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Does Institutional Quality Influence Tax Structure in Developing Countries? A Panel Data Analysis

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Does Institutional Quality Influence Tax Structure in Developing Countries? A Panel Data Analysis

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Abstract

Institutional quality is very imperative to support tax system and hence to increase economic growth of any nations. This study examined on how institutional quality affected tax structures in developing countries. Using macroeconomic data spanning 26 years (1996–2021), the study employed the Panel Autoregressive Distributed Lag (ARDL) model to investigate the effects of political stability, government performance, accountability, and corruption control on the region's tax structure. The data came from the Worldwide Development Indicators (WDI 2021), government Revenue Datasets, and Worldwide Governance Indicators (WGI 2022). The findings demonstrated that the direct-to-indirect tax ratio is significantly and favourably impacted over the long run by government effectiveness at a 10% significance level. This study implies that good governance promotes the development and implementation of tax systems that give direct taxes precedence over indirect ones, thereby promoting equity. Controlling corruption also has a positive and significant effect at the 10% significance level, indicating that reduced corruption enhances justice and might even promote a higher reliance on direct taxes. Political stability has a significant positive effect at the 1% significance level. This demonstrates how early initiatives to combat corruption and improve governance may disturb established tax systems, leading to a temporary reliance on indirect taxes or challenges increasing the share of direct taxes. Over time, it is expected that these improvements would improve and stabilize tax performance. To properly balance direct and indirect taxes, the study advises East African governments to increase government effectiveness and combat corruption.

Keywords: Institutional Quality, Tax Structure, Developing Countries, Panel Data, ARDL

1. Introduction

It is impossible to overestimate the role that taxation has had in the expansion and advancement of economies around the world. The tax system has an impact on social justice, economic development, and income creation. As the tax structure evolves, the percentage of direct taxes rises, increasing the system's progressivity in both theory and practice (Arvin et al., 2021). Every nation has a different tax structure in place to achieve a number of objectives, such as raising money, lowering income disparity, and promoting economic stability. A well-designed tax structure that successfully strikes a balance between these goals is crucial, according to research done in nations like Germany, Africa, and India (Ekeocha et al., 2023). The economic effects and equity of progressive vs regressive taxation have long been topics of discussion. While regressive taxes, like sales taxes and VAT, disproportionately affect those with lower incomes because they spend a bigger percentage of their income on taxed goods and services, progressive taxes, like income taxes, impose a greater burden on those with higher incomes. Finding the right balance between direct and indirect taxes is

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one of the first issues in tax theory and practice. The pros and cons of these two tax regimes have been the subject of continuous discussions in intellectual, political, and economic circles. In this thesis, we provide an overview of the significance of the direct tax to indirect tax ratio as a taxation instrument that might be used to assess the suitability of a tax system that aligns with economic growth, macroeconomic stability, and revenue collection.

Government rules pertaining to direct or indirect tax structures are often associated with the quality of organizations. The policies designed to increase tax revenues are determined by the tax structures and procedures that are in place in many developing countries. Lower taxation levels are typically the result of an economy's limited tax base activities. According to (Ahmed et al., 2022), every government in the globe faces the difficult task of obtaining funds to cover its expenditures on infrastructure, social welfare, and other projects. The money gathered is crucial in deciding how benefits are dispersed since it allows the government to influence activities by altering their relative costs and allows redistribution from wealthy people to those in need. Therefore, taxes are one of the best ways to finance social insurance programs, pay off public debt, and improve the performance of the public sector. Accordingly, a country's capacity to produce income is significantly influenced by its administrative and economic capacity to collect taxes effectively (Bekun et al., 2021). In an attempt to enhance the tax system, a number of tax changes have been implemented in different countries over time. For instance, Tanzania introduced a sales tax in 1969 to offset the decline in import duty income caused by an import substitution program. Following an attempt to broaden the tax base in the early 1970s, a progressive income and sales tax was implemented in 1973 to compensate for the removal of the excise tax. Early in the 1980s, an organic change in tax laws resulted from the loss of macroeconomic management. Import and sales taxes were raised in order to counteract the widening fiscal deficits (Azam et al., 2022).

It is commonly accepted that tax structures are essential to the development of tax systems. However, the foundation of many developing nations' tax systems, especially those in East Africa, is indirect taxation rather than direct taxation. Uganda, Rwanda, and the Democratic Republic of the Congo (DRC) have less progressive tax systems than Kenya and Tanzania, which have considerably more progressive direct tax-based tax structures (Ogbuabor et al., 2023). These variations in governance systems, policy frameworks, tax adjustments, and institutional quality are the reasons behind the disparities in tax structures among East African nations. Issues including poor institutional quality, tax evasion, corruption, administrative inefficiencies, and the uneven tax burden on poorer people continue to exist despite the creation of revenue agencies and

improvements in tax policy throughout the area. These fundamental flaws make it more difficult for tax systems to collect sufficient revenue and distribute the tax burden fairly. The tax ratio (direct to indirect taxes) receives minimal attention in empirical research that examines the connection between tax collections and institutional quality (Sun et al., 2022; Ahmad et al. 2021). The part that institutional quality plays in the evolution of East African tax systems has not been specifically studied. In order to improve tax systems in developing nations, this study attempts to bridge the gap between offering policy advice, creating tax structures, and raising institutional quality.

Tax reforms were first implemented in Kenya in the early 1970s. For example, when the sales tax was implemented in 1973, the tax burden was transferred to the customers. In 1990, Value Added Tax (VAT) took the role of sales tax. The Kenya Revenue Authority was established in 1995, the tax base was increased, and tariffs and tax rates were revised as part of additional tax reforms (Xu et al., 2023). According Xu et al., (2023), the Integrated Tax Management System (ITMS), which allows large and medium taxpayers to file returns and make payments online, is one of the most recent innovations in the nation's tax collection system. Significant tax reforms were put into place in the 1990s to address Uganda's financial issues. In order to enhance revenue administration, the Uganda Revenue Authority was established in 1991 as a semi-autonomous tax collection organization. Worth. The quality of the institutions has a big impact on tax arrangements in many developing nations. Research from developing Asian and sub-Saharan African countries indicates a positive relationship between tax structure and institutional quality (Yuan et al., 2021). It has been demonstrated that improving institutional quality which encompasses elements such as political stability, voice and accountability, corruption control, and government efficacy raises tax revenues. Additionally, institutional quality has a good effect on the stability of tax systems in developing nations, especially when it comes to indirect taxes, which are more affected than direct taxes (Lyeonov et al. 2021). Furthermore, the level of fiscal decentralization in developing nations is directly related to the quality of the institutions; as institutional characteristics increase, fiscal autonomy decreases.

A country's tax structure the composition of its taxation system, frequently measured by the ratio of direct to indirect taxes has a major impact on the efficiency and equity of revenue generation (Maruta et al., 2020). A greater reliance on direct taxes, like income and corporation taxes, promotes equality by taxing people and entities according to their ability to pay, whereas indirect taxes, like VAT and excise fees, tend to be regressive and disproportionately affect lower-income groups (Udeagha and Ngepah 2023). This ratio must be carefully taken into account when creating tax

arrangements that support sustainable growth and economic justice, particularly in developing countries. The direct to indirect tax ratio trend for five East African (EA) nations Uganda (UG), Kenya (KE), Tanzania (TZ), Rwanda (RWA), and the Democratic Republic of the Congo (DRC) from 1996 to 2021 is depicted in Figure 1. The tax ratio has generally shown an upward tendency in Kenya and Rwanda, but during the study period, it has fluctuated in Tanzania, the Democratic Republic of the Congo, and Uganda.
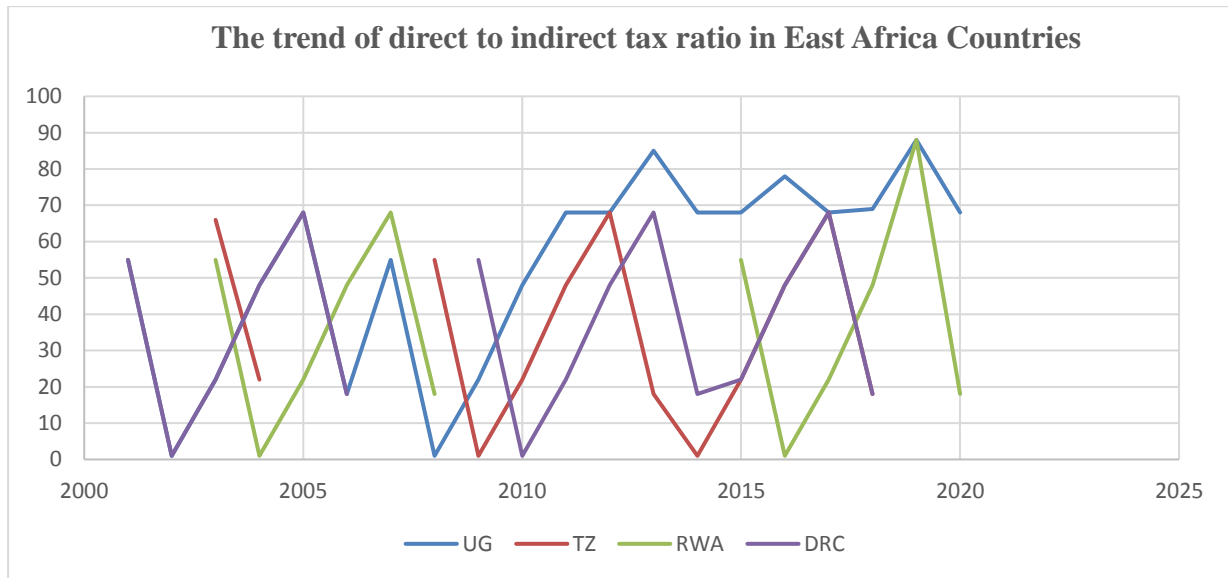

Figure 1: The Trend of the Direct to Indirect Tax Ratio in E.A Countries

For the most of the observed period, Kenya continuously exhibits the highest tax ratio, indicating a greater reliance on direct taxes as opposed to indirect taxes. The ratio remains fairly stable between 0.5 and 0.6 until around 2010, after which it begins to climb, reaching a peak of approximately 1.2 in 2020. This suggests that Kenya has progressively shifted towards a greater reliance on direct tax collection. Tanzania shows more variation in the earlier years (1995-2005), but after 2005, the ratio stabilizes at around 0.5. There is a sharp increase after 2015, peaking at about 1.5 in 2020, which is as a result of sharp rise in direct taxes attributed to tax revenues collected beyond its target Hayat (2019), during this time.

Rwanda's tax ratio remains relatively stable throughout the years, with a modest increase after 2010. By 2020, the tax ratio reaches around 0.7, indicating that Rwanda has been steadily increasing its dependence on direct taxation. Uganda shows a consistent upward trajectory, beginning below 0.2

in the mid-1990s and gradually rising to about 0.6 by 2020. This trend suggests Uganda has been increasing its direct tax collections compared to indirect taxes, although at a slower pace than some of the other nations. The DRC displays more volatility, with frequent fluctuations over the period. Its tax ratio remains lower than the other countries, indicating a heavier reliance on indirect taxes. After a decline in the mid-2000s, the ratio spikes sharply between 2015 and 2020 before dropping again. The illustration sheds light on the tax structures of East African nations over time. Kenya and Tanzania demonstrate a more substantial and consistent move towards direct taxation, particularly in recent years, while countries like Uganda and Rwanda exhibit a more gradual shift. In contrast, the DRC 's volatile pattern suggests potential fiscal challenges. These trends reflect varying degrees of reliance on direct versus indirect taxes across the region, likely shaped by each country's economic policies, tax reforms, and broader macroeconomic   factors. Most of these East African countries have set up institutions to assist in collecting taxes and creating regulations pertaining to tax structures. Kenya's tax system includes excise duty, value-added tax, income tax, and customs. These taxes are managed by the Kenya Revenue Authority (KRA), which also has the authority to audit various companies and enterprises. By simplifying and improving tax administration, the system's main goal is to increase tax compliance.

Early in the 20th century, the British imposed colonial tax frameworks, which Tanzania later adopted and modified. Sales tax was introduced in 1969, new income tax laws were adopted in 1973, tax laws were revised to update the tax bases and rates, some excise duties were removed in 1979 and export duties were removed in 1985/86, and excise duties that had been removed earlier in 1989 were reinstated, among other reforms that took place during the post-colonial era (Odd-Helge 2015). There are two different kinds of taxes in Tanzania. Each category is categorized based on how it affects the eventual payer legally and practically. Direct and indirect taxes are the two categories. Compared to many of its East African rivals, Uganda's tax system is less efficient. Pay-as-you-earn income tax (PAYE) (18%), corporate income tax (8%), and VAT and excise duty (22%), are the main sources of domestic revenue. According to Ugandans, their tax system treats common people unfairly, tax officers are dishonest, and the government does not distribute tax funds equitably (Peres et al., 2018). Small business owners feel that the tax burden is too high, as demonstrated by the recent trader demonstrations.

In Kenya, there are many obstacles to effective revenue collection, ranging from tax fraud to inefficient management that permits dishonest employees to function. Among the measures the Kenya Revenue Authority has taken to fight corruption are risk assessment and mitigation

techniques, awareness-building, and reporting corruption (Peres et al., 2018). Despite the fact that these strategies have been successful in decreasing corruption, more has to be done. The impoverished are disproportionately affected by Uganda's reliance on indirect taxes, particularly VAT, excise, and customs fees. Despite significant improvements over the past decade, Uganda's income, earnings, and capital taxes (direct taxes) still only make up a small portion of its total revenue and GDP when compared to its neighbors (Peres et al., 2018). Currently, direct taxes make up 32% of tax revenue, while indirect taxes make up roughly 66%. In 1991, the Uganda Revenue Authority was established to supervise and collect taxes. In 1996, the sales tax and the commercial transactions levy (CTL) were replaced with a new tax. Additionally, a Taxpayer Identification Number (TIN), a tax appeal tribunal, and a commercial bank-based tax payment system were put into place. A number of taxes, like the mobile money service tax (0.5 percent on all withdrawal transactions) and the social media tax (a daily cost of 200 UGX), have been put into place in an attempt to broaden the tax base and, as a result, the efficacy of tax designs [16]. Given that Rwanda's tax collection as a percentage of GDP dropped from 8.2% to 3.6% following the genocide, the government gave economic stabilization top priority. The government implemented a number of tax reforms in 1997 in an effort to boost domestic revenue, including the creation of the Rwanda Revenue Authority (RRA), a semi-autonomous body charged with collecting and enforcing taxes. Two other reforms were the introduction of the Value Added Tax (VAT) in 2001 and the digitization of tax administration processes through the use of new technologies (Khan et al., 2020). Historically, tax policies in the Democratic Republic of the Congo (DRC) have been characterized by inefficiency and low revenue production, largely due to widespread corruption and a lack of institutional ability. (Doldrums, 2020). The country's tax system mostly relies on indirect taxes like value added tax (VAT), excise taxes, and customs fees, whereas direct taxes like income and corporate taxes are still in their infancy. As part of ongoing initiatives to enhance tax system compliance and revenue collection, the General Directorate of Taxes (DGI) was founded. However, because of complicated legislation and governance concerns, the implementation of these reforms has been sluggish. To increase domestic revenue mobilization, a more effective tax strategy would need stepping up anti-corruption initiatives, cutting down on informality, and streamlining the tax law (Canh et al., 2019).

1.2 Research Objectives

i.   To determine the long-term impact of institutional quality on tax structure.

ii. To determine the short-term impact of institutional quality on tax structure.

1.3 Research Questions

   i.   What is long-term impact of institutional quality on tax structure?

  ii.   What is the short-term impact of institutional quality on tax structure?

1.3 Research Hypothesis

H_1: There is long-term impact between institutional quality and tax structure.

H_2: There is short-term impact between institutional quality and tax structure.

2. Literature Review

Using the research of several academics, this chapter offers a thorough examination of the relationship between institutions and taxation.

2.1 Theoretical Literature Review

This study guided by the standard theory of optimal taxation.

2.1.1 The Standard Theory of Optimal Taxation

A tax system should be created to maximize a social welfare function while abiding by specific restrictions, according to the conventional theory of optimum taxation (Asongu et al., 2018). The social planner is usually seen as a utilitarian in most discussions of optimal taxation, which means that the social welfare function is determined by the individual's utility within the community. This theory frequently uses a social welfare function that is a nonlinear mixture of individual utilities in its most comprehensive interpretations. The social planner can favor more equitable utility distributions, for instance, because of this nonlinearity. Some research in this area, however, makes the assumption that the social planner only considers average utility, which leads to a social welfare function that is linear in terms of individual utilities.

The Mirrlees framework's strength lies in its ability to allow the social planner to assess every possible tax structure within the optimal taxation function, hence facilitating the creation of an absolutely ideal tax structure. The Mirrlees approach's intricacy is a major disadvantage, though. The optimal taxation problem is made considerably more difficult by managing the incentive-compatibility criteria, which make sure that people do not lie about their ability to reduce their tax burden. However, since Mirrlees's original contribution, this approach has led to significant innovations. Awosusi, et al., (2022), all offer thorough justifications of the Mirrlees method.

2.2 Empirical Literature Review

According to Etudaiye-Muhtar and Abdul-Baki, (2021), nations with strong governance and low levels of corruption typically have larger tax receipts, underscoring the significance of these institutional elements in tax systems. This study contributing the theoretical knowledge on how corruption preventative can reduce the poverty and hence can stimulating the economic development. Early actions to fight corruption and enhance governance are essential for future tax revenues to reach their maximum, as seen by the greater lagged impacts of institutional variables compared to their current effects. In south-west Nigeria, taxpayers' behaviour and opinions of subpar institutions significantly influence their inclination to handle tax fraud, according to a study by Dwaikat [22], the impact of this propensity on revenue realization varies. The contribution of this work explained how institutional quality influence revenue collection of emerging country in short run and how institutional quality can increase the economic growth of the nations.

A study by Ali et al., (2021), highlights the influence of institutional quality on fiscal policy in Asia Pacific countries between 2002 and 2013. In these countries, slower growth rates in government spending and tax collection are associated with higher institutional quality. This study contributing on how institutional quality can stimulate economic growth through tax collection. The results imply that improving institutional quality may have a major influence on fiscal policy decisions and results. Jahanger et al., (2022), uses annual data from 1964 to 2016 to investigate how political climate, economic growth, and tax reforms affect total, direct, and indirect tax receipts. The results show that the modifications had an impact on changes in tax revenues brought about by GDP growth, and that the tax reforms had a favourable effect on all types of taxes. The contribution knowledge of this study explained on how direct and indirect tax can influence economic growth performance. All tax categories benefited greatly from economic expansion, but indirect taxes benefited more from government efficiency. The statistically negligible effect of corruption control on tax collections, however, raises the possibility that it may encourage revenue generation above economic expansion. The contribution of this work explained on how political change, economic growth, and tax reforms affect total, direct, and indirect tax receipts and hence stimulate national development of nations.

Using the ARDL technique, Uzar (2021), examined the variables influencing Ethiopia's tax revenue and tax efforts between 2000 and 2019. The results of the investigation show that tax structures and the efficiency of the government or the battle against corruption are not significantly correlated. The contribution of this study is explained on how corruption level influence negative tax revenue of the

emerging countries. However, Ethiopia's tax collection is significantly harmed by the quality of the regulations. According to Alvarado et al. (2024), the goals of taxation policies in many developing nations are to raise money and maintain economic expansion. This study contributing the practical knowledge on how taxation can increase economic growth of developing and developed countries. One of the most important tools available to the government for meeting spending goals and implementing long-term economic plans is tax income. The governments of industrialized nations such as the United States, Canada, the Netherlands, and the United Kingdom have utilized the significant amounts of money they receive from import taxes, value-added tax, and corporate income tax to generate prosperity (Alvarado et al., 2024). The study contribution to the policy makers on how can create funds for public spending such as health, education and infrastructure. As a result, tax income can influence or contribute to macroeconomic stability. In addition to other sources of income, the tax system enables the government to produce extra money needed to meet its urgent responsibilities (Gillberg, 2024). The contribution of this work explained on how tax income can influence or contribute to macroeconomic stability and hence stimulating economic growth of the nations.

2.3 Conceptual Framework

This part discussed the conceptual framework used in this study. Association between dependent and independent variables elaborated in diagram as follows.
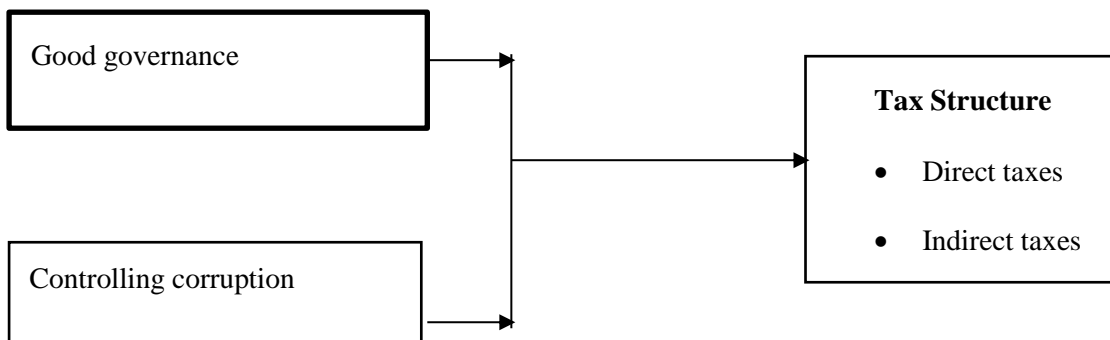

Figure 2: Conceptual framework of the study

3. Research Methodology

In order to incorporate the impact of institutional quality on tax structure, the theoretical model in equation (6) is modified to create the empirical model. Consequently, the linear model used in this investigation is as follows;

$$Tit = \beta 0 + \beta 1 Popit + \beta 2 Infit + \beta 3 Agricit + \beta 4 Indit + \beta 5 Tradeit + \beta 6 Corrit$$
$$+ \beta 7 GEit + \beta 8 Psit + \beta 9 VAit + \varepsilon it \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (i)$$

Whereby: $\beta = Beta$, *Pop= Population; Inf= Inflation; AI=Agriculture Outputs ;*

Ind= Indirect Tax; Trad= Tax Ratio; Corr=Corruption; P=Population;

GE=Government Expenditure ; VA=Voice and Accountability; e= Error Term

A pairwise correlation test must be used to analyze the linear relationship between the variables before assessing how governance quality affects tax revenue. The purpose of this study is to find any possible multicollinearity in the model. Multicollinearity has no impact on the model if the correlation coefficients between the explanatory variables are less than 0.80 (Alvarado et al., 2024). Because panel data includes both cross-sectional and time-series components, the study additionally employs a panel data unit root test to assess the stationarity of the variables. Im, Pesaran, and Shin (IPS), which assumes heterogeneous coefficients for the study variables, and Levin, Lin, and Chu (LLC), which assumes homogeneous coefficients (common autoregressive parameters across nations), are the two panel unit root tests used. By addressing the variations in their alternative hypotheses and overcoming the power and size concerns specific to each test, both tests are employed to validate the stationarity of the variables.

The objectives of the study are achieved through the application of the Panel Autoregressive Distributed Lag Model (panel ARDL), which was proposed by Kompella [29]. This model was chosen because the dynamic nature of governance variables, like political instability, necessitates an approach that distinguishes between the short-term and long-term effects on tax revenue. Unlike traditional panel data techniques, this methodology takes into account dynamics, which are common in member states of the East African Community (EAC). Consequently, different countries may have different short-run dynamic requirements and error variations. The panel ARDL model is suggested above the GMM-difference estimator published by Arellano & Bond (1991), the GMM system estimator by Alvarado et al. (2024), due to the dataset's long time period (T = 25 years) and small number of countries (N = 5). Bustinzad et al. [30], asserts that GMM estimators perform better on datasets with a high number of panels (N) relative to time period (T). Micro panel datasets with huge N and tiny T are ideal for using GMM difference and system estimators, claims Bustinzad et al. [30]. Due to our dataset's tiny N and big T structure, we employ a methodology that produces

accurate estimations under these conditions. The proportion of direct taxes to indirect taxes is what it is. Pop is the annual population growth percentage. Consumer prices are used to measure inflation, or INF. The value added to industry is called Ind, and the value added to agricultural is called Agric. Trade equals GDP. Political stability is represented by the letter P, voice and accountability by the letter VA, government performance by the letter GE, and corruption control by the letter Corr.

Table 1 Definition of Variables

Name	Definition of variables	Source
Direct tax	Direct taxes include payroll and employee taxes, capital gains, profit, and income taxes, and property taxes.	GRD
Indirect tax	International trade and transactions, taxes on goods and services, and other taxes are all included in indirect taxes.	GRD
Tax ratio	Direct tax/ Indirect tax	WGI
Inf	The annual percentage change in the typical consumer's cost of purchasing a basket of goods and services, which may be constant or vary at predetermined intervals, such annually, is what is referred to as inflation as measured by the consumer price index. Typically, the Laspeyres formula is applied.	WDI
Agric	Value added from fisheries, forestry, and agriculture (annual percentage growth)	WDI
Ind	Value added (annual percentage growth) and industry (including construction)	WDI
Trade	Trade is calculated as the total of goods and services imported and exported as a percentage of GDP.	WDI
Corr	Control of Corruption measures how much public power is perceived to be used for private gain.	WGI
Gov	Perceptions of the caliber of civil service and public services are captured by government effectiveness.	WGI
Pol	Perceptions of the probability of political instability and/or politically motivated violence, including terrorism, are measured by the Political Stability and Absence of Violence/Terrorism scale.	WGI
VA	Perceptions of how much a nation's population can influence the choice of their government are captured by Voice and Accountability.	WGI

3.1 Model Estimation

The objectives of the study are achieved through the application of the Panel Autoregressive Distributed Lag Model (panel ARDL), which was proposed by (Kompella, 2024). This model was chosen because the dynamic nature of governance variables, like political instability, necessitates an approach that distinguishes between the short-term and long-term effects on tax revenue. Unlike traditional panel data techniques, this methodology takes into account dynamics, which are common in member states of the East African Community (EAC). Consequently, different countries may have different short-run dynamic requirements and error variations. The panel ARDL model is suggested above the GMM-difference estimator published by [28], the GMM system estimator by Bustinzad et al. [30], due to the dataset's long time period (T = 25 years) and small number of countries (N = 5). Kompella, (2024), asserts that GMM estimators perform better on datasets with a high number of panels (N) relative to time period (T). Micro panel datasets with huge N and tiny T are ideal for using GMM difference and system estimators, claims (Kompella, 2024). Due to our dataset's tiny N and big T structure, we employ a methodology that produces accurate estimations under these conditions.

Given the non-stationarity problem of the series, we use a methodology that can handle a mix of both I(0) and I(1) variables. This approach estimates both short- and long-term coefficients, although GMM only takes short-term dynamics into consideration. In line with the dynamic heterogeneous panel data approach of Bustinza, et al., (2024), we thus create a panel ARDL (p,q), where p is the number of lags of the dependent variable and q is the number of lags of the explanatory variables.

Therefore, we establish a panel ARDL (p,q), where p is the number of lags of the dependent variable and q is the number of lags of the explanatory variables, in accordance with the dynamic heterogeneous panel data approach of Bustinza et al., (2024).

$$p q \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..\ldots\ldots\ldots..(ii)$$
$$y_{it} = \mu_{it} + \sum \lambda_{ij} y_{i,t-1} + \sum \delta' \chi_{i,t-1} + e_{it}.\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(iii)$$
$$j = 1 \quad i = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..\ldots\ldots\ldots..(iv)$$

Where the number of panels i = 1, 2, 3, 4, 5; and time t = 1, 2, 3. ......21 years; μ_i represents the

fixed effects; χit is a $(k \times 1)$ vector of explanatory variables; λij is a scalar; and δil is a $(k \times 1)$ coefficients vector (coefficients of the regressors).

To capture both the long-term and short-term coefficients, the aforementioned equation can be reparametrized and expressed as a linear combination of variables and first differences.

$$p - 1q - 1 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (v)$$

$$yit = \mu it + \phi iyi, t - 1 + \varphi' \chi it + \sum \lambda' \Delta yi, t - 1 + \sum \delta' \Delta \chi i, t - 1$$
$$+ eit \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (vi)$$

$$i$$

$$j = 1 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . . \dots \dots \dots . . (vii)$$

$$ij$$

$$yit \; Where \; \phi i = -(1 - \sum p \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (viii)$$

$$\lambda ij), \phi i = \sum p \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (ix)$$

$$\delta ij, \lambda i, j = -\sum p \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (x)$$

$$\lambda i, m \delta i, l = -\sum q \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . \dots \dots \dots . . (xi)$$

$$'$$

$$lm \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . . \dots \dots \dots . . (xii)$$

$$With \; j = 1, 2, \dots, p - 1, and \; l$$
$$= 1, 2, \dots, q - 1. \; If \; we \; group \; the \; variables \; in \; levels, this \; can \; be \; re$$
$$- parameterized \; as:$$
$$p - 1q - 1 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . (x)$$

$$i$$

$$j = 1$$

$$l = 0$$

$$\Delta yit = \mu i + \phi i \, [yi, t - 1 - \theta^{\wedge'} \chi it]$$
$$+ \sum \lambda i, j \Delta yi, t - j$$
$$+ \sum \delta^{\wedge'} \Delta \chi i, t - l$$
$$+ eit \dots \dots \dots \dots \dots \dots . . (xi)$$

The long-run equilibrium relationship between the variables involved (long-run coefficients) is defined by the equation $\theta i = -\phi i - 1 \varphi l$. When χit changes, ϕi shows how quickly the tax ratio adjusts to reach its long-term equilibrium. There is no indication of a long-term association if $\phi i = 0$. Assuming that variables show a convergence to long-term equilibrium in the presence of any disturbance, the parameter should be negative and statistically significant when there is a long-term link.

4.   Results and Findings

4.1   Descriptive statistics

This subsection displays the descriptive statistics for the main variables in the dataset. Understanding the basic properties of the data requires an understanding of these statistics. Descriptive statistics, such as measures of central tendency, dispersion, and distribution, offer crucial insights into the characteristics of the variables under investigation. Table 2 compiles the mean, standard deviation, minimum, and maximum values for each variable over 130 observations. By highlighting trends, patterns, and potential outliers, descriptive statistics help to improve comprehension of the data and provide the groundwork for a more thorough analysis.

Table 2 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Tax ratio	130	0.54	0.19	0.16	1.03
Population growth	130	2.97	1.58	1.19	16.62
Inflation	130	21.73	74.02	-2.41	513.90
Agriculture	130	25.73	6.62	14.71	52.36
Industry	130	23.13	7.61	13.00	45.34
Trade	130	44.92	14.24	23.98	90.74
Corruption	130	-0.79	0.56	-1.64	0.78
Gov effectiveness	130	-0.75	0.52	-1.84	0.31
Political stability	130	-1.10	0.73	-2.85	0.17
Voice & Accountability	130	-0.83	0.49	-1.73	-.114

Source: Authors computation using WDI data 2024

With 130 data points for each variable, the dataset covers 26 years, from 1996 to 2021. In 2000, when Rwanda and Uganda supported rebel organizations including the Rally for Congolese Democracy and the Movement for the Liberation of the Congo in their attempts to topple the government, Rwanda had an outlier rate of 16.62. The high DRC Congo inflation rate of 513.90 and the enormous influx of refugees from Zaire were the causes of this. According to the dependent

variable, the tax ratio, which averages 0.54 across the 130 observations, more than half of income is collected as indirect tax because tax revenue accounts for around 54.5% of income. The average population growth rate of 2.97% suggests that the populations in the sample are growing at an annual rate of 2.97%. The sample's overall price level is increasing at a comparatively high rate of 21.73% annually on average, with an average inflation rate of 21.73%. Agriculture usually accounts for 25.73% of the economy as a proportion of GDP, while the industrial sector accounts for 23.13%. Trade accounts for 44.92% of GDP on average, which is most likely determined by adding imports and exports. The average corruption index, which is negative at -0.79 in relation to institutional quality factors, indicates higher levels of corruption. The government effectiveness score of -0.75 indicates that government efficacy is typically below the neutral threshold. The political stability of the sample is relatively low, with a score of -1.102; negative numbers denote greater instability. Finally, a lesser degree of voice and accountability is indicated by the sample's mean voice and accountability score of -0.83, which most likely implies a lack of standards for democratic procedures and civil rights.

4.2   Pairwise Correlation

A useful technique in data analysis is pairwise correlation, which provides information on the relationships between variables, directs the choice of variables for models, and aids in spotting possible problems like multicollinearity that may compromise the reliability of statistical analyses.

These correlation statistics help researchers and policymakers better understand the relationships between various economic and institutional quality indicators and provide crucial information about areas that require intervention and reform. The strongest positive correlation (0.754) is found between political stability and corruption, indicating that increased political stability significantly lowers perceived corruption. The strongest negative correlation (-0.466) was found between industry value added and corruption, suggesting that higher industry value added is linked to lower perceived levels of corruption. Additionally, there is a positive correlation (0.610) between industry value added and population growth, indicating that higher industry value added is associated with higher population growth. Furthermore, there are moderately positive correlations

between political stability (0.669) and voice and accountability (0.429) and government effectiveness, indicating that higher levels of political stability and accountability are generally linked to higher levels of government effectiveness.

Table 3 Pairwise Correlation

Variables	Tax ratio	Pop	Inf	Agric	Ind	Trade	Corr	Gov	Pol	VA
Tax ratio	1.000									
Population growth	-0.193	1.000								
Inflation	-0.101	-0.080	1.000							
Agriculture value added	-0.217	-0.154	0.190	1.000						
Industry value added	-0.105	0.610	-0.007	-0.209	1.000					
Trade % GDP	0.219	0.233	0.228	-0.331	0.279	1.000				
Corruption	0.132	-0.455	-0.237	0.182	-0.466	-0.360	1.000			
Gov effect	0.345	-0.463	-0.293	-0.195	-0.463	-0.205	0.594	1.000		
Pol stability	0.285	-0.302	-0.197	0.191	-0.271	-0.156	0.754	0.669	1.000	
Voice Acc	0.330	-0.119	-0.029	-0.199	-0.106	-0.024	0.275	0.429	0.492	1.000

Source: Author's computation using WDI data 2024

4.3 Unit root tests

The study used panel unit root tests, as outlined to assess the stationarity properties of the data at both the levels and initial differences with a single lag. The Augmented Dickey Fuller principle (ADF), initially introduced by tests serve as the foundation for these tests. The LLC test takes a null hypothesis of a common unit root, whereas the IPS test accepts a null hypothesis of unity for each individual root. The table below indicates.

The below panel unit root test result displays the findings of the LLC (Levin, Lin, and Chu) and IPS (Im, Pesaran, and Shin) tests conducted on the variables at their initial values and following the taking of their first differences. The results of the LLC and IPS tests indicate whether the

variables exhibit stationarity at either level (I (0)) or first difference (I (1)). The majority of the variables, such as the tax ratio, inflation, trade, government efficacy, control of corruption, voice, and accountability, are non-stationary at their levels but become stationary after the first differencing, demonstrating that they are I (1), according to the results of the unit root test. On the other hand, because they stay at their existing levels, population growth, industry value addition, political stability, and agriculture value addition are all I (0). This information is crucial for modeling and analysis since it helps determine the appropriate techniques and transformations needed to work with these time series data.

Table 4 Unit root tests at level and at first difference.

Variable	**LLC test** Ho: Common unit root		**IPS test** Ho: Individual unit root		**Order of Integration**
	At level	At first difference	At level	At first difference	
Tax ratio	-2.36	-9.12***	-2.11	-8.77***	I(1)
Population growth	-17.53***		-19.09***		1(0)
Inflation	0.72	-18.81**	0.16	-18.32***	1(1)
Agriculture value added	-5.38***		-4.52***		1(0)
Industry value added	-4.01***		-4.21***		1(0)
Trade %GDP	0.03	-8.43***	-0.07	-9.18***	1(1)
Corruption	-1.05	-8.28***	0.38	-7.87***	1(1)
Government Effectiveness	-0.64	-8.83***	0.17	-8.07***	1(1)
Political stability	-3.07***		-1.80**		1(0)
Voice and Accountability	1.27	-6.22***	-0.01	-6.08***	1(1)

Source: Author's computations using WDI data 2024

Note, ***p<0.01, **p<0.05, *p<0.1

4.4 Cointegration test

In response to the aforementioned mixed order of unit root test results, the researcher performs panel co-integration tests to ascertain whether there is a long-term relationship between the variables in the model, as advised by Bustinza et al., (2024), the research performs a two-way analysis of the Pedroni test, assuming that the AR parameter is constant across all panels (Between Dimension) after first assuming that it is unique to each panel (Within Dimension). The analysis's findings are shown in the tables below.

4.4.1 Pedroni test (Within Dimension)

The Pedroni Cointegration test is used to determine whether variables in a panel data environment have a long-term equilibrium connection. This test compares the alternative hypothesis, which maintains that all panels are cointegrated (common AR coefficients), with the null hypothesis, which states that there is no cointegration, using a variety of statistics.

Table 5 Pedroni Cointegration test

Alternative Hypothesis: Common AR Coefficients. (Within Dimension) H0: No Cointegration	
	Test Statistics
Modified PP Statistic	1.746**
Panel PP Statistic	-1.656**
Panel ADF Statistic	-5.547***

Source: Author's computation using WDI data 2024

The findings of the Pedroni Cointegration test show that the variables in the panel data have a long-term equilibrium connection. At the 5% level, the Panel PP Statistic (-1.656) and the

Modified PP Statistic (1.746) are both significant. This suggests a long-term link between the variables and refutes the null hypothesis that there is no cointegration. The null hypothesis that there is no cointegration is also categorically denied by the Panel ADF Statistic (-5.547), which is highly significant at the 1% level. Despite possible short-term oscillations, all of these findings suggest that the variables in the panel data are cointegrated, or share a long-term equilibrium connection. Because it implies that any regression study including these variables should take into consideration their cointegrated relationship in order to prevent erroneous findings, this conclusion is essential for econometric modelling.

4.4.2 Kao test

Another technique for examining cointegration in panel data is the Kao test. The Kao test looks for a long-term equilibrium relationship between the variables, much like the Pedroni test does. The residuals from the computed Cointegration equation are subjected to Dickey-Fuller type tests in this test.

Table 6 Kao Test

H0: No Cointegration	
	Test statistics
Modified DF	0.602*
DF	2.148**
Unadjusted Modified DF	-12.567***
Unadjusted DF	-8.191***

*Note: *, **, *** represent 1%, 5% and 10% levels of significance. Source: Author's computations using WDI data 2024.*

A long-term equilibrium relationship between the variables in the panel data is shown by the Kao Cointegration test results. At the 10% level, the Modified DF Statistic (0.6025) is significant and shows some cointegration. Cointegration is further supported by the DF Statistic (2.1482), which is significant at the 5% level. The Unadjusted DF Statistic (-8.1919) and the Unadjusted Modified DF Statistic (-12.5670), both of which are highly significant at the 1% level, provide strong support

for cointegration. According to all of these results, the variables in the panel data are cointegrated, meaning that they have a long-term equilibrium relationship even in the face of short-term fluctuations. This conclusion is important for econometric modeling since it suggests that any regression study including these variables should consider their cointegrated relationship to avoid inaccurate findings.

Because it is more flexible than previous methods and can accommodate variables with different integration orders (I(0) and I(1)), the Panel ARDL methodology is recommended for investigating long-term relationships in panel data. This method provides insight into how variables change over time by estimating both short-term dynamics and long-term equilibrium relationships within a single model. Furthermore, the Panel ARDL model's error correction form accurately captures the pace at which variables return to equilibrium following short deviations, making it an excellent tool for examining cointegration and long-term correlations in panel data.

4.5 Diagnostic test results

Diagnostic tests are essential in econometric analysis to verify the validity and reliability of the regression model. Here, we present the findings of several diagnostic tests together with their p-values, which help us understand how the model works and what assumptions underlie it.

Table 7 Diagnostic results table

Diagnostic Test	Null hypothesis (Ho)	P-values Statistics
Breusch-Godfrey LM test for autocorrelation	No serial correlation	0.122
White's test for Heteroscedasticity	Homoscedasticity	0.209
Jarque-Bera test Normality	Normality	0.122
Ramsey RESET Test	No omitted variables	0.247
Multicollinearity Test (Mean VIF)	-	3.41

Source: WDI 2024 Data

Serial correlation. The model's error components are tied to time, as indicated by serial correlation (Breusch-Godfrey LM test), which could skew the test statistics and standard errors. It

may be necessary to use strategies like introducing lagged variables or use robust standard errors to get around this. **Heteroscedasticity.** White's test, which looks for heteroscedasticity, reveals that the variance of the residuals is not constant, which could lead to less accurate estimations. Robust standard errors or generalized least squares (GLS) can be used to tackle this issue. **Normality.** Inference benefits with support for residual normality (Jarque-Bera test). **Model Specification.** According to the Ramsey RESET test, which raises the possibility of model misspecification, the model might need more variables or a different functional form in order to accurately describe the relationship between the variables.

Multicollinearity. The mean VIF value shows that multicollinearity is not a major concern, even if it is present in this model to some degree and should be monitored.

4.6 Panel ADRL Regression analysis results

Results from Panel ARDL (Autoregressive Distributed Lag) show how variables interact dynamically in a panel data environment, which comprises data from different entities and time periods. Both short- and long-term correlation coefficients between the variables and the dependent variables are presented. What we can learn from these discoveries is broken down as follows:

Table 8 Panel ARDL Regression analysis results

Dependent variable: Tax ratio	
Error Correction Term	-0.236*** (0.064)
LONG-RUN	
Population Growth	-0.040 (0.289)
Inflation	-0.003** (0.001)
Agriculture value added	0.024** (0.009)
Industry value added	0.014** (0.011)
Trade	-0.018** (0.001)
Control of corruption	-0.310* (0.218)
Government Effectiveness	-0.220* (0.285)
Political stability	0.327*** (0.149)
Voice and accountability	0.369 (0.188)
SHORT-RUN	
Δ Population Growth	-0.007 (0.008)

Δ Inflation	-0.000*** (0.000)
Δ Agriculture, value added	-0.003 (0.002)
Δ Industry, value added	-0.004* (0.004)
Δ Trade.	-0.001 (0.001)
Δ Control of Corruption.	0.065 (0.0071)
Δ Government Effectiveness.	-0.026** (0.072)
Δ Political Stability.	0.034 (0.042)
Δ Voice and Effectiveness.	0.054 (0.074)
Constant	-0.299*** (0.100)
Observations	130

Note.

(i). Standard errors for coefficients are in parentheses.

(ii). *** p<0.01, ** p<0.05, * p<0.1.

5. Discussion

A long-term equilibrium relationship between the variables is demonstrated by the statistically significant negative error correction term (ECT) (-0.2358). The coefficient shows that the tax structure's divergence from equilibrium is adjusted by 23.58% every period, indicating a rather rapid response to short-term shocks. Over time, the tax system is significantly impacted by institutional quality considerations. Our results are consistent with those of Sakuntala, et al., (2024), who found that mismanagement of resources or accepting bribes are examples of corrupt actions that often cause reliance on indirect taxes. Study done by Uzar (2021), opposed with this study since revelled that there is short run between institutional quality and tax structure in developing countries. The direct-to-indirect tax ratio is negatively impacted by corruption, indicating that nations with high levels of corruption are more likely to prioritize indirect taxes above direct taxes and vice versa. The government's effectiveness was notable, indicating that successful administrations typically collect higher indirect taxes. This is because indirect taxes, such as value-added tax (VAT) or sales taxes, are usually easier to administer and less costly than direct taxes, such as income tax. Efficient governments employ streamlined administrative processes to ensure broad tax coverage and enforce compliance in sectors such as consumption, where indirect taxes are imposed. This is consistent with the findings of Uzar (2021), political stability has a significant positive effect on the tax ratio, indicating that stable administrations tend to rely more on direct taxes. Theoretical evidence for the results, a tax system should be created to maximize a social welfare function while abiding by specific restrictions, according to the

conventional theory of optimum taxation supported as per study of Uzar (2021), the study has limited availability of enough data for selected variables. There is statistical evidence in long run effect between institutional quality and tax structure in East Africa countries based on hypothesis.

> *H1: There is long-term impact between institutional quality and tax*
> *structure*

This is most likely due to the predictable settings that stable government's offer, which facilitate the collection of formal income taxes and corporate taxes. Inflation has a negative impact on the tax structure and reduces the direct-to-indirect tax ratio because governments usually resort to indirect taxes, such as VAT, which are more flexible in reaction to inflationary pressures. This outcome supports Dwaikat (2021), finding that consumption-based taxes are better under inflationary circumstances. The formalization and taxation of agricultural activities may lead to a greater dependence on direct taxes, as seen by the positive effect of agricultural sector growth on the tax ratio (0.0244). Similar to this, industrial growth raises the tax ratio because it formalizes firms and expands the tax base, which promotes direct taxes like payroll and corporate income taxes Dwaikat (2021), conversely, trade liberalization has a negative effect on the tax ratio since governments are forced to rely more on indirect taxes, including import VAT, as alternative revenue sources due to lower tariff receipts (Hayat, 2019). This study supported by Udeagha and Ngepah (2023), who conducted the similar study and revelled that there is relationship between institutional quality and tax structure in developing counties.

In the short run, government effectiveness also negatively impacts the tax structure, consistent with long-term trends. This reflects a reliance on indirect taxes, such as VAT or excise duties, during initial stages of institutional improvement, particularly in countries with weak tax compliance or limited administrative capacity (Udeagha and Ngepah, 2023). The emphasis gradually moves to broadening the tax base and improving compliance as government efficiency rises, ultimately leading to a greater reliance on direct taxes. In the near term, inflation drastically lowers the direct-to-indirect tax ratio, reducing real tax receipts and favouring consumption-based taxes such as VAT when inflation is present Khan et al., [39], this demonstrates how indirect taxes are regressive and become more noticeable as inflation increases. This finding contradict with this study since explained that there is positive association between quality institutions and tax revenue.

Finally, the small but significant negative short-term effect of industrial growth on the tax ratio reflects the initial reliance on indirect taxes during early stages of industrialization. Developing economies often depend on consumption-based taxes due to the informality or immaturity of the industrial sector, limiting direct tax collection until formalization occurs (Azam et al., 2022). This trend underscores the gradual transition toward a more direct tax-oriented structure as industrialization advances. This study supported by Bekun (2021), who conducted the similar study and reveled that there is relationship between institutional quality and tax structure in developing counties. Theoretical evidence for the results, a tax system should be created to maximize a social welfare function while abiding by specific restrictions, according to the conventional theory of optimum taxation supported as per (Azam and Ahmad, 2022). The study has limited availability of enough data for selected variables. There is statistical evidence in short run effect between institutional quality and tax structure in East Africa countries based on hypothesis.

> **H2:** *There is short-term impact between institutional quality and tax structure.*

6. Conclusion

According to the study's findings, at a 10% significance level, government effectiveness has a long-term positive and significant impact on the direct-to-indirect tax ratio. This suggests that effective governance encourages the creation and application of tax structures that prioritize direct taxes over indirect ones in order to promote equity. At the 10% significance level, control of corruption also has a positive and significant effect, suggesting that less corruption improves justice and may even encourage a greater reliance on direct taxation. At the 1% significance level, political stability has a strong beneficial impact, highlighting how crucial it is to establishing a stable environment that permits efficient government and a progressive tax system. Nonetheless, in the short term, the ratio of direct to indirect taxes is negatively impacted statistically significantly by government efficacy and corruption control. This shows that early attempts to fight corruption and enhance governance could upset current tax structures, resulting in a short-term reliance on indirect taxes or difficulties raising the proportion of direct taxes. It is anticipated that these reforms will stabilize and enhance tax performance over time. In order to properly balance direct and indirect taxes, the report advises East African states to increase government efficacy and combat

corruption. This includes designing more progressive tax structure that emphasize direct taxes while reducing reliance on regressive indirect taxes, which disproportionately burden low-income households. Key measures include enhancing transparency, adopting digital tools to minimize human intervention in tax administration, building capacity among tax officials, and ensuring transparent use of tax revenues. These actions will boost revenue collection, foster public trust, encourage compliance, and promote a tax structure that relies more on direct taxes for greater equity and fairness. Therefore, according to this study the institutional quality influence tax structure in developing country as per standard theory of optimal taxation. Also this study will help government, policy makers and research scholars to improve tax system.

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