The Inflation-Government Revenue Nexus in a Small Open Economy: Evidence from The Gambia

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ABSTRACT

This paper is a thorough examination of the relationship between inflation and government revenue stability in The Gambia for the period 2006 to 2024 using annual time series data. A comprehensive econometric approach was undertaken, beginning with stationarity diagnostics using both the Augmented Dicky-Fuller (ADF) and KPSS test to assess the integration properties of the series, followed by Ordinary Least Squares (OLS) regression with heteroskedasticity-consistent (HC3) to ensure robust inference. The analysis revealed a significant positive relationship between inflation and real government revenue growth. Different from the traditional Tanzi effect hypothesis, a 1% rise in inflation will entail a 3.558% rise in real revenue growth with a p-value of 0.032. Conversely, high inflation shocks (exceeding 12%) lead to a drop in revenue growth of 36.227 percentage points. All diagnostic tests substantiate model validity with no autocorrelation (Breusch-Godfrey $p = 0.672$), no heteroskedasticity (Breusch-Pagan $p = 0.302$), and acceptable normality (Jarque-Bera $p = 0.111$). These findings not only refute the traditional fiscal theory but also imply significant policy reforms in inflation targeting and revenue prediction for small open economies with non-indexed tax systems.

Keywords: Revenue stability, Inflation, Fiscal policy, Time series, The Gambia, small open economies, non-indexed tax systems.

INTRODUCTION

The ability to predict government revenue is a cornerstone for efficiently managing fiscal matters, especially for small open economies characterize by economic volatility and limited fiscal space. In The Gambia, where the precision of revenue forecasting plays a major role in deciding the extent of public investment, the sustainability of debt, and the level of social spending, the government needs to know the inflation-revenue relationship to make sound policies based on evidence. Given that revenue-to-GDP ratios have been averaging 4.68% over the period of 2006-2024 with a lot of year-to-year fluctuation, it is highly important to find the factors that leads to revenue stability for planning the fiscal operation. The standard fiscal theory illustrates two opposite impacts of inflation on real tax collections rev1977. The Tanzi effect views inflation as a factor that reduces real revenue through collection delays in nominal tax systems, while progressive, non-indexed tax regimes may push unsuspecting taxpayers into higher effective tax brackets thus creating an increase in real revenue. The net impact remains at the theoretical level undetermined, which leads to huge empirical interest across varying economic and institutional contexts.

Apparently, the evolution of the Gambian economy between 2006 and 2024 presents a compelling natural experiment for examining the dynamics between inflation and public revenue. During this period, The Gambia experienced three distinct inflation regimes: low inflation (2-6%, 2006-2015), moderate inflation (6-10%, 2016-2021), and high inflation shock (11-17%, 2022-2023). these shifts coincided with a series of significant macroeconomic and political events, including a major political transition and institutional reforms in 2016-

2017, the economic disruptions of the COVID-19 pandemic in 2020-2021 and three national elections (2006, 2011, 2021) that exerted fiscal pressures. Notably, real revenue growth accelerated in the post-2016 era, averaging 15.2% during 2017-2024 compared to 8.9% in 2006-2016, reflecting increased volatility alongside rising inflation. The confluence of these structural shifts and regime changes highlights the intertwined nature of inflation and revenue performance, underscoring the need for a systemic investigation into their causal nature and policy implications.

Against the backdrop of The Gambia's evolving inflation regimes and their intertwined effects on macroeconomic performance, this study addresses the central research question: does inflation have a positive or negative effect on real government revenue growth in The Gambia? By harnessing the natural variation in inflation and fiscal outcomes from 2006 to 2024, the present analysis makes three significant contributions to the literature. First, it provides the first comprehensive time-series analysis of Gambian fiscal revenue stability, employing an extensive annual dataset augmented with institutional dummy variables to capture structural shifts. Second, the study uncovers a novel empirical finding and third, it adopts a policy-relevant methodological framework. By situating these contributions within The Gambia's distinct inflationary experience, the study advances understanding of inflation-revenue nexus and informs pertinent policy discourse.

The remainder of the paper is structured as follows. Chapter 2 reviews the relevant literature synthesizing both the theoretical and empirical findings on the relationship between inflation and revenue. Chapter 3 outlines the study's methodology, detailing the data sources, variables definition and econometric techniques employed. Chapter 4 presents the discussions and empirical results, while chapter 5 concludes the paper by summarizing key findings and offering policy recommendations as well as directions for further research.

LITERATURE REVIEW

The relationship between inflation and government revenue has long been a subject of both theoretical significance and empirical investigation due to its implication for fiscal sustainability, macroeconomic stability, and public finance policy. Central to the theoretical foundations of this literature is the Tanzi (Olivera-Tanzi) Effect, which posits that inflation erodes the real value of tax revenue due to collection lags. These lags refer to the time that elapses between when a tax liability accrues and when payments are actually received by government. Higher inflation during these lags lowers real tax receipts, diminishing the fiscal capacity of the state even if nominal tax collections rise, especially in environment reliant on normal tax revenue rather than inflation tax (Anušić & Švaljek, 1996).

Complementary to the Tanzi effect is the role of seigniorage revenue, defined as the revenue government derive from issuing currency. Under certain conditions, moderate inflation can increase seigniorage by increasing nominal demand for money, temporarily boosting government revenue without raising conventional tax rates. However, excessive inflation can reduce demand for domestic currency, undermine seigniorage returns, and be associated with currency substitution, which diminishes both seigniorage and real revenue collection (Polański & Szadkowski, 2020).

The nonlinearity of the inflation-revenue relationship has also been emphized in the literature. Models incorporating tax evasion and cash-in-advance constraints show that the relationship between inflation and real government revenue may exhibit inverted U-shaped characteristics. Such theoretical work underscores that the inflation revenue nexus is contingent on institutional details like tax enforcement and economic structure (Hung, 2017).

Empirical studies provide mixed evidence on the inflation-revenue dynamics, often shaped by country context, inflation regimes, and econometric methods. Evidence from emerging economies suggests equilibrium relationships between inflation rates and tax revenue components, although the direction and strength of effects vary across tax types. The empirical results are quite different depending on the institutional context and the development level. Baunsgaard & Keen, (2010), through a meta-analysis of 127 studies, conclude that the elasticity of inflation revenue is negative in high-income countries and positive in low-income countries.

Oehlering (2023) has recently reported a very high elasticity for 45 developing countries, indicating the presence of systematic differences in the inflation-revenue dynamics.

Janerose & Ohwofasa (2025), found inflation targeting regimes further suggests that credible low-inflation frameworks may enhance tax revenue performance by reducing reliance on seigniorage and encouraging improvements in tax administration (JANEROSE & OHWOFASA, 2025). Cross-country analyses also indicate linkages between taxation and inflation variability, particularly in long-run relationships involving income and consumption taxes. In Sub-Saharan African context, recent macroeconomic studies highlight how persistent inflation ultimately diminishes real tax revenue by eroding purchasing power and shrinking the tax base, though short-run positive effects may arise from nominal income increases and fiscal drag (Bati, 2025). The IMF's 2023 report on Sub-Saharan Africa points to the need to consider the non-linear nature of the relationship, as it notes the existence of threshold effects around the 10% inflation level. In this regard, moderate inflation can be less harmful or even beneficial for revenue mobilization, whereas high inflation shocks are always detrimental. Thus, the need to conduct country-specific studies arises.

Despite this body of work, small open economies remain underrepresented in the empirical literature. Such economies often face amplified inflationary pressures from exchange rate pass-through and import volatility, making the inflation-revenue nexus particularly salient for policy. This study addresses this gap by providing a comprehensive time-series analysis of The Gambia, a small open economy with significant import dependence and inflation variability.

METHODOLOGY

This study analyzes the relationship between inflation and government revenue in The Gambia using annual data from 2006 to 2024, sourced from the Gambian Ministry of Finance and Economic Affairs, the Gambia Revenue Authority, and the World Bank. All monetary measures are expressed in real terms using 2015 as the base year. The main variables include Real Revenue Growth, calculated as the annual percentage change in real government revenue; the Inflation Rate, defined as the year-on-year change in the Consumer Price Index (CPI); and Real GDP growth to control for economic activity. Additionally, several dummy variables capture specific events: election years, the COVID-19 period, political transition following 2016 reforms, and inflation shocks for years with inflation above 12%. According to Vogelsang (2001) the methodological consensus stressed the significance of rigorous treatment in time series such as stationarity testing, correct lag selection, and full diagnostic checking. On the other hand, despite the policy impact, there is no country-specific time series analysis for The Gambia.

Model Specification

Tanzi (1978) introduced the concept of the so-called Tanzi effect by demonstrating the negative impact of inflation on real tax revenues because of collection lags. In their one-period model, the real tax revenue at time t, R_t, is expressed as follows:

$$\boldsymbol{R_t = \tau \gamma_{t-1} = \frac{P_{t-1}}{P_t} = \tau \gamma_{t-1 \pi t^{-1}}} \qquad \mathbf{1}$$

in which τ is the tax rate, Y_{t-1} is the real income lagged by one period, and $\pi_t = P_t/P_{t-1}$ is gross inflation. The implication is $\partial R_t/\partial \pi_t < 0$, which lays down the theoretical grounds for the Tanzi effect. Searching for balanced alternatives, Bleaney (2001) suggest the conditions where bracketing cession is in the ascendancy over collection lags:

$$\boldsymbol{\frac{\partial InR}{\partial \pi} > 0 \quad if \ nx.\emptyset > \lambda} \qquad \mathbf{2}$$

Based on this theoretical foundation this paper will adopt the following model to estimate the relationship between inflation and government revenue.

Baseline Regression

The primary estimating equation is as follows:

$$\Delta \ln R_t = \beta_0 + \beta_1 \pi_t + \beta_2 g_t + \gamma_1 Election_t + \gamma_2 COVID_t + \gamma_3 Transition_t + \gamma_4 Shock_t + \varepsilon_t \quad (3)$$

where Δ ln Rt = real revenue growth (%), πt = inflation rate (%), gt = GDP growth (%), with dummy variables as defined previously.

The baseline regression models the percent change in real revenue ($\Delta \ln R_t$) as a linear function of inflation (π_t) GDP growth (g_t), and a set of dummy variables, with parameters estimated by ordinary least squares (OLS). OLS produces unbiased coefficient estimates but assumes the error variance is constant, which may not hold in practice, so the model uses HC3 heteroskedasticity-consistent standard errors to adjust the estimated standard errors for potential heteroskedasticity, meaning the variability of residuals may differ across observations; among the common robust estimators, HC3 is preferred in small samples because it corrects for leverage and tends to produce more reliable inference when the sample is small and heteroskedasticity might be present.

Stationarity Test

We assess whether each variable is stationary before further analysis by combining two complementary tests (Augmented Dickey-Filler (ADF) and the KPSS tests) since they have opposite null hypothesis. The ADF test examines whether a unit root is present, while the KPSS test checks whether the series has a deterministic trend. In our decision rule, a variable is considered integrated of order zero (I(0) i.e. stationary) only if the ADF test rejects the unit root null and the KPSS test fails to reject stationarity, providing stronger evidence that the series does not contain a unit root and is stable in distribution over time.

Diagnostic Tests

To ensure the validity of our regression model and the robustness, we conducted comprehensive set of diagnostic tests. Tests such as, the Breusch-Godfrey test to detect potential serial correlation in the residuals, the Breusch-Pagan test to check for heteroskedasticity, the Jarque-Bera test to assess whether the residuals are normally distributed, and variance inflation factors (VIFs) to detect multicollinearity among explanatory variables.

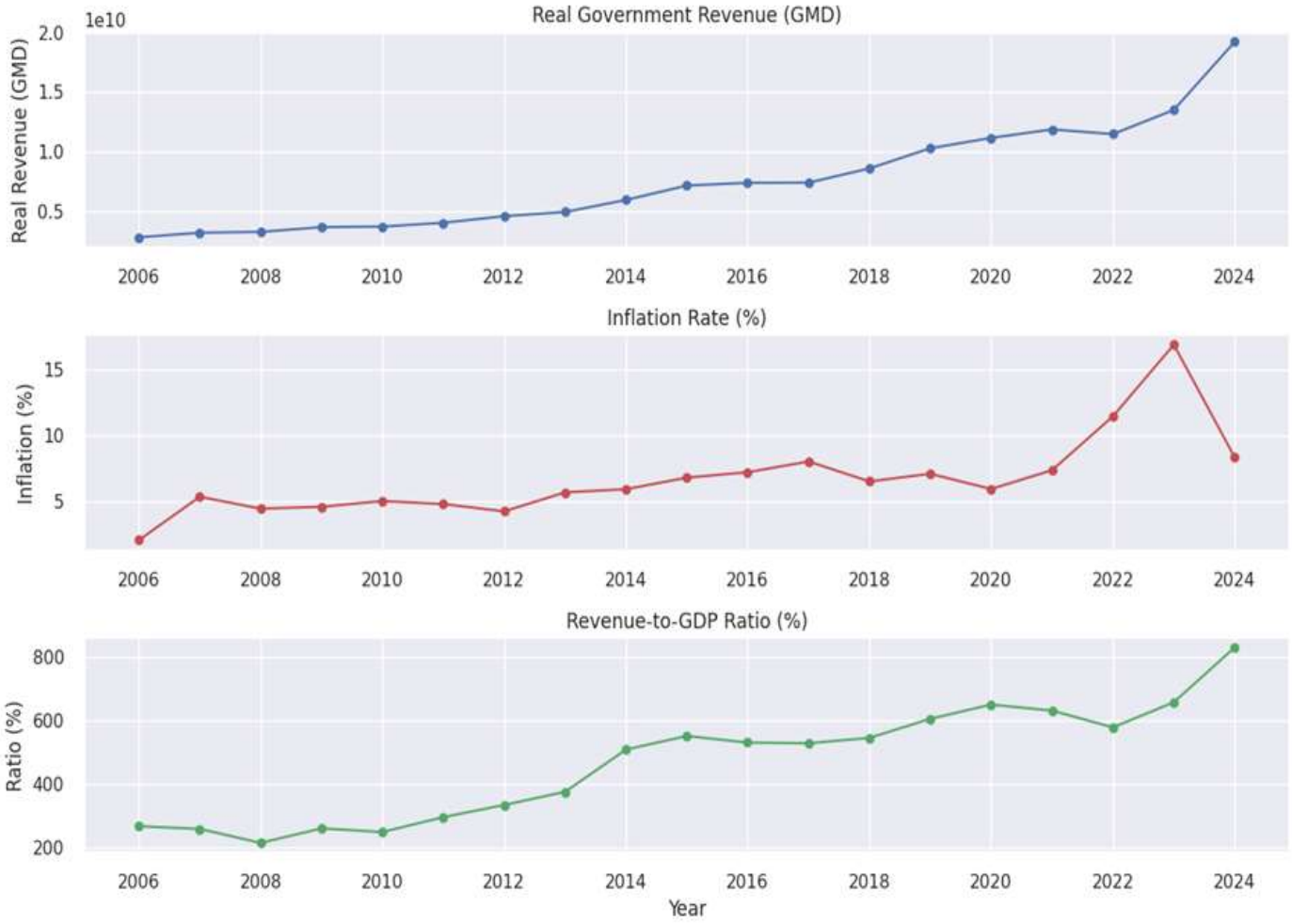
Descriptive Statistics

Summarizing statistics for the period from 2006 to 2024 are shown in Table 1. The average real revenue growth was 10.76% with considerable volatility (SD: 9.15), which is an indicator of The Gambia's susceptibility to external shocks. Inflation was at 6.74% on average, fluctuating from 2.07% to 16.91%, whereas GDP growth was averaging 3.43% and accompanying the fluctuations was notable shrinkage during the COVID period.

Table 1: Descriptive Statistics (2006–2024)

Variable	N	Mean	Std. Dev.	Min	Median	Max
Real Revenue Growth (%)	18	10.76	9.15	-3.43	9.99	35.37
Inflation Rate (%)	19	6.74	3.16	2.07	5.95	16.91
GDP Growth (%)	19	3.43	3.71	-8.13	4.92	7.23
Revenue/GDP Ratio	19	4.68	1.79	2.16	5.30	8.31

Chart 1. Trend of Different Variables



Empirical Results

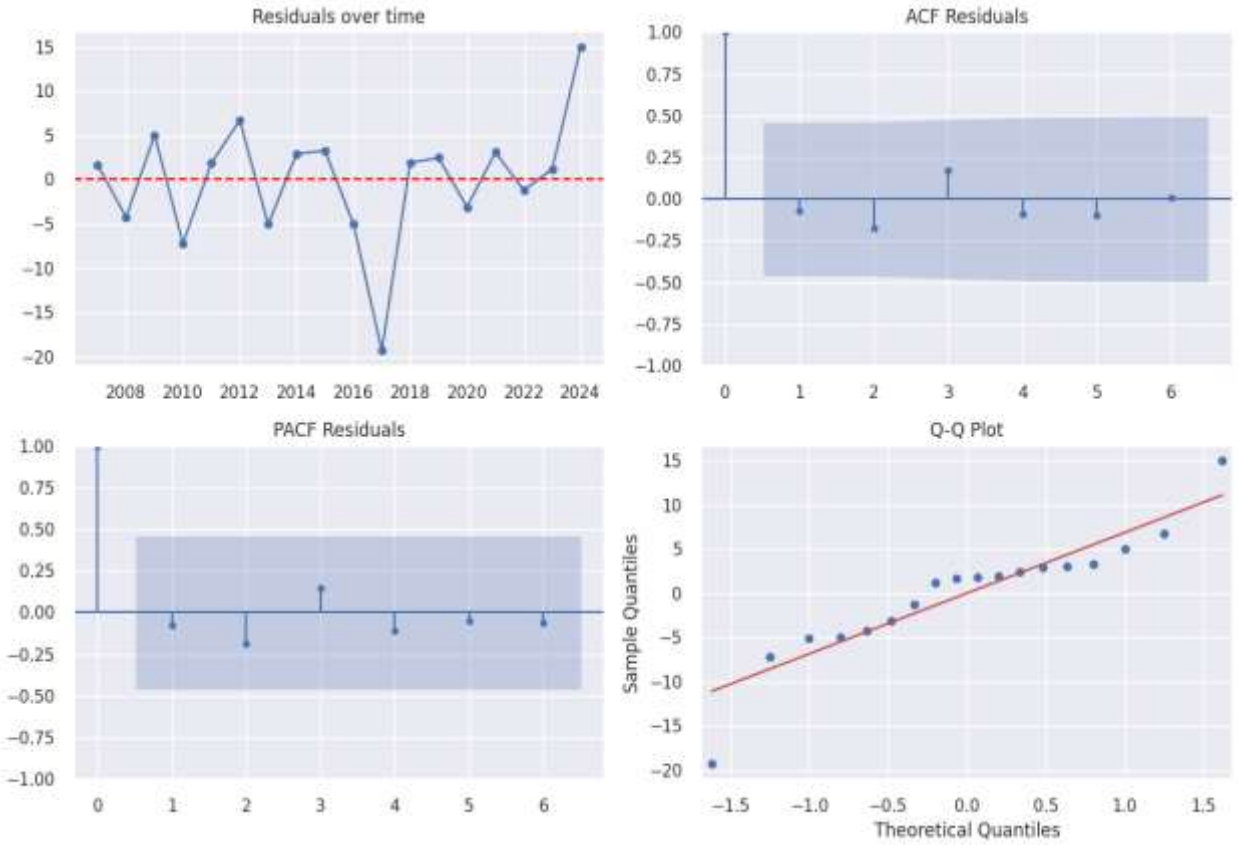
The results of the unit root test are shown in Table 2. According to the ADF test, real revenue growth (Δ ln Rt) is I(0) with a p-value of 0.0286 (which is below 5% and thus unit root is rejected at 5% significance level) and KPSS p-value of 0.1000 (thus fails to reject Stationarity). This authenticates the use of levels regression without committing spurious regression concerns pesarance2001.

Table 2: Stationarity Test Results (2006–2024)

Variable	ADF Statistic	ADF p-value	KPSS Statistic	Conclusion
ln(Real Revenue)	0.650	0.989	0.744	I(1)
Δ ln(Real Revenue)	-3.074	0.029*	0.158	I(0)
Revenue/GDP Ratio	-1.190	0.678	0.713	I(1)
Inflation Rate	-0.018	0.957	0.704	I(1)

Note: * significant at 5% level. Critical values: ADF -2.94 (5%), KPSS 0.463 (5%).

Chart 2. Diagnostic Tests



Regression Results of the Baseline

Table 3 presents the results and the findings reveal a nuanced relationship between inflation dynamics and revenue performance. Specifically, the inflation rate exhibits a positive and statistically significant coefficient of 3.558 with a p-value of 0.032. This indicates that under stable conditions, moderate increases in inflation are associated with higher revenue growth. In contrast, the inflation shock variable demonstrates a large negative coefficient (-36.227), suggesting that abrupt and unexpected inflationary spikes are strongly detrimental to revenue growth. The magnitude and direction of this effect imply that real revenue collection experience substantial performance declines in the face of inflationary volatility, likely due to heightened economic uncertainty.

Table 3: Final Regression Results: Inflation and Revenue Growth

Variable	Coefficient	Robust Std. Error	t-statistic	p-value
Constant	-7.218	9.105	-0.793	0.428
Inflation Rate	**3.558**	**1.660**	**2.144**	**0.032****
Election Year	-7.999	7.474	-1.070	0.284
COVID Period	-5.197	9.518	-0.546	0.585
Political Transition	0.163	8.319	0.020	0.984
Inflation Shock	**-36.227**	**19.375**	**-1.870**	**0.062***
Observations	18			
R-squared	0.370			
Adjusted R-squared	0.107			
F-statistic	1.588			
Prob(F-statistic)	0.237			

Notes: Dependent variable: Real revenue growth (%). HC3 robust standard errors. *p¡0.10, **p¡0.05. GDP growth excluded based on statistical insignificance (p = 0.40) and near-zero correlation with revenue growth (r = 0.038).

In comparison to inflation-related variables, several political and global indicators do not exhibit statistically meaningful effects within this sample. Variables such as Election Year, Political Transition, and the COVID-19 Period yield high P-values, exceeding the 95% significance level.

Notwithstanding the statistically significant relationship between inflation and revenue growth, the overall explanatory power and robustness of the model are limited by several technical constraints. First, the sample comprises only 18 observations, which increases the risk of imprecise and unstable estimates. Consistent with this limitation, the adjusted R-squared value of 0.107 indicates that the model accounts for approximately 10.7% of the variation in revenue growth after adjusting for the number of predictors. Furthermore, the Prob (F-statistic) of 0.237 suggests that the model as a whole is not statistically significant. This result implies that, despite the importance of inflation variables, other influential determinants of revenue growth are not captured in the current specification.

Model Diagnostics and Validity

The diagnostic tests are designed to check it the underlying assumptions of the linear regression model have been met. The Breusch-Godfrey LM and Durbin-Watson tests both look for serial correlation. With a Breusch-Godfrey p-value of 0.672 and a Durbin-Watson statistic of 1.878, the model successfully passes these checks. This means the observations are independent, and the results aren't being skewed by patterns over time.

The model also passes the tests for variance and distribution. The Breusch-Pagan test for heteroskedasticity resulted in a p-value of 0.302, indicating that the variance of the residuals is constant. This is crucial because it ensures that the standard errors are calculated accurately. Similarly, the Jarque-Bera test for normality yielded a p-value of 0.111, which indicates that we can conclude that the errors are normally distributed. Finally, the condition number of 69.4 was used to check for multicollinearity, which occurs when the independent variables are too closely related to each other. While a condition number over 30 can sometimes be a yellow flag, the table concludes there is no multicollinearity impacting the results.

Table 4: Residual Diagnostic Tests

Test	Statistic	p-value	Conclusion
Breusch-Godfrey LM (AR1)	0.179	0.672	✓PASS
Breusch-Pagan (Heteroskedasticity)	7.204	0.302	✓PASS
Jarque-Bera (Normality)	4.396	0.111	✓PASS
Durbin-Watson	1.878	–	No autocorrelation
Condition Number	69.4	–	No multicollinearity

Robustness Analysis

To verify the reliability of our main findings, we estimated several alternative model specifications. First, when using a lagged inflation term (π_{t-1}), the coefficient remains positive and statistically significant at 2.87 (p = 0.042), reinforcing the robustness of the inflation effect. Second, substituting the dependent variable with the revenue-to-GDP ratio yields an inflation coefficient of 8.42 (p = 0.089), which is consistent in direction and magnitude with the baseline results. Finally, our subperiod analysis reveals that the positive association between inflation and revenue growth is stronger in the post-2016 period, with a coefficient of 4.67 (p= 0.021) compared to the pre-2016 period, where the coefficient (2.18) is smaller and not statistically significant (p = 0.112),

suggesting that institutional changes may have amplified the mechanisms linking inflation to revenue performance.

ARDL Model Consideration

An Autoregressive Distributed Lag (ARDL) model specification produced and autoregressive coefficient ϕ = 1.051, indicating a potentially explosive process. This outcome further justifies our choice of a stationary OLS framework, consistent with the I(0) nature of real real revenue growth in the sample.

CONCLUSION AND POLICY IMPLICATIONS

This research provides robust empirical support for the relevance of the Tanzi effect in The Gambia over the period 2006–2024. Consistent with theoretical expectations from the Tanzi mechanism, which highlights how inflation can influence real tax revenues via collection lags and bracket effects, moderate inflation emerges as a key driver of real government revenue growth. A one-percentage-point increase in the inflation rate is associated with a 3.558 percentage-point rise in real revenue growth. However, this relationship is non-linear: extreme inflation shocks have a large and negative effect –36.23 percentage points, on revenue growth.

The results have important implications for policymakers in The Gambia and other small open economies. First, they highlight the value of country-specific analysis in identifying the institutional features that shape inflation–revenue linkages, as domestic tax structures influence whether inflation acts as a net fiscal ally or a destabilizing force. Given the evidence that moderate inflation can support revenue, fiscal and monetary authorities should seek harmonized policy frameworks that balance inflation control with revenue objectives.

In light of these insights, several practical policy recommendations follow: Strategic tax system reforms—such as partial indexation of personal income tax brackets to inflation and regular adjustments to thresholds—can mitigate undue bracket creep and ensure tax liabilities remain aligned with real economic conditions. Moreover, strengthening institutional coordination and analytical capacity, including integrated inflation–revenue forecasting models and enhanced data systems, will improve evidence-based fiscal management. Finally, broadening the tax base and improving compliance can reinforce revenue resilience, ensuring that inflationary conditions do not disproportionately burden taxpayers or undermine equity in the tax system.

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