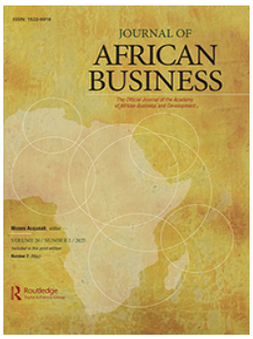

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To Starve the Beast or Not to Starve the Beast? Evidence from Debt-Distressed Region

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ABSTRACT

The elimination of budgetary disequilibrium remains a contentious issue, with scholars and policymakers debating the efficacy of tax alterations versus limiting government outlays. This topic has garnered significant attention, although research on the spending-revenue nexus is noticeably skewed against Africa, which presents an intriguing research opportunity. The International Monetary Fund (IMF) reported a concerning rise in public debt across Africa, highlighting the urgent need for public finance consolidation. In contrast to the extant literature, this study examines the dynamic link between revenues and expenditures from 1990 to 2022. Applying wavelet decomposition to account for temporary variations, our analysis reveals dynamic patterns in the revenue-expenditure nexus. Our findings support the institutional separation hypothesis in the short run, suggesting a distinct relationship between revenues and outlay. However, in the medium-to long-run, our results support the fiscal synchronization hypothesis, accentuating a more intertwined association between revenues and expenditures. This study sheds light on the nuanced dynamics of budgetary equilibrium in Africa, providing insights that can inform policy priorities and decision-making. Finally, by focusing on the unique context of Africa and using advanced techniques, this study contributes to the existing literature on budgetary equilibrium, filling a crucial gap in our knowledge of the public finance dynamics in the region.

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1. Introduction

Whether budgetary disequilibrium can be resolved through tax adjustments or by implementing constraints on government expenditures remains a contentious issue in the literature (AbuAl-Foul & Baghestani, 2004; Bartlett, 2007; West & Winer, 1980). This ongoing debate has garnered significant attention from scholars and policymakers alike, leading to a substantial increase in the volume of research papers on this topic (Jiranyakul, 2022; Koren & Stiassny, 1998; Makhlouf & Dahmani, 2022; Payne, 1997; Salvi & Schaltegger, 2022). Surprisingly, while there is a wealth of literature investigating

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the relationship between revenues and expenditures, the focus has predominantly been on industrialized and Asian economies, as evident in studies such as Kumhof et al. (2014), Akram and Rath (2019) and Chang and Ho (2002), with relatively less emphasis on African countries (Babarınde et al., 2021; Baharumshah et al., 2016; Nzimande & Ngalawa, 2022).

According to the International Monetary Fund (IMF), (Comelli et al., 2023), public debt levels in Africa are approaching those observed in the early 2000s, before the impact of the Heavily Indebted Poor Countries (HIPC) initiative. Furthermore, the IMF reports that 19 out of the 35 low-income economies in sub-Saharan Africa are currently facing or at a high risk of debt distress. Consequently, the consolidation of public finances in the region has emerged as a critical policy priority. However, the question arises: should policymakers focus primarily on adjusting taxes, expenditures, or both? In addition, what form should consolidation efforts take? The answer to these questions is far from straightforward. Unfortunately, existing theories offer limited guidance on this matter, thereby making it an empirical question. In theory, four hypotheses have been proposed: tax-spend, spend-tax, institutional, and fiscal synchronization hypotheses, each carrying distinct implications for the consolidation of public finances.

The tax-spend hypothesis, often attributed to Friedman, posits that government spending adjusts in response to revenue levels. Thus, implementing tax reductions could serve to instill fiscal discipline in government expenditure. This concept, commonly known as "starving the beast," suggests that reducing government revenues leads to sizable deficits, which, in turn, compel the government to curtail its spending (Bartlett, 2007; Nzimande & Ngalawa, 2022). However, the research on the effectiveness of tax limitations in restraining spending growth and reducing debts or deficits yields mixed results. For instance, Bohn (1991) found that tax cuts tend to be followed by spending cuts, while Romer and Romer (2007) found no evidence supporting the notion of starving the beast. By contrast, the spend-tax hypothesis proposes that the political system determines the course of action, with taxes being adjusted to align with government spending levels (Romer & Romer, 2007). Consequently, the government should adopt policies that restrain spending growth to reduce deficits or debts rather than relying on increasing tax revenues (Narayan & Narayan, 2006). Meltzer and Richard (1981) developed a general equilibrium model in which a median voter whose income is below the mean income possesses decisive voting power. The tax and spending preferences of the median voter are simultaneously considered. The median voter recognizes that higher taxes diminish work incentives and aggregate income, and subsequently reduce revenues. Moreover, voters comprehend both the costs and benefits associated with changes in government size, leading the median voter to elect an optimal size (Meltzer & Richard, 1981, 1983). Consequently, revenue and spending decisions are made concurrently, a concept referred to as fiscal synchronization (Narayan & Narayan, 2006, Nzimande & Ngalawa, 2022). The absence of a causal relationship between revenues and expenditures, often referred to as institutional separation, implies that the expenditure and revenue decision-making processes by fiscal authorities are independent of each other.

From the literature review, it becomes apparent that evidence of the association between revenue and expenditure yields mixed and inconclusive results. This could be explained by differences in the techniques and samples used. For example, Nzimande and

Ngalawa (2022) identified evidence supporting institutional separation among eleven Southern Africa Development Community (SADC) member states. Moreover, their findings suggested that taxes cause spending in Botswana, whereas for Mauritius and Mozambique, the evidence supports the spending – tax hypothesis. Conversely, Chang et al. (2002) found that spending influences revenues in South Africa, implying that to achieve budgetary balance, the country should control its expenditures. In contrast, Nyamongo et al. (2007) found no short-term evidence of causality between revenues and expenditures but observed a bidirectional causality in the short run in the case of Namibia.

Given these contradictory findings and the urgent need to consolidate public finances in Africa, we are motivated to investigate the revenue-spending nexus specific to the African context. Understanding the relationship between revenue and expenditure has significant implications for effective consolidation of public finance. It is widely acknowledged that the dynamics of macroeconomic variables vary over time and are not static (Dahlberg & Johansson, 1998; Karabacak & Meçik, 2022; Shahbaz et al., 2016). However, many studies exploring the revenue-expenditure relationship overlook this aspect (Gurvich & Krasnopeeva, 2020; Tashevska et al., 2020). Sun et al. (2023) identify two reasons why the association between revenues and outlays may vary over time. First, according to Keynesian theory, which advocates a countercyclical fiscal policy, a looser relationship between revenue and spending is expected in the short run. Second, sustainability concerns prompt authorities to adjust both spending and revenue in the medium- to long-run, leading to a tighter connection between these variables. This suggests that the relationship between government revenues and expenditures is time-varying; thus, ignoring this relationship could yield misleading and inconclusive results. Existing literature in Africa neglects the time-varying nature of the relationship between revenue and outlays. We aim to bridge this gap by allowing this relationship to vary over time and to be frequency-dependent. To the best of our knowledge, this is the first attempt to do so in an African context, especially in a panel setting.

The nature and direction of causality between revenue and expenditure vary significantly among countries. Studies that overlook these differences may lead to misleading findings and erroneous policy recommendations. Therefore, it is crucial to consider cross-country variation. Some studies, such as Makhlouf and Dahmani (2022) and Phiri (2019), have addressed this issue through a country-by-country analysis. Although this approach accounts for differences across countries, it overlooks the potential interdependencies that may exist among them. The literature extensively documents the challenges associated with disregarding this interdependency (Baltagi & Hashem Pesaran, 2007; Chudik et al., 2011; Pesaran, 2007). Hence, our approach not only incorporates cross-section dependency, but also allows for a country-specific examination of the spending-revenue relationship. Therefore, our techniques allow us to exploit additional information that is typically overlooked in time-series studies.

2. Literature review

The 2007–09 global financial crisis and, recently, the global pandemic COVID-19, sent government debts across the globe to new and unprecedented levels (Canelli et al., 2022; Edmond et al., 2020). According to the World Bank, borrowing to

mitigate the economic and social impact of the pandemic added $550 billion to the external debt obligations of low- and middle-income countries. This is against the background in which public debt rose sharply in some countries, especially African economies, leaving them exposed to any sudden change in investor risk appetite and compounding debt problems. In Africa, public debt reached levels that were last witnessed in the early 2000s, before the intervention of the World Bank through HIPC initiatives. The dangers and effects of elevated public debt are well documented in the literature (Checherita-Westphal & Rother, 2012; Panizza & Presbitero, 2013). For instance, debt adversely affects economic growth (Gomez-Puig et al., 2022; Panizza & Presbitero, 2013). In some cases, debt is the primary cause of financial instability, eventually leading to high inflation (Spaventa, 1987). Against this backdrop, public debt consolidation has become a priority for African countries. To restore equilibria in public finances, adjustments are inevitable. However, the question is whether adjustments should be made in the form of spending cuts, tax adjustments, or both. The economic theory does not provide a straightforward answer to this question, rendering it an empirical one. Many studies attempt to answer this question by investigating the link between public revenue and outlays. However, such studies often contradict each other and ignore Africa, a debt-distressed region, as a ground for research (N. P. Nzimande & Ngalawa, 2022). This section reviews recent evidence on this topic.

Given the extensive study of the link between government revenues and expenditures in the literature, our focus is primarily on African studies and those that allowed for the time-varying nature of the spending-revenue nexus.

In a study for Thailand, Jiranyakul (2022) found no causal relationship between government revenues and expenditures in the short run. However, they document evidence of causality running from spending to revenues in the long run, referred to as the spend-tax hypothesis. Therefore, Jiranyakul (2022) concluded that the relationship between government spending and revenue changes over time, which should be considered in studies of this nature. Hence, studies, such as those by AbuAl-Foul and Baghestani (2004) and Chang et al. (2002), N. Nzimande and Ngalawa (2019), and Narayan and Narayan (2006), amongst others, which implicitly impose a constant relationship between government revenues and expenditures, must be treated cautiously as they could offer misleading policy prescriptions.

The importance of the changing nature of the relationship between spending and revenues is further highlighted by Linhares and Nojosa (2020) and Sun et al. (2023), among others. Therefore, it is surprising that, despite mounting evidence suggesting the time- and frequency-dependent nature of the relationship between revenues and expenditures, African literature continues to neglect this aspect.

The few studies that attempted to incorporate the time-varying nature of the association between government revenues and expenditures, such as Makhlouf and Dahmani (2022), Nsor-Ambala and Asafo-Adjei (2023), Baharumshah et al. (2016), and Nyamongo et al. (2007), relied on traditional time series approaches, thereby overlooking the potential role of interdependency. Canova and Ciccarelli (2013) argue that countries can no longer be treated in isolation and that spillovers are crucial for economic analysis. Thus, country-by-country or time-series analyses fail to exploit the additional information provided by panel datasets.

Studies such as Wolde-Rufael (2008) and Nzimande and Ngalawa (2022) utilized panel data in Africa and attempted to account for heterogeneity and interdependencies. However, the deficiency in these studies is that, similarly to the other existing studies, they ignore the time- and frequency-dependent nature of the association between government revenues and expenditures. Additionally, these studies only considered a subset of African countries; for example, N. P. Nzimande and Ngalawa (2022) only concentrated on SADC member states, whereas Wolde-Rufael (2008) only considered 13 African states. Therefore, there is a need to conduct a more comprehensive analysis of the government spending nexus in Africa.

3. Data and methodology

3.1. Data

We test the causality relationship between spending (SPE) and revenue (REV) for 20 African countries (Benin, Burkina Faso, Burundi, the Central African Republic, Comoros, the Republic of Congo, Equatorial Guinea, Eswatini, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Madagascar, Mozambique, Namibia, Nigeria, Seychelles, and Togo) in the period 1990–2022. We follow AbuAl-Foul and Baghestani (2004) and Bohn (1991), among others, by using revenue and expenditure as a ratio of GDP. Controlling for GDP eliminates the question of whether nominal or real variables must be used. To deal with heteroskedasticity, both variables are transformed into logarithms. Our data covers the period 1990–2022 and was collected from the World Economic Outlook database of the International Monetary Fund (IMF).

3.2. Bootstrap panel causality

The Granger causality test, which is based on a vector autoregressive (VAR) model, is used to determine whether one time series is useful in predicting another. To this end, the coefficients of the lagged values of a variable (e.g. X) are examined within the VAR model. If the coefficients are found to be statistically significant in explaining the variations in the other variable (e.g. Y), then it can be said that there is a causality relationship from X to Y. Consequently, the Granger causality test highlights the predictive capacity of one variable over another.

Although numerous tests have been developed for individual time series, relatively few have been proposed based on panel data. Among them, the bootstrap panel Granger causality test, proposed by Kónya (2006), has become popular in empirical literature. This test is based on a set of equations and considers both cross-sectional dependence and heterogeneity among panel members. As unit-specific critical values are computed through bootstrap simulations, this test mitigates size distortions and improves the finite-sample properties of the test, especially in small samples and panels with cross-sectional dependence. In addition, the Kónya causality test allows for heterogeneous panel structures, which means that this test allows each country to have its unique causal dynamics, thus providing a more detailed picture than a traditional panel approach. Furthermore, although traditional Granger causality tests often require pretesting for unit roots and cointegration, which can be unreliable and lead to conflicting conclusions, Kónya's bootstrap panel approach avoids

these issues, making the analysis more robust and reliable. This is particularly important in the context of economic and financial data, where the presence of unit roots and cointegration is common and can significantly affect the causality test results. By circumventing the need for pretesting, the Kónya causality test reduces the risk of drawing incorrect conclusions because of the limitations of the unit root and cointegration tests. Moreover, the Kónya causality test is well-suited for analyzing the complex relationships between economic variables across different countries or regions. By allowing heterogeneous panel structures, this test can capture the unique dynamics of each panel member, providing valuable insights into the diverse causal relationships that may exist within the panel. This is particularly relevant in the context of globalization, where countries are increasingly interconnected, and the causal relationships between economic variables may vary significantly across different countries or regions. Overall, the bootstrap panel Granger causality test proposed by Kónya (2006) offers several advantages over traditional causality tests, including its ability to handle cross-sectional dependence, heterogeneity, and small sample sizes. By avoiding the need for pretesting and allowing for heterogeneous panel structures, this test provides a more robust and reliable framework for analyzing causal relationships in panel data, making it a valuable tool for researchers and policymakers alike.

To apply the bootstrap panel Granger causality test, we estimate the following set of equations using the seemingly unrelated (SUR) equation estimator of Zellner (1962), because the use of SUR systems allows for a more efficient estimation of causal relationships:

$$\begin{aligned}
REV_{1,t} &= \beta_{1,1} + \sum_{k=1}^{l1} \alpha_{1,1,k} REV_{1,t-k} + \sum_{k=1}^{l2} \delta_{1,1,k} SPE_{1,t-k} + e_{1,1,t} \\
REV_{2,t} &= \beta_{1,2} + \sum_{k=1}^{l1} \alpha_{1,2,k} REV_{2,t-k} + \sum_{k=1}^{l2} \delta_{1,2,k} SPE_{2,t-k} + e_{1,2,t} \\
&\vdots \\
REV_{N,t} &= \beta_{1,N} + \sum_{k=1}^{l1} \alpha_{1,N,k} REV_{N,t-k} + \sum_{k=1}^{l2} \delta_{1,N,k} SPE_{N,t-k} + e_{1,N,t}
\end{aligned} \tag{1}$$

And

$$\begin{aligned}
SPE_{1,t} &= \beta_{2,1} + \sum_{k=1}^{l3} \alpha_{2,1,k} REV_{1,t-k} + \sum_{k=1}^{l4} \delta_{2,1,k} SPE_{1,t-k} + e_{2,1,t} \\
SPE_{2,t} &= \beta_{2,2} + \sum_{k=1}^{l3} \alpha_{2,2,k} REV_{2,t-k} + \sum_{k=1}^{l4} \delta_{2,2,k} SPE_{2,t-k} + e_{2,2,t} \\
&\vdots \\
SPE_{N,t} &= \beta_{2,N} + \sum_{k=1}^{l3} \alpha_{2,N,k} REV_{N,t-k} + \sum_{k=1}^{l4} \delta_{2,N,k} SPE_{N,t-k} + e_{2,N,t}
\end{aligned} \tag{2}$$

Where REV and SPE represent the government revenue and spending, respectively. N and k denotes the number of countries and the optimal lag length, respectively. Considering this set of equations, four alternative causality relationships can be tested: (a) There is a unidirectional causality that runs from SPE to REV if not all $\delta_{2,i}$ are zero but all $\delta_{1,i}$ are zero. (b) There exists a unidirectional causality from REV to SPE if not all $\delta_{1,i}$ are zero but all $\delta_{2,i}$ are zero. (c) There is a bidirectional causality between SPE and REV if not all $\delta_{1,i}$ and $\delta_{2,i}$ are zero. (d) There is no causality relationship between SPE and REV if all $\delta_{1,i}$ and $\delta_{2,i}$ are zero. These restrictions can be tested by employing Wald test statistics for which the necessary critical values are obtained using bootstrap simulations. These simulations are useful for remedying small sample bias and allowing for cross-sectional dependence.

3.3. Wavelet decomposition

We can analyze the existence of a causality relationship using the bootstrap causality test; however, the findings only help to determine whether the causality relationship exists in the analysis period or not, ignoring the changes in the relationship at different frequencies. Thus, we decompose the series using wavelet transform and test the causality using the obtained components in this study. Wavelet decomposition is a mathematical tool used to analyze the different frequency components of a signal or function.

We employ the maximal overlap discrete wavelet transform (MODWT) because it handles any sample size, which is a major advantage over the discrete wavelet transform. In addition, the filters used in MODWT have a zero phase, which avoids phase distortion and preserves the time information of the signal (see Dghais and Ismail, 2013). Wavelet ($W_{j,t}$) and scaling ($V_{j,t}$) coefficients of the MODWT can be expressed as follows:

$$w_{j,t} = \sum_{l=0}^{L-1} \frac{\psi_{j,l}}{2^{j/2}} Y_{t-l} \bmod N$$

$$V_{j,t} = \sum_{l=0}^{L-1} \frac{\phi_{j,l}}{2^{j/2}} Y_{t-l} \bmod N$$

Where Y_t is the considered variable, $\phi_{j,k}$ and $\psi_{j,k}$ captures long- and short-run behaviors, respectively. The choice of the wavelet filter and scale significantly influences the symmetry and shape of the wavelet, which in turn impacts its ability to represent specific features and frequencies in the analyzed signal. We use the Daubechies Least Asymmetric as the wavelet filter because Daubechies wavelets perform much better than other families of wavelets. We choose eight as the wavelet length by considering the suggestion of Gençay et al. (2001) and determine the largest scale by using $J_0 = \log_2(T)$. After determining the J_0, we decompose the considered series into different frequencies and apply the causality test to these considered components.

4. Empirical findings

In this section, we present our findings for both the original and decomposed series. Table 1 presents the findings obtained from the original series. In the original series, we

ignore the time-varying and frequency-dependent nature of the spending-revenue nexus. This will enable us to compare our findings with those of existing studies.

Table 1 presents the results of the original series. We find that, for most countries, there is no significant causal relationship between government revenues and expenditures. This finding aligns with previous studies conducted in Africa, such as Nzimande and Ngalawa (2022), who documented evidence supporting the institutional separation hypothesis. This suggests a lack of coordination between the institutions responsible for revenue decisions and those responsible for spending decisions. This lack of causality can be attributed to the distinct processes involved in making spending and revenue decisions. Spending decisions often involve political considerations and are influenced by voters, politicians, and legislators, whereas revenue decisions are typically made by revenue collection agencies or the government's executive arms. In the absence of effective coordination between these entities, it is unsurprising to find a lack of causality between revenues and outlays.

Dahlberg and Johansson (1998) propose that the absence of a causal relationship between revenues and spending may arise when tax and spending decisions are based on rule-of-thumb approaches, which is in line with Hall's hypothesis of consumption. This suggests that countries have the flexibility to address budget imbalances by adjusting either the revenues, spending, or both (Akram & Rath, 2019; Dahlberg & Johansson, 1998). Our findings are also consistent with Keynesian theory, which advocates countercyclical fiscal policies to stabilize business cycles. In the short run, this implies a loose connection between revenue and spending, as efforts are focused on stabilizing the economy and meeting infrastructure and development needs (Sun et al., 2023).

In the original series (refer to Table 1), we observe a causality running from revenues to spending in Mozambique, Equatorial Guinea, and Seychelles. Similar evidence is found in the short term for the Republic of Congo, Kenya, Gabon, and Namibia. These

Table 1. Bootstrap Causality Test Results for Original Series.

	H_0: SPE↛REV				H_0: REV↛SPE			
Countries	Wald Test Stat.	10% CV	5% CV	1% CV	Wald Test Stat.	10% CV	5% CV	1% CV
Benin	4.297	26.213	34.445	59.034	3.261	30.481	41.786	70.984
Burkina Faso	3.418	18.189	23.23	36.542	1.411	254.254	337.92	528.313
Burundi	2.832	37.508	49.029	76.737	6.034	25.461	35.848	63.946
Central African Republic	0.871	11.504	16.158	30.059	0.433	44.313	59.175	98.76
Comoros	7.062	12.786	19.069	35.686	0.692	40.357	53.326	85.08
Republic of Congo	3.691	7.937	10.86	18.476	9.028	32.516	45.786	82.131
Equatorial Guinea	0.981	11.115	16.069	29.489	49.889*	4.549	6.505	12.093
Eswatini	0.141	4.697	7.024	13.169	31.629	56.761	72.091	113.068
Ethiopia	2.608	12.452	18.603	34.697	9.427	14.758	21.412	39.347
Gabon	1.494	29.768	44.92	88.531	9.988	21.302	30.453	57.158
Ghana	4.626	47.897	59.63	90.806	13.74	41.759	54.371	86.47
Guinea	16.411	61.547	75.144	117.954	0.021	16.786	30.591	163.36
Kenya	4.464	11.755	16.448	29.252	1.189	17.051	24.297	48.116
Lesotho	0.009	18.346	24.883	41.368	16.768	26.745	34.37	54.883
Madagascar	0.668	20.852	32.168	61.927	0.743	20.301	29.807	57.311
Mozambique	0.901	13.795	20.283	37.694	134.277*	34.384	46.326	76.096
Namibia	0.297	20.947	28.405	47.403	11.76	26.424	35.852	58.607
Nigeria	5.574	18.708	26.956	49.81	4.461	21.767	30.171	51.159
Seychelles	0.316	39.606	51.163	79.298	23.175***	22.081	29.243	46.607
Togo	0.761	11.146	16.613	33.715	11.67	26.072	38.929	70.763

Note: * and *** indicate significance at the 1 and 10% levels, respectively. The CV represents the critical value obtained using 10,000 simulations.

findings are consistent with the research conducted by Wolde-Rufael (2008), who also identified evidence supporting the tax-spend hypothesis in Kenya. This implies that in these economies, government spending is determined by the available revenue resources during the planning process. Consequently, to address budget imbalances in these countries, one possible approach could be to implement a strategy of "starving the beast." The concept of starving the beast suggests that by reducing revenues and creating a deficit, the government would be compelled to cut back on spending, thereby restoring budget equilibrium (Becker et al., 2003; Metaphor, 2007).

However, it is worth noting that contrary to this perspective, scholars such as Buchanan and Wagner (1977) argue that reducing taxes may not necessarily lead to spending cuts. It may result in increasing spending and exacerbate budget imbalances. This phenomenon is known as fiscal illusion, where voters misinterpret tax reductions as a decrease in the cost of government services, leading to a greater demand for such services.

Overall, these findings underscore the complex relationship between revenues and spending decisions, suggesting that the interplay of factors such as revenue availability, political processes, and voter behavior can influence the fiscal dynamics and budget outcomes of different economies. The experiences of countries like Equatorial Guinea, Gabon, and Congo highlight how oil and gas revenues can significantly impact economic growth and political status, but also present challenges in managing budget imbalances

The findings reported in Table 1 implicitly impose an unnecessarily restrictive limitation, assuming that the relationship between revenues and expenditures is time and frequency independent. However, this assumption contradicts the voluminous evidence documented in macroeconomic studies, which suggests that the relationship between macroeconomic variables varies over time and across frequencies. To address this issue, the results presented in Tables 2–4 allow for a more dynamic relationship that can differ over time.

Table 2 focuses on the short-run results. Our findings reveal evidence supporting the spend-tax hypothesis in the short run for several specific countries, including the Central African Republic (CAR), Equatorial Guinea, the Kingdom of Eswatini, Guinea, Togo, and Mozambique. These findings align with the prevailing notion that government spending tends to be procyclical in developing countries (Abbott & Jones, 2011, 2013; Ilzetzki, 2011). In such cases, politicians are incentivized to advocate for higher spending without fully considering the revenue side. This evidence suggests that spending decisions are made before tax or revenue decisions, with spending levels determined first and the necessary resources subsequently mobilized.

Our results are consistent with the expectation that, due to macroeconomic imbalances, it is unsurprising to find that government spending causes revenues in the short run. In the face of unexpected macroeconomic disturbances, such as the COVID-19 pandemic, authorities must react quickly by increasing emergency spending (e.g. emergency relief funds) without necessarily worrying too much about the immediate impact on revenues. This short-run behavior is likely driven by the need to address pressing social and economic concerns during times of crisis.

Shifting our focus to the medium and long-term dynamics of governments, we uncover intriguing findings. In contrast to the results observed in the short run (as depicted in Table 2) and the original series (as shown in Table 1), our analysis reveals

Table 2. Bootstrap Causality Test Results for Short Run.

	H_0: SPE↛REV				H_0: REV↛SPE			
Countries	Wald Test Stat.	10% CV	5% CV	1% CV	Wald Test Stat.	10% CV	5% CV	1% CV
Benin	10.817	21.136	29.706	44.918	24.229	32.013	43.167	74.158
Burkina Faso	5.003	26.573	34.467	60.064	32.139	41.747	71.236	695.066
Burundi	13.638	28.2	36.905	56.148	2.717	26.225	34.989	59.065
Central African Republic	25.763***	20.634	28.46	46.854	5.79	30.314	38.37	64.949
Comoros	3.266	26.154	36.041	62.566	7.911	41.319	60.052	160.244
Republic of Congo	15.74	26.07	32.44	50.635	41.118**	29.521	37.635	60.955
Equatorial Guinea	58.99**	31.182	41.229	69.828	6.384	32.087	41.654	70.728
Eswatini	46.459**	28.838	38.063	61.713	13.42	33.463	43.063	68.93
Ethiopia	13.139	30.629	40.391	65.408	28.835	30.237	42.476	67.433
Gabon	9.92	29.345	38.052	60.498	31.303***	26.632	34.432	56.019
Ghana	3.662	19.265	25.392	44.015	12.555	29.208	39.626	66.184
Guinea	70.039*	31.777	41.02	67.865	14.341	34.967	51.252	112.927
Kenya	9.384	26.14	35.587	53.801	32.691***	30.381	41.117	70.583
Lesotho	9.255	28.115	36.747	61.041	8.197	21.734	28.822	46.812
Madagascar	6.098	25.166	33.426	56.507	21.72	26.783	36.956	64.949
Mozambique	29.861***	27.646	36.882	55.151	116.083*	24.265	31.186	49.715
Namibia	14.39	23.386	30.445	48.244	29.983***	23.831	31.542	53.718
Nigeria	11.262	28.648	39.12	65.444	6.957	26.904	35.789	64.003
Seychelles	17.021	21.745	28.275	46.419	3.183	29.51	38.676	59.655
Togo	5.16	20.461	27.056	45.435	4.788	23.987	31.63	51.411

Note: *, **, and *** show the significance at the 1, 5, and 10% levels, respectively. The CV represents the critical value obtained using 10,000 simulations.

a robust reverse causality between government revenues and expenditures in the medium and long run. This finding suggests that authorities in these countries, with an eye on long-term sustainability, carefully evaluate the trade-off between the incremental costs of higher taxation and the incremental benefits of government spending. As a result, they strive to determine the optimal levels of both revenues and spending. Consequently, spending and revenue decisions are not mutually exclusive in the long run. Therefore, we find compelling evidence in support of the fiscal synchronization hypothesis for almost all the countries included in our sample, both in the medium run and the long run (refer to Tables 3 and 4). These findings have significant implications for policymakers seeking to maintain sustainable fiscal policy. The sustainability of fiscal policies requires that a stable long-run relationship between government outlays and revenues be maintained. Intuitively, as contended by Sun et al. (2023), this implies that fiscal policy sustainability relies on the adjustability of revenues and expenditures to restore budgetary disequilibrium. Hence, direct adjustment dynamics are informative for policymakers. In light of these findings, our research suggests that policymakers have two primary options to restore the sustainability of fiscal policies: (*i*) Policymakers can consider implementing measures to increase government revenues, such as raising taxes, expanding the tax base, or improving tax collection efficiency. By enhancing revenue generation, governments can better align their income with their expenditures, thereby promoting fiscal sustainability. (*ii*) Alternatively, policymakers can focus on managing government spending to ensure that it aligns with available revenues. This may involve implementing cost-cutting measures, prioritizing essential public services, and improving the efficiency of government programs. By controlling expenditures, governments can maintain a balanced budget and avoid accumulating excessive debt. Ultimately, the choice between these two options will depend on the specific economic, social, and political context of each country. Policymakers must carefully consider the potential impacts of their decisions on

Table 3. Bootstrap Causality Test Results for Medium Run.

	H_0: SPE↛REV				H_0: REV↛SPE			
Countries	Wald Test Stat.	10% CV	5% CV	1% CV	Wald Test Stat.	10% CV	5% CV	1% CV
Benin	19899.84*	20.347	27.556	52.175	2712.614*	79.449	97.335	141.535
Burkina Faso	7154.561*	23.954	33.19	54.634	22234.02*	83.46	103.129	145.79
Burundi	251.308*	34.666	43.633	70.485	2225.985*	79.929	98.242	136.017
Central African Republic	22806.12*	37.829	50.622	82.083	19277.76*	51.741	65.74	102.098
Comoros	4021.186*	37.752	48.31	83.014	42751.17*	80.342	95.945	135.174
Republic of Congo	11628.56*	31.14	41.845	70.248	21090.25*	90.724	112.157	157.364
Equatorial Guinea	16828.56*	40.244	53.066	81.906	12216.61*	85.993	101.243	149.399
Eswatini	4467.699*	20.676	28.011	45.889	16295.3*	82.581	97.644	143.628
Ethiopia	9448.574*	21.814	31.245	52.155	18517.49*	31.665	43.825	69.271
Gabon	10074.12*	45.775	61.883	90.365	29913.98*	88.209	105.209	154.728
Ghana	5158.466*	36.32	45.211	74.433	989.455*	89.889	105.612	153.104
Guinea	8722.993*	29.51	42.016	62.723	9205.075*	78.873	95.493	142.658
Kenya	13520.02*	19.67	27.833	48.245	35040.02*	57.057	72.544	104.522
Lesotho	58713.01*	17.286	24.871	44.348	31457.02*	24.851	34.853	62.417
Madagascar	8282.913*	43.583	55.6	85.149	689.992*	51.082	65.569	99.901
Mozambique	21512.68*	40.686	55.916	81.613	14683.37*	60.942	76.678	120.017
Namibia	1379.172*	33.77	45.947	73.338	980.7*	57.086	74.05	108.644
Nigeria	9864.452*	26.042	35.783	56.677	4804.068*	47.235	60.545	91.806
Seychelles	332.448*	37.769	52.606	85.991	445.284*	55.005	69.496	105.462
Togo	19.668	35.048	46.838	76.451	1182.278*	49.612	68.734	105.805

Note: * shows the significance at the 1% level. The CV represents the critical value obtained using 10,000 simulations.

Table 4. Bootstrap Causality Test Results for Long Run.

	H_0: SPE↛REV				H_0: REV↛SPE			
Countries	Wald Test Stat.	10% CV	5% CV	1% CV	Wald Test Stat.	10% CV	5% CV	1% CV
Benin	54604.43*	13.831	20.151	36.375	231489.1*	74.289	91.98	133.211
Burkina Faso	4562.671*	10.794	15.796	31.963	61486.0*	58.678	76.699	115.597
Burundi	830606.7*	46.406	58.704	93.129	283173.9*	25.289	33.688	60.644
Central African Republic	200.541*	23.263	32.497	56.302	865.622*	71.575	88.119	129.07
Comoros	421966.9*	43.735	54.373	80.966	518668.7*	75.847	91.303	133.155
Republic of Congo	496398.6*	40.991	54.091	82.761	195316.8*	81.561	96.448	137.475
Equatorial Guinea	177856.3*	49.997	62.454	90.58	96020.93*	62.454	78.025	123.366
Eswatini	31394.88*	41.819	53.807	77.706	2016.785*	85.87	102.35	144.404
Ethiopia	454595.6*	22.725	30.55	52.408	502902.6*	84.065	98.574	138.258
Gabon	255501.1*	63.322	74.769	105.726	14.788	86.343	99.266	142.736
Ghana	89321.73*	53.721	65.554	92.761	5216.875*	80.819	94.628	139.385
Guinea	129544.5*	48.311	60.238	88.606	89801.69*	69.181	82.402	122.861
Kenya	66723.0*	37.364	49.38	74.634	342607.9*	46.246	60.019	101.443
Lesotho	108836.4*	48.04	63.55	96.434	143003.5*	34.711	47.733	74.651
Madagascar	93408.12*	51.758	63.403	88.956	60826.82*	65.042	83.506	118.412
Mozambique	228308.3*	41.069	52.199	71.866	620637.0*	69.652	86.253	127.361
Namibia	424222.7*	30.669	40.439	63.143	1172303.0*	60.179	75.681	106.378
Nigeria	176515.8*	31.929	43.31	68.803	44479.32*	79.081	95.938	138.715
Seychelles	268389.1*	47.683	58.112	87.419	941816.0*	66.052	81.219	119.42
Togo	98484.68*	27.812	37.278	61.779	631883.0*	75.875	93.514	128.714

Note: * shows the significance at the 1% level, respectively. The CV represents the critical value obtained using 10,000 simulations.

economic growth, social welfare, and public sentiment. By striking the right balance between revenue generation and expenditure management, governments can foster long-term fiscal sustainability while promoting the well-being of their citizens.

Compared to the existing studies in Africa, our results offer a crucial insight into the relationship between government revenues and expenditures. Firstly, our findings support the notion that the spending-revenue nexus is not static but varies over time. Hence,

studies such as Nzimande and Ngalawa (2019), Ghartey (2010), and Phiri (2019), which failed to consider this important feature, could be misleading, explaining the typically documented conflicting results. Our findings imply that since the intertemporal government budget constraint must eventually be satisfied, a simultaneous adjustment of revenues and outlays in the current period imposes limits on the trajectory of future expenditures and revenues.

We further argue that the typically observed unidirectional causality between revenue is only limited to the short run (Mutascu, 2017; Sun et al., 2023). The intertemporal budget constraint together with the median voter decision, will always ensure optimal levels of both expenditures and revenues in the medium to long run period. In other words, there are limits on the extent to which government revenues/or taxes can be raised; likewise, spending cuts have a floor beneath which they cannot be lowered. Therefore, to satisfy the intertemporal budget constraint, and eventually maintain sustainable policies, spending cuts must be accompanied by increasing revenues.

5. Concluding remarks

The escalating public debt and deficits in Africa, exacerbated by the expenditures resulting from the COVID-19 pandemic, have sparked significant apprehension regarding the viability of fiscal policies. According to the International Monetary Fund, debt levels in Africa are approaching those observed in the early 2000s, and 19 out of the 35 sub-Saharan African countries are currently facing or at an elevated risk of debt distress. As a result, rectifying fiscal imbalances and ensuring the long-term sustainability of fiscal policies have emerged as paramount policy priorities in the region.

Gaining insights into the interplay between revenues and expenditures is crucial for effectively addressing budgetary imbalances. Theoretical frameworks offer four potential relationships between public revenues and outlays: the spend-tax, tax-spend, fiscal synchronization, and institutional separation hypotheses. Consequently, theoretical guidance for making appropriate adjustments to rectify budgetary imbalances is limited. As a result, understanding the relationship between revenues and outlays becomes an empirical endeavor. Unfortunately, the existing studies conducted in Africa have yielded inconclusive and varied results. Furthermore, these studies often overlook the dynamic nature of the revenue-spending relationship, adding further complexity to the analysis.

Against this backdrop, this study investigated the relationship between revenues and expenditures in an often overlooked and debt-distressed region of Africa. In contrast to the existing literature, we adopt an approach that allows the revenue-spending relationship to vary over time. Initial analysis using the original series, with a few exceptions, indicated the absence of causality between revenue and expenditure. This finding supports the institutional separation hypothesis, suggesting a lack of coordination or inadequate collaboration between the institutions responsible for revenue decisions and those overseeing spending (typically the legislature). To delve deeper, we further decompose the series into different frequency components: short, medium, and long run.

In the short run, with the exceptions of Equatorial Guinea, Guinea, Mozambique, Gabon, and Kenya, we find no significant relationship between revenues and expenditures. This confirms evidence for institutional separation. However, this lack of coordination cannot be sustained as it may lead to unsustainable levels of

debt and deficits. Moving to the medium and long run frequencies, our results reveal a distinct behavior compared to the short run. At these frequencies, we observe compelling evidence of fiscal synchronization, indicating a reciprocal causality between revenues and expenditures. This suggests that, in the long run, authorities strive to coordinate their actions by weighing the marginal costs of higher taxes against the marginal benefits of increasing spending to reduce imbalances and ensure sustainability. In other words, our findings demonstrate that unlike in the short run, spending and revenue decisions are not made in isolation from each other.

To address the high government levels of indebtedness in the region, our findings suggest that governments must adjust both revenues and spending. This is because there is a limit beyond which expenditures cannot be cut, and similarly, revenues can be raised to a limited degree. Thus, it is important to ensure that both expenditures and revenues are optimally adjusted. Overall, our results underscore the importance of allowing the revenue-spending relationship to vary over time to comprehensively grasp its nature and dynamics.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Abbott, A., & Jones, P. (2011). Procyclical government spending: Patterns of pressure and prudence in the OECD. *Economics Letters*, *111*(3), 230–232. https://doi.org/10.1016/j.econlet.2011.02.009

Abbott, A., & Jones, P. (2013). Procyclical government spending: A public choice analysis. *Public Choice*, *154*(3–4), 243–258. https://doi.org/10.1007/s11127-011-9816-9

AbuAl-Foul, B., & Baghestani, H. (2004). The causal relation between government revenue and spending: Evidence from Egypt and Jordan. *Journal of Economics & Finance*, *28*(2), 260–269. https://doi.org/10.1007/BF02761616

Akram, V., & Rath, B. N. (2019). Is there any evidence of tax-and-spend, spend-and-tax or fiscal synchronization from panel of Indian state? *Applied Economics Letters*, *26*(18), 1544–1547. https://doi.org/10.1080/13504851.2019.1584363

Babarınde, G. F., Adewusı, O. A., Abdulmajeed, I. T., & Babarınde, G. F. (2021). Public revenue-expenditure nexus: A test of fiscal synchronization hypothesis in Nigeria. *Turk Turizm Arastirmalari Dergisi*, *3*(4). https://doi.org/10.26677/TR1010.2021.907

Baharumshah, A. Z., Jibrilla, A. A., Sirag, A., Ali, H. S., & Muhammad, I. M. (2016). Public revenue-expenditure nexus in South Africa: Are there asymmetries? *South African Journal of Economics*, *84*(4), 520–537. https://doi.org/10.1111/saje.12130

Baltagi, B. H., & Hashem Pesaran, M. (2007). Heterogeneity and cross section dependence in panel data models: theory and applications introduction. *Journal of Applied Econometrics*, *22*(2), 229–232. https://doi.org/10.1002/jae.955

Bartlett, B. (2007). "Starve the beast": Origins and development of a budgetary metaphor. *Independent Review*, *12*(1), 5–26.

Becker, G. S., Lazear, E. P., & Murphy, K. M. (2003). The double benefit of tax cuts. *The Wall Street Journal*. https://www.wsj.com/articles/SB106548881712135300

Bohn, H. (1991). Budget balance through revenue or spending adjustments?: Some historical evidence for the United States. *Journal of Monetary Economics*, *27*(3), 333–359. https://doi.org/10.1016/0304-3932(91)90013-E

Buchanan, J. M., & Wagner, R. E. (1977). *Democracy in deficit: The political legacy of lord Keynes* (Vol. 8). Academic Press.

Canelli, R., Fontana, G., Realfonzo, R., & Veronese Passarella, M. (2022). Is the Italian government debt sustainable? Scenarios after the covid-19 shock. *Cambridge Journal of Economics*, *46*(3), 581–587. https://doi.org/10.1093/cje/beac014

Canova, F., & Ciccarelli, M. (2013). Panel vector autoregressive models: A Survey☆ the views expressed in this article are those of the authors and do not necessarily reflect those of the ECB or the Eurosystem. In Fomby, T. B., Kilian, L., & Murphy, A. (Eds.), *VAR models in macroeconomics–new developments and applications: Essays in honor of Christopher A. Sims* (pp. 205–246). Emerald Group Publishing Limited.

Chang, T., & Ho, Y.-H. (2002). A note on Testing"Tax-and-spend, spend-and-tax or fiscal synchronization": The case of China. *Journal of Economic Development*, *27*(1), 151–160.

Chang, T., Liu, W. R., & Caudill, S. B. (2002). Tax-and-spend, spend-and-tax, or fiscal synchronization: New evidence for ten countries. *Applied Economics*, *34*(12), 1553–1561. https://doi.org/10.1080/00036840110103265

Checherita-Westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European Economic Review*, *56*(7), 1392–1405. https://doi.org/10.1016/j.euroecorev.2012.06.007

Chudik, A., Pesaran, M. H., & Tosetti, E. (2011). *Weak and strong cross-section dependence and estimation of large panels*. Oxford University Press.

Comelli, F., Kovacs, P., Villavicencio, J. J. M., Sode, A., David, A., & Eyraud L. (2023). *Navigating fiscal challenges in Sub-Saharan Africa: Resilient strategies and credible anchors in turbulent waters*. Departmental Paper No 2023/007 (International Monetary Fund).

Dahlberg, M., & Johansson, E. (1998). The revenues-expenditures nexus: Panel data evidence from Swedish municipalities. *Applied Economics*, *30*(10), 1379–1386. https://doi.org/10.1080/000368498324995

Dghais, A. A. A., & Ismail, M. T. (2013). A Comparative Study between Discrete Wavelet Transform and Maximal Overlap Discrete Wavelet Transform for Testing Stationarity. *International Journal of Mathematical Science and Engineering*, *7*(12), 471–475.

Edmond, C., Holden, R., & Preston, B. (2020). Should we worry about government debt? Thoughts on Australia's COVID-19 response. *Australian Economic Review*, *53*(4), 557–565. https://doi.org/10.1111/1467-8462.12402

Gençay, R., Selçuk, F., & Whitcher, B. (2001). Differentiating intraday seasonalities through wavelet multi-scaling. *Physica A: Statistical Mechanics and Its Applications*, *289*(3–4), 543–556. https://doi.org/10.1016/S0378-4371(00)00463-5

Ghartey, E. E. (2010). Cointegration and causal relationship between taxes and spending for Kenya, Nigeria and South Africa. *International Economic Journal*, *24*(2), 267–282. https://doi.org/10.1080/10168730903510674

Gomez-Puig, M., Sosvilla-Rivero, S., & Martinez-Zarzoso, I. (2022). On the heterogeneous link between public debt and economic growth. *Journal of International Financial Markets, Institutions and Money*, *77*, 101528. https://doi.org/10.1016/j.intfin.2022.101528

Gurvich, E. T., & Krasnopeeva, N. A. (2020). Analysis of tax-spend nexus for Russian regional budgets. *Voprosy ekonomiki*, (2), 5–29. https://doi.org/10.32609/0042-8736-2020-2-5-29

Ilzetzki, E. (2011). Rent-seeking distortions and fiscal procyclicality. *Journal of Development Economics*, *96*(1), 30–46. https://doi.org/10.1016/j.jdeveco.2010.07.006

Jiranyakul, K. (2022). Is the Thai government revenue-spending nexus asymmetric? *Journal of the Asia Pacific Economy*, *28*(2), 1–16. https://doi.org/10.1080/13547860.2022.2046935

Karabacak, M., & Meçik, O. (2022). Analysing the tax structure of Turkish economy: A time-varying causality analysis. *Sosyoekonomi*, *30*(51), 149–164. https://doi.org/10.17233/sosyoekonomi.2022.01.08

Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, *23*(6), 978–992. https://doi.org/10.1016/j.econmod.2006.04.008

Koren, S., & Stiassny, A. (1998). Tax and spend, or spend and tax? An international study. *Journal of Policy Modeling*, *20*(2), 163–191. https://doi.org/10.1016/S0161-8938(96)00073-7

Kumhof, M., Laxton, D., & Leigh, D. (2014). To starve or not to starve the beast? *Journal of Macroeconomics*, *39*, 1–23. https://doi.org/10.1016/j.jmacro.2013.10.005

Linhares, F., & Nojosa, G. (2020). Changes in the tax-spend nexus: Evidence from selected European countries. *Economics Bulletin*, *40*(4), 1–12.

Makhlouf, A., & Dahmani, M. D. (2022). On the estimation of tax-spend debate in Algeria: Evidence from Nardl modelling and asymmetric causality test. *Journal of Developing Areas*, *56*(4), 169–192. https://doi.org/10.1353/jda.2022.0071

Meltzer, A. H., & Richard, S. F. (1981). A rational theory of the size of government. *Journal of Political Economy*, *89*(5), 914–927. https://doi.org/10.1086/261013

Meltzer, A. H., & Richard, S. F. (1983). Tests of a rational theory of the size of government. *Public Choice*, *41*(3), 403–418. https://doi.org/10.1007/BF00141072

Metaphor, B. (2007). Starve the beast. *Independent Review*, *12*(1), 5–26.

Mutascu, M. (2017). The tax–spending nexus: Evidence from Romania using wavelet analysis. *Post-Communist Economies*, *29*(3), 431–447. https://doi.org/10.1080/14631377.2017.1319170

Narayan, P. K., & Narayan, S. (2006). Government revenue and government expenditure nexus: Evidence from developing countries. *Applied Economics*, *38*(3), 285–291. https://doi.org/10.1080/00036840500369209

Nsor-Ambala, R., & Asafo-Adjei, E. (2023). The government revenue–expenditure nexus in Ghana: A wavelet analysis. *Cogent Economics & Finance*, *11*(1), 2213014. https://doi.org/10.1080/23322039.2023.2213014

Nyamongo, M. E., Sichei, M. M., & Schoeman, N. J. (2007). Government revenue and expenditure nexus in South Africa. *South African Journal of Economic and Management Sciences*, *10*(2), 256–269. https://doi.org/10.4102/sajems.v10i2.586

Nzimande, N., & Ngalawa, H. (2019). Fiscal policy sustainability in SADC countries. *African Finance Journal*, *21*(1), 86–97.

Nzimande, N. P., & Ngalawa, H. (2022). Tax-spend or spend-tax? The case of Southern Africa. *Economies*, *10*(4), 85. https://doi.org/10.3390/economies10040085

Panizza, U., & Presbitero, A. F. (2013). Public debt and economic growth in advanced economies: A survey. *Swiss Journal of Economics and Statistics*, *149*(2), 175–204. https://doi.org/10.1007/BF03399388

Payne, J. E. (1997). The tax-spend debate: The case of Canada. *Applied Economics Letters*, *4*(6), 381–386. https://doi.org/10.1080/135048597355357

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312. https://doi.org/10.1002/jae.951

Phiri, A. (2019). Asymmetries in the revenue–expenditure nexus: New evidence from South Africa. *Empirical Economics*, *56*(5), 1515–1547. https://doi.org/10.1007/s00181-017-1397-0

Romer, C. D., & Romer, D. H. (2007). *Do tax cuts starve the beast: The effect of tax changes on government spending*. Massachusets: National Bureau of Economic Research Cambridge.

Salvi, M., & Schaltegger, C. A. (2022). Tax more or spend less? Historical evidence from Switzerland's federal budget plans. *International Tax and Public Finance*, *30*(3), 1–28. https://doi.org/10.1007/s10797-021-09716-8

Shahbaz, M., Mahalik, M. K., Shah, S. H., & Sato, J. R. (2016). Time-varying analysis of CO2 emissions, energy consumption, and economic growth nexus: Statistical experience in next 11 countries. *Energy Policy*, *98*, 33–48. https://doi.org/10.1016/j.enpol.2016.08.011

Spaventa, L. (1987). The growth of public debt: Sustainability, fiscal rules, and monetary rules. *Staff Papers - International Monetary Fund*, *34*(2), 374–399. https://doi.org/10.2307/3867139

Sun, W., Lai, H., & Liu, D. (2023). Tracking China's fiscal sustainability: A time-frequency perspective. *Emerging Markets Finance & Trade*, *59*(9), 2851–2865. https://doi.org/10.1080/1540496X.2023.2202792

Tashevska, B., Trenovski, B., & Trpkova-Nestorovska, M. (2020). The government revenue–expenditure nexus in Southeast Europe: A bootstrap panel granger-causality approach. *Eastern European Economics*, *58*(4), 309–326. https://doi.org/10.1080/00128775.2020.1724156

West, E. G., & Winer, S. L. (1980). Optimal fiscal illusion and the size of government. *Public Choice*, *35*(5), 607–622. https://doi.org/10.1007/BF00140089

Wolde-Rufael, Y. (2008). The revenue–expenditure nexus: The experience of 13 African countries. *African Development Review*, *20*(2), 273–283. https://doi.org/10.1111/j.1467-8268.2008.00185.x

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association*, *57*(298), 348–368. https://doi.org/10.1080/01621459.1962.10480664