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**WATAF
DISCUSSION
PAPER**

**WEST AFRICAN TAX
ADMINISTRATION FORUM**

VALUE ADDED TAX COLLECTION EFFICIENCY IN WEST AFRICA

WATAF DP/23/002

WATAF Discussion Papers describe reports of commissioned studies but are published to elicit comments and encourage debate. The views expressed in WATAF Discussion Papers are those of the author(s) and do not necessarily represent the views of the WATAF Secretariat, Council, or General Assembly.

February 2023

About WATAF

The West African Tax Administration Forum (WATAF) comprises Tax Administrations of all of the 15 West African countries: Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo that are members of the Economic Community of West African States (ECOWAS). WATAF was created to lead tax policy coordination and concerted tax administration capacities in the region. WATAF promotes tax transparency, harmonises regional tax laws and policies, promotes regional integration, and facilitates regional knowledge sharing, including dialogues to improve the quality of tax administration in Member States in order to increase the mobilisation of domestic revenue.

The inaugural meeting of WATAF was held at the Forum of Heads of Tax Administration in West Africa at the Rockview Hotel, Abuja, Nigeria on 12 September 2011. The original signatories to WATAF's formation were representatives of Tax Administrations from five West African Countries, namely, Benin, Ghana, The Gambia, Liberia, and Nigeria.

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WATAF Discussion Paper Series

Value Added Tax Collection Efficiency in West Africa

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ABSTRACT

Tax systems are influenced by several factors, ranging from structural and institutional to political factors that may affect the performance of tax revenue in diverse ways. In West Africa, the value-added tax (VAT) contributes most to total tax revenue with an average of about 35 per cent of the total tax revenue, excluding social contributions where applicable. The administration of VAT is relatively convenient but its collection can be less efficient due to certain factors. The current study investigated the main drivers of VAT collection efficiency in West Africa by assessing the effect of both tax and non-tax-related factors in order to provide insights for policy reforms. The study employed a battery of panel data estimation methods that account for possible variations of a VAT model and revealed that societal institution, economic structure and political development are the main drivers of the performance of VAT performance in West Africa. The study argues that a structural approach to reforming the VAT system would help the countries to have much better performance and that an institution of a peer-review system on VAT policy matters would provide a critical avenue for relatively new VAT-implementing countries to improve their efficiency much faster.

Keywords: Value Added Tax, West Africa, Tax Collection Efficiency, Per Capita Income, Institutions

JEL Codes: F15, H21

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ABBREVIATIONS AND ACRONYMS

AGVA	Agriculture Value-Added
DEMO	Democratic Index
ECOWAS	Economic Community of West African States
EFD	Electronic Fiscal Device
ETR	Electronic Tax Register
FE	Fixed Effect
GDP	Gross Domestic Product
GST	Goods and Services Tax
IMF	International Monetary Fund
OECD	Organisation for Economic Cooperation and Development
POLS	Pooled Ordinary Least Square
RE	Random Effect
RGDP	Real Gross Domestic Product
TOPEN	Trade Openness
URBAN	Degree of Urbanisation
VAT	Value-Added Tax
VAT_CE	Value-Added Tax Collection Efficiency
VAT_R	Value-Added Tax Efficiency
WAEMU	West African Economic and Monetary Union
WATAF	West African Tax Administration Forum

(...) the tax system will be further strengthened over the medium term by improving collection efficiency, enhancing compliance, and reorganizing the business practices of revenue agencies as well as employing appropriate technology (emphasis is mine)

Source: Federal Government of Nigeria Budget Breakdown and Highlights, p 30, January 2023.

1. INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

The intention of most governments to improve the collection efficiency of the tax system is borne out of the pressure to raise more revenue to fund the provision of public goods and services whose demand keeps increasing. While the overall tax system may score high or low in its efficiency rating at a certain point in time, the same may not be true for each tax type, including the Value Added Tax (VAT). VAT is a form of consumption tax that is being implemented in 187 countries (including at least 14 in West Africa (Price Waterhouse Coopers (PwC), 2022)) since it was first advanced in the early 20th century in the United States of America by Adams T. Sewell. VAT as a consumption tax covers a wide range of goods and services, giving it a broader tax base and strong potential to spur growth and also create some distortions. The tax is administratively convenient to collect but its channels of collection can easily be complicated by third-parties that collect it on behalf of revenue authorities.

In spite of the popularity of VAT as a revenue instrument, the literature on the topic is limited. Empirical evidence of its collection efficiency in West Africa seems non-existent or, at the least, scanty. According to the Revenue Statistics in Africa (2022), VAT contributes over 30 percent of tax revenue in West Africa and it directly affects about 430 million people (see Worldometer, 2023). An understanding of the collection efficiency of VAT systems is crucial for tax revenue performance and policy reforms. The revenue imperative of improving tax collection efficiency in West Africa shows in the wide fiscal gap and huge total external debt of about USD164 billion. (Statistica, 2023). In addition, the four largest economies in the region - Cote d'Ivoire, Ghana, Nigeria, and Senegal - would require USD14 billion annually to meet up their trade funding requirement, according to a joint report by International Financial Corporation and World Trade Organisation (2022). An enhanced and well-functioning VAT system can drive total tax revenue upward by nearly 40 percent over a short time period, based on the experiences of developed economies and a few advanced tax systems. Unlike direct taxes, VAT is relatively easy to administer, difficult to evade, and usually unavoidable, and it can be at the retail or wholesale point although its types generally are consumption type, revenue type and gross national product type.

¹ The Organisation for Economic Cooperation and Development's Revenue Statistics in Africa contains detailed information on [tax revenue and tax types in Africa](#). The latest version was launched in 2022.

² The United Nations' Worldometer is a real time dashboard that presents estimates of population for regions and countries of the world. It is available online: <https://www.worldometers.info/world-population/western-africa-population/>. VAT by design is consumption-based and affects every economic agent, young or old and female or male.

Both types are levied at every stage of production and supply, with every agent in the chain remitting VAT revenue collected to the government (input VAT) and including the same in the price of their goods or services (output VAT). Ultimately the incidence of VAT is borne by the final consumer, who is the end user of the goods or services. From an allocation standpoint, VAT is the most effective form of business tax, because it offers the least distortion to the economy. Hence, a proportional payment for government services is necessary to prevent distortion in the pattern of goods and services produced. Thus, the value added to production is an accurate indicator of a firm's use of government services (Oakland, 1967).

The administration and collection of VAT in West Africa dates back to 1954 when the French colonial government introduced it in its colony of the Cote d'Ivoire. Since then, almost all countries in the region have been collecting it. Table 1 presents a summary of the administrative structure of VAT collection in West Africa. Among others, scholars have advocated for the expansion of tax bases, improvement in collection efficiency, and the encouragement of strict compliance as more effective ways to increase revenues than raising the tax rate (Sanni, 2012). By subjecting a product to a flat rate, the government would generate equal revenue from categories of VATable goods and services while leaving consumption patterns unchanged. The practice of VAT has implications for a region such as West Africa with a substantial proportion of its population in the lower class. Similarly, VAT is implicitly a regressive tax. With an increased VAT rate, the price of goods and services will rise. Consequently, the poor masses bear a much heavier burden, as their marginal propensity to consume is higher than the middle and upper echelon in the economy (Sekwati and Malema, 2011).

1.2 THE PROBLEM

Tax revenue collection has attracted much attention in both academic and policy circles. Several factors including socioeconomic, political-legal, administrative, and cultural systems influence the tax system. There are different types and kinds of taxes but of particular interest to this study is the VAT levied on the consumption of goods and services, because of its widespread usage across many countries of the world and has accounted for about one-fourth of the world's total revenue generated from taxes (Aizeman and Jinjark, 2005; Organisation for Economic Cooperation and Development (OECD), 2022).

In principle, a 'good' tax system must be economical, buoyant, and productive, to mention just a few. Policymakers want to raise more revenue but are usually uncertain about the optimal manner to undertake such a venture. Moreover, additional tax revenue mobilisation must ensure minimal distortions, otherwise, its overall economic objectives will be lost. VAT, although, has its advantages and serves as a fiscal tool but can also become highly inefficient due to the role of third parties. There are large number of stakeholders involved and this may place financial and administrative burdens on the tax authorities, and consequently render VAT revenue collection sub-optimal. Expenses incurred in monitoring, assessing, and auditing a large number of third parties, for instance, must be kept below a certain threshold if the principle of 'economy' must prevail. The structure of the economies of West Africa particularly presents challenges to tax authorities: large and growing hard-to-tax sectors such as ser-

⁴ Guinea Bissau proposed to replace its sales tax with VAT from 2023 (see International Bureau for Fiscal Documentation's Tax Research Platform at www.ibfd.org).

vices, agriculture, and construction; large informal sector, huge subsistent production, large informal cross-border trading, and so on. Effort to maximise VAT revenue, therefore, requires an understanding of the potential distortions of costly tax policy, such as an increase in VAT rate; and the expected improvement in the efficiency of VAT system itself. The current study interrogates the latter, and addresses a key question: what are the structural and institutional drivers of VAT collection efficiency in West Africa?

Controversies exist about factors that affect the efficiency of collecting VAT . Factors such as the number of firms or individuals captured in the tax net, the number of registered large taxpayers, VAT sensitization and tax awareness of the society, detection, and enforcement of tax laws (Weru et al, 2013; Tagkalakis, 2014; Atanasijevic et al, 2018; Anjulo and Waje, 2018; Masunga et al, 2020; Alsarmi and Ahemed, 2022) have been identified as critical factors determining VAT collection efficiency. On the other hand, Antic (2014) and Ristic et al (2019) opined that, on the part of the government and tax authorities, changes in the standard VAT rate, implementation of ideal VAT policies, sanctions (in terms of tax fines and penalties), as well as tax exemptions for certain goods and services have negative effects on VAT collection efficiency. Besides, Das-Gupta et al (2016); Aziz and Al-Harethi (2018); Dobrovic et al (2018) have identified that issues surrounding the tax administrative system, the autonomy of tax administration, accountability and government (political) regimes and how it affects the collection efficiency of VAT.

Furthermore, the use of Electronic Fiscal Devices (EFDs), Electronic Tax Registers (ETRs), artificial intelligence, as well as other Information and Communication Technology (ICT) facilities, has proven to be an efficient way of improving VAT collections (Shahroodi 2010; Maswadeh and Hanandeh 2020; Li and Zhong 2021). However, studies by Bostan et al (2017); Cabello et al (2020); Sani and Sani (2020); Adegbe et al (2022) revealed that the use of EFDs and other technological devices has not significantly increased VAT collection efficiency, especially when the EFDs are old generation, and when they are not fully utilised and implemented. Eilu (2018) submitted that beyond the efficiency of EFDs and ETRs are the issues of competent tax officers, affordable and stable power supply, organisational and stakeholder training, and overall enabling environments that affect the efficiency of VAT collection.

Moreover, a few related studies on the relationship between macroeconomic indicators and VAT have avoided the collection efficiency paradigm. While the studies by Nwafor (2010) and Owolabi and Adegbite (2013) established a positive relationship between economic growth and VAT, Muhibat et al. (2013) and Okwara and Amori (2017) showed that they have a negative relationship. The studies by Alm and Asmaa (2013); Adegbite and Adejare (2017); Salti and Chabaan (2010) claimed that an inverse relationship exists between consumption and VAT but Rowland et al (2015); and Ajibola and Olowolaju (2017) suggested a positive relationship between consumption and VAT. Similarly, extant studies reported mixed claims on the relationship between revenue and VAT (Michael and Ben, 2007; Okoye and Gbegi, 2013; Omolapo et al 2013; Smith et al 2011; Saeed et al, 2012; and Okoyeuzu, 2013). The various

³The literature in government spending efficiency is more common than its revenue counterparts. Adegboye and Akinyele (2022) presents a survey of literature in spending efficiency in sub-Saharan Africa. Besides, the correlations among the selected variables (see Appendix : B) do not provide clear, consistent insights to validate theoretical reasoning on VAT collection efficiency in West Africa, hence the study.

findings, albeit controversial, have neglected the contribution of shocks to macroeconomic structures and their probable impact on the VAT system and have created a paucity of evidence on the quantitative assessment of the drivers of VAT collection efficiency.

The controversies that exist in the literature and the peculiarity of West Africa present a necessity to evaluate the factors that influence VAT collection efficiency using macro-level data of the countries within the region. Among others, the ratio of tax revenue to GDP in most countries in the region fall below the necessary estimates that are required to fund the Sustainable Development Goals. Besides, the socio-economic outlooks in West Africa suggest the need for more public revenue to fund basic public goods in large quantity. VAT is a key instrument to realise effective domestic revenue mobilisation to ensure availability of reliable finance for these public goods. Against the backdrop of a high unemployment rate, dependence on natural resources, a large informal economy, relatively weak institutions, and widespread tax evasion in West Africa, the study aims at providing insights into VAT collection efficiency. The insight could provide support to the domestic revenue mobilisation drive as a reliable, sustainable, and predictable source of public finance.

1.3 STRUCTURE OF SUBSEQUENT SECTIONS

Subsequent sections of this report are organised as follows: Section Two contains an overview of the VAT structure in West Africa with its performance while Section Three presents a brief summary of related literature. Section Four centres on data and methodology; Section Five deals with results and discussion of findings and Section Six concludes and highlights the main policy implications and recommendations of the study.

2. VALUE-ADDED TAX SYSTEMS IN WEST AFRICA: AN OVERVIEW

The adoption of VAT in West Africa as a fiscal instrument dates back to 1954 when the French Administration experimented it in its colony of Cote d'Ivoire (Figure 1 shows the location of Cote d'Ivoire (Costa d'Avorio) in West Africa). The success of the experiment motivated the French Government to do large scale implementation of VAT. VAT as a tax type is levied on consumption or purchases by businesses, households and the public sector. In many countries, enterprises serve as the tax collectors by adding VAT liability to the producer's price of goods or services. To avoid double VAT payments to the government, business firms would deduct their VAT paid from the amount collected on behalf of the tax authorities. As of December 2022, there were at least 187 countries worldwide that collected VAT (and Goods and Service Taxes, GST). However, both the GST and VAT are consumption taxes that share similar characteristics but have different names. As presented in Table 1, VAT in West Africa in practice could have exemptions (for food, exports, health, insurance, agriculture, transport, education sector, humanitarian goods or services and so on). A VAT may have a zero, reduced and standard rates, and its VAT revenue is collected at the point of consumption. It accounts for at least a fourth of total tax revenues in West Africa as of 2021 (OECD's Revenue Statistics in Africa (2022)).

⁶ African Development Bank suggested a minimum of 15 percent but a higher threshold was set to meet up with the financing requirements for development goals. Relatively, the average tax ratio in West Africa is nearly a half the OECD's 34 percent (OECD's Revenue Statistics in Africa, 2022)

Figure 1: Political and Economic Map of West Africa



Source: LorenzoT81

Table 1 contains information on VAT administrative structure in West Africa. Fourteen (14) WA-TAF Member States have functional consumption-related taxes that can be classified as VAT (or GST) whose formal implementation was from 1960 in Cote d'Ivoire to replace the local tax on turnover. It has also replaced the import turnover tax and tax on production in other countries. The VAT rates in the region ranges from a minimum of 7.5 to 19 per cent of the cost of the item under consideration. Registration and enrolment by firms for VAT purpose are mandatory at the start of the business operations, during the application for enterprise incorporation, and registration for tax purposes. Enterprises may enlist as a VAT collector just at the time certificate of incorporation is issued (PwC, 2019).

Most of the Francophone countries have entered four double tax treaties with France, Norway, and Kuwait, together with the countries of the West African Economic and Monetary Union (WAEMU) - Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo. The treaty reflects in the VAT rates in these countries that have their revenue agencies as a department of the Ministry of Finance and Economy. However, some countries (for example Liberia, Togo, Sierra Leone, and The Gambia) have unified agency that combines the customs and domestic taxes into one entity while others such as Nigeria runs multi-systems . The Member States of West African Economic and Monetary Union (WAEMU) have harmonised their rules on VAT and each member state is required to fix a unique rate that must be between 15% and 20% (College, 2021).

Across all countries VAT calculated is remitted monthly (Fossat and Bua, 2013). There are clearly written penalties and sanctions to ensure taxpayers' compliance with tax and reve-

⁷ <https://www.istockphoto.com/photo/western-africa-map-gm521291707-50220416>.

⁸ Unification of domestic tax and customs functions may not remove the semi-autonomous status and privilege that revenue authorities have due to the nature of their business. Togo's revenue office is unified but semi-autonomous.

nue regulations. Among the countries in Table 1, twelve (12) of them have ratified the African Continental Free Trade Area (AfCFTA) agreement and have completed (or working on) the tariff schedules for both trade in goods and trade in services (PwC, 2021). In some countries in West Africa (such as Ghana) tax administration encourages voluntary disclosures and facilitates tax dispute resolutions to ensure efficiency. Compliance with tax laws and payments is low due to several barriers including the inefficiency of the institutions responsible for tax administration (Opoku and Tanaka, 2020), low transparency and tax collection, low level of enlightenment of taxpayers and the incidents of tax evasion and avoidance. Other factors are infrastructural decay, corruption, and poor information technology implementation. It is imperative for the countries in the region to broaden its tax base and improve collection capacity. The tenth column of Table 1 contains the average VAT revenue performance in relation to total tax revenue of the countries, with its range being 17.3 to 43.6 (African Tax Outlook, 2021). The full trend of VAT revenue is presented in Figure 2.

⁹ Benin and Liberia are yet to ratify AfCFTA (https://en.wikipedia.org/wiki/African_Continental_Free_Trade_Area)

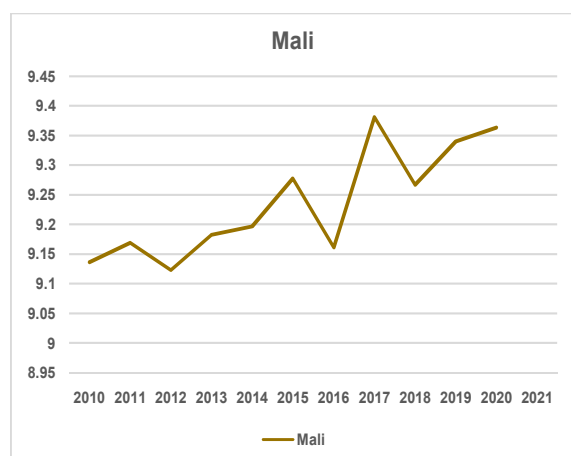
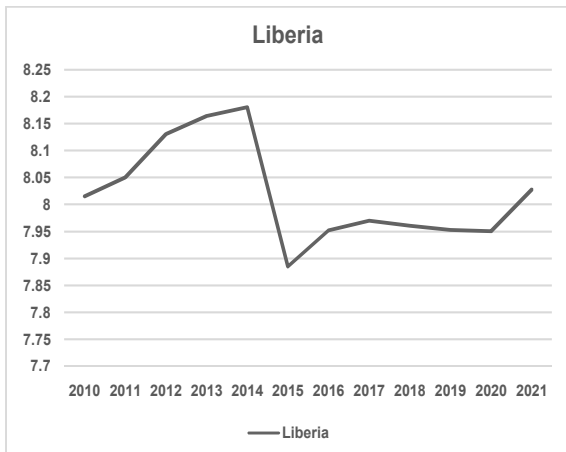
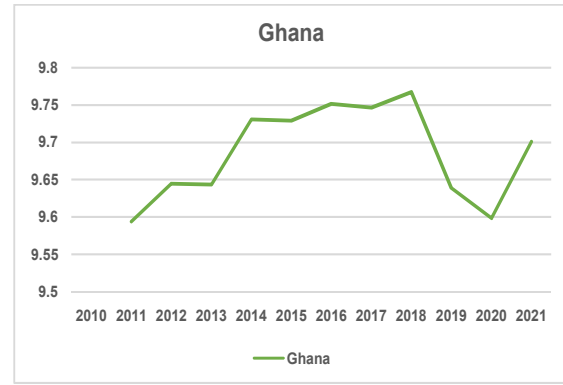
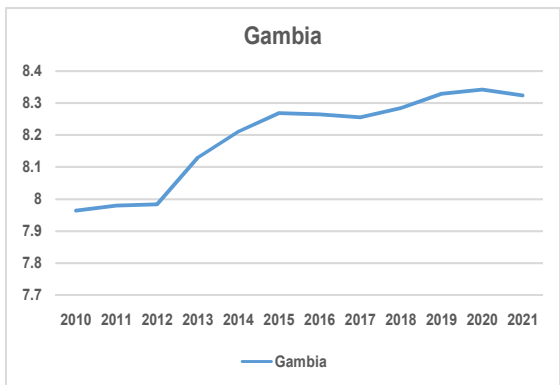
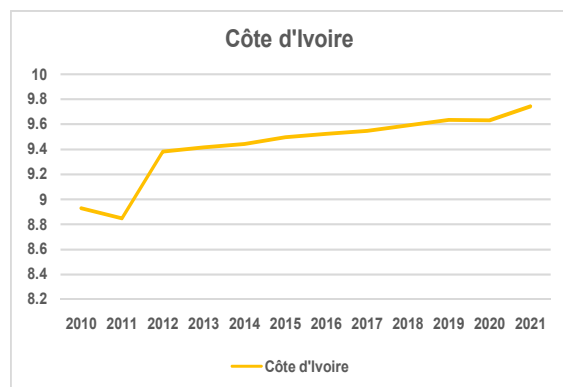
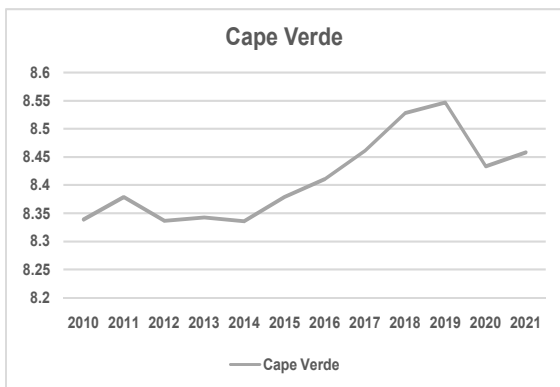
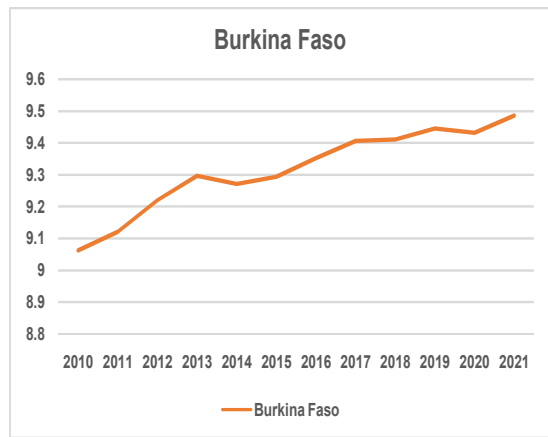
¹⁰ AfCFTA has implications for VAT revenue mobilisation. Import tax removal is one among several implications of free trade agreements.

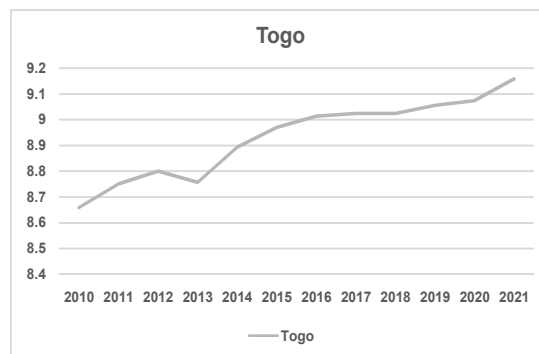
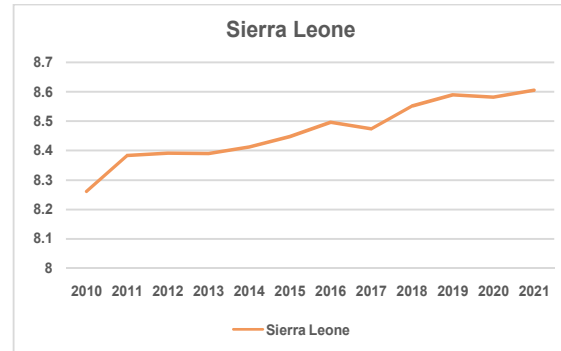
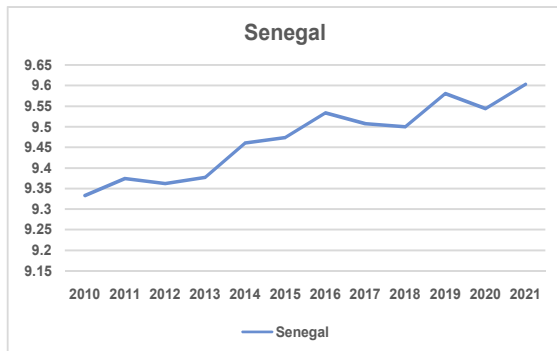
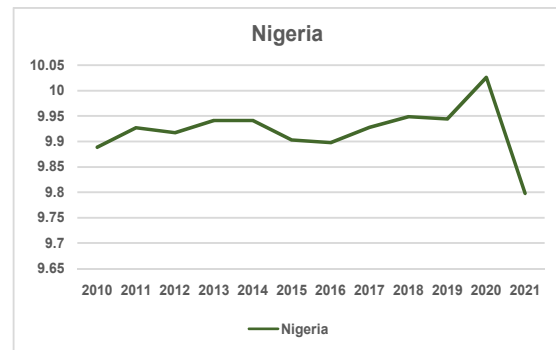
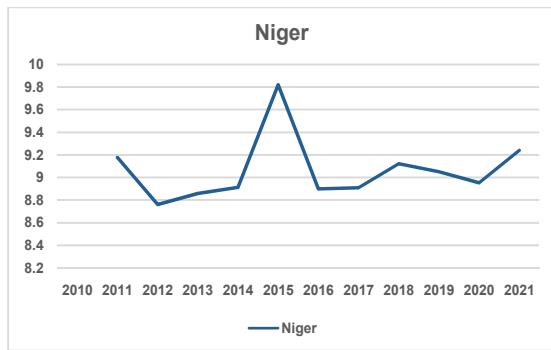
Table 1: VAT Administrative Structure in West Africa

Country	Date Instituted	Statutory Rate (%)	Mode: Registration	Mode: Administration	Offences for Penalty	Import and Export Rule	Incentives Types	Responsible Agent	Performance (%)
Benin	1991	18	Register with tax department	VAT calculated and filed before the 10th of the following month	Late submission of returns and payment	Imported goods are subject to custom duties, while exports are zero-rated	Zero rate and full exemptions	Direction Générale des Impôts in the Ministry of Economy and Finance	41.9
Burkina Faso	1993	18	File applications for registration	VAT calculated by remitted monthly.	Non-payment and late payment	Imported goods have custom duties but exports are zero-rated	Incentives Types	Direction Générale des Impôts in the Ministry of Economy and Finance	41.7
Cape Verde	2004	15	Register with tax department	VAT calculated and remitted by the last working day of the following month.	Non-payment and late payment	VAT is levied on imported goods while exports are exempted from tax	Zero rate and full exemptions	National Revenue Authority	39.6
Cote d'Ivoire	1960	18	Compulsory registration for business entities	VAT calculated and remitted by the 10th, 15th and 20th (on the basis of the transaction) of the following month	Late or non-submission of returns and late payment	Imports are subject to VAT, exports are exempted with the exception of services used in the country	Partial and full exemptions	Direction Générale des Impôts in the Ministry of Economy and Finance	27.8
Gambia	2012	15	Register with tax department	VAT calculated and filed before the 15th of the following month	Failure to file VAT returns and register for VAT	Imported goods are subject to VAT but services enjoy deductions, while exports are zero-rated	Partial and full exemptions	Gambia Revenue Authority	33.5
Ghana	2014	12.5	Register with tax department	VAT calculated by taxpayers and remitted by the last working day of the following month.	Late submission of returns and payment, failure to issue tax invoice	Imports and exported goods are subject to VAT, while exported services are zero-rated	Zero rate, partial and full exemptions	Domestic Tax Revenue Division of the Ghana Revenue Authority	23.2
Guinea	1996	18	File applications for registration	VAT calculated and filed before the 15th of the following month	Late payment, failure to submit monthly tax return, failure to file return within 10 days of receipt of notice to submit	Imports are subject to VAT, exported goods and services are subject to VAT, if the services were rendered in Guinea	Zero rate, partial and full exemptions, special reliefs	Direction Générale des Impôts	17.3
Liberia	2001	10	File applications for registration	VAT calculated and filed before the 21st of the following month	Failure to register, late filing, failure to file, pay on time, and pay the correct amount	Imported goods are subject to GST and imported services are exempt, while exported goods are exempt and exported services are subject to GST	Zero rate, partial and full exemptions	Liberia Revenue Authority	23.9

Mali	1881	18	File single application for registration	VAT calculated and filed before the 15th of the following month	Late submission of returns and payment	Imported goods are subject to import duties, while select exported goods are subject to stamp duty	Zero rate, partial and full exemptions	Direction Générale des Impôts in the Ministry of Economy and Finance	36.7
Niger	1986	19	File applications for registration	VAT calculated by taxpayers and remitted monthly.	Late submission of returns and payment	VAT is imposed on imports while exports are zero-rated	Zero rate and full exemptions	Direction Générale des Impôts in the Ministry of Economy and Finance	34.4
Nigeria	1994	7.5	File applications for registration	VAT calculated and filed before the 21st of the following month	Failure to register for, remit, and collect VAT; and to issue tax invoice and keep proper records	VAT is chargeable on imports. Exported goods and service are VAT exempt and zero-rated.	Partial and full exemptions	Federal Inland Revenue Service and Nigeria Customs Service	17.5
Senegal	1980	18	Application is submitted during incorporation	VAT calculated and filed before the 15th of the following month	Non-payment of taxes	Imports are subject to VAT while exports are exempted	Zero rate, partial and full exemptions	Direction Générale des Impôts in the Ministry of Economy and Finance	38.3
Sierra Leone	2009	15	Register with tax department	VAT calculated by taxpayers and remitted by the last working day of the following month.	"Late submission of return and payment, failure to register and display a GST certificate, non-filing of a GST return"	Imports are subject to GST while exported goods are zero-rated	Zero rate and full exemptions	National Revenue Authority	25.1
Togo	1995	18	File applications for registration	VAT calculated is due for payment from the 1st day of the month.	Late submission of returns and payment	Some imports are exempted from VAT especially food-related ones	Zero rate, partial and full exemptions Zero rate, partial and full exemptions Reduced rates, full exemptions	Office Togolais Des Recettes	43.6

Source: Author's computation based on various sources





3. REVIEW OF RELATED LITERATURE

The literature on the efficiency of tax systems in developing countries is limited but growing. At present, there is no consensus view on the dominant factors that explain the level of collection efficiency. Anecdotal evidence exists, but theoretical literature and the empirical evidence that validate them are scanty. Some aspects of VAT collection efficiency have been evaluated in existing studies, though, and their conclusions are discussed in a manner that can serve the interests of West African tax administration using some subheadings as follows.

Electronic Fiscal Devices and VAT Collection Efficiency

Lumumba et al (2010) examined the effectiveness and efficiency of Electronic Tax Registers (ETRs) in filing VAT returns processing in Kenya. The study revealed that ETRs provide timely and accurate information to taxpayers in filing monthly VAT returns. They also reduce tax reporting burdens on firms and businesses, improve the efficiency of government operations and enhance VAT revenue collection. In addition, ETRs have led to the timely preparation of financial reports and an increase in VAT returns. In the same vein, Weru et al (2013) inves-

tingated the effect of the newly introduced/implemented ETRs on the tax collection system in Kenya. The study employed survey research methods (both qualitative and quantitative) and showed that the ETRs system efficiently enhanced tax revenue collection, blocked tax evasion loopholes, and ensured wider tax compliance by businesses.

Mixed results on the effect of tax collection devices on the efficiency of VAT collection were revealed by Chege et al (2015) who determined the impact of using Electronic Fiscal Devices (EFDs) on VAT revenue collection in Tanzania. Using a descriptive research design, the study showed that tax rollout was statistically significant for VAT collection efficiency. However, tax compliance checks and enforcement of EFDs were not significantly related to VAT collection. Likewise, Sani and Sani (2020) determined the effect of the electronic tax system on revenue collection efficiency in Nigeria. Multiple regression analysis were used in the study and found that online tax registration, filing, and remittances exerted significant effects on tax revenue collection efficiency, except for online tax payment which has no significant impact on revenue collection efficiency. Shahroodi (2010) identified factors that determined the efficiency of the tax system in Iran. Using the statistical method of analysis, the study identified the use of Information Technology (IT), appropriate machinery, and facilities as effective factors that enhanced the efficiency of the tax system but found that other factors such as the use of private sector services to collect tax, tax procedures/processes, tax, and judicial fines did not enhance tax system efficiency.

Furthermore, Anjulo and Waje (2018) examined factors determining VAT collection practices in Ethiopia and revealed that awareness on VAT, technology (ETR), tax evasion, tax audit and enforcement, and VAT management significantly improved VAT revenue collection performance and efficiency. In a related study, Eilu (2018) reviewed the use of Electronic Fiscal Devices (EFDs) for the efficient collection of VAT in Kenya and Tanzania. The author conducted a systematic review and reported that the use of robust and user-friendly technology, organisation and stakeholder training, fairness and enforcement of VAT estimates and laws, government (political and financial) support, and an affordable as well as stable power supply were significant factors in the adoption of EFDs for VAT collection.

In the same vein, Masunga et al (2020) assessed the influence of the electronic tax system on the collection of tax revenue in Tanzania. The study employed linear regression analysis and showed that the use of an electronic tax system had significant positive effects on tax revenue collection. In addition, factors such as the increase in the number of firms and the registration of large taxpayers positively improved tax revenue generation. Adegbe et al (2022) examined the relationship between electronic tax management systems and tax revenue collection efficiency in Nigeria. The study indicated that electronic tax management systems (digital billing system), perceived ease of use, the internet, and mobile payment systems exerted a significant impact on the efficiency of filing tax returns by taxpayers.

On the other hand, Cabello et al (2020) determined the efficiency of VAT collection in Brazil. The study employed both data envelope and stochastic frontier analyses to generate an efficiency score. The study revealed that there was low efficiency in the collection of value-added tax in Brazil), and there also existed a huge difference in VAT collection efficiency among the Brazilian states. In addition, Bostan et al. (2017) analysed the impact of electronic fiscal de-

vices (EFDs) on VAT collection in the post-European Union accession of Romania. Two-stage linear regression analysis was used and it was found that the use of EFDs did not significantly increase VAT collection. Also, the use of EFDs reduced the fiscal efficiency index due to the use of old-generation EFDs that did not accommodate the use of updated electronic registers.

Li and Zhong (2021) employed technology (Artificial Intelligence) to improve tax collection efficiency in China. Applying the use of AI Technology to VAT revenue collection, it was revealed that AI Technology had efficiently improved complicated tax collection and management abilities. In addition, it reduced tax risks and costs. Maswadeh and Hanandeh (2020) examined the effects of the computerised tax system on tax performance in the income tax department in Jordan. The results of the study revealed that computerised tax systems - electronic computing, information technology software, useful accounting information, and competent employees - efficiently improved the performance of the income tax department.

Taxpayers' Perception and VAT Collection Efficiency

Dobrovic et al. (2016) identified factors that influenced the optimal/efficient collection of taxes in Slovakia. Qualitative research analysis was used and the study showed that taxpayers' dissatisfaction with the tax collection system, the amount of money spent on tax administration, and the simplicity (electronisation) of the tax system were factors determining the efficient collection of taxes. In addition, Quispe et al. (2020) investigated the factors that significantly affected tax collection efficiency in Ecuador. Stochastic frontier analysis was used to determine the level of efficiency. The study identified administrative processes, reasons for not paying tax, taxpayers' perception of investment in tax revenue, taxpayers' level of satisfaction with information verification, and sanctions (fines and penalties) as factors influencing tax collection efficiency. Popa and Botos (2021) examined VAT collection efficiency regarding the VAT gap and the level of corruption among developing countries in the European Union. The survey method was used and the study showed that VAT efficiency was influenced by the VAT gap (in the total achievable VAT revenue) and by the corruption perception index.

Conversely, mixed results were found in the studies of Alsarmi and Ahemed (2022) who evaluated the determinants of tax collection efficiency in Oman. The study found that tax awareness in society significantly impacted tax collection efficiency, but audit procedures had a detrimental effect. However, it showed there was no significant relationship between tax electronic procedures and tax revenue collection efficiency.

Tax Administration System and VAT Collection Efficiency

Das-Gupta, Estrada, and Park (2016) measured VAT administration efficiency and examined its effect on tax revenue collection in India. Using the survey method, the study constructed a quantifiable measure of Tax Administration which was used to compare the effectiveness of different tax administrations on tax revenue. The study concluded that the effectiveness of tax administration had a huge impact on tax revenue collection efficiency. Aziz and Al-Harethi (2018) identified factors determining the efficiency of tax administration in Yemen. Using the survey method, tax administration autonomy, accountability, transparency, and motivation had significant effects on the efficiency of tax administration.

Moreover, Ryu and Lee (2013) reviewed efficiency in tax jurisdictions in Korea. Using data

envelopment analysis (DEA) to extract the efficiency scores, the study opined that the national tax revenue collection was inefficient as evidenced by a significant level of waste observed in the study. In addition, the efficiency level of all tax jurisdictions dwindled over time as a result of the 1997 crisis in Korea. Ristic et al. (2019) used regression analysis to identify factors enhancing VAT collection efficiency. The study identified that changes in the standard tax rate were inversely related to the tax collection efficiency rate. Therefore, a higher tax rate reduced taxpayers' compliance and subsequently reduced VAT performance and tax revenue collection efficiency. Dobrovic et al. (2018) examined the efficiency of tax administration in Slovakia. The survey method was used and tax reforms were found to potentially increase the efficiency of the tax system and subsequently increased tax awareness, especially among young people.

Conversely, Alm and Duncan (2014) estimated the efficiency of tax agencies among OECD and selected Non-OECD countries. By employing data envelopment and stochastic frontier analysis to estimate the efficiency of tax agencies, the study revealed that tax agencies in both OECD and selected Non-OECD countries were efficient at tax revenue collection and that countries that collected tax revenue with fewer inputs/resources were more efficient. Haldenwang et al (2014) evaluated tax collection through Semi-autonomous revenue agencies (SARAs) in Peru. Using the survey method, the study showed that SARAs were more efficient at the growth, variation, and stabilisation of revenue collection than conventional tax administration. Antic (2014) measured the efficiency of the single-rate and broad-based VAT systems in Bosnia and Herzegovina. Using the survey method, the study showed that broadening the scope of exemptions for VAT-able goods and services impacted VAT efficiency negatively. The study concluded that the implementation of an ideal VAT policy design cannot produce a high level of VAT efficiency and performance.

Tax Audit, Tax Reforms, Sanctions, and VAT Collection Efficiency

Mohanty, Kumar, and Patra (2017) examined the major determinants of VAT efficiency in India. Using fixed and random effects, the study showed that the urbanisation ratio, bank credit ratio, the share of the agricultural sector, and the billing and collection efficiency exerted favourable effects on VAT efficiency. However, the unregistered manufacturing sector and the share of the service sector adversely affected VAT efficiency. Also, Mukherjee (2020) estimated the efficiency of value-added (Goods and Services) tax in India. Stochastic frontier analysis was used in estimating efficiency and the study found that a non-linear relationship existed between tax collection efficiency and the level of income. States with high income tended to have lower tax efficiency but as the level of income rose, the tax efficiency of high-income states increased more than the tax efficiency of low-income states. Also, Atanasijevic et al. (2018) investigated the efficiency of tax collection, tax evasion risk management, and control of the tax administration. Data analytics was used to develop risk indicators for tax evasion which were based on differences in income distribution. The study revealed that the development of risk indicators provided an efficient way of detecting tax evasion among taxpayers. The study also found an increase in tax revenue through a self-tax declaration, which improved tax administration.

Hybka (2009) evaluated VAT collection efficiency in the pre and post-European Union accession period in Poland. Quantitative analysis was used and the results of the study showed that in the pre-EU accession period in Poland, VAT collection efficiency was not improved. Conversely, there was a significant increase in VAT productivity and efficiency after the EU acces-

sion of Poland. In addition, Yuliandari et al. (2017) analysed the effectiveness and efficiency of tax collection from hotels and restaurants to increase revenue generation in Mataram. The qualitative research method was employed. The findings of the study showed that tax revenue collection from hotels and restaurants were highly effective and efficient. This is because the income realised from them was above the set targets and their contribution to overall income was high.

Existing studies on VAT performance lack insights into reforming the tax in West Africa. Both micro and macro studies point to the presence of inefficiencies in the system. However, not enough attention has been paid to the political and institutional factors in examining the subject. The current study incorporates these measures and analyses the West African data to assess the variables.

4. DATA AND METHODS

This section presents the approaches to the study with particular reference to data sources, measurement of variables, and estimation techniques. The presentation benefits from the insights provided by Aizenman and Jinjarak (2005). The content however focuses on the peculiarities of the West African economy.

4.1 DATA SOURCES AND MEASUREMENT OF VARIABLES

The cross-country information on the countries of West Africa was sourced from publicly available databases such as the African Tax Administration's African Tax Outlook (2021 Edition), the World Bank's World Development Indicators (2021 Edition), and the World Bank online data dashboard. At the time of compiling and conducting the data analysis of this study, a total of twelve (12) countries have the required user information for the objective of the study. We dropped Guinea, Guinea Bissau, and Liberia because of incomplete information on some key variables for analysis. We have the list of countries (as in Table 1) included in the panel study, their average VAT revenue to total tax revenue and GDP as well as their VAT rates. We have utilised the most recently available information on the country's VAT rates, which is contained in the VAT in Africa Guide (Eighth Edition, 2022), a regular publication of PricewaterhouseCoopers. The source of data for each variable is presented in the Appendix A. The study used data on VAT revenue, total consumption, nominal GDP, real GDP per capita, total tax revenue, and trade openness. Others are the degree of urbanisation, the extent of democratic practice as a measure of institutional quality, and the share of agriculture's value added to the economy. The description of the variables in the analysis is as follows:

VAT collection efficiency: This serves as the dependent variable in the model. It is an index derived from the ratio of VAT revenue to total consumption multiplied by the inverse of the standard VAT rates of each cross section (that is country). We denote this variable as VAT_CE.

VAT efficiency: This variable replaces VAT_CE to assess the sensitivity of the findings to measurement. It helps to evaluate the robustness of our estimates from the econometric analysis. It is derived from the ratio of VAT revenue to nominal GDP multiplied by the inverse of the VAT standard rates. Simply put, it is the substitution of consumption for GDP that produces the

¹¹ The World Bank provides information on development indicators of virtually all countries and it can be accessed on <https://data.worldbank.org/indicator/>.

variable. We denote it as VAT_R in the model.

Trade openness (TOPEN): The variable that measures the extent to which an economy participates in the global economy. It remains an important explanatory variable in tax literature (McNabb et al. 2021). It is the combination of imports and exports divided by GDP (in percentage) that produces a measure of trade openness. Import values are a significant revenue base for VAT collection, particularly in countries like West Africa that are consumption-based and import-dependent. Unless there is a large-scale free trade agreement, VAT revenue tends to increase with a higher level of openness in an economy. That is, it is expected to have a positive effect (+).

Share of agriculture value added (AGVA): In most developing worlds including West Africa, the agricultural sector provides means of livelihood and employment for a substantial proportion of the population more than any other sector. However, the sector is largely subsistent and lacks adequate connections to the modern economic structure. Both anecdotal and scientific facts state the difficulty tax authorities would encounter to tax the agricultural sector in these countries (Mkandawire, 2010; Cyan, 2013 & Rodriguez, 2018). Moreover, due to pervasive inequities, potential political gains, and possibly cultural reasons developing countries provide exemptions and zero-rate for agricultural inputs and products on a large scale. Thus, the higher the share of the agricultural sector in an economy the more difficult it is to collect taxes including VAT. For example, (primary/direct) agricultural production may be difficult to monitor or assess for withheld VAT revenue, where applicable. Besides, the use of government subsidies and supply of agricultural inputs by governments have been a common practice in some countries in recent years to sustain food production, and overcome shocks due to climate change and artificial barriers. The AGVA is measured as a percentage of GDP, and we expect a negative effect on the efficiency of value-added tax collections (-).

Real gross domestic product per capita (RGDP): This is a measure of prosperity in an economy at least per head, and it also signifies the extent of consumption that is available in an economy. VAT revenue increases with higher per capita income (+).

Urbanisation (URBAN): The number of people living in areas described as urban in each country matters for tax collection, and their proportion to the total population (in %) of the entire country is used to determine the degree of urbanization. The degree of urbanization is an indication of the possibility of reaching taxpayers and easy access to tax authorities. In an urbanized economy, tax compliance is higher and tax evasion is lower. The indicator is expected to increase VAT collection efficiency (+).

Democracy index (DEMO): The quality of institutions is a crucial factor that determines the efficiency and effectiveness of public policy in each economy. Tax policy and practice are not an exemption when it comes to having a strong institution to drive it. Among several measures, the democracy index captures the extent of democratic practice in the economy. It shows the possibility of legitimacy that can be enjoyed by the government. A full democratic regime may collect taxes with ease and at a lower cost than an authoritarian regime which may find it dif-

¹² PricewaterhouseCoopers (PwC) publishes country-specific information on tax types for various countries in the World. The information can be accessed online on <https://www.pwc.com/ng/en/publications/vat-in-africa.html>.

difficult and costlier to do so. The index scores each regime in ascending order. A country with a score of 1 is less democratic than one with a score of 2. Therefore, we would expect a positive effect on VAT collection efficiency (+).

Year of VAT (Year_VAT): This is a dummy variable that represents the experience in VAT administration of the countries under study. Years of policy implementation could determine its success or otherwise. We expect a country that is older in years of VAT administration to achieve a higher level of efficiency than a younger one. A count of one (1) is assigned to the first year of VAT implementation while others move on in ascending order. The introduction of VAT that is later than 2010 implies a value of zero (0) for those years between 2010 and the year of VAT institutionalisation. For example, if VAT implementation commences in 2012 in a country, there will be zero (0) in 2010 and 2011, while 2012 will have 1, 2013, 2, and so on.

4.2 ESTIMATION MODEL AND METHODS

In conducting the empirical modelling, we assume a linear probability relation between the VAT collection index and the selected variables of interest that have the potential to influence it. The data are fitted within a panel data framework with a small cross-section (12) and a moderate period (12). The estimated model is as follows:

$$Y_{it} = c_i + bZ_{i,t} + u_i + e_{i,t}$$

Where i = the number of countries in the study (=12) and t = length of time (that is 2010 - 2021 =12 years). Y is the VAT collection efficiency score (and VAT efficiency score for the robustness analysis). For certain estimators, the dependent variable can be transformed by the logarithm of their odds. The model parameters 'c', 'b', and 'u' have some attributes that are consistent with the estimators. In all estimations, 'c' represents the intercept term for each country, while 'b' is the parameter coefficient of the explanatory variables after controlling for the individual country's time-invariant characteristics captured in 'u'. It can be described as an intra-country error term and has the tendency to be absorbed by the intercept term 'c' in any given framework, depending on the underlying assumptions. The 'b' is constructed to hold values for all the cross sections but the 'c' vector varies with the choice of estimators. In the Fixed Effect (FE) model, it lacks randomness and remains fixed, whereas it may be treated as a time-varying vector of the coefficients in the Random Effect (RE) models if driven by the purpose of the investigation.

We further examine the reliability and sensitivity of the model parameters with the introduction of additional explanatory variables. This is necessitated to avoid omitted variable bias. Moreover, Z is the vector of explanatory variables (trade openness, agriculture value added, degree of urbanization, democracy index, year of VAT institutions, and real GDP per capita), and 'e' depicts the error term capturing the idiosyncratic shocks that are due to randomness in the variables of interest. Ideally, institutional variables have a slow rate of change, thus, shocks from a measure of institutions are usually small and negligible in the short run. In contrast, the hyper-parameters of the model's error term may fluctuate more with variations in per capita income, the share of agriculture value-added, and in particular trade openness.

Several estimators could be applied to panel data of the type we have in this study but we

recognise that econometric analysis and inference may create bias in policy inference when estimations are forced to work in a particular direction. Against this backdrop, we provide a robustness check for estimation by employing more than one estimator. Specifically, the pooled ordinary least square (POLS), FE, and RE regressions are considered suitable to fit the study data. Using the redundant fixed effect with likelihood ratio and the common correlated effect with the Hausman test, one can determine if either POLS or FE, and whether FE or RE are more appropriate for inference making.

5. RESULTS AND DISCUSSIONS

5.1 SUMMARY STATISTICS

Table 2 presents a descriptive analysis of the data series used in the study. The mean and median values, for all the variables, are between their maximum and minimum values which show a high consistency level of the data series. The skewness reveals all variables to be positively skewed except urbanisation. The kurtosis of agricultural value-added, VAT efficiency, trade openness, urbanisation, and VAT- collection efficiency variables exceed 3 which means that the series is peaked (leptokurtic), compared to normal (mesokurtic) distribution. On the other hand, institutional quality measured by the democracy index and the real gross domestic product is flat (platykurtic), since kurtosis is less than 3, it implies that its distributions are flatter relative to normal distribution.

Table 2: Summary Statistics

	AGVA	DEMO	VAT_R	TOPEN	URBAN	VAT_CE	RGDP
Mean	25.6805	4.8420	0.3018	61.3689	44.5397	0.0377	3202.389
Median	22.2218	4.5100	0.2694	58.3976	45.3410	0.0018	2507.404
Maximum	60.6110	7.9400	2.0370	116.9511	67.0000	0.4444	7271.076
Minimum	4.4000	2.8000	0.0024	20.7225	16.2080	0.0001	1128.348
Std. Dev.	12.3489	1.4027	0.1890	20.0547	12.7258	0.1072	1691.917
Skewness	1.0023	0.6440	5.4709	0.7857	-0.5868	2.9663	0.73363
Kurtosis	3.9468	2.4539	50.4623	3.5654	3.0720	10.0847	2.273073
Jarque-Bera	29.4908	11.7452	14234.39	16.7349	8.2976	512.3436	16.0877
Probability	0.0000	0.0028	0.0000	0.0002	0.0157	0.0000	0.0003
Sum	3698.004	697.250	43.4665	8837.130	6413.728	5.4323	461144.0
Sum Sq. Dev.	21807.050	281.3645	5.1083	57513.78	23158.31	1.6445	4.09E+08
Observations	144	144	144	144	144	144	144

Note: AGVA, DEMO, VAT_R, TOPEN, URBAN, VAT_CE, and RGDP represent agricultural value-added, democracy index, value-added efficiency, trade openness, urbanization, value-added collection efficiency, and real gross domestic products respectively.

The skewness and kurtosis of the descriptive statistics imply mixed findings of near normality and positively skewed series. Both the skewness and kurtosis statistics are important because they are used to compute the Jarque-Bera statistic which is subsequently used to test the normality of variables employed by the study. However, we expect that the series by nature will be skewed, thus, the outcomes are not surprising and have no effect on the intent that the model estimators are not normality-restricted.

5.2 CORRELATION MATRIX

Table 3 (graphically, the Appendix: B) shows the degree of correlation among the variables. The principal diagonal represents the relationship between each of the variables and itself, while the values outside the principal diagonal represent the relationship between one variable and other variables. The results show that the democracy index, trade openness, and VAT collection efficiency are positively related to VAT efficiency. However, their positive relationship with VAT efficiency is weak. Conversely, agricultural value-added, urbanisation, and real GDP are negatively associated with VAT efficiency. Summarily, correlation analyses were done to check the possibility of multicollinearity among the variables used. The table provides no evidence of multicollinearity among the variables of interest employed in the model.

Table 3: Correlation Matrix

VARIABLES	AGVA	DEMO	TOPEN	URBAN	RGDP	VAT_CE	VAT_R
AGVA	1.0000						
DEMO	-0.3315	1.0000					
TOPEN	-0.1354	0.5019	1.0000				
URBAN	-0.4724	0.4612	0.3151	1.0000			
RGDP	-0.6319	0.5684	0.2403	0.7187	1.0000		
VAT_CE	-0.1497	0.3031	0.1613	0.2524	0.3405	1.0000	
VAT_R	-0.2286	0.2654	0.3239	-0.1074	-0.0156	0.0138	1.0000

Note: AGVA, DEMO, VAT_R, TOPEN, URBAN, VAT_CE, and RGDP represent agricultural value-added, democracy index, value-added efficiency, trade openness, urbanisation, value-added collection efficiency, and real gross domestic product respectively.

5.3 MAIN DETERMINANTS OF VAT PERFORMANCE

VAT Collection Efficiency and VAT Efficiency Ratio

Collection efficiency and efficiency ratios were used as measures of VAT performance. From Table 4, the coefficients of agricultural value added, trade openness, and real GDP per capita as shown by the results of the Pooled OLS estimator in column I are positive and statistically significant, indicating that VAT collection efficiency is increasing as the coefficient of these variables increases. Columns IV-VI, with the efficiency ratio as the dependent variable, yield similar results. One exception is urbanisation, which has a negative sign and is statistically significant.

Table 4: Determinants of VAT Efficiency

Explanatory Variables	Dependent: C – Efficiency				Efficiency	
	I	II	III	IV	V	VI
LAGVA	0.0864 ***(0.0227)	-0.0367 0.0243	-0.0317 0.0231	-0.180028 ***(0.0371)	0.0864 ***(0.0227)	-0.1748 **(0.0398)
LTOPEN	0.0740 **(0.0307)	-0.0190 0.0200	-0.0147 0.0191	0.1113 **(0.0502)	0.0740 **(0.0307)	0.1105 *(0.0522)
LURBAN	-0.0620 -0.0366	-0.0152 0.0819	0.0048 0.0670	-0.1556 0.0598	-0.0620 *(0.0366)	-0.1607 *(0.0646)
DEMO	0.0089 0.0079	-0.0051 0.0072	-0.0031 0.0069	** (0.0299) 0.0129	0.0089 0.0079	0.0311 ** (0.0137)
LRGDP	0.1434 *** (0.0322)	0.0187 0.0304	0.0228 0.0290	-0.1228 *(0.05265)	0.1434 *** (0.0322)	-0.1162 *(0.0557)
Observation	144	144	144	144	144	144
Number of Country	12	12	12	12	12	12
R-Square	0.2319	0.8937	0.0349	0.3406	0.2319	0.3009
F-Stat	8.3328	0.0000	0.4207	0.0000	0.0000	11.8830

Notes: *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively.

Robustness: VAT Collection Efficiency and VAT Efficiency

In light of the asymptotic properties of the Fixed Effect Model (columns II and V) and Random Effect Model (columns III and VI), the log odds transformation of the dependent variable is necessary to accommodate the small sample in the study. In Table 5, the results of the study showed that only the coefficient of real GDP is statistically significant. This is because it is positively related to the log odds of VAT collection efficiency across the three estimators/models. Conversely, the coefficient of FE and RE of agricultural value added is negatively related to the log odds of VAT collection efficiency. The results also showed that the democracy index exhibited a significantly positive relationship with the transformed VAT efficiency ratio across all three models. While trade openness was significantly positive, agricultural value added and real GDP were negative but statistically significant in the POLS and RE models.

Table 5: Determinants of VAT Efficiency (in Log-Odds)

Explanatory Variables	Dependent: C – Efficiency				Efficiency	
	I	II	III	IV	V	VI
LAGVA	-0.3660	-0.8551	-0.8478	-0.8904	-0.1649	-0.7206
	0.4197	** (0.3626)	** (0.3523)	*** (0.1208)	0.2962	*** (0.1525)
LTOPEN	0.2414	-0.1266	-0.1146	0.6419	0.0851	0.4638
	0.5670	0.2977	0.2898	*** (0.1633)	0.2432	*** (0.1767)
LURBAN	0.4589	0.8069	0.8104	-0.0716	0.2661	-0.1560
	0.6762	1.2187	1.0826	0.1969	0.9943	0.2627
DEMO	0.2211	0.0003	0.0090	0.1507	0.1823	0.1655
	0.1465	0.1078	0.1050	*** (0.0423)	** (0.0892)	*** (0.0511)
LRGDP	1.0635	0.8664	0.8733	-0.9000	0.2021	-0.6645
	*(0.5945)	*(0.4528)	** (0.4409)	*** (0.1710)	0.3695	*** (0.2054)
Observation	144	144	144	144	144	144
Number of Country	12	12	12	12	12	12
R-Square	0.2722	0.9345	0.1235	0.5430	0.6696	0.2984
F-Stat	10.3264	113.2607	3.8904	32.5684	15.961	11.6538

*Notes: The table presents the results of the transformed value-added collection efficiency and value-added efficiency. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Decisions on the model suitability shows that in the C-Efficiency model, RFE-LR prefers FE and the Hausman chooses RE but in the Efficiency model the two tests favour FE.*

Sensitivity Analysis: Inclusion of the Year of VAT Institution

For a robustness check, the study considered the year since VAT was implemented to measure how the maturity of VAT implementation can influence its collection efficiency. The results in Table 6 in the POLS model (column I) showed that the coefficient of the year VAT was instituted could explain the performance of VAT collection in West Africa. The results reveal that the implementation of VAT may result in tax revenue mobilisation from citizens' consumption expenditure but may not necessarily favourably influence their tax behaviour. By design VAT is notoriously difficult to evade but taxpayers may involve themselves in practices that reduce its tax bases, underestimate sales records, distort efficient report audits and so on. The net effects of taxpayers' behaviour may therefore pull down the level of collection efficiency in an economy. This may suggest that the consideration in reforming the VAT system should not only be limited to revenue consideration but also the ease with which the tax is administered. To accomplish this, it is imperative to not only design a policy but also have an effective and efficient institutional framework and environment that support its implementation. In line with previous result on a few variables, the results showed that agricultural value added, trade openness, and urbanisation had a significant role in explaining real GDP, as can be seen in Table 2.

Table 6: Explaining VAT Efficiency Through Years of Implementation

Explanatory Variables	Dependent: C – Efficiency				Efficiency	
	I	II	III	IV	V	VI
LAGVA	0.0595	-0.0367	-0.0327	-0.1860	-0.1102	-0.1778
	***(0.0216)	0.0244	0.0231	***(0.0384)	0.1017	***(0.0425)
LTOPEN	0.0577	-0.0184	-0.0200	0.1077	0.0981	0.1063
	** (0.0285)	0.0206	0.0200	** (0.0506)	0.0858	** (0.0538)
LURBAN	-0.1116	-0.0374	0.0414	-0.1667	0.3051	-0.1729
	*** (0.0352)	0.1773	0.0758	*** (0.0625)	0.7373	** (0.0698)
DEMO	-0.0020	-0.0051	-0.0038	0.0275	0.0740	0.0295
	0.0076	0.0072	0.0069	** (0.0135)	** (0.0302)	** (0.0147)
LRGDP	0.1664	0.0182	0.0254	-0.1176	0.1108	-0.1086
	*** (0.0300)	0.0307	0.0290	** (0.0533)	0.1279	** (0.0581)
YEAR_VAT	-0.0029	0.0003	-0.0010	-0.0006	-0.0087	-0.0006
	*** (0.0005)	0.0024	0.0011	0.0010	0.0100	0.0011
Observation	144	144	144	144	144	144
Number of Country	12	12	12	12	12	12
R-Square	0.3519	0.8937	0.0413	0.3425	0.4089	0.2856
F-Stat	12.4000	62.3664	0.9847	11.8970	5.1283	9.1284

Notes: The table presents the results of the transformed value-added collection efficiency and value-added efficiency. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Decisions on the model suitability shows that in the C-Efficiency model, RFE-LR prefers FE and the Hausman chooses RE but in the Efficiency model the two tests favour FE.

Sensitivity Analysis: Log-odds of the Year VAT was Implemented

A sensitivity check was also done for the year VAT was implemented. The results in Table 7 showed that the coefficient of years since VAT was instituted is significantly negative for both VAT collection efficiency and VAT efficiency in the POLS model (column I) and FE (column V) model respectively. However, the VAT efficiency ratio was not sensitive to the year VAT was instituted.

Table 7: Explaining VAT Efficiency Through Years of Implementation: Robustness

Explanatory Variables	Dependent: C – Efficiency					
	Efficiency					
	I	II	III	IV	V	VI
LAGVA	-1.0850	-0.8581	-0.8543	-0.8895	-0.1553	-0.6710
	***(0.3562)	0.3636	0.3500	***(0.1251)	0.2921	** (0.1650)
LTOPEN	-0.1938	-0.0872	-0.1527	0.6425	-0.0371	0.4287
	0.4694	0.3068	0.3002	*** (0.1650)	0.2463	** (0.1833)
LURBAN	-0.8662	-0.4949	1.1892	-0.0698	4.3046	-0.1705
	0.5792	2.6348	1.2895	0.2057	** (2.1132)	0.2884
DEMO	-0.0726	-0.0006	0.0062	0.1511	0.1852	0.1695
	0.1257	0.1081	0.1050	*** (0.0442)	** (0.0879)	*** (0.0551)
LRGDP	1.6772	0.8366	0.8924	-0.9008	0.2945	-0.6035
	*** (0.4946)	* (0.4572)	** (0.4391)	*** (0.1736)	0.3668	*** (0.2159)
YEAR_VAT	-0.0780	0.0200	-0.0094	0.0001	-0.0621	0.0006
	*** (0.0095)	0.0359	0.0187	0.0033	** (0.0288)	0.0049
Observation	144	144	144	144	144	144
Number of Country	12	12	12	12	12	12
R-Square	0.5113	0.9346	0.1280	0.5430	0.6814	0.2543
F-Stat	23.8913	106.0284	3.3527	26.9426	15.7314	7.7308

*Notes: The Table presents the results of the log-odds transformation of years since VAT was first implemented. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Under the C-Efficiency the RFE-LR prefers the FE mode but the Hausman test chooses the RE model. In the Efficiency model, POLS and RE models are selected by the RFE-LR and Hausman test.*

Across all models and their estimates all the listed explanatory variables are crucial for understanding VAT performance. It was real GDP per capita that dominated the transformed models, while democracy and other factors influenced a few other models. The interaction with VAT collection is crucial in making reforms to improve the efficiency of tax collection, despite its nature as a dummy variable. Similar to studies such as Aizenman and Jinjark (2005), Mohanty, Kumar, and Patra (2017), and Mukherjee (2020), we have found that the gains from VAT-collection efficiency are motivated by certain macroeconomic variables. Hence, our variables of interest deserve attention in VAT policy and administrative reforms in West Africa.

The empirical findings of the study must, however, be treated with caution. First, we detected a (weak) cross-sectional dependency in the correlations of the residuals. This is an interesting but not surprising discovery because the selected countries are all members of ECOWAS. Among other provisions, there is free movement of people across the region, in addition to a common external tariff regime. Even though there is a relatively low level of intra-West Africa trade, the countries have deeper integration in several areas - the French-speaking members of ECOWAS have some levels of agreements that foster deeper relationships and a level of

commonality. One such case is the existing tax treaties among WAEMU members.

Second, the current study did not attempt to conduct a microanalysis of the administration of VAT in West Africa. Instead, it seeks to understand the macroeconomic, institutional, and other structural factors that affect the VAT system. It is instructive to consider that several moderating factors could similarly drive these macroeconomic factors at the same time. Besides, the tax system, although it is widely acknowledged, can affect macroeconomic factors in a significant way. The third and final point is that this pioneering study suffers from data availability to the extent that the assumption of homogeneity is upheld as much as possible. Although the pooled OLS performed reasonably well in some analyses, it would be exciting to have richer data on the countries in the region. This would enable us to have the privilege of employing some more advanced panel data econometric tools. In particular, we implemented the Panel Autoregressive Distributed Lag (PADRL) and Generalised Method of Moments (GMM) but did not report the results for a few reasons. The PARDL's dynamic fixed effect produces a significant error term but could not generate country-by-country outputs while the GMM results do not perform better than the ones reported in these studies. Other estimators in PARDL did not produce meaningful estimates. The implication is that the results of studies on VAT and its performance could be highly sensitive to empirical strategies. Consequently, the findings should be applied with reference to empirical assumptions and strategies utilised.

6. CONCLUSION AND POLICY IMPLICATIONS

The study investigated the potential of structural and institutional factors in explaining the efficiency of value-added tax in West Africa. A proper understanding of the main determinants of VAT performance is a ladder to having an improved VAT system from the perspective of tax policy and administration, including an increase in revenue. We argue that this constitutes one of the first sets of studies on the issue, especially in the region. The position we have now articulated may serve as a starting point for future studies. Without any bias, a few sets of explanatory variables examined are relevant to VAT performance. Although there is no particular variable that is more relevant than others across all specifications and models.

Perhaps the suggestion of the Hausman Tests that the FE model supersedes the RE model is understood in the context of asymptotic statistical properties only. We note that the selection test is a guide to the choice of the most suitable and appropriate models. In the case where the model performances are similar, the selection strategy could be sacrosanct. The current analysis shows that no particular model captures all desired rules for evaluating econometric results. Therefore, in the opinion of the researchers, the strengths of each model have been discussed and the policy implications have been presented. Furthermore, the recommendation for further studies is based heavily on this crucial point.

The study utilised macroeconomic panel data that could be improved upon with micro-level data. As a result, future studies should utilise the findings and caveats in the study. An effort should be made to correct for cross-sectional dependency that could bias our estimates. This may be essential as more heterogeneous and diverse datasets are available. We are persuaded that an investigation of VAT efficiency in a microeconomic framework may be worthwhile to complement our findings. In particular, the examination of the efficiency of electronic

fiscal devices and VAT tax registers may be appropriate and beneficial policy areas to investigate. Although the introduction of these devices is relatively new (for instance Ghana, 2018 and Liberia, 2020), their impact on collection efficiency, envisaged at their launch, deserves to be assessed. The assessment outcomes can help to scale up the use of these devices and to improve their implementation. A country-specific research project, in conjunction with tax authorities and the ministry of finance, seems the most appropriate in this direction. In such a case, a nonlinear model may be added to the linear model used in this study, provided reasonably large cross-sectional units are accessible.

On the main policy implications of the current study. The findings have necessitated policy prescriptions that may prove useful for tax policymakers. It is evident from the study that macroeconomic variables influence VAT performance in West Africa. Among others, the study suggests that government efforts to connect the informal economy to the mainstream economic system should continue. While it is costly to formalise the informal sector, the long-run benefits are enormous and would work to serve the public interest beyond tax revenue collection.

In addition, tax policy in West Africa should ensure that business growth and development remain paramount in policy formulation. As found in this study, the level of income per head of the population matters for tax revenue collection and its efficiency. In particular, the mechanism for VAT collection from high and low-income earners is similar, therefore, the higher the level of income per head, the better for revenue collection and the higher the efficiency score. Hence, tax policy and its administration in developing countries must have composite outcomes in view. A narrow perspective of tax policy-making tends to undermine the goodness of tax systems in West Africa.

Moreover, tax authorities must continuously improve the societal institutions in West Africa. Strong institutions provide a stimulus for economic growth and development, leading to high per capita income, and consequently high consumption, a major determinant of VAT revenue. In particular, democratic institutions should be seen as growth promoters both for tax administrators and other policymakers.

Finally, our findings revealed that years of VAT policy experimentation and implementation count as a critical input in the tax performance in West Africa. It thus suggests that lessons should always be drawn from the failure and success of the previous years in order to improve future tax performance. Countries that are relatively new or young in VAT practices (and in other tax-types) should embrace peer learning. The WATAF Member States should continuously call upon one another to learn, share, and compare notes. As a matter of importance and urgency, regular peer-review meetings (in VAT system) should be instituted by WATAF, with the coordination of ECOWAS, to help Member Countries to spur faster growth and development in their tax systems and economies.

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APPENDIX

A. Sources of Variables

Statutory VAT Rates:	VAT in Africa Guide (PwC) 2022 Edition.
VAT Revenue:	African Tax Outlook (ATAF), 2022 Edition.
Total VAT Revenue:	African Tax Outlook (ATAF), 2022 Edition.
Nominal GDP:	African Tax Outlook (ATAF), 2022 Edition.
Trade Openness:	World Development Indicators (World Bank), 2022.
Agriculture Value Added:	World Development Indicators (World Bank), 2022.
Real GDP Per Capita:	World Development Indicators (World Bank), 2022.
Democracy Index:	Economic Intelligence Unit (www.eiu.com), 2022 Edition.

B. Graph of Correlations among Variables

