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Article

Governance and Fiscal Sustainability: Evidence from Developed and Emerging Economies

Seydou Nourou Ndiaye ^{1,*}, Zakari-Yaou Doulla Harouna ¹, Adama Sow Badji ² and Babacar Sène ^{1,*}

¹ Cheikh Anta Diop University, Faculty of Economics and Management, Centre for Applied Economic Research (CREA), Laboratory of Finance for Development (LAFIDEV), Dakar Fann BP. 5084, Senegal

² Cheikh Anta Diop University, Dakar, Faculty of Economics and Management, Centre for Applied Economic Research (CREA), Dakar Fann BP. 5084, Senegal

* Correspondence: seydounourou3.ndiaye@ucad.edu.sn (S.N.N.); babacar.sene@ucad.edu.sn (B.S.)

Abstract

The quality of governance is a key driver of resource mobilisation in a context marked by successive shocks that exacerbate fiscal imbalances. This study aims to analyse the role of institutional quality in the relationship between public expenditure and tax revenue in a panel of 162 countries, broken down into developed and emerging economies between 2000 and 2023. Using Dumitrescu and Hurlin's (2012) causality tests and the cross-sectional autoregressive model with staggered lags (CS-ARDL) to control for cross-sectional heterogeneity and cross-dependence, the results reveal a bidirectional causality linking expenditure and revenue for the entire panel; emerging countries are more sensitive to fiscal policies; public expenditure significantly stimulates tax revenue in the short and long term, with an effect amplified by institutional quality; long-term sustainability depends crucially on the institutional framework. This study highlights the need for targeted institutional reforms and fiscal rules differentiated according to countries' level of economic development.

Keywords: fiscal sustainability; institutional quality; CS-ARDL; heterogeneity

1. Introduction

Since the early 2020s, global economies have been facing a succession of global shocks of exceptional magnitude, putting a strain on the fiscal stability of states. The Covid-19 health crisis has severely disrupted macroeconomic balances, forcing states to resort to massive fiscal support measures in the face of the collapse of economic activity. As economies began to recover, the Russian-Ukrainian war reignited geopolitical tensions, exacerbating volatility in the energy and food markets and increasing fiscal burdens through higher public spending. At the same time, growing economic rivalry between the United States and China has resulted in a persistent trade war, fuelling instability in global trade and complicating fiscal planning in many exporting countries. Added to this is instability in the Middle East, whose economic repercussions, although indirect, are not insignificant, particularly for developing countries.

In this global context marked by recurring shocks and growing pressure on public finances, the issue of fiscal sustainability becomes crucial. It depends fundamentally on the ability of states to mobilise their internal resources effectively while controlling expenditure dynamics. However, this ability varies greatly depending on the level of economic development and the quality of public institutions. The differences observed between developed and emerging countries highlight the heterogeneous challenges facing economic decision-makers. Therefore, understanding the relationship between public expenditure, tax revenue and institutional quality is an important issue for fiscal sustainability, particularly in a global context marked by recurring shocks and increasing pressure on public finances (Baharumshah et al., 2016).

In the period leading up to Covid-19, several developing countries took on massive amounts of debt, both on international financial markets and from bilateral creditors, notably China. According to Estevao and Essl (2022) Estevao M. and Essl S., “When the debt crises hit, don’t simply blame the pandemic,” World Bank Blog, 28 June 2022., the public debt of 65 developing countries increased by 18% of GDP over the period 2011-2019, while in sub-Saharan Africa it increased by 27% of GDP over the same period. This trend was accompanied by primary budget deficits estimated at 14% for developing countries as a whole and 18% for sub-Saharan Africa.

In developed countries, public debt reached a record high, with a ratio exceeding 85% of GDP for all OECD countries in 2025. This sustained increase, largely fuelled by the Covid-19 crisis and continued high public spending, is reflected in particularly extreme situations such as those in Japan (255.2% of GDP) and the United States (123.3% of GDP). Within the European Union, Greece (151.2%), Italy (138.3%) and France (115.8%) are among the most heavily indebted countries (OECD, 2025).

The Covid-19 crisis, the Russian-Ukrainian war and geopolitical tensions in the Middle East have severely damaged the credit ratings of developing countries, due in particular to the temporary suspension of debt servicing and soaring interest rates, which has excluded most of them from international financial markets. However, this suspension was not enough to restore their fiscal sustainability: the global economic downturn has made the debt of 139 developing countries unsustainable Debt Service Watch, “An unprecedented global debt crisis,” Development Finance International, October 2023 in 2023. Indeed, public debt servicing absorbs on average 38.3% of budget revenues and 29.5% of total public expenditure.

This issue varies greatly from one geographical area to another. In terms of the ratio of debt servicing to public revenue, sub-Saharan Africa appears to be the most affected region, as it devotes 53% of its revenue to this purpose. It is followed by Asia (31.4%), Europe (20.7%), Latin America and the Caribbean (31.4%) and the Middle East and Central Asia (39.6%). With regard to public expenditure, the data show that debt servicing has a crowding-out effect on expenditure, particularly investment expenditure. Sub-Saharan Africa also remains the most affected region, with 39.4% of its expenditure absorbed by debt servicing, compared to 21.6% in Asia, 16.6% in Europe, 26.5% in Latin America and the Caribbean, and 27.8% in the Middle East and Central Asia.

The institutional quality index highlights a marked gap between developed countries, which have an average score of +1.02, and developing countries, which have an average score of -0.28. This gap reflects the ability of developed countries to establish coherent, effective and interconnected institutional systems across all pillars of governance – political stability and absence of violence, government effectiveness, regulatory quality, control of corruption, and rule of law – unlike developing countries, where these dimensions often remain fragile or unevenly consolidated.

The theoretical literature on fiscal policy, particularly on the relationship between public revenue and expenditure, is addressed under four distinct hypotheses. The “spend and tax” hypothesis posits that public expenditure is exogenous and that revenue is adjusted ex post to comply with the intertemporal budget constraint (Barro, 1979; Peacock and Wiseman, 1979). The second hypothesis, “tax and spend”, proposed by Friedman (1978) and Buchanan and Wagner (1978), argues that public expenditure must be adjusted according to available revenue. The third hypothesis, known as “fiscal synchronisation”, proposed by Meltzer and Richard (1981), argues that decisions on public expenditure and revenue must be taken jointly. Finally, the “neutrality” hypothesis of Baghestani and McNown (1994) asserts that there is no constraint requiring revenue to be adjusted to expenditure and vice versa.

Furthermore, institutionalist literature emphasises the central role of institutions in budgetary performance. According to North (1990), the strength of institutions determines economic incentives and the ability of states to collect taxes. Effective institutions promote transparency, limit corruption and strengthen taxpayer confidence, which improves revenue mobilisation. This study follows this theoretical line of thinking. It aims to analyse the differential effects of governance quality on fiscal sustainability in developed and emerging countries. In the theoretical literature, several points

continue to fuel debate, including the direction of causality (Saez and Zucman, 2022), non-linear effects and regional externalities between neighbouring countries.

This study makes several significant contributions to the literature on public finance. First, it offers a differentiated reading of fiscal dynamics by distinguishing between developed and emerging countries. In this sense, it highlights the structural specificities of each group of countries. This differentiation reinforces the contextual relevance of the results and provides a better understanding of fiscal adjustment mechanisms according to the level of development. Secondly, it assesses fiscal performance in a context of institutional strengthening. Unlike traditional studies, which analyse the effects of expenditure and institutions separately, this study shows that the quality of institutions plays a moderating role in the effectiveness of fiscal policies. Thirdly, it uses a CS-ARDL (Cross-Sectionally Augmented ARDL) model on an extensive sample of 162 countries, adapted to non-stationary panels with cross-sectional dependence and heterogeneity between units. This methodological choice overcomes the limitations of traditional approaches (PMG, MG, DFE), which are often unsuitable for global macroeconomic panels, and ensures the statistical robustness of the results obtained. The rest of the document is organised as follows: section 2 provides an analysis of stylised facts relating to the evolution of revenue and expenditure as a percentage of GDP, as well as the institutional quality index. Section 3 reviews the empirical literature. Section 4 develops the methodological approach used. Section 5 presents the results obtained and section 6 concludes.

2. Analysis of Stylised Facts

Over the period 2000 to 2023, Figure 1 shows an upward trend in public expenditure (EXP), rising from around 28.9% to over 33% of GDP on average, peaking in 2020 (36%) in response to the economic effects of the Covid-19 pandemic for the study sample. In contrast, public revenue (REV) has grown more moderately, averaging around 26-28% of GDP, suggesting a widening fiscal imbalance over time. At the same time, average institutional quality (IND) remains low overall, fluctuating around the neutrality threshold, with some improvements observed between 2007 and 2014, before experiencing a gradual decline. These developments reflect growing pressures on public finances in an unstable global environment marked by exogenous shocks (Covid-19, the Russian-Ukrainian war, Sino-American tensions, conflicts in the Middle East) that have increased pressure on governments, particularly those with more fragile governance.

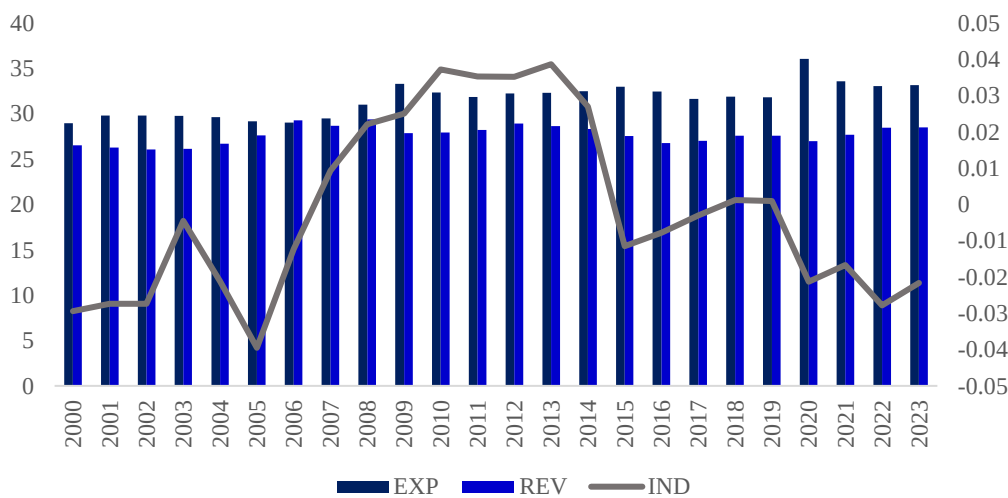


Figure 1. Changes in revenue, expenditure and the overall institutional quality index. Source: authors, based on IMF and World Bank data.

Analysis of Figure 2 below reveals that developed countries have generally posted a structural primary surplus. Between 2000 and 2023, they followed a fiscal trajectory characterised by a sustained

level of public revenue, exceeding 40% of GDP, reflecting a solid tax collection capacity supported by efficient institutions. Public expenditure, meanwhile, fluctuated between 32% and 35%, with two notable peaks in 2009 and 2020, corresponding respectively to the global financial crisis and the Covid-19 pandemic. This temporary increase in expenditure illustrates the fiscal responsiveness to systemic shocks. At the same time, institutional quality, which had initially been improving, began to erode from 2020 onwards, under the combined effect of internal political tensions, the contested management of successive crises and increased geopolitical uncertainties, such as the Russian-Ukrainian war and trade conflicts.

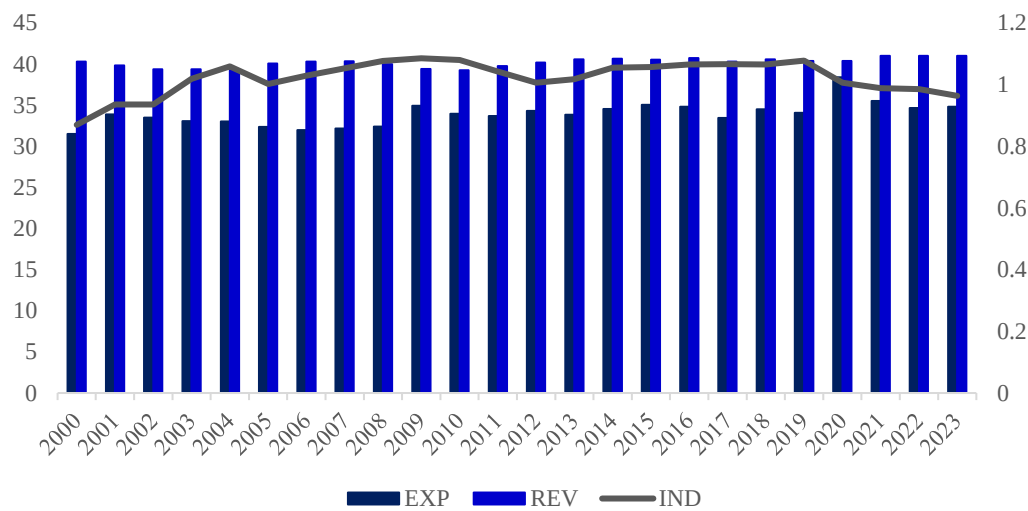


Figure 2. Evolution of revenue, expenditure and the institutional quality index of developed countries. Source: authors, based on data from the IMF and the World Bank.

From 2000 to 2023, developing countries recorded a gradual increase in average public expenditure, from 28.2% to nearly 32.7% of GDP, with a marked peak in 2020 (35.4%) linked to the fiscal response to the Covid-19 pandemic (see Chart 3). In contrast, public revenue grew more moderately, fluctuating between 22% and 25% of GDP, reflecting a still limited fiscal capacity despite increased financing needs. This growing divergence between expenditure and revenue highlights a persistent structural deficit. At the same time, institutional quality (measured by the IND indicator) remained negative throughout the period, reflecting generally weak governance, despite a slight improvement between 2010 and 2014, followed by a further deterioration.

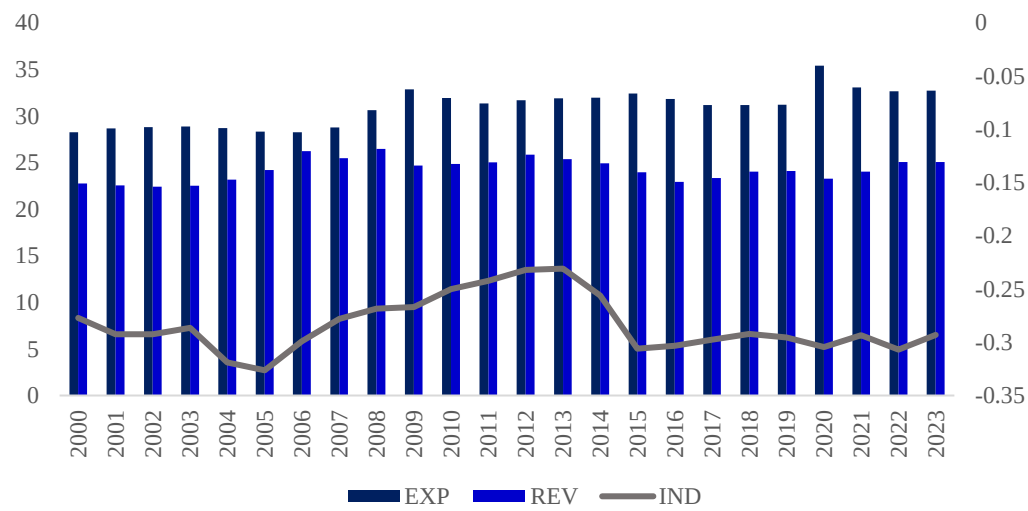


Figure 3. Evolution of revenues, expenditures and the institutional quality index of emerging countries. Source: authors, based on IMF and World Bank data.

3. Review of the Literature

Barro's (1979) contributions on Ricardian equivalence paved the way for a wealth of empirical literature analysing the relationship between public revenue and expenditure. This literature provides contrasting results as to the direction of this relationship. In the short term, empirical verification of the relationship has developed around causality tests and VAR models. In the long term, however, the analysis is generally based on a linear cointegration relationship between public revenue and expenditure (Hakkio and Rush, 1991; Trehan and Walsh, 1991; Bohn, 1991; Quintos, 1995).

The meta-analysis by Gemmell et al. (2016) covering 28 OECD countries estimates revenue-expenditure elasticity at 0.38 in the short term and 0.52 in the long term, with particularly marked sensitivity during periods of recession. Furthermore, the work of Gupta et al. (2019) on 45 emerging economies revealed more volatile elasticities and a significant impact of exchange rate shocks. Using a VECM model for the period 1981-2016, Uche and Ogbonna (2019) study the relationship between revenue and public expenditure in Nigeria. The results reveal the existence of a unidirectional causality from expenditure to revenue, in line with the theory of Peacock and Wiseman (2024) and Musgrave and Musgrave (1976). Kazungu (2019) uses quarterly data for Tanzania to test the causality between public revenue and expenditure. He concludes that public expenditure is exogenous to Tanzanian public revenue.

However, Meher (2020) uses a VECM model to determine the short- and long-term relationship between revenue and public expenditure in Odisha over the period 1981-2017. The results show that there is a long-term unidirectional causality from revenue to public expenditure. However, the results do not confirm the existence of a short-term causal relationship between revenue and public expenditure. Similarly, Dritsaki (2018) uses an ARDL approach to annual data from Greece covering the period 1980-2015. His results confirm the theory of Buchanan and Wagner (1979), according to which revenue causes expenditure. Using the same approach, Adebisi and Salako (2020) find no evidence of long-term cointegration, but still show a causality from revenue to expenditure for Nigeria over the period 1961-2016. The same results are confirmed by Saunoris's (2015) work for the United States over the period 1951-2008.

The fiscal synchronisation theory has been confirmed by several empirical studies. Kaya and Arslan (2020) examine the asymmetric relationship between public revenue and expenditure in Turkey using quarterly data covering the period 2006-2019. They find a bidirectional asymmetric causality between the two fiscal variables. Oumer and Ramakrishna (2020) analyse the dynamics between public expenditure and revenue in Ethiopia over the period 1974-2016, using the NARDL approach. Their results show an asymmetric relationship, both in the short and long term, between actual revenue and actual expenditure. The asymmetric and bidirectional nature of causality implies that expenditure and revenue decisions are made simultaneously. From this perspective, Chang and Chiang (2009) analyse a sample of 15 OECD countries over the period 1992-2006 using a panel VECM model. The results reveal bidirectional causality for all countries in the sample. Ho and Huang (2009) also apply a panel VECM model to data covering the period 1999-2005 for 31 Chinese provinces. They find no significant short-term causal relationship between public revenue and expenditure. However, in the long term, their results confirm bidirectional causality, thus validating the fiscal synchronisation hypothesis.

Finally, Brady and Magazzino (2018) test the causality between public revenue and expenditure in a panel of 28 European countries over the period 1980-2015. The results of Dumitrescu and Hurlin's (2012) causality test indicate no causal link between the two variables for the sample as a whole, corroborating the institutional separation hypothesis put forward by Baghestani and McNown (1994).

Recent empirical literature incorporates governance dimensions, with significant results illustrated by the work of Mauro (2018); Acemoglu et al., (2020) and Cabral et al., (2021). These authors show that improved control of corruption, regulatory quality and political stability strengthens the capacity to mobilise internal resources.

4. Methodological Approach

In panel data analysis, checking for inter-individual dependence is an essential statistical approach. Several methods have been developed for this purpose, some of which are preferred depending on whether the panel is balanced or unbalanced, as well as its size (small or large). Among the most commonly used are the LM test by Breusch and Pagan (1980); Pesaran's adjusted LM (2004); Pesaran's CD tests (2015, 2021); Juodis and Reese's CDw (2022); Fan et al.'s CDw+ (2015); and Pesaran and Xie's CD* (2021). These tests can be applied directly to the variables or to the estimated residuals of an individual fixed effects model.

4.1. Tests for Inter-Individual Dependencies

In this study, we use the last four tests, which we apply to the residuals from the fixed effects model. The equations below show the statistics associated with each of these tests:

Pesaran (2015, 2021):

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij} \quad (1)$$

Juodis and Reese (2022):

$$CD_w = \left(\frac{1}{NT} \sum_{i=1}^N \sum_{t=1}^T \varepsilon_{i,t}^2 w_i^2 \right)^{-1} \left(\sqrt{\frac{2}{TN(N-1)}} \sum_{t=1}^T \sum_{i=2}^N \sum_{j=1}^{i-1} w_i \varepsilon_{i,t} w_j^* \varepsilon_{j,t} \right) \quad (2)$$

Fan et al. (2015):

$$CD_{w+} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij} + \sum_{i=2}^N \sum_{j=1}^{i-1} |\rho_{ij}| \times 1 \left(|\rho_{ij}| > 2\sqrt{\frac{\ln(N)}{T}} \right) \quad (3)$$

Pesaran and Xie (2021):

$$CD^* = \frac{CD + \left(\frac{T}{2\theta} \right)^{\frac{1}{2}}}{1 - \theta} \quad (4)$$

$$\theta = 1 - \left(\frac{1}{n} \sum_{i=1}^n a_{i,n}^2 \right) \quad , \text{ and } CD \sim N(0,1)$$

With

All of these tests are based on the same assumptions: the null hypothesis posits weak cross-dependence between units (independence or negligible dependence), while the alternative hypothesis assumes strong cross-dependence (significant correlation between residuals).

4.2. Panel Heterogeneity Tests

The literature on heterogeneity tests divides them into two main categories. Their importance lies in strengthening the robustness of estimates by ensuring that the model takes into account both cross-sectional dependence and heterogeneity within the panel. The first category, illustrated by the Pesaran and Yamagata (2008) test, helps to guide the choice between fixed-effects and random-effects models, emphasising the correlation between individual characteristics and independent variables. In contrast, the second category, proposed by Blomquist and Westerlund (2013), has the particularity of simultaneously taking into account cross-sectional dependence and individual-specific heterogeneity. Pesaran and Yamagata (2008) propose the following two statistics for this purpose:

The literature on heterogeneity tests classifies these tests into two categories. The importance of these tests is to ensure the robustness of the estimates by ensuring that the model takes into account

both cross-sectional dependence and panel heterogeneity. The first category, which includes the Pesaran and Yamagata (2008) test, helps to choose between the appropriate fixed effects and random effects model by emphasising the correlation between individual characteristics and independent variables. In contrast, the second category, proposed by Blomquist and Westerlund (2013), has the particularity of simultaneously taking into account cross-sectional dependence and individual-specific heterogeneity. Pesaran and Yamagata (2008) propose the following two statistics:

$$\tilde{\Delta} = \sqrt{\frac{N}{2k}} \left(\frac{1}{N} \tilde{S}_2 - k \right)' \quad (5)$$

$$\tilde{\Delta}_{adj} = \sqrt{\frac{N}{2k(T-k-1)}} \left(\frac{(T-k-1)}{T} \cdot \frac{1}{N} \tilde{S}_2 - k \right)' \quad (6)$$

Blomquist and Westerlund (2013), for their part, developed statistics given by:

$$\Delta_{HAC} = \sqrt{\frac{N}{2k}} \left(\frac{1}{N} \sum_{i=1}^N \left(\beta_i - \beta_{WFE} \right)' \left(\frac{X_i' M_i X_i}{\hat{\sigma}_{i,HAC}^2} \right) \left(\beta_i - \beta_{WFE} \right) - k \right)' \quad (7)$$

$$\Delta_{HAC,adj} = \sqrt{\frac{N}{2k(T-k-1)}} \left(\frac{(T-k-1)}{T} \cdot \frac{1}{N} \sum_{i=1}^N \left(\beta_i - \beta_{WFE} \right)' \left(\frac{X_i' M_i X_i}{\hat{\sigma}_{i,HAC}^2} \right) \left(\beta_i - \beta_{WFE} \right) - k \right)' \quad (8)$$

For both tests, the null and alternative hypotheses relating to parameter homogeneity are formulated as follows:

$$H_0 : \beta_i = \beta \quad \text{Homogeneity of parameters}$$

$$H_1 : \beta_i \neq \beta \quad \text{Heterogeneity of parameters}$$

$$\tilde{\Delta} = \sqrt{\frac{N}{2k}} \left(\frac{1}{N} \tilde{S}_2 - k \right)' \quad (9)$$

4.3. Panel Causality Test in the Presence of Heterogeneity

To examine the existence of a causal relationship between two variables in a heterogeneous panel, Dumitrescu and Hurlin (2012) developed a statistical technique that we use in this study. The presence of heterogeneity implies that the causal link within the sample may vary across individual units, as illustrated by the following equations:

$$Y_{it} = \alpha_i + \sum_{k=1}^p \gamma_i^{(k)} Y_{i,t-k} + \sum_{k=1}^p \beta_i^{(k)} X_{i,t-k} + \epsilon_{it} \quad (10)$$

$$X_{it} = \alpha_i + \sum_{k=1}^p \phi_i^{(k)} X_{i,t-k} + \sum_{k=1}^p \beta_i^{(k)} Y_{i,t-k} + \eta_{it} \quad (11)$$

The equations below describe the causal relationship between the variable Y_{it} and X_{it} at different periods and for different cross-sectional units. The coefficients $\gamma_i^{(k)}$, $\beta_i^{(k)}$ and $\phi_i^{(k)}$ represent the parameters associated with the lagged explanatory variables. The error terms are denoted ϵ_{it} and η_{it} , respectively. In summary, the test hypotheses are as follows:

$$H_0 : \beta_i^{(k)} = 0 \quad \forall i = 1, \dots, N \quad \text{et} \quad b = 1, \dots, B$$

$$H_1 : \beta_i^{(k)} \neq 0 \quad \forall i = 1, \dots, N_1 \quad \text{et} \quad b = 1, \dots, B$$

$$H_1 : \beta_i^{(k)} = 0 \quad \forall i = N_2, \dots, N \quad \text{et} \quad b = 1, \dots, B$$

Based on these assumptions, Dumitrescu and Hurlin (2012) propose a mean statistic associated with the null hypothesis of homogeneous non-causality.

4.4. Pesaran's CADF Stationarity Test (2007)

To take into account the cross-dependence between units in panel data, Pesaran (2007) proposes the CADF (Cross-sectionally Augmented Dickey-Fuller) unit root test, which enhances the classic ADF test by adding the cross-sectional means of the levels and first differences of the variables in order to control for unobserved common influence. In this study, we use Pesaran's (2007) stationarity test, as it is suitable for large panels with high cross-sectional dependence. Unlike first-generation tests, this test avoids biases due to the omission of common factors. Furthermore, the work of Hurlin and Mignon (2007) provided a summary of the main panel stationarity tests, including the CADF test by Pesaran (2007) used in this study. The form of the CADF regression can be specified as follows:

$$\Delta Y_{i,t} = \alpha_i + \beta_i Y_{i,t-1} + \gamma_i \bar{Y}_{t-1} + \theta_i \Delta \bar{Y}_t + \varepsilon_{i,t} \quad (12)$$

$\bar{Y}_{t-1}$ is the cross-sectional mean of $Y_{i,t-1}$; $\Delta \bar{Y}_t$ is the cross-sectional mean of the first differences of $\Delta Y_{i,t}$; the unit-specific coefficients are given by $\alpha_i, \beta_i, \gamma_i, \theta_i$; $\varepsilon_{i,t}$ is the random term.

The null hypothesis of non-homogeneous stationarity is formulated as follows:

$H_0 : \beta_i = 0$ for all i , against the potentially heterogeneous alternative:

$$\begin{cases} H_1 : \beta_i < 0; i = 1, 2, \dots, N_1 \\ \beta_i = 0; i = N_1 + 1, N_1 + 2, \dots, N \end{cases}$$

4.5. Cointegration Test in a Heterogeneous Panel

Identifying a long-term equilibrium relationship between non-stationary variables in a heterogeneous panel is a necessary preliminary step for applying econometric models that incorporate short- and long-term dynamics. To this end, several panel data cointegration tests have been developed in the econometric literature. Among the most robust and commonly used are the tests by Pedroni (1999), Kao (1999) and Westerlund (2007). In this study, we use the panel cointegration test proposed by Pedroni (1999) to examine the equilibrium relationship between variables because of its reliability and accuracy. This test allows us to verify the existence of a long-term cointegration relationship before estimating the associated parameters. It is particularly applicable in the presence of cross-sectional dependence, heterogeneity and a unit root (Hurlin and Mignon, 2007). The basic equation used in the Pedroni (1999) test can be specified as follows:

$$Y_{i,t} = \phi_i + \alpha_i t + \beta_i X_{i,t} + \mu_{i,t} \quad (13)$$

$Y_{i,t}$ is the dependent variable; ϕ_i is the individual fixed effect; t is an individual linear trend; β_i are the parameters associated with the matrix of independent variables $X_{i,t}$; $\mu_{i,t}$ is the error term and is tested for stationarity. Based on this equation, the author proposes seven statistics (parametric, semi-parametric and non-parametric), including four within-group (*within-dimension*) and three between-group (*between-dimension*) statistics based on the estimated residuals $\hat{\mu}_{i,t}$. In this framework, the regression of the residuals is written as follows:

$$\Delta \hat{\mu}_{i,t} = \rho_i \mu_{i,t-1} + \sum_{k=1}^{K_i} \gamma_{i,k} \Delta \hat{\mu}_{i,t-k} + e_{i,t} \quad (14)$$

The *within*-group statistics are based on an alternative hypothesis of homogeneous cointegration and are given by:

Panel v-Statistic:

$$Z_{\hat{v}} = \left(\sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2 \right)^{-1}$$

Panel rho-Statistic:

$$Z_{\hat{\rho}} = \left(\sum_{i=1}^N \sum_{t=1}^T \frac{1}{L_{11i}} e_{i,t-1}^2 \right)^{-1} \sum_{i=1}^N \sum_{t=1}^T L_{11i}^{-2} (e_{i,t-1} \Delta e_{it} - \hat{\lambda}_i)$$

Panel PP-Statistic (adjusted Phillips-Perron):

$$Z_t = \left(\sum_{i=1}^N \sum_{t=1}^T \frac{1}{L_{11i}} e_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T L_{11i}^{-2} (e_{i,t-1} \Delta e_{it} - \hat{\lambda}_i)$$

Panel ADF-Statistic (augmented Dickey-Fuller):

$$Z_t^* = \left(\sum_{i=1}^N \sum_{t=1}^T \frac{1}{L_{11i}} e_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T L_{11i}^{-2} e_{i,t-1}^* \Delta e_{it}^*$$

Inter-group statistics (*between-dimension*) are based on the alternative hypothesis of heterogeneous cointegration for at least one group of individuals and are given by:

Group rho-statistic:

$$\tilde{Z}_{\hat{\rho}} = \sum_{i=1}^N \left(\sum_{t=1}^T \frac{1}{e_{i,t-1}^2} \right)^{-1} \sum_{t=1}^T (e_{i,t-1} \Delta e_{it} - \hat{\lambda}_i)$$

Group PP-Statistic (adjusted Phillips-Perron):

$$\tilde{Z}_t = \sum_{i=1}^N \left(\sum_{t=1}^T \frac{1}{e_{i,t-1}^2} \right)^{-1/2} \sum_{t=1}^T (e_{i,t-1} \Delta e_{it} - \hat{\lambda}_i)$$

Group ADF-Statistic (Augmented Dickey-Fuller):

$$\tilde{Z}_t^* = \sum_{i=1}^N \left(\sum_{t=1}^T \frac{1}{e_{i,t-1}^2} \right)^{-1/2} \sum_{t=1}^T e_{i,t-1}^* \Delta e_{it}^*$$

4.6. CS ARDL Panel Model

In this research, we use a second-generation panel model known as the cross-sectionally augmented autoregressive model with lagged differences (CS ARDL) developed by Chudik and Pesaran (2015). This model has several advantages over alternative econometric methods. First, it allows for the simultaneous estimation of short- and long-term relationships. Second, it offers the crucial advantage of being able to incorporate variables with different integration orders. Third, it incorporates a lagged dependent variable and a lagged cross-sectional mean. This model is a generalisation of the classic ARDL panel, within the framework of the dynamic common correlation estimator, taking into account both sample heterogeneity and unobserved common factors (Chudik et al., 2017). In this study, the CS-ARDL model captures the temporal and structural heterogeneity of the countries studied, taking into account cross-dependencies and national specificities, providing robust results for the formulation of differentiated fiscal policies adapted to the institutional context. The general form of the CS ARDL model can be expressed as follows:

$$Y_{i,t} = \alpha_i + \sum_{j=1}^p \phi_{it} Y_{i,t-j} + \sum_{j=0}^q \beta_{it} X_{i,t-j} + \sum_{j=0}^r \delta \bar{Z}_{t-j} + e_{i,t} \quad (15)$$

Where $Y_{i,t}$ is the dependent variable; $X_{i,t}$ is a matrix of independent variables; $\bar{Z}_{t-l}$ is the cross-

sectional mean defined by $\bar{Z}_t = \frac{1}{N} \sum_{i=1}^N Z_{i,t} = (\bar{Y}_t, \bar{X}_t)$; p ; q ; and r denote the number of lags for each type of variable; $e_{i,t}$ is the error term.

Based on the previous general equation, the long-term parameters can be obtained using the Grouped Means (GM) method, and are as follows:

$$\hat{\beta}_{(CS\ ARDL)} = \frac{\sum_{j=0}^q \vec{\delta}_{jl}}{1 - \sum_{l=1}^p \hat{\phi}_{il}}$$

$$\hat{\beta}_{(Mean\ Group)} = \frac{1}{N} \sum_{j=1}^N \delta_j$$

The error correction form of the CS ARDL model is then written as follows:

$$\Delta Y_{i,t} = \zeta_i + \psi_i \left(Y_{i,t-1} - \alpha_i - \beta_i X_{i,t-1} - \phi_{1,i} \bar{Y}_{t-1} - \phi_{2,i} \bar{X}_{t-1} \right) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + \pi_{1,i} \Delta \bar{Y}_t + \pi_{2,i} \Delta \bar{X}_t + \epsilon_{it} \quad (16)$$

$\Delta Y_{i,t}$ is the dependent variable; $X_{i,t}$ is the matrix of independent variables; $\bar{Y}_{t-1}$ and $\bar{X}_{t-1}$ represent cross-sectional effects, capturing interdependencies between units; $\phi_{i,j}$ the parameters of the delayed cross-sectional means; $\Delta Y_{i,t-j}$ and $\Delta X_{i,t-j}$ are the short-term dynamic components; λ_{ij} and δ_{ij} are the short-term coefficients; $\Delta \bar{Y}_t$ and $\Delta \bar{X}_t$ are the short-term cross-sectional effects; ψ_i measures the speed of adjustment towards long-term equilibrium; β_i the long-term coefficients; $\pi_{1,i}$ and $\pi_{2,i}$ capture the sensitivity to average shocks in the system; ϵ_{it} is the error term.

5. Results and Discussions

The governance index (IND) was constructed using Principal Component Analysis (PCA) based on five indicators from the World Bank database (Kaufmann et al., 2011). These are government effectiveness, democratic expression and accountability, control of corruption, political stability and absence of violence, and regulatory quality. The composite index thus obtained is then used in conjunction with public expenditure to capture the moderating effect on the budgetary impact.

5.1. Preliminary Analysis

In this subsection, we present the preliminary results of the analysis. Table 1 presents descriptive statistics for the variables used in this study, covering 162 countries over the period 2000 to 2023. The data are mainly from the International Monetary Fund (IMF) and the World Bank (WB).

The results reveal that public revenue represents an average of 27.69% of GDP with a high dispersion (12.55) and a minimum of 0.64% to a maximum of 85.78%. Public expenditure is higher on average, reaching 31.57% of GDP, with a minimum of 2.49%, a maximum of 133.28% and a standard deviation of 15.59. The governance index has a slightly negative average value close to zero (-0.002), reflecting a generally weak governance situation in the sample, but also significant institutional heterogeneity between countries, with extremes ranging from -2.17 to 2.83.

A comparative analysis of budgetary variables highlights significant disparities between developed and emerging countries. Developed countries have significantly higher average public revenues (REV) ($40.18\% \pm 8.83$) than emerging countries ($24.24\% \pm 11.16$), with a much smaller range (14.44% - 63.05% compared to 0.64% - 85.78%). In terms of expenditure (EXP), the average levels appear to be relatively closer between the two groups ($33.92\% \pm 18.15$ for developed countries and $30.92\% \pm 14.74$ for emerging countries), but the latter are distinguished by more pronounced extreme values (2.49% - 133.28%), reflecting greater budgetary instability.

The governance index (IND) is the most significant difference between the two categories of countries. Developed economies have a clearly positive average score (1.02 ± 0.49), while emerging countries have a negative average (-0.28 ± 0.68). This institutional divergence, combined with the

increased volatility of fiscal indicators in emerging economies, suggests a close link between the quality of governance, the effectiveness of public policies and the stability of public finances.

Similarly, analysis of the REVIND and EXPIND interaction variables highlights starkly contrasting budgetary dynamics between developed and emerging countries. Developed countries have clearly positive REVIND values (40.19 ± 19.71), reflecting the fact that their better institutional quality is accompanied by an increased capacity to mobilise revenue. Conversely, emerging countries have a negative average REVIND (-5.43 ± 18.67), revealing that institutional weakness limits the generation of public revenue, with some extremely worrying situations (minimum of -129.88). The divergence is even more pronounced in terms of the EXPIND variable. In developed countries, the interaction between governance and public expenditure remains positive (32.66 ± 20.21), a sign of more efficient budget management, where strong institutions reinforce the effectiveness of expenditure. In contrast, emerging countries have a strongly negative EXPIND average (-9.69 ± 24.93), with very low minimums (-200.30). These extreme values reflect contexts where poor institutional quality leads to compression or efficiency in public spending, potentially to the detriment of essential services and productive investments. They thus support the hypothesis of an institutional crowding-out effect mentioned in the problem statement.

Table 1. Summary statistics.

Descriptive statistics	Mean	Max	Min	Std. Dev.	JB	Prob	Obs
All countries							
REV	27.687	85.783	0.6367	12.552	344.658	0.000	3888
REVIND	4.428	101.627	-129.875	26.637	256.166	0.000	3.888
EXP	31.568	133.277	2.4894	15.585	8.865.881	0.000	3.888
EXPEND	-0.5412	130.731	-200.298	29.649	1323.388	0.000	3888
CRED	50.722	304.575	0.3831	44.018	1.904.298	0.000	3.888
CROI	3.717	86.827	-50.338	5.290	208.387.3	0.000	3.888
IMP	45.098	208.333	1.1277	24.266	8.669.940	0.000	3.888
IND	-0.002	2.824	-2.168	0.842	93.508	0.000	3.888
Developed countries							
REV	40.181	63.053	14.439	8.829	26.946	0.000	840
REVIND	40.185	101.627	-8.207	19.709	12.584	0.002	840
EXP	33.921	125.978	9.015	18.152	1.840.909	0.000	840
EXPENDITURE	32.656	130.731	-8.554	20.209	476.799	0.000	840
CRED	104.712	304.575	12.300	47.269	40.998	0.000	840
CROI	2.479	24.615	-16.040	3.569	1.013.552	0.000	840
IMP	53.374	208.333	9.099	33.451	1.040.932	0.000	840
IND	1.022	2.824	-0.174	0.4935	63.992	0.000	840
Emerging countries							
REV	24.244	85.784	0.637	11.164	2.116.665	0.000	3.048
REVIND	-5.426	81.963	-129.875	18.669	1.330.048	0.000	3048

EXP	30.919	133.277	2.489	14.737	5.771.667	0.000	3.048
EXPENDITURE	-9.690	106.249	2.489	24.928	4.202.054	0.000	3.048
CRED	35.842	194.674	0.383	28.834	2.057.327	0.000	3048
CROI	4.057	86.827	-50.338	5.627	155.493.9	0.000	3048
IMP	42.8171	191.458	1.128	20.469	1.696.904	0.000	3.048
IND	-0.284	2.153	-2.168	0.685	105.942	0.000	3048

Source: authors’ calculations.

5.2. Results of Inter-Individual Dependence and Heterogeneity Tests

Table 2 presents the results of the inter-individual dependence and heterogeneity tests These tests were carried out as part of this study using four separate tests: the CD test by Pesaran (2015, 2021), the CDw test by Juodis and Reese (2021), the CDw+ test by Fan et al. (2015) and the CD* test by Pesaran and Xie (2021).

The results reveal a significant cross-sectional dependence across the entire sample as well as within each of the subgroups, as indicated by the CD, CDw and CDw+ statistics, all of which are significant. This dependence reflects the fact that economic shocks spread simultaneously among the countries in the sample, reflecting the intensity of economic, trade and financial interconnections at the global level. The particularly high value observed for emerging countries (CDw+ = 13433.29) reflects the increased sensitivity of these economies to international contagion phenomena, often due to their greater exposure to external fluctuations, shallower financial markets and more pronounced macroeconomic vulnerability.

The heterogeneity of the slopes also appears significant across all groups, as confirmed by the Pesaran-Yamagata (2008) and Blomquist-Westerlund (2013) tests. These results, which are essential for empirical estimation, indicate that the relationships between variables differ structurally from one country to another, leading to the rejection of the hypothesis of coefficient homogeneity. Heterogeneity is particularly marked for all countries (Delta-adj = 34.558) as well as for emerging countries (Delta-adj = 33.030), revealing the diversity of fiscal, institutional and macroeconomic configurations. The comparison between groups shows that, even though developed countries exhibit less pronounced heterogeneity, it remains statistically significant (Delta-adj = 19.575). Furthermore, the lack of significance of the CD* test for the latter group suggests a different structure of cross-sectional dependence, which is probably more attenuated or more homogeneous. Overall, these results justify the use of econometric methods capable of simultaneously taking into account cross-sectional dependence and country heterogeneity, and confirm the relevance of a differentiated analysis between developed and emerging economies.

Table 2. Cross-sectional dependence and slope heterogeneity.

Cross-sectional dependence	CD	CDw	CDw+	CD*
All countries	12,230***	2,940***	19,873.130***	14,440***
Developed countries	8.40	3.70	931.63	1.05
Emerging countries	47.56	4.49	13.433.29***	11.71
Slope heterogeneity				
All countries				
Pesaran, Yamagata. 2008	Delta	Delta-adj		
	28.217	34.558***		
Blomquist, Westerlund. 2013	Delta (HAC)	Delta (HAC) adj		

	55.648	68.154
Developed countries		
Pesaran, Yamagata. 2008	Delta	Delta-adj
	17.870	19.575***
Blomquist, Westerlund. 2013	Delta (HAC)	Delta (HAC) adj
	13.826***	15.146
Emerging countries		
Pesaran, Yamagata. 2008	Delta	Delta-adj
	30.152	33.030***
Blomquist, Westerlund. 2013	Delta (HAC)	Delta (HAC) adj
	27.412	30.028

Source: authors’ calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

5.3. Results of Stationarity Tests in a Heterogeneous Panel

The second-generation stationarity test developed by Pesaran (2007) is used in this study. Table 3 presents the results of the Cross-sectionally Augmented Dickey-Fuller (CADF) stationarity test applied to all variables in the model. The CADF unit root tests reveal that most variables are integrated of order one I(1) in the three samples, becoming stationary in first differences. Only a few variables are exceptions: CROI is stationary at level I(0) for all groups, while CRED is I(0) only for developed and emerging countries. This predominance of I(1) variables justifies the use of econometric techniques adapted to non-stationary series, in particular the search for cointegration.

Table 3. Stationarity test.

Variable	Level	First difference	
All countries	CADF	CADF	Decision
REV	-1.404	-2.500***	I(1)
REVIND	-1.549	-2.513***	I(1)
EXP	-1.788	-2.456***	I(1)
EXPIND	-1.604	-2.575***	I(1)
CRED	-1.696	-2.164***	I(1)
CROI	-2.134***		I(0)
IMP	-1.421	-2.581***	I(1)
IND	-1.673	-2.597	I(1)
Developed countries			
REV	-2.012	-3.388***	I(1)
REVIND	-2.373	-3.637***	I(1)
EXP	-2.193	-3.683***	I(1)
EXPIND	-2.339	-3.767***	I(1)
CRED	-2.592**		I(0)

CROI	-2.931***		I(0)
IMP	-2.330	-3.744***	I(1)
IND	-2.397	-3.573***	I(1)
Emerging countries			
REV	-1.511	-2.542***	I(1)
REVIND	-1.455	-2.597***	I(1)
EXP	-1.857	-2.518***	I(1)
EXPIND	-1.317	-2.246***	I(1)
CRED	-1.913**		I(0)
CROI	-2.171 ***		I(0)
IMP	-1.625	-2.700***	I(1)
IND	-1.491	-2.537***	I(1)

Source: authors' calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

5.4. Results of Cointegration Tests in a Heterogeneous Panel

Table 4 presents the results of the Pedroni (1999) cointegration test applied to all countries in the sample, as well as to the two subgroups: developed countries and emerging countries - in particular, the modified variance ratio, the Phillips–Perron t and the Augmented Dickey–Fuller t - are all significant at the 1% level for both intra-group and inter-group statistics. These results indicate the existence of a robust cointegration relationship between the variables studied, both for the overall sample and for each of the two subgroups. This suggests that, despite the heterogeneous dynamics observed between developed and emerging countries, the variables in the model evolve jointly in the long term.

Table 4. Pedroni (1999) cointegration test.

Statistics	All countries		Developed countries		Emerging countries	
	Statistics	P-value	Statistic	P-value	Statistic	P-value
Modified variance ratio	-12.338***	0.000	-5.650***	0.000	-10.965***	0.000
Modified Phillips–Perron t	5.671***	0.000	2.903***	0.002	4.987***	0.000
Phillips–Perron t	-7.200***	0.000	-3.439***	0.000	-6.291***	0.000
Augmented Dickey–Fuller t	-5.647***	0.000	-2.584***	0.005	-5.023***	0.000
Modified Phillips–Perron t	9.325***	0.000	4.813***	0.000	8.119***	0.000
Phillips–Perron t	-9.631***	0.000	-4.122***	0.000	-8.576***	0.000
Augmented Dickey–Fuller t	-7.424***	0.000	-3.128***	0.000	-6.743***	0.000

Source: authors' calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

5.5. Results of the Dumitrescu and Hurlin (2012) Causality Test

Table 5 presents the results of the Dumitrescu and Hurlin (2012) causality test, applied to all countries in the sample. These results reveal a significant bidirectional causality between public expenditure (EXP) and public revenue (REV). The Z-bar and Z-bar tilde statistics, both significant at the 1% threshold, indicate that changes in expenditure influence revenue, and vice versa. This result

suggests the existence of an interactive fiscal mechanism in which expenditure decisions can be adjusted according to available revenue, while tax collection efforts respond to expenditure requirements. This reciprocal link reflects active fiscal coordination, where the two levers of fiscal policy – revenue and expenditure – are dynamically coordinated to ensure fiscal sustainability.

Refining the analysis by country group, the bidirectional causality between public expenditure and public revenue is confirmed in both developed and emerging countries. In developed countries, this relationship could reflect strong institutional stability, enabling medium-term budget planning, where revenues and expenditures are mutually adjusted within the framework of fiscal rules or credible multi-year forecasts. In emerging economies, however, this dynamic can be explained more by the presence of structural budgetary constraints and frequent macroeconomic shocks, forcing the authorities to make reactive and iterative adjustments between expenditure policies and resource mobilisation strategies. The strength of the link between the two fiscal variables, regardless of the economic context, thus highlights the importance of flexible, adaptive and well-coordinated fiscal governance that is capable of responding effectively to uncertainties while maintaining a framework of sustainability.

Table 5. Causality of Dumitrescu and Hurlin (2012).

All countries	Z-bar	Z-bar tilde	Decision
EXP does not Granger-cause REV	5.9370	4.0775	Bidirectional
REV does not Granger-cause EXP	7.3283	5.2265***	
Developed countries			
EXP does not Granger-cause REV	3.671	2.648	Bidirectional
REV does not Granger-cause EXP	3.475	2.486***	
Emerging countries			
EXP does not Granger-cause REV	4.778	3.215	Bidirectional
REV does not Granger-cause EXP	6.453	4.600	

Source: authors' calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

5.6. Results of the CS ARDL Model

The results of the CS-ARDL model enable us to analyse the dynamic and structural relationships between government revenue (GR) and its main fiscal and macroeconomic determinants for both the sample countries as a whole and the subgroups of developed and emerging countries (see Table 6). This analysis is based on robust econometric estimates that simultaneously take into account the individual heterogeneity of countries and cross-sectional dependence, making the results empirically robust and economically consistent. The effects identified show specificities marked by their level of development, highlighting the importance of differentiating public resource mobilisation strategies according to the institutional and economic contexts specific to each group of countries.

In the short term, the results reveal a persistence of public revenues, illustrated by the positive and significant coefficient of the lagged variable L.REV in the three subsamples, including 0.148 for all countries, 0.329 for developed countries, and 0.120 for emerging countries. This phenomenon of fiscal inertia is more pronounced in developed economies, due to a more stable and institutionalised tax system, where revenues are less sensitive to economic shocks.

Current public expenditure (EXP) has a positive and significant effect on revenues in all the groups studied. The elasticity of revenues to expenditure increases with the level of development:

0.543 for all countries, 0.619 for developed countries, and 0.722 for emerging countries. This trend suggests that fiscal stimuli boost economic activity, and therefore tax revenues, with a greater multiplier effect in emerging economies, where public demand is a key driver of economic activity.

The effect of the interaction between public expenditure and institutional quality (EXPIND) is particularly significant. The estimated coefficients are high and statistically significant in all three specifications: 0.587 for the overall sample, 0.760 for developed countries, and 0.814 for emerging countries. These results highlight a strong complementarity between institutional efficiency and fiscal policy. In other words, at the same level of expenditure, the capacity to mobilise tax revenues is substantially enhanced when institutions are effective, the regulatory framework is reliable, and governance is efficient. The more pronounced effect in emerging countries indicates that gains in governance generate a proportionally higher fiscal impact there, due to greater room for improvement.

Credit to the private sector (CRED), used as an indicator of the level of financial development, has a positive and significant effect in the overall sample (0.367) and for developed countries (0.469), but remains insignificant in emerging countries. This heterogeneity reflects a financial system that is still poorly integrated into the tax system in developing economies and a banking sector that is more oriented towards consumer financing than productive investment, limiting its indirect effect on revenue.

Economic growth (CROI) clearly supports public revenues, as evidenced by the significant coefficients obtained for all groups: 0.623 for the whole, 0.161 for developed countries, and 0.361 for emerging countries. This reinforces the idea of a virtuous circle between growth and tax mobilisation. In developed economies, growth is generally more stable, resulting in a weaker marginal effect, while in emerging economies, even moderate growth can lead to substantial tax gains. In contrast, imports (IMP) do not have a significant effect in the overall sample, but their impact is marked in developed countries (0.077) and very strong in emerging countries (0.706). This illustrates the dependence of emerging economies on customs duties and indirect taxes, which are often the main sources of revenue in a context of low direct taxation.

The error correction term (ECM) coefficients are negative and significant across all groups, with values of -0.852 for the overall sample, -0.671 for developed countries, and -0.880 for emerging countries. These results confirm the existence of a fiscal adjustment mechanism towards long-term equilibrium. The higher speed of adjustment in emerging countries reflects stricter fiscal constraints or stronger pressure from international donors, requiring a rapid return to sustainable public finances.

The long-term relationships validate the trends observed in the short term, while highlighting the structural stability of the link between public expenditure, quality of governance and tax revenue mobilisation. The coefficients associated with public expenditure remain positive and significant across all groups: 0.487 for the overall sample; 0.594 for developed countries; and 0.412 for emerging countries. This confirms that current expenditure, when well targeted, improves tax collection in a sustainable manner.

The effect of the interaction between public expenditure and institutional quality (EXPIND) is sustained in the long term, with significant and particularly high effects in emerging countries (0.867) and developed countries (0.859), compared to 0.318 for the overall sample. This result suggests that institutions act not only as a facilitating framework in the short term, but also as catalysts for sustainable fiscal performance in the long term. In emerging economies, this can be interpreted as a requirement for institutional support for spending policies to ensure their effectiveness.

With effective institutions in place, even a substantial increase in public spending can remain compatible with fiscal sustainability. Indeed, when funds are allocated efficiently and control, audit and accountability mechanisms function properly, the risks of waste, corruption and resource loss are greatly reduced. In this case, public spending contributes more to growth and, ultimately, to broadening the tax base, thereby supporting the sustainability of public finances. Conversely, in a fragile institutional context, even moderate levels of spending can compromise sustainability.

Institutional weaknesses encourage mismanagement, misappropriation and administrative inefficiency, significantly reducing the potential economic impact of public expenditure. Furthermore, the lack of transparency and accountability mechanisms hinders the necessary adjustments in the event of budgetary slippage, increasing the risks of medium- and long-term unsustainability.

Table 6. Results of CS ARDL (MG) model estimates.

Model	All countries		Developed countries		Emerging countries	
	Coef.	Std. Err	Coef.	Std. Err	Coeff.	Std. Err
Short Run Analysis						
L.REV	0.148	0.032	0.329	0.061	0.120	0.034
EXP	0.543	0.151	0.619	0.292	0.722***	0.199
EXPIND	0.587	0.150	0.760	0.271	0.814***	0.190
IND	0.701	0.844	6.819	10.538	6.543	5,224
CRED	0.367***	0.044	0.469	0.012	0.075	0.055
CROI	0.623***	0.028	0.161	0.045	0.361***	0.035
IMP	0.013611	0.024	0.077	0.031	0.706***	0.03
Adjusted Term (MG)	-0.852***	0.032	-0.671	0.061	-0.880***	0.034
Long Run Analysis						
EXP	0.487	0.189	0.594	0.376	0.412	0.177
EXPIND	0.318	0.132	0.859	0.111	0.867***	0.231
IND	13.779	10.697	37.436	40,042	5,084	6,542
CRED	0.450***	0.192	0.420	0.075	0.167	0.063
CROI	0.268	0.106	0.236	0.259	0.465***	0.058
IMP	0.194	0.278	0.400	0.396	0.548***	0.066

Source: authors' calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

5.7. Robustness of Results

In order to verify the consistency and robustness of the results obtained using the CS-ARDL approach, the study used the PMG-ARDL method developed by Pesaran et al. (1999). The results obtained are presented in Table 7 below. These results show that the relationships between revenue (REV), expenditure (EXP) and cross-expenditure on the governance index (EXPIND) are positive and significant at the 1% threshold. Indeed, improved governance strengthens the impact of expenditure on revenue in both the short and long term in all countries in the sample, as well as in developed and emerging countries. Across the entire panel, the results reveal that a 1% increase in public expenditure leads to an increase in public revenue of approximately 0.015% in the long term and 0.143% in the short term. This impact is 0.111% in the long term and 0.165% in the short term when accompanied by an improvement in the level of governance.

Table 7. Results of the Panel ARDL (PMG) model estimates.

Model	All countries		Developed countries		Emerging countries	
	Coef.	Std. Err	Coef.	Std. Err	Coeff.	Std. Err
Long Run Analysis						
EXP	0.015***	0.0055	0.176	0.036	0.0332	0.0134
EXPIND	0.111	0.0059	0.0889	0.0296	0.147	0.0165

IND	0.146	0.0394	2.722***	0.8413	0.356	0.6229
CRED	0.030	0.0032	0.0093	0.0038	0.0185438	0.007
CROI	0.221	0.0234	0.285	0.0182	0.314	0.0324
IMP	0.038	0.0079	0.028	0.0080	0.063	0.0121
Adjusted Term (MG)	-0.293	0.0210	-0.296	0.0553	-0.309	0.0234
Short Run Analysis						
EXP	0.143	0.0826	0.180	0.1209	0.425	0.0970
EXPIND	0.165	0.1065	0.287	0.2003	0.648	0.1326
IND	1.431	2.4614	8.178288	7.8687	2,539	3.0278
CRED	0.0396	0.0388	0.419	0.0117	0.156	0.0488
CROI	0.118	0.0164	0.033	0.0184	0.316	0.0204
IMP	.0298*	0.0181	0.072	0.0258	0.523	0.0225
Cons	6.649***	0.5596	13.756***	2.4618	6.182***	0.5798
Number of observations	3726		805		2921	

Source: authors’ calculations. *, **, and *** indicate that the estimated coefficients are statistically significant at 10%, 5%, and 1% levels, respectively.

For developed countries, the results show a positive and significant relationship in both the long term and the short term. They indicate a greater impact in the short term for cross-cutting governance expenditure (0.287**). On the other hand, a 1% increase in public expenditure directly translates into a 0.18% increase in revenue in the short term and a 0.176% increase in the long term. This impact is greater in developed countries than in emerging countries (0.033). Finally, emerging countries are distinguished by a crucial need to improve their level of governance. The impact of public expenditure on revenue is greater in the short term (0.425) than in the long term (0.033). Combined with the governance index (EXPIND), the impact is 0.648 in the short term and 0.147 in the long term. Overall, the results estimated using the PMG-ARDL method confirm that all exogenous variables have a positive influence on public revenue in both developed and emerging countries. These influences are particularly significant for the variable (EXPIND) in both subsamples. These estimates confirm the consistency and robustness of those obtained using the CS-ARDL panel approach.

6. Conclusion and Economic Policy Implications

This study analysed the relationship between public expenditure, institutional quality and tax revenues using a panel of 162 countries, divided between developed and emerging economies, over the period 2000-2023. By adopting the CS-ARDL model, which allows us to take into account cross-sectional dependence, unobserved heterogeneity and short- and long-term dynamics, we have identified differentiated and structurally robust fiscal mechanisms.

The empirical results show, consistently across the three country subgroups, that public expenditure has a positive and statistically significant effect on public revenue, both in the short and long term. This effect is significantly amplified by institutional quality, as revealed by the positive impact of the EXPIND interaction variable. This evidence of the moderating role of institutions is an important first contribution of the study: it highlights that the ability of expenditure to mobilise resources in a sustainable manner depends heavily on the effectiveness and credibility of institutional frameworks. Thus, fiscal reforms focused solely on the amounts spent, without improving the governance framework, are likely to have limited effects. Furthermore, the results of the causality test by Dumitrescu and Hurlin (2012) highlight a bidirectional causal link between public revenue and expenditure, both for the entire sample and for developed and emerging countries.

The second major contribution of this study lies in the use of a CS-ARDL specification on a large global sample. This approach captures complex budgetary dynamics that are often ignored by standard models, including asymmetric adjustments, group effects and interdependencies between countries. The use of this advanced methodology makes the analysis more robust and strengthens the relevance of the results for a variety of political and economic contexts.

In addition, the study highlights a third original contribution, namely the existence of differentiated fiscal regimes according to the level of development. In emerging economies, public spending and its interaction with institutions have a stronger impact on public revenues, reflecting greater sensitivity to public policy. In developed countries, tax systems appear more stable but remain influenced by institutional and financial channels. This typology offers useful analytical insights for the implementation of fiscal policies differentiated according to the stage of economic and financial development.

Finally, the significance and negativity of the adjustment term in all estimates validate the existence of a stable long-term relationship between the variables. This fourth contribution reinforces the idea that fiscal policy is intertemporally sustainable, provided that it is part of a favourable institutional framework. Thus, strengthening public governance appears not only as a requirement for good management, but also as a structural lever for fiscal performance. In short, this study contributes to the literature by combining fiscal and institutional dimensions within a rigorous and comprehensive methodological framework. It invites policymakers to design fiscal policies that are more effective, sustainable and adapted to institutional and economic contexts.

The significant effect of the EXPIND interaction variable shows that the quality of institutions determines the effectiveness of public spending on revenue mobilisation. Countries should therefore invest in reforms in the areas of fiscal transparency, anti-corruption and quality of spending. This would create an economic environment conducive to broadening the tax base without increasing tax rates. Similarly, the significance of the CRED variable implies that greater access to banking services, formalisation of the informal sector, sound SME financing policies and increased use of formal means of payment can better connect the financial and tax systems. In countries where foreign trade revenues remain significant (particularly emerging countries), it is strategic to improve customs management, reduce fraud, and diversify sources of tax revenue beyond customs duties. Finally, the negativity and significance of the adjustment term shows that fiscal imbalances are corrected over time. In this sense, countries could strengthen their fiscal governance through multi-year planning and thus the implementation of medium-term budgetary frameworks (MTBFs) and credible fiscal rules to ensure the sustainability of public finances and rigorous monitoring of fiscal balances, even during recovery phases, to guarantee macroeconomic stability.

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