacity. Hence, the accuracy of the tax effort of a country depends to a large extent on the accuracy of the model used to explain the tax ratio.

The concept of tax effort is related to a country's effectiveness in mobilizing internal resources. It concerns not only its tax policy but also all economic policy measures that may influence the level of public revenue. It helps to assess the degree to which a country can exploit its tax potential. Thus, a tax effort higher than one (or 100 %) may lead to the conclusion that the country has difficulty to mobilize additional resources because it largely exploits its tax potential. However, a tax effort that is lower than one indicates an under exploited tax capacity.

The tax effort phenomenon helps to distinguish the share of tax revenue determined by structural factors from the share determined by economic policy and other factors. The structural factors which public authorities cannot exploit in the short term are the tax potential or the public revenue potential. However, monetary, budgetary and exchange rate policy measures that are likely to influence the level of effective public resources, do define the actual tax effort.

## 2.2 Empirical Literature

The literature on tax effort as a way of assessing the tax performance across different countries is huge. In spite of the fact that panel data technique deals with the concept of average while stochastic frontier tax function deals with the concept of maximum most studies have focused on the application of panel data technique and very few have applied the stochastic frontier approach. The reason for this might partly be due to the wide applications of panel data in various applied studies in comparison to stochastic frontier techniques. A recent study that used the concept of stochastic frontier is Pessino and Fenochietto (2010) for 96 developed and developing countries.

In the determination of the determinants of tax ratio, which precedes the estimation of the tax effort of a country, most studies have used total tax share in GNP or GDP as the dependent variable while a few have used total tax share as well as direct tax and indirect tax share in GNP or GDP. The explanatory variables have taken different combinations in the literature, often chosen based on data availability. Common in the literature is agricultural share in GDP, which has often been found to have a negative effect though not significant in some studies. For example, Shin (1969) and Piancastelli (2001) found agricultural share of GDP to have a negative and significant effect on total tax revenue share in GDP while ALm and Martinez-Vazquez (2003) found a negative but insignificant effect of agricultural share in GDP in a panel of developed and developing countries. Instead of agricultural share of GDP, some studies have used manufacturing, industry or service share of GDP and the results are not uniform, though a positive effect seems to be common among the studies that used this variable as an explanatory variable. Trade/export/import share in GDP, and M2/GDP ratio have been found to have positive and significant effect on total tax share in GDP by many studies- for example, Bahl (2003), and Ahsan and Wu (2005). Per capita income have also been a factor with positive effect on tax revenue in empirical studies though not found to be significant in some studies, a few studies have also found it to have a negative effect ( for example, ALm and Martinez-Vazquez (2003) ). A number of other explanatory variables have been used in the literature. However, all of them have not been used simultaneously in

one study. These explanatory variables include: population growth, external debt stock GDP ratio, inflation rate, urban population as a share of total population, a corruption index and a measure of income inequality (for example, the Gini coefficient).

The study departs from previous studies in the literature by focusing on the ECOWAS region and considers the tax efforts for direct, indirect, trade and total tax, whereby tax effort for total tax is considered with and without natural resource related tax.

### 3. METHODOLOGY

#### 3.1 The Stochastic Frontier Tax Function

The tax efforts of the ECOWAS countries is estimated using the stochastic frontier tax function, which is basically an application of the stochastic frontier production function, as it is the most recent technique in estimating tax efforts in a cross-section time-series context, compared to the fixed and random effects techniques which have also been applied in the empirical literature.

The stochastic frontier production function was first developed by Aigner, Lovell and Schmidt (1977) for measuring technical efficiency. The *i*th individual specific stochastic output frontier production function at time *t* is written as :

$$Y_{it} = \exp(\beta_0 + \beta X_{it} + V_{it} - U_{it}) \quad i = 1,2,3,\dots,N: \quad t = 1,2,3,\dots,T \quad (3.1)$$

Where *Y* is the output variable, *X* is the vector of input variables,  $\beta$  is a vector of parameters, *V* is the disturbance term which is stochastic and can be positive or negative, *U* is the inefficiency term and is also a random variable with non-negative truncation. *U* follows a normal distribution with mean  $\mu$  and variance  $\sigma_u^2$ , *V* follows a normal distribution with zero mean and variance  $\sigma_v^2$  and *U* and *V* are statistically independent. The technical efficiency level of individual *i* at time *t* is the ratio of the actual to potential output ( Kumbhaker and Lovell, 2000).

In the context of stochastic frontier tax function,  $Y_{it}$  which is an output in the frontier production function is a tax ratio (percentage of GDP), the vector *X* which represents the inputs in production are the determinants of tax ratio.

The counterpart of technical efficiency in the stochastic frontier production function under stochastic frontier tax function is tax effort, which is obtained as the ratio of actual tax revenue to the stochastic frontier tax revenue (which is the tax capacity) and is between zero and one. Hence for a stochastic frontier tax function estimated for N countries over T periods the tax effort of country i in period t ( $TAXEFF_{it}$ ) is given by equation (3.2).

$$TAXEFF_{it} = \frac{Y_{it}}{\exp(\beta_0 + \beta X_{it} + V_{it})} = \frac{\exp(\beta_0 + \beta X_{it} + V_{it} - U_{it})}{\exp(\beta_0 + \beta X_{it} + V_{it})} = \exp(-U_{it}) \quad (3.2)$$

In accordance with the tax effort literature, for example, Pessino and Fenochietto (2010), Hudson and Teere (2004), Tanzi (1987) and Bahl (1971), the reduced form equation of tax ratio takes the vector X in equation (3.2) to compose of the following variables, GDP per capita (GDPPC), openness of the economy (OPNM), the share of agriculture in GDP (AGS), Proportion of total population that lives in the urban sector (URB), financial depth (M2/GDP ratio), inflation rate (INF) and literacy rate (LIR). There are other variables which can be included in the vector X. But empirical studies do not include all possible determinants (for example, income distribution which is measured by the Gini coefficient and a measure of corruption). Because of availability of data on these variables for most of the countries, we did not consider all the theoretical determinants in the stochastic frontier estimation.

Per Capita GDP is used as a proxy for the level of development of a country. The expected sign of the coefficient associated with this variable is positive on the basis that the more developed a country is the easier it is for the country to apply high technology driven techniques to collect taxes and this increases tax revenue.

Openness of an economy to international trade is expected to have a positive effect on tax revenue as a result of the increase in trade volume engendered by liberalization, which in turn increases international trade tax revenue owing to increase in the base.

The share of agriculture in GDP is expected to have a negative effect on tax revenue. This is predicated on the fact that it is difficult to tax this sector given the nature of their operations in developing economies, often rural based with weak access to the banking system.

The coefficient associated with the share of urban population in total population is expected to be positive. This stems from the fact that the demand for government services increases with increase in urban population and many public sector activities are concentrated in the cities. Hence, higher tax revenue are expected to be collected in order to satisfy the increase in demand for public services. This implies that governments increase their commitment to tax collection efforts when there is a growing demand for their services, precipitated in part by growing urban population.

Increase in the degree of monetization of an economy increases tax revenue because it becomes easier to collect tax revenue. Hence, the coefficient of broad money as a ratio to GDP, which is a measure of the depth of the financial system, is expected to be positive. The coefficient of the rate of inflation is expected to be negative precipitated on the fact that high rates of inflation acts as a sign of poor macroeconomic policy, which reduces investment and hence tax revenue. The coefficient associated with literacy rate is positive. This is because people are more likely to know the reasons for paying tax in a more educated society than a less educated society and this has positive effect on tax compliance.

### **3.2 Estimation Technique**

The estimation of the stochastic frontier tax function in equation (3.1) was done using data on the relevant variables over the period 2000-2010 for all the ECOWAS countries and some non-ECOWAS countries in sub-Sahara Africa. The inclusion of non-ECOWAS countries in the study is predicated on the fact that working with only ECOWAS countries benchmarks tax efforts to the best performing countries in ECOWAS, which could lead to overestimation of tax effort compared to benchmarking it to the best

performing countries in sub-Saharan Africa. Five countries were selected from the non-ECOWAS group. The choice was dictated by considering countries with total tax ratio (percentage of GDP) being more than 20 percent. In this respect, South Africa (with tax ratio of 31.2 %), Namibia (with tax ratio of 26.1 percent) and Botswana (with tax ratio of 22.5 percent) were considered. Two other countries, Kenya (with tax ratio of 18.3 percent) and Zambia (with tax ratio of 17.0 percent) which had high tax ratios relative to most ECOWAS countries, though less than the 20 percent benchmark, were also included among the countries. The choice of the benchmark of 20 percent was based on the fact that the macroeconomic convergence criteria for a single currency in the ECOWAS region has tax revenue GDP ratio to be at least 20 percent.

The stochastic frontier tax function specified in equation (3.1) was estimated using the 15 ECOWAS and 5 non-ECOWAS sub-Saharan African countries for five various tax categories. These categories are: direct tax (dtaxr), indirect tax (itaxr), trade tax (ttaxr), total tax (the sum of direct, indirect and trade taxes excluding natural resource related tax (dittaxr)) and total tax, including natural resource related tax (ditntaxr). The estimation was done in the general-to-specific context whereby insignificant variables were dropped until the parsimonious model was obtained. The considered the tax inefficiency term to follow the Battese and Coellie half normal model and the Battese and Coellie general truncated normal model. The log-likelihood was used to determine the appropriate frontier. Based on the choice of frontier model, the tax efforts were obtained for each tax category considered, using equation (3.2).

### **3.3 Data Sources and Description**

The data for modelling equation (3.2) is from the World Development Indicators, African Development Indicators and African Economic Outlook and the International Financial Statistics. Appendix Table I shows the description of the data.

## **4. EMPIRICAL RESULTS**

### **4.1 Descriptive Statistics of Variables**

Table 4.1 shows the descriptive statistics of variables used in the estimation and Table 4.2 show the tests for normality of the variables. The tests for normality show that all but one of the model variables are normal at the 1 percent level. Agricultural share of GDP is normal at the 10 Percent level, suggesting that the means of these variables can serve as appropriate summary measures over the period 2000-2010. Hence, we used the means to do a brief comparison of the revenue from the various taxes on an intra-zone and inter- zone basis. This comparison is also done for the explanatory variables.

The descriptive statistics of variables show that the average of total tax revenue (excluding natural resource related tax ) as a percentage of GDP over the period 2000 to 2010 was 13.2 percent for ECOWAS countries, 20.6 percent for five the non-ECOWAS countries ( Botswana, Kenya, Namibia, South Africa and Zambia) and 15.0 percent for all the countries combined. Within ECOWAS, UEMOA had an average tax ratio (excluding natural resource related tax) of 12.2 percent, WAMZ had 13.4 percent and Cape Verde had 20.1 percent. Average tax ratio with the inclusion of natural resource related tax was 16.1 percent, 21.5 percent and 17.5 percent in ECOWAS, non-ECOWAS and all the countries combined. The difference between the tax ratio with the inclusion of natural resource related taxes and that without the inclusion of natural resource related tax was 2.9 percent for ECOWAS countries compared to 2.4 percent for the non-ECOWAS countries, implying that natural resource related tax was higher in the ECOWAS countries than the five non-ECOWAS countries. Within the ECOWAS countries, the average tax ratio with the inclusion of natural resource related tax was 14.1 percent for UEMOA countries, 17.9 percent for WAMZ countries and 21.4 percent for Cape Verde over the period 2000 to 2010, revealing that natural resource related tax was about 4.6 percent of GDP in the WAMZ countries, 1.9 percent in the UEMOA and 1.3 percent in Cape Verde.



The average tax ratio for trade tax is higher than that of direct and indirect taxes in the ECOWAS countries. The average trade tax, indirect tax and direct tax ratios over the period 2000 to 2010 were 4.9, 4.2 and 4.1 percents respectively for the ECOWAS region, 5.6, 6.1 and 8.8 percent respectively for the non-ECOWAS countries. This implies that trade tax revenue was higher than indirect tax in the region and indirect tax is higher than direct tax. However, in the non-ECOWAS region, direct tax revenue was higher than indirect tax revenue while indirect tax revenue is higher than trade tax revenue. Within ECOWAS, trade tax was higher than both direct tax and indirect taxes in the UEMOA and WAMZ but not in Cape Verde, where indirect tax was higher than trade tax and direct tax. The average tax ratios for direct, indirect and trade were 3.5, 3.7 and 5.0 percents respectively for UEMOA, 4.5, 4.3 and 4.6 percents respectively for WAMZ and 6.7, 7.4 and 6.0 percents respectively for Cape Verde. These figures also reveal that direct tax and indirect tax ratios are higher in Cape Verde than in WAMZ and are higher in WAMZ than in UEMOA while trade tax ratio was higher in Cape Verde than in WAMZ and UEMOA but less in WAMZ than in UEMOA.

With respect to the independent variables, Table 4.1 shows that literacy rate, urban population proportion, M2/GDP ratio and GDP per capita were higher in the non-ECOWAS countries than the ECOWAS countries. Literacy rate, M2/GDP, urban population proportion and GDP per capita over the period 2000 to 2010 were 83.2 percent, 0.4, 41.2 percent and US\$ 2078.8 in the five non-ECOWAS countries and 46.9 percent, 0.3, 39.8 percent and U.S \$396.7 respectively in ECOWAS. Within ECOWAS, literacy rate was higher in Cape Verde ( 77.4 percent) than in WAMZ (52.1 percent) and UEMOA (39.2 percent), M2/GDP ratio was higher in Cape Verde (0.8) than in WAMZ ( 0.2) and UEMOA (0.3), urban proportion was higher in Cape Verde ( 57.3 percent) than in WAMZ ( 46 percent) and UEMOA ( 32.9 percent) and GDP per capita was also higher in Cape Verde ( US\$1505.3) than in WAMZ ( U.S\$310) and UEMOA (U.S \$322). Agricultural share of GDP was lower in the non-ECOWAS countries (12.5 percent) than the ECOWAS countries (33.2 percent) and within ECOWAS, WAMZ had a higher agricultural share of GDP (37.8 percent) than UEMOA (32.8 percent) and Cape Verde (9.2 percent). Inflation rate was lower in ECOWAS (8.0 percent) countries than the non-

ECOWAS countries (9.8 percent). The low inflation rate in ECOWAS relative to the non-ECOWAS countries could be attributed to the low inflation rate in the UEMOA ( 4.7 percent) and Cape Verde ( 5.8 percent) as the WAMZ had an average inflation rate of 12.9 percent. Openness of the economy, which was measured as the ratio of imports to GDP ( in percentage) was higher in the ECOWAS countries ( 41.5 percent) than the non-ECOWAS countries (29.6 percent) and within ECOWAS it was higher in Cape Verde (59.2 percent), than WAMZ (43.4 percent) and UEMOA( 37.8 percent).

**Table 4.1: Descriptive Statistics of the Frontier Estimation Variables**

Variable	Obs	Mean	Std Dev	Min	Max
<b>UEMOA</b>					
Direct Tax, % GDP	88	3.5	1	0.9	6.4
Indirect Tax, % GDP	88	3.7	2.9	0	10.5
Trade Tax, % of GDP	88	5	2.3	0.01	9.8
Direct, Indirect, Trade Tax, % GDP	88	12.2	3.4	1.3	18.52
Natural Resource Tax, % GDP	88	1.9	2.5	0	11.93
Total Gov.Tax plus Natural Resource Tax, %GDP	88	14.1	4	3.5	24.29
literacy Rate	88	39.2	13.5	16	65.8
Inflation	88	4.7	5	-3.5	19.4
M2 as a ratio of GDP	88	0.3	0.1	0.1	0.4
Openness	88	37.8	13	21.2	97
Agricultural Share of GDP	88	32.8	9.3	11.91	54.84
Urban Population, % Total Population	88	32.9	10.6	16	49.9
GDP Per Capita PPP U.S \$(2005)	88	322	151.1	150.71	628.2
<b>WAMZ</b>					
Direct Tax, % GDP	66	4.5	1.8	1.9	11.33
Indirect Tax, % GDP	66	4.3	2.8	1.1	10.7
Trade Tax, % of GDP	66	4.6	2.9	0.3	11.2
Direct, Indirect, Trade Tax, % GDP	66	13.4	5.3	4.6	27.7
Natural Resource Tax, % GDP	66	4.6	9.9	0	35.2
Total Govt.Tax plus Natural Resource Tax, %GDP	66	17.9	7.9	9	41.5
literacy Rate	66	52.1	16.5	29.5	78.9
Inflation	66	12.9	8.1	-2.8	40.5
Openness	66	43.4	18.5	20.5	99.1
M2 as a ratio of GDP	66	0.2	0.1	0.1	0.43
Agricultural Share of GDP	66	37.8	16.4	19.67	75.52
Urban Population, % Total Population	66	46	9.1	31	61.4
GDP Per Capita PPP US\$ (2005)	66	310	102.6	135.4	540.3
<b>CAPE VERDE</b>					
Direct Tax, % GDP	11	6.7	0.3	6.1	7.1
Indirect Tax, % GDP	11	7.4	3.5	3	11.3
Trade Tax, % of GDP	11	6	1.7	4.7	8.7
Direct, Indirect, Trade Tax, % GDP	11	20.1	2	16.7	22.8
Natural Resource Tax, % GDP	11	1.3	0.2	1.1	1.8
Total Govt. Tax plus Natural Resource Tax, %GDP	11	21.4	1.9	18.5	24.2
literacy Rate	11	77.4	2.1	73.8	79.5
Inflation	11	5.8	8.1	-2.3	21.7
Openness	11	59.2	7.1	50	73
M2 as a ratio of GDP	11	0.8	0.1	0.6	0.88
Agricultural Share of GDP	11	9.2	1.9	6.8	12.6
Urban Population, % Total Population	11	57.3	2.5	53.4	61.1
GDP Per Capita PPP US\$ (2005)	11	1505.3	255.4	1215.3	1904

**Table 4.1: Descriptive Statistics of the Frontier Estimation Variables Continued**

<b>ECOWAS</b>					
<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Min</b>	<b>Max</b>
Direct Tax, % GDP	165	4.1	1.6	0.9	11.3
Indirect Tax, % GDP	165	4.2	3	0	11.3
Trade Tax, % of GDP	165	4.9	2.5	0.01	11.2
Direct, Indirect, Trade Tax, % GDP	165	13.2	4.6	1.3	27.7
Natural Resource Tax, % GDP	165	2.9	6.6	0	35.2
Total Govt. Tax plus Natural Resource Tax, %GDP	165	16.1	6.2	3.5	41.5
literacy Rate	165	46.9	17.6	16	79.5
Inflation	165	8	7.7	-3.5	40.5
Openness	165	41.5	16.1	20.5	99.1
M2 as a ratio of GDP	165	0.3	0.2	0.05	0.9
Agricultural Share of GDP	165	33.2	14.2	6.8	75.5
Urban Population, % Total Population	165	39.8	12.4	16	61.4
GDP Per Capita PPP US\$ (2005)	165	396.7	329.6	135.4	1904
<b>NON-ECOWAS</b>					
Direct Tax, % GDP	55	8.8	3.6	2.6	15.6
Indirect Tax, % GDP	55	6.1	3.1	1.5	10.7
Trade Tax, % of GDP	55	5.6	4.2	0.6	16.3
Direct, Indirect, Trade Tax, % GDP	55	20.6	6.2	10.1	34.6
Natural Resource Tax, % GDP	55	0.9	1.7	0	5
Total Govt. Tax plus Natural Resource Tax, %GDP	55	21.5	5.3	13.8	34.6
literacy Rate	55	83.2	3.8	68	88.2
Inflation	55	9.8	5.5	2	26.3
Openness	55	29.6	5.6	19.5	41.7
M2 as a ratio of GDP	55	0.4	0.2	0.2	0.9
Agricultural Share of GDP	55	12.5	11.7	1.5	34.6
Urban Population, % Total Population	55	41.2	14.7	19.7	60.4
GDP Per Capita PPP US\$(2005)	55	2078.8	1482	317.4	4219.7
<b>ALL COUNTRIES IN THE ESTIMATION</b>					
Direct Tax, % GDP	220	5.3	3.1	0.93	15.6
Indirect Tax, % GDP	220	4.6	3.2	0	11.3
Trade Tax, % of GDP	220	5.1	3	0.01	16.27
Direct, Indirect, Trade Tax, % GDP	220	15.03	5.9	1.3	34.6
Natural Resource Tax, % GDP	220	2.4	5.8	0	35.2
Total Govt. Tax plus Natural Resource Tax, %GDP	220	17.5	6.4	3.5	41.5
literacy Rate	220	56	22	16	88.2
Inflation	220	8.5	7.3	-3.5	40.5
Openness	220	38.5	15.1	19.5	99.1
M2 as a ratio of GDP	220	0.3	0.17	0.1	0.9
Agricultural Share of GDP	220	28.1	16.3	1.5	75.5
Urban Population, % Total Population	220	40.1	13	16	61.4
GDP Per Capita PPP US\$(2005)	220	817.2	1075.1	135.4	4219.65

**Table 4.2: Results of the Normality Tests for All Variables**

Variable	Skewness/Kurtosis tests for Normality				
	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
dtaxr	220	0.0000	0.0017	43.45	0.0000
itaxr	220	0.0010	0.0000	40.40	0.0000
dittaxr	220	0.0000	0.0892	16.39	0.0003
ditntaxr	220	0.0000	0.0017	29.78	0.0000
m2gdp	220	0.0000	0.0004	44.94	0.0000
ags	220	0.0227	0.5300	5.54	0.0627
urb	220	0.2870	0.0000	19.77	0.0001
gdppcp	220	0.0000	0.0000	64.26	0.0000
inf	220	0.0000	0.0001	40.88	0.0000
opnm	220	0.0000	0.0000	69.89	0.0000
lir	220	0.8933	0.0000	.	0.0000
ntaxr	220	0.0000	0.0000	.	0.0000

## 4.2 The Determinants of tax Revenue

Stochastic frontiers tax functions were estimated for various forms of tax revenue. Tables 4.3 to 4.7 show the results of the maximum likelihood estimation of the stochastic frontier tax functions. The various taxes for which the estimations were done are direct tax, indirect tax, trade tax, total government tax ( the sum of direct, indirect and trade tax) and total government tax plus taxes related to natural resource rent. For each of the taxes considered, estimation was done under two scenarios: (i) by considering the inefficiency term in tax mobilization to follow the Batesse-Coelli half normal distribution (ii) by considering the inefficiency term to follow the Batesse-Coelli general truncated normal distribution.

The results show that across the various tax functions, the parameter estimates of the half normal and general truncated normal distributions are similar. The signs and significance of the variables in each of the estimated model are similar, except for the case of indirect tax where the share of agriculture is not significant in the half normal model but is significant in the truncated normal model. The Log-Likelihoods of the estimations are however higher for the truncated normal models than the half normal model except for the model which includes natural resource related tax, implying that the truncated normal models are in general better than the half normal models for the determination of tax efforts. The null hypothesis that the inefficiency term in tax mobilisation is zero cannot be rejected for both the half normal and truncated normal cases. This is the case across all the tax types considered. These test results are shown at the bottom of each of the tables (Table 4.3 to 4.7).

Table 4.3 shows the stochastic frontier tax function for direct tax. The table shows that direct tax in the countries in the estimation is determined by the share of agriculture in GDP and literacy rate. Agricultural share of GDP has negative effect on direct tax while literacy rate has a positive effect and both are significant at the 1 % level, suggesting that the higher the share of agriculture in GDP the lower is direct tax and the more literate the

population is the better the direct tax mobilization process. All the other variables which were included in the initial estimation of the model were found to be insignificant.

Table 4.4 shows the stochastic frontier tax function for indirect tax. The result shows that indirect tax in the countries in the estimation is determined positively by the degree of monetization (financial dept) of the economy (measured as the ratio of M2 to GDP), negatively by the share of agriculture in GDP and positively by literacy rate. Thus, unlike direct tax which is determined only by the share of agriculture in GDP and literacy rate, indirect tax is also determined by the financial depth of the economies. The share of agriculture is however not significant in the half normal version of the model but given that the log likelihood is higher in the general truncated version of the model, we attach importance to the general truncated version, suggesting that the share of agriculture in GDP is a variable that matters in the stochastic frontier tax function for indirect tax.

**Table 4.3: The Stochastic Frontier Tax Function: Direct Tax**

	Battese Coelli Half Normal		Battese Coelli Truncated Normal	
	Coefficient	P-Value	Coefficient	P-Value
Constant	0.129	0.593	0.098	0.674
Ln(M2/GDP)	-	-	-	-
Ln (AGS)	- 0.203	0.000	- 0.234	0.000
Ln (GDPPC)	-	-	-	-
Ln (URB)	-	-	-	-
Ln (OPN)	-	-	-	-
Ln(LIR)	0.626	0.000	0.632	0.000
	Log Likelihood = - 82.55		Log Likelihood = - 76.56	
	Likelihood-ratio test for $\sigma_u^2 = 0$ $\chi^2 = 42.16$ (0.000)		Z test for $\sigma_u^2 = 0$ : Z = - 5.73 (0.000)	



**Table 4.4: The Stochastic Frontier Tax Function: Indirect Tax**

	Battese Coelli Half Normal		Battese Coelli Truncated Normal	
	Coefficient	P-Value	Coefficient	P-Value
Constant	1.941	0.000	1.945	0.000
Ln( M/GDP)	0.118	0.000	0.115	0.000
Ln(AGS)	-	-	-0.002	0.000
Ln ( GDPPC)	-	-	-	-
Ln(URB)	-	-	-	-
Ln ( OPN)	-	-	-	-
Ln(LIR)	0.143	0.000	0.142	0.000
	Log Likelihood = - 190.174		Log Likelihood = - 187.310	
	Likelihood-ratio test for $\sigma_u^2 = 0$ $\chi^2 = 34.88 (0.000)$		Z test for $\sigma_u^2 = 0$ : Z= -2.05 (0.020)	

Table 4.5 shows the stochastic frontier tax function for trade tax. The table shows that trade tax in the countries in the estimation is determined positively by the degree of monetization (financial dept) of the economy (measured as the ratio of M2 to GDP), positively by GDP per capita (a proxy for the level of development of the economy), positively by openness of the economy to import and positively by literacy rate. Hence, while the share of agriculture in GDP is important in explaining direct tax and indirect tax it is not important in explaining trade taxes in the countries used in the estimation. Also, while GDP per capita and openness to trade are not important in explaining direct tax and indirect tax they are significant in the trade tax model. Literacy rate, which is significant in both the direct tax and indirect tax stochastic frontier models, is also significant in the model for trade tax. The ratio of M2 to GDP is also significant in the trade tax model as in the indirect tax model, unlike the direct tax model. Openness to trade has the highest elasticity with respect to trade tax, followed by literacy rate and financial dept but literacy rate has the highest elasticity in the direct and indirect tax stochastic frontiers.

**Table 4.5: The Stochastic Frontier Tax Function: Trade Tax**

	Battese Coelli Half Normal		Battese Coelli Truncated Normal	
	Coefficient	P-Value	Coefficient	P-Value
Constant	- 0. 162	0.000	-0.162	0.000
Ln( M2/GDP)	0.158	0.000	0.157	0.000
Ln(AGS)	-	-	-	-
Ln(URB)	-	-	-	-
Ln ( GDPPC)	0.059	0.000	0.059	0.000
Ln ( OPN)	0.324	0.000	0.324	0.000
Ln(LIR)	0.316	0.000	0.315	0.000
	Log Likelihood = - 219.26		Log Likelihood = - 216.26	
	Likelihood-ratio test for $\sigma_u^2 = 0$ $\chi^2 = 88.70$ (0.000)		Z test for $\sigma_u^2 = 0$ : Z=-14.71 (0.000)	

**Table 4.6: The Stochastic Frontier Tax Function: Total Tax Including Natural Resource Related Tax**

	Battese Coelli Half Normal		Battese Coelli Truncated Normal	
	Coefficient	P-Value	Coefficient	P-Value
Constant	1.365	0.000	1.994	0.000
Ln( M2/GDP)	0.187	0.000	0.201	0.000
Ln (AGS)	-	-	-	-
Ln ( GDPPC)	-	-	-	-
Ln (URB)	0.102	0.076	0.118	0.042
Ln ( OPN)	-	-	-	-
Ln(LIR)	0.388	0.000	0.368	0.000
	Log Likelihood = - 14.581		Log Likelihood = - 19.29	
	Likelihood-ratio test for $\sigma_u^2 = 0$ $\chi^2 = 9.94 (0.001)$		Z test for $\sigma_u^2 = 0$ : Z= -5.71(0.000)	

Table 4.6 shows the stochastic frontier tax function for total tax, including natural resource related tax revenue. The table shows that total tax revenue, including natural resource related tax, from the countries in the estimation depends on financial dept, urbanization and literacy rate. While financial dept and literacy rate are significant at the 1 % level, urbanization is significant at the 5 % level. Urbanisation is not significant in the model that excludes natural resource related tax. Moreover, GDP per capita and openness are significant in the model that excludes natural resource related tax but both are insignificant in the model that includes natural resource tax. Table 4.7 shows the stochastic frontier tax function for total tax, excluding natural resource related tax revenue.

**Table 4.7: The Stochastic Frontier Tax Function: Total Tax Excluding Natural Resource Related Tax**

	Battese Coelli Half Normal		Battese Coelli Truncated Normal	
	Coefficient	P-Value	Coefficient	P-Value
Constant	- 0.095	0.000	0.462	0.000
Ln( M2/GDP)	0.012	0.000	0.061	0.000
Ln (AGS)	-	-	-	-
Ln ( GDPPC)	0.079	0.000	0.049	0.000
Ln (URB)	0.034	0.000	-	-
Ln ( OPN)	0.149	0.000	0.054	0.000
Ln(LIR)	0.529	0.000	0.569	0.000
	Log Likelihood = - 57.15		Log Likelihood = - 56.74	
	Likelihood-ratio test for $\sigma_u^2=0$ $\chi^2 = 64.86 (0.000)$		Z test for $\sigma_u^2=0$ : Z= -11.478 (0.000)	

### **4.3 Estimated Tax Effort of Countries**

#### **4.3.1 Tax Effort of Countries over the period 2000-2010**

##### **ECOWAS Countries' Tax Effort during 2000-2010**

The tax effort of the ECOWAS countries and the other countries in the estimation were obtained from the estimated stochastic frontier tax functions as the ratio of actual tax revenue ( as a percentage of GDP) to potential tax revenue ( as a percentage of GDP), as in Kumbhaker and Lovell (2000) and Pessino and Fenochietto (2010). The tax efforts were obtained for various categories of taxes as well as total tax (with and without natural resource related taxes).

Table 4.8 shows the tax efforts of ECOWAS Countries over the period 2000-2010. The tax efforts of the countries over the period 2000 to 2010 show that the tax efforts of ECOWAS countries for direct tax are high though they are below the tax capacities. The exceptions to this are Guinea Bissau and Nigeria with direct tax efforts of 41 percent and 53 percent respectively. For the other ECOWAS countries, the direct tax efforts range from 63 percent (for Togo) to 87 percent (for Gambia).

**Table 4.8 Tax efforts of ECOWAS Countries over the period 2000-2010**

		Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource Related Tax	Total Tax Including Natural Resource Related Tax
<b>UEMOA</b>	Benin	0.82	0.33	0.86	0.81	0.84
	Burkina Faso	0.78	0.67	0.30	0.78	0.77
	Cote D'Ivoire	0.73	0.32	0.43	0.54	0.85
	Guinea Bissau	0.53	0.13	0.31	0.35	0.78
	Mali	0.79	0.24	0.81	0.80	0.86
	Niger	0.85	0.28	0.78	0.86	0.81
	Senegal	0.77	0.92	0.27	0.84	0.82
	Togo	0.63	0.11	0.51	0.47	0.78
<b>WAMZ</b>	Liberia	0.77	0.36	0.70	0.68	0.86
	Nigeria	0.41	0.15	0.17	0.24	0.82
	Gambia	0.87	0.38	0.58	0.79	0.85
	Ghana	0.82	0.86	0.36	0.75	0.78
	Guinea	0.83	0.55	0.31	0.72	0.81
	Sierra Leone	0.78	0.25	0.58	0.62	0.82
<b>CAPE VERDE</b>		0.71	0.58	0.33	0.61	0.80
<b>NON-ECOWAS</b>	Botswana	0.28	0.25	0.46	0.41	0.84
	Kenya	0.84	0.75	0.15	0.59	0.80
	Namibia	0.90	0.56	0.75	0.88	0.82
	South Africa	0.88	0.77	0.06	0.70	0.80
	Zambia	0.87	0.21	0.66	0.65	0.82



In the case of indirect tax, with the exception of Senegal, Ghana and Burkina Faso with tax efforts from indirect tax being 92 percent, 86 percent and 67 percent respectively, the tax efforts of most of the ECOWAS countries are low, ranging from 11 percent ( for Togo) to 55 percent (for Guinea).

In the case of trade tax, the tax efforts of the ECOWAS countries are generally low, ranging from 17 percent (for Nigeria) to 58 percent (Sierra Leone and Gambia) with the exception of Liberia, Niger, Mali and Benin with trade tax efforts of 70, 78,81 and 86 percents respectively. For most of the ECOWAS countries, the tax efforts from trade tax are higher than that from indirect tax. The exceptions are Ghana, Senegal, Burkina Faso, Guinea and Cape Verde.

Considering the aggregation of the three taxes ( direct, indirect and trade), the tax efforts of all the ECOWAS countries were below their potential in spite of the fact that most of them had tax efforts indices which were more than 70 percent, ranging from 72 percent for Guinea to 86 percent for Niger. Cape Verde, Sierra Leone, and Liberia had tax efforts being 61, 62 and 68 percents respectively while the low tax effort countries are Nigeria, Guinea Bissau, Togo and Cote D'Ivoire with tax efforts of 24, 35, 47 and 54 percents respectively. The low tax efforts of Guinea Bissau derives from its very low tax efforts on both trade and indirect tax and the same holds for Cote D'Ivoire though Cote D'Ivoire had a higher tax efforts on these two taxes than Guinea Bissau. Togo's low tax effort was mainly driven by its very low tax efforts on indirect taxes while Nigeria's low tax effort emanates from its very low tax efforts on all the three tax types considered.

For all the ECOWAS countries, when natural resource related taxes are included in tax revenue, tax efforts are high with the least being 77 percent (Burkina Faso) and the highest being 86 percent (Mali and Liberia). However, Nigeria is the country with the greatest difference between the two types of tax efforts (with resource related taxes and without resource related taxes). Nigeria has a total tax effort of 24 percent when natural resource related tax is excluded from taxes but when it is included, it has a tax effort of

82 percent, implying that more effort was placed on mobilizing natural resource related tax revenue than other types of taxes during the period 2000 to 2010. Appendix Tables 1 to 20 shows the tax efforts of each country for the various tax types considered from 2000 to 2010.

### **Non-ECOWAS Countries' Tax Effort during 2000-2010**

In the non-ECOWAS countries included in the estimation, effort on direct tax outweighs efforts on indirect and trade taxes, as observed in most ECOWAS countries, with Botswana being the exception, where trade tax effort outweighs efforts from direct and indirect taxes. Namibia had the highest tax efforts on direct tax and trade tax ( being 90 and 75 percents respectively ) while South Africa had the highest tax efforts on indirect tax with 77 percent, followed by Kenya with 75 percent. When effort on total tax is considered without including natural resources, all the countries had a relatively high tax effort though less than 100 percent, ranging from 59 percent ( for Kenya) to 88 percent (for Namibia), with the exception of Botswana with a tax effort of 41 percent. With the inclusion of tax revenue from natural resources makes, the non-ECOWAS countries with high tax efforts remained high tax effort countries and Botswana moved from a low tax effort country ( 41 percent) to a high tax effort country ( 84 percent).

### **4.2.2 Tax Effort of Countries in 2010**

#### **ECOWAS Countries' in 2010**

Table 4.9 shows the tax efforts of ECOWAS countries in 2010. The tax effort of the ECOWAS countries in 2010 reveals that as in the case of the average tax efforts over the period 2000 to 2010, most of the countries had high tax efforts on direct tax mobilization. The high tax efforts range from 77 percent (for Cote D'Ivoire) to 95 percent (for Ghana). The countries with relatively low tax efforts on direct tax in 2010 are Cape Verde (66 percent) and Nigeria (55 percent) while Guinea Bissau had a very low direct tax effort, with an index of 21 percent. The table also shows that the tax efforts of

the ECOWAS countries on direct tax were higher than the efforts on indirect taxes, with Cape Verde, Ghana and Gambia being the exceptions. Also, their tax efforts on indirect tax were higher than their efforts on trade taxes, with Liberia and Benin being the exceptions both countries were at their tax potentials for trade tax in 2010.

The countries with relatively low tax efforts on direct tax in 2010 are Cape Verde (66 percent) and Nigeria (55 percent) while Guinea Bissau had a very low direct tax effort, with an index of 21 percent. Considering total tax revenue including natural resource related tax revenue, all the ECOWAS countries had high tax efforts in 2010, ranging from 80 percent ( for Guinea Bissau) to 95 percent ( for Niger). However, when natural resource related taxes are excluded, the tax efforts of six of the countries deteriorated by large margins (at least 25 percent), suggesting that in 2010 the tax revenue mobilization process of these countries were highly motivated by natural resources related taxes. These countries are Benin, Niger, Senegal, Liberia, Ghana and Guinea. In Nigeria and Guinea Bissau, the tax efforts reduced by very large margins when natural resource related taxes are excluded. The tax effort of Guinea Bissau reduced from 80 percent to 7 percent and that of Nigeria reduced from 81 percent to 25 percent, suggesting that these two countries were greatly inefficient in mobilizing taxes from sources that are not natural resource related while putting much effort on natural resource related taxes in 2010. The rest of the ECOWAS countries moved from tax efforts which were in the range of 80 to 86 percent to tax efforts in the range of 41 to 58 percent, with Togo and Sierra Leone moving from 82 and 86 percents respectively to 41 and 49 percents respectively. This suggests evidence of Togo and Sierra Leone putting higher efforts on natural resource related taxes in 2010 compared to other forms of taxes, though the evidence is not as strong as the cases observed in Nigeria and Guinea Bissau.

**Table 4.9 Tax efforts of ECOWAS Countries in 2010**

		Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource Related Tax	Total Tax Including Natural Resource Related Tax
<b>UEMOA</b>	Benin	0.88	0.38	1.00	0.97	0.88
	Burkina Faso	0.80	0.71	0.33	0.80	0.81
	Cote D'Ivoire	0.77	0.36	0.45	0.58	0.83
	Guinea Bissau	0.21	-	0.04	0.07	0.80
	Mali	0.82	0.24	0.58	0.65	0.81
	Niger	0.91	0.52	0.60	1.00	0.95
	Senegal	0.90	0.82	0.23	0.84	0.82
<b>WAMZ</b>	Togo	0.50	0.06	0.49	0.41	0.82
	Liberia	0.91	0.42	1.00	0.86	0.85
	Nigeria	0.55	0.20	0.09	0.25	0.81
	Gambia	0.89	0.93	0.02	0.71	0.88
	Ghana	0.95	1.00	0.48	1.00	0.83
	Guinea	0.94	0.67	0.40	0.97	0.83
<b>CAPE VERDE</b>	Sierra Leone	0.80	0.26	0.31	0.49	0.86
<b>NON-ECOWAS</b>	Botswana	0.66	0.90	0.23	0.57	0.82
	Kenya	0.21	0.28	0.45	0.39	0.89
	Namibia	0.94	0.92	0.14	0.75	0.69
	South Africa	0.88	0.48	0.81	0.84	0.82
	Zambia	0.90	0.75	0.07	0.73	0.91
		0.87	0.23	0.65	0.64	0.82

## **Non-ECOWAS Countries' Tax Effort in 2010**

In 2010, tax efforts for direct tax in the non-ECOWAS countries were higher than those for indirect and trade taxes, except for Botswana, where trade tax effort was higher than direct tax effort and indirect tax effort. Also, direct tax efforts were high for only four of the non-ECOWAS countries, ranging from 88 percent (for Namibia) to 90 percent (for South Africa), and it was only 21 percent in Botswana. Indirect tax efforts were high in Kenya and South Africa in 2010 with indirect tax efforts of 92 percent and 72 percent respectively but it was low in Namibia and Zambia with 48 percent and 23 percent respectively. While Indirect tax efforts were high in Kenya and South Africa but low in Namibia and Zambia in 2010, Kenya and South Africa had low tax efforts on trade tax with 14 percent and 7 percents respectively and Namibia and Zambia had high tax efforts on trade tax with 81 percent and 65 percent respectively. Considering total tax effort including natural resource related taxes, all the non-ECOWAS countries had high tax efforts with South Africa and Botswana having tax efforts of 91 and 89 percents respectively with the least being 69 percent ( Kenya). When natural resource related taxes are excluded, it was only Botswana that deteriorated in tax effort by a large margin, moving from high tax effort (89 percent) to low tax effort (39 percent). The tax efforts of Kenya and Namibia increased with this exclusion, suggesting that in 2010 the tax revenue mobilization process of these two countries were not motivated by mobilization of natural resource tax revenue. Also, South Africa and Zambia remained high tax effort countries with tax efforts of 73 and 64 percents respectively.

## **5. Conclusion and Recommendations**

### **5.1 Conclusion**

Assessment of the convergence criteria under the ECOWAS Monetary Cooperation Programme shows that satisfaction of the tax revenue performance criterion has been challenging, as in the case of some of the other criteria for the member states. The non-satisfaction of this criteria, which implies poor fiscal performance on the side of revenue generation, coupled with high government expenditure by member states has made it difficult for member states to perform well on the primary criterion on budget deficit. The primary criterion on budget deficit also has implications for the satisfaction of the criterion on inflation.

Based on the recognition of the interactions or linkages among the secondary criterion on tax revenue, the budget deficit and the rate of inflation and the poor performance of member states on tax revenue (as a percentage of GDP) WAMA found it imperative to investigate whether each of the ECOWAS countries is operating its tax generation process below or above its potential, a phenomenon known as tax effort .

The methodology involved the use of aggregate annual data over the period 2000 to 2010 for all the ECOWAS countries and five non-ECOWAS sub-Saharan African economies (Botswana, Kenya, Namibia, South Africa and Zambia). The empirical estimation considered tax revenue models based on Pessino and Fenochietto (2010), Hudson and Teera (2004) and earlier by Tanzi (1978) and Bahl (1971). Stochastic frontier tax functions were estimated for the following tax-GDP ratios: direct tax, indirect tax, trade tax and total tax (with and without natural resource related tax). The explanatory variable were GDP Per capita, openness of the economy to import, agricultural share of GDP, urbanization, financial dept, literacy rate and inflation. The stochastic frontier tax functions were estimated using the general-to-specific method by arriving at the parsimonious models through the deletion of insignificant variables using both the half-

normal and general truncated normal distributions for the inefficiency term of the stochastic frontier model.

The actual tax revenue ratios were divided by the predicted values, to obtain an index of tax effort for each of the countries over the period 2000 to 2010. These were used to determine whether a country is above or below its potential in terms of tax performance. An index that is above one means that the country is above its tax potential while an index that is below one implies that the country is below its tax potential.

The estimated stochastic frontier tax functions show that: (i) direct tax effort is explained negatively by the share of agriculture in GDP and positively by literacy rate, (ii) indirect tax effort is explained negatively by the share of agriculture in GDP, positively by financial deepening and literacy rate (iii) trade tax is explained positively by financial deepening, GDP per capita and openness of the economy and literacy rate (iv) total tax revenue is explained positively by financial deepening, GDP per capita and openness of the economy and literacy rate. When natural resource related tax is included in total tax, the proportion of urban population in total population has a positive effect on total tax revenue. Inflation rate is not found to be significant in determining any of the tax ratios considered.

The tax effort indices show that all the ECOWAS countries and the non-ECOWAS countries considered in the study were below their tax capacities in 2010 and during the period 2000-2010. However, apart from Guinea Bissau, Togo and Nigeria with tax efforts on direct tax being 21 percent, 50 percent and 55 percent respectively, the ECOWAS countries had high tax efforts on direct tax in 2010. Moreover, the tax efforts of ECOWAS countries were higher on direct tax than on indirect tax and trade tax in 2010 and during the period 2000-2010. The tax efforts on indirect tax during the period 2000-2010 were low for most of the ECOWAS countries, with the exception of Burkina Faso, Senegal and Ghana the indirect tax efforts were below 60 percent in all the ECOWAS countries. In terms trade tax in ECOWAS countries, with the exception of Benin, Mali, Niger and Liberia tax efforts were lower than 50 percent in 2010 and 60

percent during the period 2000 to 2010. When total tax excluding natural resource related tax is considered, Guinea Bissau, Nigeria, Togo and Sierra Leone had tax efforts below 50 percent while Cote D'Ivoire, Niger and Cape Verde had tax efforts which are between 55 percent and 65 percent and the rest of the ECOWAS countries had high tax efforts in 2010 (in the range of 70 percent and 97 percent). The inclusion of natural resource related tax in total tax revenue changed Guinea Bissau, Nigeria, Togo and Sierra Leone from low tax effort to high tax effort countries in 2010 with the greatest change in tax effort coming from Guinea Bissau in 2010 and over the period 2000 to 2010, the greatest came from Nigeria.

## **5.2 Recommendations**

Drawing from the results of the study, the following recommendations are important to the ECOWAS countries.

1. Guinea Bissau and Togo, from the UEMOA countries, and Nigeria from the WAMZ countries, should place great emphasis on administrative procedures that would enhance their direct tax revenue mobilization as these countries have low tax efforts on direct tax and they therefore have potential to raise more direct tax revenue through improved tax administration.
2. The ECOWAS countries should review their procedures for mobilizing indirect taxes to determine where leakages are with a view to strengthening compliance on indirect taxes though Burkina Faso, Senegal and Ghana showed effort on indirect tax mobilisation. This could be done by reviewing the method of administration of the Value Added Tax (VAT), which is usually the biggest component of indirect tax. The methods of administration of value added tax (VAT) in Burkina Faso, Senegal and Ghana could be used as references for other countries. This is imperative given the fact that indirect taxes are far below their potential in most of the countries (the existence of low indirect tax efforts).



3. With the exception of Benin, Mali and Niger in the UEMOA and Liberia in the WAMZ all The ECOWAS countries require efforts to improve their trade tax mobilization as most of them are operating more than 40 percent below their trade tax potential, though Benin, Mali, Niger and Liberia showed high tax efforts on trade tax. This is more important in Nigeria, Senegal, Burkina Faso Guinea Bissau, Guinea, Ghana and Cape Verde which were below their trade tax potential by at least 70 percent over the period 2000 to 2010.
4. Guinea Bissau in the UEMOA and Nigeria in WAMZ had high tax efforts (more than 75 percent in 2010 and over the period 2000 to 2010) when natural resource related taxes are included in total tax revenue but the exclusion of natural resource related taxes from total tax revenue reduces the tax efforts of these countries to 24 and 35 percents respectively for Nigeria and Guinea Bissau in 2010 and 25 and 7 percent respectively for Nigeria and Guinea Bissau over the period 2000 to 2010. This therefore suggests that these two countries should shift their tax administration from emphasis on natural resource related taxes which is considered to be windfall relative to other tax types.
5. Each of the ECOWAS countries should continue to encourage policies that would improve the use of the banking system by the private sector for the purpose of making payments as the depth of the financial system has positive effect on indirect and trade tax revenue.
6. The ECOWAS countries should emphasize policies that would encourage the development of the agricultural sector so that it becomes an easy-to-tax sector, in the interest on increasing direct and indirect tax revenue. This follows from the fact that the study found that agricultural share of GDP has negative effect on tax both direct and indirect tax revenue. This could be done by bolstering the transformation of agricultural products industrial products.
7. As ECOWAS countries impose taxes on imports, it is important for them to maintain a policy of no non-tariff barriers to trade, except for health, social and

security reasons. This is important because openness of these economies to import has a positive effect on trade tax revenue.

8. To the extent that literacy rate is found to have a positive and significant effect on all tax types considered, efforts at improving the literacy rates in the ECOWAS economies are necessary to be sustained as this would improve the ability of tax payers to understand when and why taxes are paid, thereby increasing compliance across all tax types.
9. The positive effect of GDP per capita on trade tax suggests that it would be essential for supply side policies which can improve the growth of the economy to be strengthened. This includes investment in physical capital (including roads, electricity,) and the health sector.

## REFERENCES

- Ahsan, S.M and Wu, S. (2005). "Tax Structure and Reform in China, 1979-2002," Mimeo, Department of Economics, Concordia University, Canada.
- Aigner, D J. Lovell, K. C.A and Schmidt P (1977), "Formulation and Estimation of Stochastic Frontier Production Function Models," *Journal of Econometrics*, Vol. 6, 1977: 21-37.
- ALm, J and Martinez-Vazquez, J (2003), " Sizing the Problem of the Hard-To-Tax, " Paper presented at the "*Hard to Tax: An International Perspective*" conference Andrew Young School of Policy Studies, Georgia State University, May 15-16
- Bahl, R.W (1971). " A Regression Approach to Tax Effort and Tax Ratio Analysis," *IMF Staff Papers*, Vol.18, pp 570-612.
- "Reaching the Hardest to Tax: Consequences and Possibilities, "Paper presented at the "*Hard to Tax: An International Perspectives*" conference, Andrew Young School of Policy Studies, Georgia State University, may 15-16.
- Battese, G and Coelli, T (1992), "Frontier Production Functions, Technical Efficiency and Panel Data: With Application to Paddy Farmers in India", *Journal of Productivity Analysis*, 3 153-169.
- Begun, L (2007), "A Panel study on Tax effort and Tax Buoyancy with Special Reference to Bangladesh", *Working Paper Series: WP0715Bangladesh Bank*.
- Hudson, J. and Teera, J (2004), "Tax Performance: A Comparative Study," *Journal of International Development* 16, No. 6, pp. 785-802.
- Kumbhakar, S and Lovell, K (2000), "Sochastic Frontier Analysis" , *Cambridge University Press*, Cambridge.
- Lotz, J.R and E.R Morss (1967). "Measuring 'Tax Effort' in Developing Countries," *IMF Staff Papers*, Vol. 14, pp 478-499.
- Pessino, C and Fenochietto, R (2010), "Determining Countries' Tax Efforts" *Hacienda Publica Espanola/ Revista de Economia Publica*, Vol. 195, pp.61-83.
- Piancastelli, M (2001)," Measuring the Tax Effort of Developed and Developing Countries: Cross-Country Panel Data Analysis, 19989-95," Discussion Paper: CEPR. Discussion Paper No 3643.

Shin, K (1969). "International Difference in Tax Ratio," *The Review of Economics and Statistics*, Vol. 51, pp 213-220.

Stotsky, J.G and WoldeMariam A (1997). "Tax Effort in Sub-Saharan Africa," *IMF Working Paper*, WP/97/107 73

Tanzi, V (1987), "Quantitative Characteristics of the Tax Systems of Developing Countries," in David Newbery and Nicholas Stern (eds), *The Theory of Taxation in Developing Countries*, Oxford University Press.

## APPENDIX

**APPENDIX TABLE I: TAX REVENUE PERFORMANCE IN ECOWAS MEMBER STATES**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>BENIN</b>	12,8	12.6	13.7	14.4	14.6	14.5	15.4	16.9	17.2	16	18.4
<b>BURKINA FASO</b>	11,8	9.4	9.7	10.3	11.8	11.8	12	12.5	12.1	11.8	12
<b>CABO VERDE</b>	17,3	18.7	19.7	18.6	19.6	21.5	23.4	24.4	25.2	21.7	20.9
<b>COTE D'IVOIRE</b>	14,3	14.6	15.8	14.5	14.2	13.9	14.4	15.5	15.6	16.4	17
<b>THE GAMBIA</b>	23,3	19.2	14.1	13.8	22.4	17.2	18.8	19.4	17.6	17.5	18.6
<b>GHANA*</b>	11.6	10.6	9.6	11.7	13.1	12.7	12.4	12.2	11.6	12.1	12.8
<b>GUINEA</b>	10,2	11.4	12	10.5	9.5	12.2	14.8	13.5	14.7	15.2	17
<b>GUINEA BISSAU</b>	11,4	10.4	8.6	9.2	7.7	11.3	11.3	5.7	5.5	6.9	6.1
<b>LIBERIA</b>	13,7	11.4	10.7	6.4	9.2	14.7	13.2	12.6	12.5	23.2	24.7
<b>MALI</b>	12,3	12.7	12.5	14.2	14.8	15.4	14.9	14.2	13.3	14.6	14.2
<b>NIGER</b>	9,1	8.9	10.5	10.5	11	10.3	10.7	11.5	11.7	12.6	13.4
<b>NIGERIA</b>	16,7	19.5	14	15.7	14.8	17.2	14.9	11.7	16.2	12	15
<b>SENEGAL</b>	17,3	16.6	16.9	16.8	17.4	18.6	19	19.5	18.3	18.9	19.4
<b>SIERRA LEONE</b>	10,8	13.4	11.4	16.7	13.7	8.1	8.5	7.8	8.7	9.8	11.1
<b>TOGO</b>	11,0	10.5	11.5	13.9	15.7	14.6	15.4	16.2	14.9	14.7	14.3
<b>UEMOA</b>	<b>13.9</b>	<b>13.7</b>	<b>14.6</b>	14.4	14.8	14.7	15.1	17.3	16.7	16.1	16.2
<b>WAMZ</b>	<b>16.5</b>	<b>19.1</b>	<b>14.2</b>	<b>15.9</b>	<b>15.3</b>	<b>17.4</b>	<b>15.6</b>	<b>14.3</b>	<b>17.8</b>	<b>11.9</b>	<b>10.5</b>
<b>ECOWAS</b>	<b>15.6</b>	<b>17.3</b>	<b>14.3</b>	<b>15.4</b>	<b>15.1</b>	<b>16.5</b>	<b>15.5</b>	<b>15.3</b>	<b>17.4</b>	<b>13.4</b>	<b>12.5</b>
<b>No. of countries</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

Sources: WAMA and The Central Banks in ECOWAS

\* The figures are based on the rebased GDP figures.

**Appendix Table II: DATA DESCRIPTION AND SOURCES**

Variable	Symbol	Description	Source
GDP Per capita	GDPPC	Real Gross Domestic product divided by total population	African Development Indicators
Openness	OPEN	Calculated as t import, divided by GDP	International Financial Statistics
Share of Agriculture	AGS	Calculated as Agricultural value added divided by GDP	African Development Indicators
Urbanisation	URB	Calculated as total urban population divided by total population	African Development Indicators
Monetisation	(M2/GDP)	Calculated as the ratio of broad money to nominal GDP	African Development Indicators
Inflation Rate	INF	Calculated as the percentage change in consumer price index	WAMA Database
Nominal GDP	GDP	GDP at current price	African Development Indicators
Tax Revenue	TR	Total tax revenue generated by the central and state government	WAMA Database
Real GDP	Y	GDP at constant price	African Development Indicators
Literacy Rate	LIR	Calculated as 100 minus illiteracy rate	African Development Indicators
Direct Tax Ratio	DTAXR	Calculated as total direct tax revenue divided by GDP	African Economic Outlook
Indirect Tax Ratio	ITAXR	Calculated as total indirect tax revenue divided by GDP	African Economic Outlook
Trade Tax Ratio	TTAXR	Calculated as total trade tax revenue divided by GDP	African Economic Outlook
Total tax excluding natural resource related tax	DITTAXR	Calculated as the sum of direct, indirect and trade taxes	African Economic Outlook
Total tax including natural resource related tax	DITNTAXR	Calculated as the sum of direct, indirect and trade taxes plus natural resource related tax	African Economic Outlook

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Benin**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.81	0.30	0.84	0.79	0.86
2001	0.81	0.27	0.81	0.75	0.82
2002	0.81	0.31	0.79	0.76	0.89
2003	0.80	0.32	0.82	0.78	0.84
2004	0.80	0.33	0.79	0.75	0.75
2005	0.77	0.31	0.81	0.74	0.71
2006	0.83	0.33	0.95	0.88	0.89
2007	0.79	0.35	0.93	0.82	0.87
2008	0.83	0.37	0.85	0.81	0.85
2009	0.84	0.37	0.89	0.84	0.85
2010	0.88	0.38	1.00	0.97	0.88
2000-2010	<b>0.82</b>	<b>0.33</b>	<b>0.86</b>	<b>0.81</b>	<b>0.84</b>

**Burkina Faso**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.89	0.58	0.29	0.78	0.83
2001	0.79	0.60	0.28	0.73	0.82
2002	0.76	0.63	0.28	0.74	0.81
2003	0.75	0.63	0.25	0.72	0.83
2004	0.73	0.70	0.29	0.77	0.88
2005	0.74	0.70	0.29	0.76	0.80
2006	0.84	0.72	0.35	0.90	0.86
2007	0.75	0.70	0.31	0.77	0.47
2008	0.78	0.72	0.31	0.79	0.75
2009	0.79	0.72	0.32	0.80	0.59
2010	0.80	0.71	0.33	0.80	0.81
2000-2010	<b>0.78</b>	<b>0.67</b>	<b>0.30</b>	<b>0.78</b>	<b>0.77</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Cape Verde**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.72	0.25	0.44	0.57	0.90
2001	0.79	0.25	0.45	0.59	0.85
2002	0.77	0.28	0.46	0.58	0.88
2003	0.74	0.26	0.50	0.58	0.87
2004	0.71	0.62	0.27	0.59	0.58
2005	0.69	0.65	0.27	0.62	0.78
2006	0.69	0.74	0.25	0.63	0.83
2007	0.67	0.78	0.25	0.64	0.81
2008	0.67	0.82	0.24	0.65	0.87
2009	0.67	0.86	0.24	0.66	0.59
2010	0.66	0.90	0.23	0.57	0.82
2000-2010	<b>0.71</b>	<b>0.58</b>	<b>0.33</b>	<b>0.61</b>	<b>0.80</b>

**Cote D'Ivoire**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.79	0.35	0.43	0.57	0.85
2001	0.75	0.37	0.44	0.57	0.83
2002	0.74	0.35	0.43	0.55	0.86
2003	0.65	0.32	0.43	0.51	0.86
2004	0.60	0.31	0.41	0.49	0.88
2005	0.69	0.28	0.37	0.49	0.81
2006	0.77	0.27	0.43	0.55	0.82
2007	0.73	0.28	0.43	0.52	0.81
2008	0.84	0.31	0.44	0.59	0.88
2009	0.74	0.35	0.44	0.56	0.89
2010	0.77	0.36	0.45	0.58	0.83
2000-2010	<b>0.73</b>	<b>0.32</b>	<b>0.43</b>	<b>0.54</b>	<b>0.85</b>



**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Gambia**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.84	0.14	0.99	0.88	0.86
2001	0.80	0.12	0.80	0.70	0.90
2002	0.85	0.17	0.73	0.74	0.87
2003	0.90	0.21	0.67	0.81	0.85
2004	0.88	0.23	0.88	0.91	0.90
2005	0.89	0.27	0.63	0.80	0.84
2006	0.89	0.31	0.66	0.85	0.86
2007	0.88	0.32	0.67	0.86	0.83
2008	0.86	0.54	0.21	0.64	0.83
2009	0.89	0.92	0.06	0.74	0.77
2010	0.89	0.93	0.02	0.71	0.88
2000-2010	<b>0.87</b>	<b>0.38</b>	<b>0.58</b>	<b>0.79</b>	<b>0.85</b>

**Ghana**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.74	0.73	0.26	0.61	0.49
2001	0.78	0.73	0.29	0.63	0.87
2002	0.55	0.73	0.31	0.57	0.86
2003	0.71	0.87	0.33	0.67	0.63
2004	0.83	0.97	0.31	0.74	0.81
2005	0.85	0.92	0.36	0.76	0.84
2006	0.88	0.88	0.42	0.85	0.82
2007	0.83	0.85	0.33	0.70	0.81
2008	0.90	0.90	0.38	0.79	0.81
2009	0.93	0.95	0.47	0.90	0.80
2010	0.95	1.00	0.48	1.00	0.83
2000-2010	<b>0.82</b>	<b>0.86</b>	<b>0.36</b>	<b>0.75</b>	<b>0.78</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Guinea**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.75	0.45	0.28	0.56	0.87
2001	0.80	0.47	0.25	0.59	0.82
2002	0.76	0.54	0.28	0.62	0.88
2003	0.60	0.53	0.27	0.56	0.88
2004	0.69	0.50	0.26	0.57	0.43
2005	0.88	0.51	0.32	0.70	0.87
2006	0.92	0.50	0.30	0.75	0.81
2007	0.91	0.51	0.30	0.72	0.85
2008	0.94	0.68	0.37	0.95	0.85
2009	0.94	0.68	0.39	0.97	0.79
2010	0.94	0.67	0.40	0.97	0.83
2000-2010	<b>0.83</b>	<b>0.55</b>	<b>0.31</b>	<b>0.72</b>	<b>0.81</b>

**Guinea Bissau**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.27		0.72	0.46	0.81
2001	0.49		0.55	0.40	0.81
2002	0.67		0.38	0.36	0.78
2003	0.54	0.46	0.31	0.51	0.85
2004	0.85		0.32	0.38	0.82
2005	0.46		0.32	0.26	0.34
2006	0.59	1.00	0.00	0.64	0.84
2007	0.81		0.45	0.43	0.84
2008	0.54		0.20	0.23	0.84
2009	0.34		0.10	0.12	0.83
2010	0.21		0.04	0.07	0.80
2000-2010	<b>0.53</b>	<b>0.13</b>	<b>0.31</b>	<b>0.35</b>	<b>0.78</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Liberia**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.54	0.37	0.49	0.47	0.94
2001	0.51	0.48	0.44	0.49	0.84
2002	0.39	0.34	0.36	0.38	0.87
2003	0.65	0.19	0.61	0.47	0.81
2004	0.89	0.25	0.61	0.63	0.88
2005	0.87	0.36	0.60	0.66	0.84
2006	0.90	0.38	0.78	0.78	0.86
2007	0.93	0.40	0.91	0.90	0.89
2008	0.95	0.43	1.00	1.00	0.83
2009	0.90	0.39	0.94	0.84	0.89
2010	0.91	0.42	1.00	0.86	0.85
2000-2010	<b>0.77</b>	<b>0.36</b>	<b>0.70</b>	<b>0.68</b>	<b>0.86</b>

**Mali**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.71	0.24	0.95	0.83	0.87
2001	0.69	0.25	0.97	0.86	0.74
2002	0.61	0.19	0.83	0.72	0.89
2003	0.78	0.19	0.80	0.76	0.89
2004	0.78	0.27	0.92	0.86	0.88
2005	0.81	0.24	0.92	0.85	0.91
2006	0.91	0.25	0.91	1.00	0.82
2007	0.90	0.24	0.72	0.79	0.78
2008	0.88	0.24	0.67	0.74	0.93
2009	0.85	0.24	0.62	0.69	0.92
2010	0.82	0.24	0.58	0.65	0.81
2000-2010	<b>0.79</b>	<b>0.24</b>	<b>0.81</b>	<b>0.80</b>	<b>0.86</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Niger**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.69	0.17	0.81	0.74	0.80
2001	0.81	0.20	0.81	0.79	0.72
2002	0.78	0.20	1.00	0.86	0.95
2003	0.82	0.22	0.88	0.85	0.73
2004	0.88	0.24	0.85	0.89	0.77
2005	0.87	0.21	0.82	0.85	0.87
2006	0.82	0.24	0.69	0.69	0.83
2007	0.93	0.28	0.73	0.92	0.77
2008	0.93	0.35	0.69	0.94	0.81
2009	0.92	0.42	0.65	0.97	0.74
2010	0.91	0.52	0.60	1.00	0.95
2000-2010	<b>0.85</b>	<b>0.28</b>	<b>0.78</b>	<b>0.86</b>	<b>0.81</b>

**Nigeria**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.30	0.16	0.21	0.25	0.95
2001	0.41	0.21	0.32	0.33	0.74
2002	0.45	0.14	0.23	0.27	0.85
2003	0.48	0.15	0.22	0.27	0.82
2004	0.40	0.13	0.19	0.23	0.79
2005	0.37	0.12	0.16	0.21	0.85
2006	0.34	0.11	0.10	0.17	0.70
2007	0.36	0.13	0.12	0.19	0.84
2008	0.40	0.15	0.11	0.21	0.77
2009	0.47	0.17	0.10	0.22	0.91
2010	0.55	0.20	0.09	0.25	0.81
2000-2010	<b>0.41</b>	<b>0.15</b>	<b>0.17</b>	<b>0.24</b>	<b>0.82</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Senegal**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.77	0.90	0.27	0.82	0.80
2001	0.69	0.88	0.30	0.80	0.94
2002	0.70	0.91	0.30	0.83	0.77
2003	0.72	0.90	0.27	0.81	0.86
2004	0.73	0.93	0.25	0.82	0.81
2005	0.79	0.97	0.27	0.86	0.68
2006	0.78	1.00	0.29	0.91	0.78
2007	0.70	0.99	0.28	0.84	0.90
2008	0.80	0.93	0.27	0.84	0.80
2009	0.86	0.88	0.25	0.84	0.87
2010	0.90	0.82	0.23	0.84	0.82
2000-2010	<b>0.77</b>	<b>0.92</b>	<b>0.27</b>	<b>0.84</b>	<b>0.82</b>

**Sierra Leone**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.72	0.23	0.69	0.64	0.81
2001	0.79	0.27	0.81	0.73	0.80
2002	0.76	0.26	0.72	0.68	0.81
2003	0.78	0.27	0.70	0.70	0.80
2004	0.81	0.27	0.69	0.68	0.83
2005	0.80	0.27	0.55	0.62	0.82
2006	0.82	0.30	0.54	0.63	0.92
2007	0.77	0.19	0.56	0.57	0.67
2008	0.78	0.21	0.45	0.53	0.87
2009	0.79	0.24	0.37	0.51	0.86
2010	0.80	0.26	0.31	0.49	0.86
2000-2010	<b>0.78</b>	<b>0.25</b>	<b>0.58</b>	<b>0.62</b>	<b>0.82</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Togo**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.51	0.13	0.45	0.41	0.76
2001	0.70	0.21	0.47	0.50	0.76
2002	0.50	0.10	0.44	0.38	0.80
2003	0.77	0.15	0.51	0.52	0.77
2004	0.76	0.09	0.49	0.48	0.76
2005	0.65	0.10	0.52	0.47	0.78
2006	0.74	0.13	0.59	0.57	0.75
2007	0.62	0.06	0.59	0.49	0.79
2008	0.59	0.06	0.56	0.46	0.81
2009	0.55	0.06	0.53	0.44	0.76
2010	0.50	0.06	0.49	0.41	0.82
2000-2010	<b>0.63</b>	<b>0.11</b>	<b>0.51</b>	<b>0.47</b>	<b>0.78</b>

**Botswana**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.20	0.14	0.48	0.34	0.84
2001	0.22	0.14	0.48	0.33	0.81
2002	0.28	0.17	0.34	0.32	0.75
2003	0.35	0.28	0.29	0.37	0.83
2004	0.33	0.32	0.39	0.42	0.87
2005	0.30	0.35	0.48	0.46	0.88
2006	0.33	0.27	0.53	0.46	0.81
2007	0.30	0.26	0.61	0.50	0.90
2008	0.26	0.27	0.54	0.45	0.87
2009	0.24	0.28	0.50	0.42	0.74
2010	0.21	0.28	0.45	0.39	0.89
2000-2010	<b>0.28</b>	<b>0.25</b>	<b>0.46</b>	<b>0.41</b>	<b>0.84</b>

**APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010**

**Kenya**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.74	0.65	0.25	0.54	0.91
2001	0.73	0.69	0.21	0.53	0.81
2002	0.78	0.72	0.16	0.55	0.83
2003	0.81	0.73	0.15	0.56	0.80
2004	0.83	0.73	0.14	0.56	0.81
2005	0.86	0.74	0.12	0.57	0.83
2006	0.89	0.74	0.12	0.61	0.77
2007	0.85	0.71	0.12	0.54	0.71
2008	0.90	0.78	0.13	0.61	0.81
2009	0.92	0.85	0.13	0.67	0.77
2010	0.94	0.92	0.14	0.75	0.69
2000-2010	<b>0.84</b>	<b>0.75</b>	<b>0.15</b>	<b>0.59</b>	<b>0.80</b>

**Namibia**

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.90	0.70	0.75	0.93	0.79
2001	0.91	0.65	0.64	0.87	0.91
2002	0.93	0.54	0.50	0.81	0.87
2003	0.91	0.49	0.55	0.77	0.79
2004	0.89	0.46	0.68	0.80	0.88
2005	0.90	0.63	0.64	0.85	0.78
2006	0.91	0.60	0.86	0.97	0.75
2007	0.89	0.59	1.00	1.00	0.89
2008	0.89	0.56	0.95	0.95	0.76
2009	0.89	0.52	0.88	0.89	0.76
2010	0.88	0.48	0.81	0.84	0.82
2000-2010	<b>0.90</b>	<b>0.56</b>	<b>0.75</b>	<b>0.88</b>	<b>0.82</b>

### APPENDIX TABLE III: TAX EFFORTS OF COUNTRIES FROM 2000 TO 2010

#### South Africa

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.87	0.76	0.06	0.68	0.84
2001	0.86	0.77	0.06	0.68	0.82
2002	0.87	0.70	0.05	0.65	0.75
2003	0.88	0.72	0.05	0.67	0.73
2004	0.85	0.72	0.04	0.65	0.79
2005	0.86	0.81	0.06	0.69	0.71
2006	0.88	0.84	0.07	0.74	0.84
2007	0.89	0.84	0.08	0.74	0.84
2008	0.89	0.81	0.07	0.74	0.78
2009	0.90	0.78	0.07	0.74	0.79
2010	0.90	0.75	0.07	0.73	0.91
2000-2010	<b>0.88</b>	<b>0.77</b>	<b>0.06</b>	<b>0.70</b>	<b>0.80</b>

#### Zambia

year	Direct Tax	Indirect Tax	Trade Tax	Total Tax Excluding Natural Resource	Total Tax Including Natural Resource
2000	0.91	0.21	0.84	0.75	0.69
2001	0.93	0.21	0.55	0.75	0.84
2002	0.85	0.20	0.68	0.67	0.92
2003	0.86	0.20	0.64	0.63	0.84
2004	0.85	0.17	0.65	0.61	0.77
2005	0.83	0.16	0.61	0.60	0.81
2006	0.87	0.21	0.67	0.59	0.82
2007	0.86	0.20	0.62	0.65	0.82
2008	0.87	0.24	0.64	0.62	0.77
2009	0.86	0.24	0.69	0.63	0.90
2010	0.87	0.23	0.65	0.64	0.82
2000-2010	<b>0.87</b>	<b>0.21</b>	<b>0.66</b>	<b>0.65</b>	<b>0.82</b>



