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The Impact of Fiscal Policy on Economic Growth In The Southern Africa Region: A Spatial Econometric Approach

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ABSTRACT

This spatial analysis examines the relationship between fiscal policy and economic growth in the Southern African Development Community (SADC). Using econometric techniques on data from 2000-2017 across 12 member states, the study reveals that tax revenue negatively impacts the economic growth of neighbouring countries, highlighting harmful tax competition. It emphasises the need for coordinated regional tax policies to foster sustainable growth and manage public debt levels. The findings provide insights for SADC nations to enhance fiscal policy frameworks and promote regional cooperation for shared prosperity.

Introduction

Analysing government finances—revenues, expenditures, and public debt—is essential for budgeting. Excessive deficits hinder economic performance, especially in Africa (Wolde-Rufael, 2008; Darrat, 1998). The phenomenon of the budget process has gained a lot of attention from researchers and policymakers in both developing and developed countries (Barro, 1990; Barro & Sala-i-Martin, 1992; Connolly & Li, 2016; Quashigah et al., 2016; Engen & Skinner, 1992)

Empirical studies on fiscal variables and growth typically follow three econometric approaches: single-country regressions, panel data, and long-run relationships (Ojede et al., 2018; LeSage, 1999; Narayan & Narayan, 2006). Many studies overlook the impact of geographical space, as highlighted by Tobler's law: "Everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236). In Africa, fiscal policy decisions in one country can be influenced by changes in neighbouring countries (Case et al., 1993; Kopczewska et al., 2016; Ertur & Koch, 2007).

The Southern African Development Community (SADC) is a regional economic community of 16 countries facing unique challenges and opportunities for integration. Its members include Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe. Established in 1992, the SADC promotes regional integration, economic growth, and sustainable development. The region is characterised by diverse geographic attributes, with some countries being landlocked or island economies, which heightens the significance of spatial effects. For instance, landlocked nations like Lesotho and Eswatini heavily rely on South Africa for international trade.

The SADC region is significant for several reasons. It has over 360 million people, many facing poverty, inequality, and underdevelopment. In 2020, the average GDP per capita was only $5,126, well below the global average, highlighting ongoing economic challenges (SADC, 2019). Additionally, member states have diverse economic structures, development levels, and resource endowments, which create both opportunities and challenges for regional integration. For instance, South Africa's advanced economy contrasts sharply with the agrarian economies of Malawi and Mozambique. Furthermore, the region's complex political history, marked by colonial legacies and civil conflicts, has significantly influenced its social cohesion, governance, and economic paths.

This study aims to examine the impact of fiscal policy variables, specifically tax revenues and government expenditures, on economic growth in the SADC region. It also investigates spatial spillover effects, where fiscal policies in one member state influence the economic performance of neighbouring countries. By addressing these objectives, the research seeks to offer valuable insights for more effective and coordinated regional fiscal policymaking.

Fiscal policies in one region can significantly impact neighbouring areas (Geys, 2006). The spatial spillover effect is regarded as the impact of government policy in one country on the performance of other economies with respect to the distance in space" (Kopczewska et al., 2017, p. 78). This study emphasises spatial dependence, as observations in the SADC region are likely not independent. Heterogeneity and overlapping regional attributes of countries impact the initial convergence towards economic integration in SADC (Ade et al., 2017). There is a need for policy harmonisation to support other member countries for a common goal.

This study aims to bridge key gaps in the literature. First, it challenges the focus on single-country analyses and traditional panel data approaches that neglect spatial interdependencies. Second, it highlights the need for coordinated fiscal policies among SADC member states, an area that warrants further exploration. The research emphasises the importance of regional cooperation and tax harmonisation to mitigate harmful spillover effects and promote sustainable economic growth. Finally, unlike previous studies that often isolate fiscal variables, this study integrates government expenditure, tax revenue, and public debt into a unified analytical framework, illuminating their collective impact on economic growth in the region and providing crucial insights for effective policymaking

Economic and Fiscal Conditions in the Southern African Development Community (SADC) Region

The SADC region is characterised by significant heterogeneity, with diverse economic and fiscal behaviours. Member states range from large, resource-rich economies like South Africa to small, landlocked nations such as Lesotho and Eswatini. This diversity, compounded by colonial legacies and post-independence challenges, has led to uneven economic growth and fiscal imbalances.

Landlocked countries in SADC face unique economic hurdles, relying heavily on coastal neighbours for access to international markets and trade routes. Geographic isolation often limits their ability to develop robust domestic industries and generates higher transportation costs. Consequently, these nations experience lower export competitiveness and greater fiscal vulnerabilities compared to maritime countries. The economic interdependence within the SADC can amplify the spillover effects of fiscal policy decisions. For instance, uncoordinated tax policies or government spending in one country can significantly impact neighbouring economies, especially those dependent on trade. This situation highlights the importance of fostering regional cooperation and harmonising fiscal policies.

To examine temporal changes in fiscal variables, the study period (2000-2017) is divided into three sub-periods: 2000-2005, 2006-2011, and 2012-2017. This segmentation allows for an analysis of fiscal trends surrounding significant economic events, including the global financial crisis.

In the first sub-period (2000-2005), the average tax revenue as a percentage of GDP was about 22%, while government expenditure averaged 19%. During this time, public debt levels were notably high, averaging 60% of GDP, reflecting significant fiscal stress among member states (SADC, 2019). The following period (2006-2011) experienced a modest recovery, with average tax revenues rising to 24% and government expenditure increasing to 21%. However, public debt also escalated to approximately 65% of GDP, indicating persistent fiscal challenges (World Bank, 2018). The final sub-period (2012-2017) marked a stabilization phase, with tax revenues averaging 25% and government expenditure at 22%. Despite this stabilization, public debt levels remained concerning, averaging 62% of GDP, highlighting the need for sustainable fiscal policies (IMF, 2020).

The 2008 global financial crisis profoundly impacted the SADC region, sharply declining GDP growth rates. Tax revenues fell to an average of 20%, while government expenditure surged to 24% as countries sought to stimulate their economies. As nations borrowed to counteract the downturn, public debt levels surged to nearly 70% of GDP (Reinhart & Rogoff, 2010). Following the crisis, the region experienced a gradual post-crisis recovery (2009-2017). Tax revenues rebounded, averaging 24%, while government expenditure stabilised around 22%. However, public debt continued to rise, reflecting ongoing fiscal pressures (Egbunike et al., 2018).

High-growth economies like South Africa and Botswana showed resilience, with average tax revenues exceeding 30% of GDP. Conversely, smaller nations such as Lesotho and Eswatini struggled, with tax revenues averaging around 15%, reflecting their limited economic bases (Gumus & Mammadov, 2019). Public debt levels varied significantly; for instance, while South Africa maintained a debt-to-GDP ratio of around 55%, countries like Zimbabwe faced ratios exceeding 90%, highlighting the vulnerabilities in fiscal management (World Bank, 2018).

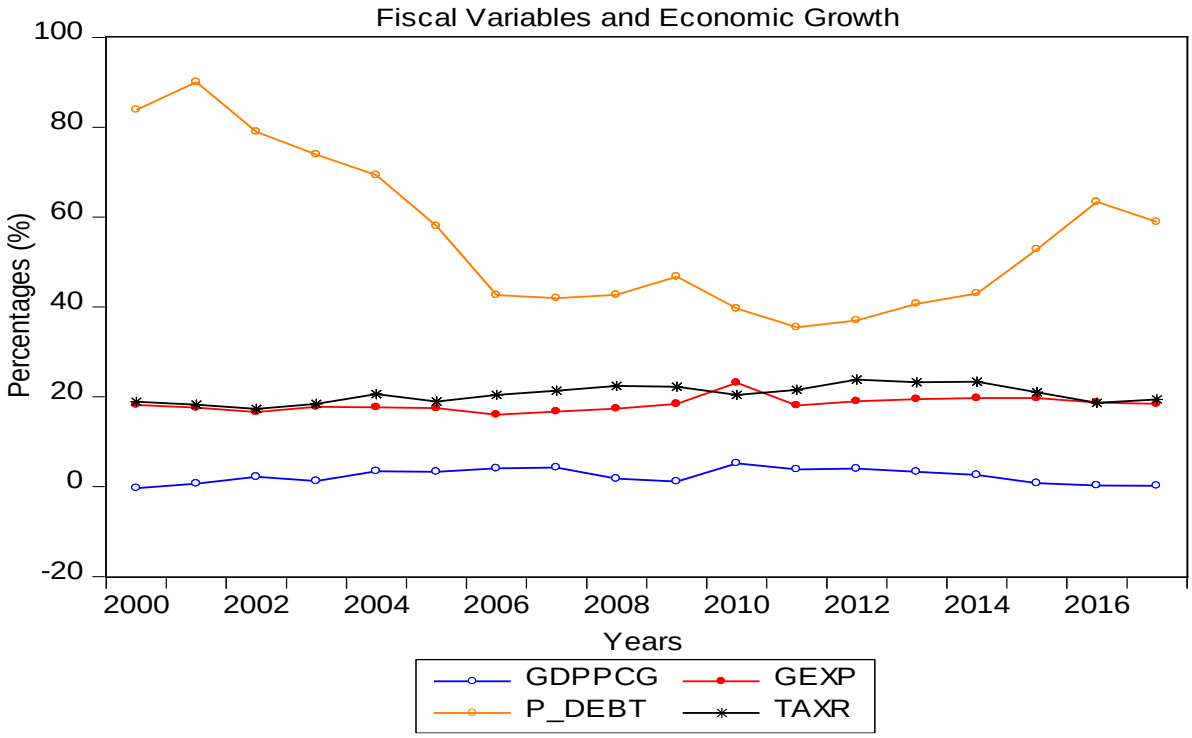

Figure 1. Economic Growth and Fiscal Variables Trends in SADC (2000-2017)

Source: author`s computations

Figure 1 shows average GDP per capita growth (GDPPCG), government expenditure (GEXP), public debt (P_DEBT) and tax revenue (TAXR) across member states.

The annual average public debt as a percentage of GDP in the SADC region experienced a notable decline from 90% in 2001 to 43% in 2006, followed by an increase to 63% in 2016, as illustrated in Figure 1. This trajectory indicates a recovery

period after 2001, with debt levels stabilizing at an average of 36% of GDP from 2009 to 2013 during the post-recession phase. However, from 2014 to 2018, there was a significant rise, with debt levels averaging 50%. Public debt remained relatively stable between 2016 and 2018, averaging 54% (SADC, 2019). This trend suggests that while the region has kept public debt within the macroeconomic convergence target of 60%, it continues to face challenges, particularly as many developed and developing nations grapple with persistent government budget deficits and constrained fiscal capacity.

Tax revenue during this period has remained subdued, averaging just 24%. The data presented in Figure 1 indicates that government expenditure has consistently been lower than tax revenue, suggesting a potential imbalance in fiscal policy. Following the global financial crisis, government expenditure surged to 23% in 2010, likely intended to stimulate local economies. Despite this increase, the overall economic performance of the region has been lacklustre, averaging 4.5% growth, with a stark decline to 1% during the financial crisis.

The insights from Figure 1 highlight the importance of prudent fiscal policy for national welfare. A balanced approach to managing expenditures and increasing tax revenue is vital for sustaining economic growth and achieving fiscal stability in the region. Despite challenges from geographical diversity and uneven development, the SADC has made progress in regional integration through initiatives like a free trade area and macroeconomic policy harmonization. However, progress remains uneven, necessitating further coordination to tackle common fiscal and economic challenges and fully unlock the region's growth potential.

Literature Review

The existing literature on the relationships between fiscal variables and economic growth primarily focuses on single-country or panel analyses, often neglecting spatial dimensions (Perotti, 2004; Reinhart & Rogoff, 2010; Stoilova & Patonov, 2012; Ash et al., 2017; Lupu et al., 2018). This study aims to rigorously explore the linkages between key fiscal policy elements and economic performance, emphasising spatial interdependencies within the SADC region.

Critical Elements of Economic Growth

Economic growth typically leads to a corresponding increase in public sector size (Wagner, 1883; Dritsaki & Dritsaki, 2010), although causality is bidirectional (Loizides & Vamvoukas, 2005; Lupu et al., 2018). In Africa, fiscal expenditures can negatively impact growth, while consumption expenditures show a positive effect (Kweka & Morrissey, 2000; Mazorodze, 2018; Amusa & Oyinlola, 2019; Shafuda & De, 2020).

Tax structures that rely on direct taxes tend to support economic growth more effectively (Stoilova & Patonov, 2012; Nantob, 2014). Mixed results are observed regarding tax revenue and spending across developed and developing countries (Lien & Thanh, 2017). In Ghana and Nigeria, tax revenue positively affects growth

(Quashigah et al., 2016; Egbunike et al., 2018; Lien & Thanh, 2017), whereas a negative relationship is noted in South Africa (Egbunike et al., 2018; Khumbuzile & Khobai, 2018).

Public debt is often seen as a short-term stimulus for aggregate demand and output. However, in the long run, it can lead to crowding out, where high long-term interest rates reduce capital investment and output, ultimately hindering economic growth. Additionally, high levels of debt constrain countercyclical fiscal policies, contributing to volatility and low growth rates (Kumar & Woo, 2010). Reinhart and Rogoff (2010) found a weak relationship between public debt and growth across both emerging markets and advanced economies. Specifically, a debt-to-GDP ratio above certain thresholds is linked to lower growth outcomes, while lower levels of external debt-to-GDP negatively affect growth, particularly in emerging markets. However, Herndon et al. (2014) pointed out data coding issues, suggesting these findings might be erroneous. Other studies applying panel regression have identified a non-linear impact of debt on growth, indicating a threshold (90-100% of GDP) beyond which the public debt-to-GDP ratio harms growth (Checherita-Westphal & Rother, 2011; Woo & Kumar, 2015; Panizza & Presbitero, 2013; Kharushi & Ada, 2018; Senadza et al., 2018). While public debt can stimulate growth in some cases, unmonitored increases may lead to negative impacts (Roşoiu, 2019; Jayaraman & Lau, 2009), although this effect is not observed in developed countries (Ash et al., 2017).

Spatial Effect

Most studies have focused on developed countries, largely ignoring spatial dependence. The growth of each state often reflects the growth of neighbouring states in the U.S (Karjoo & Sameti, 2015; Segura, 2017). Using the Spatial Durbin Model (SDM) with fixed effects on spatial economic convergence, a weak convergence process per capita and productivity was found (Flores-Chamba et al., 2019). Ojede et al. (2017) showed that productive government expenditures positively impact economic growth in both the short and long run, including indirect spillover effects. Few studies have explicitly examined spatial roles in fiscal variables and growth, with some focusing only on local regions (Karjoo & Sameti, 2015; Flores-Chamba et al., 2019). Research using the SDM has indicated that external spillovers can stimulate economic growth in European countries (Kopczewska et al., 2017; Goujard, 2013). Regarding state taxes, revenue-neutral harmonisation promotes growth, while tax cuts by individual states can adversely affect their own revenues and economic activity, creating spillovers based on trade links (Fajgelbaum et al., 2015). In developing countries, external debt accumulation can hinder growth, but some are exempt from the debt overhang hypothesis (Daud & Podivinsky, 2012; Myovella, 2018). Ignoring spatial influence may bias results in traditional econometric methods (Anselin, 1988). This study differs by focusing on neighbouring countries rather than counties within a single country

Research Methods

This section outlines the conceptual framework for analysing the relationship between fiscal variables and economic growth, focusing on government expenditure (Wagner, 1883), tax revenue (Engen & Skinner, 1996), and the public debt-growth hypothesis (Reinhart & Rogoff, 2010).

Government Expenditures and Economic Growth: Of the three functional forms for testing Wagner's law proposed by Peacock and Wiseman (1961), Goffman (1968), and Gupta (1967), this study focuses on the model specified by Peacock and Wiseman (1961) as specified below,

$$\ln(GEXP_t) = \alpha + \beta \ln(GDP_t) + \varepsilon_t \quad \ldots (1)$$

Mann (1980) estimated the relationship between the share of expenditures and economic growth.

Tax Revenue and Economic Growth: Based on the accounting framework established by Solow (1956), there are five ways in which taxes can influence economic growth. High taxes may deter investment rates, weaken labour supply growth, and consequently discourage labour force participation. This can hinder the effective use of human capital and impede productivity growth (Engen & Skinner, 1996).

$$\ln(TAX_t) = \alpha + \beta \ln(GDP_t) + \varepsilon_t \quad \ldots (2)$$

Public Debt and Economic Growth: Considering the Reinhart and Rogoff (2010) specification for debt/GDP ratios (RGDPG) public debt as a percentage share of GDP$\left(\frac{Pdebt}{GDP}\right)$, external debt as a percentage share of GDP$\left(\frac{Edebt}{GDP}\right)$, and the inflation rate (Infl) as follows;

$$RGDPG = \beta_0 + \beta_1 \left(\frac{Pdebt}{GDP}\right)_t + \beta_2 \left(\frac{Edebt}{GDP}\right)_t + \beta_3 \, INFl_t + \varepsilon_t \quad \ldots (3)$$

The relationship between public debt to GDP and economic growth is expected to be negative (Reinhart & Rogoff, 2010). Encompassing all the above models without considering external debt and inflation, the model presented in (4) is expanded with tax revenue as a percentage of GDP (TAXR) the vector is expressed as

$$Y = [Ln(GDP), GEXP, TAXR, PDEBT] \quad \ldots (4)$$

To motivate the empirical methodology, (4) is adopted for further analysis of the fiscal variables and growth regression.

Empirical Model Specification: For our empirical study, we formulate the following functional relationship between fiscal policy and economic growth for panel data investigation.

$$RGDP = f(GEXP, TAXR, PDEBT) \quad \ldots (5)$$

where RGDP: real output in growth; ED: debt as a percentage of GDP; GEXP: government expenditure as a percentage of GDP; and PDEBT: public debt as a percentage of GDP.

The relationship for panel estimation is specified below

$$Ln(GDP_{it}) = \beta_0 + \beta_1 GEXP_{it} + \beta_2 TAXR_{it} + \beta_3 PDEBT_{it} + \mu_{it} + \varepsilon_{it} \quad \ldots (6)$$

Here, ln (GDP) denotes real GDP per capita growth for country i where i =1,…N represent each of the SADC countries considered at time t and t = 1,…T denote each year during the period, $GEXP_{it}$ total government expenditures as a percentage of GDP, $TAXR_{it}$ is the total tax revenue as a percentage of GDP, $PDEBT_{it}$ is debt as a proportion of GDP, μ_{it} represent country-specific effects, and ε_{it} is the error term. The study uses panel data covering a 17-year period (1988–2004) relating to 13 members of SADC for the empirical analysis. The data are drawn from the Global Development Finance and World Development Indicators, and the annual publication of the World Bank (2006a).

Spatial Framework: The issue of spatial interdependence takes a turn from the conventional panel regression model employed in this study. In the presence of spatial effect the Ordinary Least Squares estimation may be biased, inconsistent and will be misleading (Niebuhr, 2002; LeSage & Pace, 2014; Myovella, 2018). The apparent solution to this problem will be contingent on the form of spatial effects. Fiscal policy shocks in one state may affect the economic process of neighbouring regions via several mechanisms such as the mobility of firms, labour, goods, etc. (Ojede et al., 2018).

Modelling Spatial Effects: Spatial econometrics literature has developed models accounting for three types of interaction effects: endogenous interaction among the dependent variable, exogenous interaction among the explanatory variables, and interactions among the error term (Vega & Elhorst, 2013). The empirical strategy involves estimating the fundamental functional form proposed by OLS and examining spatial autocorrelation among SADC countries. If spatial dependence is present, the Spatial Autoregressive (SAR), Spatial Error Model (SEM), or Spatial Durbin Model (SDM) can be employed (Elhorst, 2010; Anselin, 1988). Spatial dependence can be incorporated as a spatially lagged dependent variable (SAR) or in the error structure (SEM), specifying interactions between spatial units.

Ordinary Least Squares (OLS): The first consideration is a simple pooled linear regression model which accounts for spatial-specific effects, but not the spatial interaction effects. The fundamental reasoning is that they control for space-specific time-invariant variables whose omission could potentially bias the estimates (Elhorst, 2010). The simple linear regression model is used as a benchmark for comparison with the spatial models. The model is thus specified as;

$$y_{it} = X_{it}\beta + \mu_i + \varepsilon_{it}\ ; \quad \varepsilon_{it} \sim N(0, \sigma^2 I_n) \quad \ldots (7)$$

Where i represents the cross-sectional dimensions with i = (1…,N), t denotes the time dimension with t = 1,…,T and y_{it} is the dependent variable at region i and time t, X_{it} is a $1 \times k$ row vector of explanatory variables and β is a $k \times 1$ vector of fixed unknown parameters, μ_i denotes spatial specific effect, and ε_{it} denote independently and identically distributed error terms.

Spatial Durbin Model (SDM): The Spatial Durbin Model (SDM) acknowledges that dependencies in spatial relationships can occur in both dependent and independent variables. It incorporates spatial lags of these variables, accounting for exogenous and endogenous interaction effects while excluding autocorrelated error terms (Elhorst, 2010). This approach addresses potential endogeneity, as a country's GDP per capita growth and that of its neighbors are determined simultaneously. Additionally, spatial dependence among observations can influence fixed effects, a concern noted in various studies (Lee & Yu, 2010; Ganau, 2017; Langer, 2019).

The SDM is specified as;

$$y_{it} = \rho \sum_{j=1}^{n} w_{ij}\, y_{jt} + x_{it}\beta + \sum_{j=1}^{n} w_{ij}\, x_{ijt}\boldsymbol{y_{jt}} + \mu_i + \delta_i + \varepsilon_{it} \quad \ldots (8)$$

ε_{it}~ N $(0,\sigma^2 I_n)$

In the model, y_{it} is an $nx1$ vector of explanatory variables, ρ is the coefficient of spatial lagged dependent variables, measuring the response of the neighbouring countries in the growth regression, where $0 < \rho < 1$. $w_{ij}y_{jt}$ captures the endogenous interaction effect among the dependent variable and it describes the impact of a country by their neighbours, $w_{ij}x_{ijt}$ denote the exogenous interaction effect among the regressors and it describes the characteristics of the neighbouring countries, γ is a $kx1$ vector of fixed unknown parameter that measures the indirect spillover effect, β's give the direct effects. The other parameter implication is the same as the ones discussed earlier. Testing $\gamma = 0$ can determine if the model collapses to the SAR model, while setting $\gamma + \rho\beta = 0$ to investigate whether the model simplifies to SEM.

Spatial Regression Model: The Spatial Durbin Model is adopted as the starting point for a general specification. The SDM has been considered for spatial growth regression models (Ertur & Koch, 2007; LeSage & Fischer, 2008). However, if the SDM cannot best fit the data, the robust Lagrange Multiplier (LM) test developed by Anselin et al. (1996) is applied to test for the relevance of the SAR or SEM.

To model the spatial interdependencies is specified as;

$$Ln(GDP_{it}) = \rho \sum_{J=1}^{N} w_{ij} Ln(GDP_{jt}) + \beta_1 GEXP_{it} + \beta_2 TAXR_{it} + \beta_3 PDEBT_{it} + \gamma_1 \sum_{J=1}^{N} w_{ij} GEXP_{ijt} + \gamma_2 \sum_{J=1}^{N} w_{ij} TAXR_{ijt} + \gamma_3 \sum_{J=1}^{N} w_{ij} PDEBT_{ijt} + \mu_i + \delta_i + \varepsilon_{it} \quad \ldots (9)$$

Where $W \cdot Ln(GDP)$ is a spatial lag variable of real GDP per capita growth in the neighbouring countries, $W \cdot GEXP$, $W \cdot TAXR$ and $W \cdot PDEBT$ are the spatial lag variables in the neighbouring countries government expenditure, tax revenue and public debt in the SADC region, W is a non-negative nxn weighting matrix. $\beta's$ and $\gamma's$ are estimated parameters, μ_i and δ_i denote the country-fixed effects and time fixed effect respectively while ε_{it} is the usual error term.

Estimation and Post Estimation: Due to unobserved heterogeneity, econometric estimation of panel data models typically involves fixed effects (FE) and random effects (RE) (Arellano, 2003). The choice between these is determined through Hausman's specification test (Elhorst, 2010), although it can also be based

on theoretical grounds (Kopczewska et al., 2017). Time effects are introduced to account for each period. Post-estimation issues include assessing the goodness-of-fit of regressions, which differs from other econometric models. Key measures involve the significance of beta coefficients and spatial terms, aiming for a model with the most significant variables (Kopczewska et al., 2017). The Lagrange Multiplier and Robust Lagrange Multiplier tests are employed to select a parsimonious model.

Coefficient Interpretation: The coefficients in spatial models can often be misinterpreted as partial derivatives, like simple linear regression models (LeSage & Dominguez, 2012). Relying on point estimates from spatial regression specifications (γ, λ, and ρ) to infer spatial spillovers may lead to erroneous conclusions (LeSage & Pace, 2009). In contrast, coefficients in a properly specified simple linear regression and spatial error model are correctly interpreted as direct effects (Golgher & Voss, 2016). However, for the Spatial Autoregressive (SAR) and Spatial Durbin Model (SDM), caution is needed, as their coefficients cannot be interpreted as simple partial derivatives.

To interpret these models, summary measures of direct, indirect, and total effects serve as model coefficients. Changes in regressors for a specific region produce direct effects locally and indirect spillover effects on neighbouring regions. For example, increasing government expenditure in one country yields direct local effects and indirect effects in adjacent countries. The total effect of a regressor change is the sum of these effects. While government officials often prioritize direct effects (LeSage & Dominguez, 2012), indirect effects are also crucial for considerations of regional integration.

Data sources: Empirical investigation is obtained by sourcing data from World Bank Development Indicators (WDI), the United Nations University data portal (ICTD UNU-WIDER), and the African Development Bank Group (AfDB) for a sample of 12 SADC countries spanning from 2000 to 20171.

The dataset for this analysis is sourced from meticulously curated records. GDP per capita growth figures come from the World Bank's World Development Indicators (WDI) database, while public debt and government expenditure data are obtained from the African Development Bank (AfDB). Tax revenue data presented challenges due to gaps in several key African economies, including Angola, Zambia, Botswana, the Democratic Republic of Congo, and Eswatini. To address these voids, a multi-pronged approach was taken. For Angola and Zambia, missing data points were supplemented from the WDI after confirming consistent trends with alternative sources. Gaps in DRC and Eswatini records were filled by extrapolating from the latest data available in 2016, based on stable trends. Botswana's tax revenue

[1] *Four member states – Mauritius, Madagascar, Seychelles, and Comoros – are excluded from this study due to their unique geographic characteristics. They do not share borders with other SADC countries, resulting in no spatial spillover effects. This study focuses on land-based economies, where interdependencies can be effectively analysed.*

figures for 2000-2002 were reconstructed from the Bank of Botswana's annual reports, ensuring coherence with the ICTD/UNU WIDER dataset.

Results and Discussion

The rigorous empirical analysis and in-depth discussions are presented step-by-step, as outlined in the comprehensive methodological framework. The analysis of panel data explicitly addresses the group of countries, reflecting a time constant and unobserved effect. Using panel data enhances information, variability, degrees of freedom, and efficiency (Gujarati & Porter, 2009), capturing effects that purely time series or cross-sectional data could miss.

Panel Descriptive statistics: The study analyses a strongly balanced panel of 12 SADC member states over 18 years, yielding 216 observations. On average, the region faces high public debt levels, with a mean public debt-to-GDP ratio (PDEBT) of 55.51. The average real GDP per capita growth (Ln(GDP)) is relatively low. Notably, tax revenue (mean TAXR of 20.57) surpasses government expenditure (mean GEXP of 18.33) on average. However, the median values for both government expenditure and tax revenue show little variation across the SADC member states, indicating relative homogeneity in these fiscal variables. In summary, the descriptive statistics highlight high public debt, low GDP growth, and a fiscal structure where tax revenues generally exceed government spending in the SADC region during the study period.

Table 1. Descriptive Statistics for the SADC region, 2000-2017

Variable	**Ln(GDP)**	**GEXP**	**PDEBT**	**TAXR**
Observations	216	216	216	216
Mean	2.3332	18.3330	55.5072	20.5788
Median	2.7963	18.2492	39.0960	18.7704
Max	18.066	70.0647	241.6910	56.91614
Mini	-18.4911	1.7720	4.9726	0.9545
Std. Deviation	4.1324	8.6590	42.5676	10.6215
Skewness	-0.9641	1.4426	1.6437	0.6757
Kurtosis	8.9186	8.1525	5.7311	3.2604
Jarque-Bera	348.7270	313.8495	164.3879	17.04823
P-value	0.0000	0.0000	0.0000	0.0002
Cross-sections:12	Time period (T):18			

Source: author`s computations

The ranges for Ln (GDP), GEXP, PDEBT and TAXR are 36.55, 68.29, 236.71 and 55.96 respectively. These wide ranges are attributed to huge heterogeneity in the region. In terms of variability, public debt and tax revenue vary more than other variables in the region; Ln (GDP) is slightly skewed to the right, as shown by a

negative value, while other variables are skewed to the left. The Jarque-Bera normality tests indicate that the null is rejected since the p-value (s) are less than all levels of significance. Therefore, the residuals are not normally distributed.

Spatial Analysis: The essence of spatial interconnectedness in the SADC region is both empirical and policy relevant. The case for policy harmonization can be understood through the lens of spillover effects, where strategic interactions among member states generate positive or negative externalities. Investigating these spillover effects is crucial for achieving regional integration goals. A foundational aspect of this analysis involves examining the SADC contiguity matrix, which illustrates the geographic and economic relationships among member countries.

Description of the SADC spatial weights (W) matrix: The spatial binary contiguity matrix describes a country configuration regarding sharing borders or neighbourhoods in the SADC region[2]. As noted earlier, this matrix (W) captures the potential connections or spatial dependence between different countries in the SADC region based on adjacency. The dimension of the SADC spatial weights matrix is 12×12, reflecting the number of countries included in the analysis, in accordance with Tobler's law of geographical contiguity.

[2] *Regarding spatial configurations, Angola shares borders with three countries, while Botswana has four neighbours. The Democratic Republic of Congo (DRC) borders three countries, and Eswatini shares borders with two countries. Lesotho has a single border with South Africa, whereas Malawi is neighbouring three countries. Mozambique shares borders with six countries, and Namibia has four neighbours. South Africa shares borders with six countries, and Tanzania is adjacent to four countries. Lastly, Zambia has eight neighbours, while Zimbabwe shares borders with four countries.*

Figure 2. Map: Southern African Development Community (SADC)

Source: GADM Maps with Modifications

The SADC's W matrix analyses proximity relations and the impact of fiscal policy choices in one country on the economic growth of other member states within the SADC region. It is important to note that the binary contiguity matrix is row-standardised, ensuring that each row sums to one.

Model Specification Test for Spatial Dependence: The presence of spatial autocorrelation among SADC countries enables the application of spatial modelling techniques to explore the relationship between fiscal variables and economic growth. It is crucial to decide whether to incorporate spatial effects as a lag of the dependent variable or within the error structure. This determination involves conducting the Lagrange Multiplier (LM) test for errors and lags, which will guide the selection of the appropriate model—either the Spatial Error Model (SEM),

Spatial Autoregressive Model (SAR), or Spatial Durbin Model (SDM)—for capturing spillover effects in the region.

Table 2. Ordinary Least Squares for the SADC Region 2000-2017

Dependent Variable: Ln(GDP)	**Coefficient**	**Std. Err.**	**t-stat**	**P>t**
PDEBT	-0.0099	0.0069	-1.43	0.154
GEXP	0.0933	0.0436	2.14	0.033**
TAXR	-0.0174	0.0369	-0.47	0.638
Intercept	1.5273	0.8660	1.76	0.079*
Cross Sections Number=12	Sample Size=216	R^2=0.0424	AIC=1223.57	
Durbin-Watson stat 1.1611				
F-Test = 3.129 P-Value > F(3 , 212)= 0.0267				
Global Moran MI = 1.0000 P-Value > Z(10.599) 0.000				

Source: author's computations

The study commenced by estimating a simple linear regression model (SLM) using ordinary least squares (OLS). As shown in Table 2, the coefficients had the expected signs, indicating that increases in public debt and tax revenue could negatively impact economic growth, while higher government expenditure positively influenced growth. Notably, only government expenditure was statistically significant, with a p-value of 0.033. The model displayed positive autocorrelation, reflected in a Durbin-Watson statistic of 1.16, below the optimal value of 2. Despite a low R-squared value, the variables collectively significantly affected economic growth, as indicated by the significant F-statistic.

The OLS-estimated Spatial Lag Model (SLM) produced reasonable results; however, residual diagnostic analysis indicated the necessity of considering a spatial model due to spatial autocorrelation. Moran's test on the SLM residuals provided strong evidence against the null hypothesis of no spatial autocorrelation, with a p-value of 0.000. Therefore, it was essential to conduct the Lagrange Multiplier (LM) tests to evaluate spatial dependence in the OLS residuals, given the contiguous nature of the regions. The results of the LM tests are summarised in Table 3.

Table 3. Lagrange Multiplier tests on OLS Residuals

LM TEST		**LM value**	**P-value**	
LM Error (Burridge)	H_0: λ = 0 LM Error	104.037	P-Value > Chi2(1)	0.000
(Robust)		21.167	P-Value > Chi2(1)	0.000
LM Lag (Anselin)	H_0: ρ = 0	104.037	P-Value > Chi2(1)	0.000
LM Lag (Robust)		19.701	P-Value > Chi2(1)	0.000

Source: author's computations

The LM error test rejects the null hypothesis of no spatial autocorrelation among the errors at the 5% significance level, indicating that spatial lambda is significantly different from zero. Similarly, the LM lag test by Anselin et al. (1996) shows strong evidence of spatial autocorrelation among lagged dependent variables. Both tests suggest that either the SAR or SEM models can fit the data, but the choice between them remains unclear. Further diagnostic tests are needed to assess the relevance of these models compared to the SDM for capturing spatial dependence in the SADC region.

Table 4. Testing for the relevance of SAR and SEM against the SDM

Model Testing		**Chi-Square**	**Prob > Chi-Square**
Testing for SAR	H0: $\gamma = 0$	chi2(3) = 7.12	0.0683*
Testing for SEM	H0: $\gamma + \rho\beta = 0$	chi2(3) = 7.76	0.0511*

*significant at 10% level of significance

Source: author`s computations

Table 4 describes the relevant model for capturing spatial effects in the SADC region. The null hypothesis suggesting that spatial effects can be modelled through the SAR model is rejected at the 10% significance level, indicating that the SDM cannot be simplified to a SAR model. Similarly, the SEM model's test results also reject the null at the 10% significance level, confirming that it cannot be reduced to an SEM. Therefore, the conclusion is that the SDM is the appropriate model for capturing spatial effects in the SADC region. In a specific-to-general approach of model selection, if both hypotheses $H_0: \gamma = 0$ and $H_0: \gamma + \rho\beta = 0$ are rejected then the SDM would best describe the data. LeSage and Fischer (2008) contend that the Spatial Durbin Model (SDM) is always the preferable starting point. Consequently, the results suggest that the SDM is an ideal model for capturing spatial effects in the SADC region and adequately describing the data. This study will incorporate the strategy proposed by Elhorst (2014) alongside LeSage and Fischer's approach for model comparison. We will estimate the OLS, SAR, SEM, and SDM to facilitate comparative analysis and further examination.

Estimation and Model Comparison: The results in Table 5 present estimates from the spatial autoregressive model, spatial error model, and spatial Durbin model, using a twelve-neighbour specification for the Southern African Development Community (SADC) region. The analysis controls for both neighbourhood and time-fixed effects, which is crucial, as neglecting these fixed effects could lead to an upward bias in the estimated spatial interaction and spillover effects (Elhorst, 2010).

Table 5. Model Comparison

	Spatial Autoregressive Model		Spatial Error Model		Spatial Durbin Model	
Dependent variable: L(GDP)	Random Effect	Fixed Effect	Random Effect	Fixed Effect	Random Effect	Fixed Effect
Cons. *P-value*	0.9485 *0.321*	-	1.0904 *0.345*	-	7.7750 *0.000***	-
PDEBT *P-value*	-0.0119 *0.012***	-0.0009 *0.885*	-0.0097 *0.052**	-0.0013 *0.846*	-0.0067 *0.203*	-0.0015 *0.748*
GEXP *P-value*	0.0905 *0.325*	0.0965 *0.247*	0.0912 *0.316*	0.0969 *0.242*	0.1108 *0.227*	0.1082 *0.235*
TAXR *P-value*	0.0003 *0.996*	0.2662 *0.549*	0.0039 *0.941*	0.0319 *0.479*	0.0124 *0.773*	0.0077 *0.842*
W* PDEBT *P-value*	-	-	-	-	-0.0365 *0.004***	-0.0128 *0.387*
W* GEXP *P-value*	-	-	-	-	-0.0539 *0.581*	-0.0519 *0.572*
W* TAXR *P-value*	-	-	-	-	-0.2286 *0.005***	-0.1856 *0.014***
rho *P-value*	0.1568 *0.059**	-0.2132 *0.002****	-	-	0.0771 *0.434*	-0.2957 *0.003****
Lambda *P-value*	-	-	0.1610 *0.083**	-0.1976 0.017**	-	-
Log likelihood	-605.839	-588.478	-605.946	-588.759	-597.795	-584.401
AIC	1225.68	1186.96	1225.89	1187.52	1215.59	1184.80
Hausman Test *H_0: RE appropriate* *P-value*	χ^2_4 =15.6 *0.0037****		χ^2_4 =35.0 *0.0000****		χ^2_7 =36.9 *0.000****	

***, **,* indicate 1%, 5% and 10% level of significance

Source: author`s computations

Before interpreting the coefficients, it is necessary to examine the individual fixed and random effects model specifications. The Hausman test conducted suggests rejecting the null hypothesis of the appropriateness of the random effects

model, as the p-value is highly significant at the 1% level of significance, indicating the fixed effects model is the appropriate choice for all models in this context. Furthermore, the log-likelihood and Akaike Information Criterion (AIC) model selection criteria indicate that the spatial Durbin model (SDM) with fixed effects is the most suitable specification for capturing the SADC region's spatial effect outcome is consistent with the results presented in Table 4.

The spatial rho and lambda are statistically significant, indicating spatial dependence in the region. Specifically, the negative and significant rho from the SDM model suggests a competitive process that causes resource outflows between member states. Notably, there is no spatial clustering of similar high or low-value patterns in the SADC region, meaning that the economic growth of one country is not influenced by its neighbours. The interpretation of SDM coefficients differs from that of a simple linear regression model, and the direct and indirect effects presented in Table 6 are used to assess the signs and impacts of the regressors.

Table 6. Direct, Indirect and Total effects for the SAR and SDM models

Direct effect	**SAR**	**SDM**
PDEBT	-0.0007 *(0.920)*	0.0006 *(0.898)*
GEXP	0.0937 *(0.252)*	0.1075 *(0.228)*
TAXR	-0.0231 *(0.595)*	0.0199 *(0.591)*
Indirect effect		
PDEBT	-0.0001 *(0.928)*	-0.0111 *(0.378)*
GEXP	-0.0171 *(0.291)*	-0.0668 *(0.391)*
TAXR	0.0047 *(0.581)*	-0.1641*** *(0.008)*
Total Effect		
PDEBT	-0.0008 *(0.886)*	-0.0118 *(0.342)*
GEXP	0.0766 *(0.255)*	0.0407 *(0.693)*
TAXR	-0.0184 *(0.603)*	-0.1441** *(0.049)*

***, ** denote significance level at 1% and 10% respectively

P-values are in parenthesis

Source: author`s computations

The interpretation will focus solely on the SDM estimates, as the results in Tables 4 and 5 indicate that it is the most parsimonious model specification. However, the results from the SAR model show that the signs of the direct effects align with theoretical expectations. According to the theoretical framework, public debt and tax revenue are expected to negatively impact economic growth, while government expenditure is anticipated to have a stimulative effect on growth.

Direct Effect: In the Spatial Durbin model, the signs of public debt and tax revenue contradict theoretical expectations. The direct impacts of increases in public debt, government expenditure, and tax revenue are not significant, indicating that changes in these variables do not affect economic growth in other member states. The findings on public debt align with previous studies suggesting that only high debt levels harm growth (Reinhart & Rogoff, 2010; Woo & Kumar, 2015; Cecchetti et al., 2011). Overall, fiscal policy appears ineffective in stimulating economic growth for SADC member states, supporting Engen and Skinner (1992), who argue that fiscal policy can stifle growth due to the distortionary effects of taxation and inefficient expenditures.

Indirect Effect: The indirect spillover effect of increasing tax revenue is negative and statistically significant. This suggests that higher tax revenues in neighbouring member states have a detrimental spillover impact on the economic growth of contiguous countries. This finding is counterintuitive, as the a priori expectation would be that a favourable tax shock is a disincentive to investment and employment, thereby negatively affecting economic growth. More precisely, a rise in corporate and personal income taxes could lead to the mobility of firms and labour to neighbouring countries. Therefore, a positive spillover impact was anticipated in contiguous states. The total effect of tax revenues is harmful and is largely driven by the indirect effect.

In contrast, the coefficients for the indirect effects of government expenditures and public debt are statistically insignificant. This suggests that increases in government spending or public indebtedness do not affect the economic growth of neighbouring countries within the SADC region. The absence of indirect spillover effects from positive shocks to government expenditures contradicts expectations, as both positive and negative externalities could arise. However, this outcome can be explained by Tiebout's (1956) hypothesis, which posits that informed and discerning consumers respond to changes in revenue and expenditure, leading to migration patterns that align with their preferences for public goods.

The insignificant result for the indirect spillover effect of government expenditure suggests that such spillovers may be limited by strict controls on access to public goods like healthcare, housing, employment, and business opportunities, despite relatively relaxed migration policies in the region. This can be viewed as a negative externality from positive government expenditure shocks in neighbouring states. The findings align with the view that public goods serve more to redistribute welfare and pool risk rather than stimulate economic growth (Segura, 2017), contrasting with other empirical evidence (Case et al., 1993; Ojede et al., 2018). The insignificant indirect effect of public debt indicates that a member state's debt does not impact the economic growth of its neighbours, reflecting the ambiguous relationship between these variables. Overall, the average indirect effect exceeds the direct effects, suggesting high interconnections among regional economies, where changes in one economy influence its contiguous neighbours (Kopczewska et al., 2017).

Policy Implications: The key finding of this spatial econometric analysis is the revelation of significant spillover effects from tax revenues on the economic growth of neighbouring SADC countries. This underscores the intensifying tax competition dynamic within the region, as countries seek to attract investment and boost their growth by undercutting their neighbours' tax rates. While this strategy may provide short-term benefits for individual countries, the results suggest that it ultimately hinders the overall economic development of the SADC region.

For SADC policymakers, a coordinated regional approach to fiscal policy harmonization is essential. Instead of competing to lower tax rates, member states should collaborate to create a level playing field that fosters equitable and sustainable growth. This could involve regional tax harmonization initiatives, such as establishing minimum corporate and personal income tax rates and coordinating tax incentive schemes to avoid a beggar-thy-neighbour approach. The findings also emphasise the need to boost economic expansion, which directly influences public debt levels, a key concern for policymakers in the post-pandemic recovery. By adopting fiscally responsible policies that stimulate growth, SADC countries can create the fiscal space needed to tackle pressing development challenges and reduce their vulnerability to debt distress.

Beyond tax policy coordination, the spatial spillover effects uncovered in this study also underscore the need for greater regional cooperation in other areas of fiscal policy. For instance, harmonising public expenditure frameworks, aligning budget processes, and sharing best practices on public financial management could help mitigate the adverse cross-border implications of fiscal decisions. This would require stronger institutional mechanisms for policy coordination and information sharing within the SADC. Ultimately, the policy implications of this research emphasise the vital imperative of adopting a regional, collaborative approach to fiscal policymaking in the SADC. By working together to level the playing field, harmonise policies, and capitalise on synergies, member states can harness the power of spatial spillovers to unlock new avenues for shared prosperity and sustainable development.

Conclusion

This study offers valuable insights into the complex relationship between fiscal policy and economic growth in the Southern African Development Community (SADC) region, emphasising the importance of spatial dependencies. Key findings indicate that government expenditures have a positive but statistically insignificant impact on economic growth, suggesting that while infrastructure and social services are essential, their effects are not quantifiable in this context. In contrast, tax revenues negatively and significantly affect economic growth, highlighting the need for coordinated regional tax policies to mitigate adverse cross-border spillover effects.

The analysis reveals strong spatial interdependence in the fiscal policy-growth nexus, indicating that fiscal policies in one member state significantly influence the economic performance of neighbouring countries. This interdependence

underscores the necessity for coordinated fiscal strategies, as uncoordinated approaches can lead to detrimental outcomes, such as aggressive tax competition that undermines regional stability. These results contrast with other studies that found local tax increases deter growth but may benefit contiguous countries (Kopczewska et al., 2017; Goujard, 2013; Ojede et al., 2019). Although these findings are unexpected, they suggest that public services primarily aim to redistribute welfare and pool risks rather than promote economic growth (Segura, 2017).

Moreover, there is no evidence of spatial dependence for public debt in the region, indicating that debt distribution operates independently. The analysis reveals no significant spillover effects from public debt and government expenditures, suggesting that the debt accumulation and spending behaviours of individual countries do not create externalities for other member states due to strategic interactions. These findings carry important policy implications, especially in the context of slow economic growth, spatial dependence, and inter-country interactions. The negative spillover effects associated with tax revenue underscore the need for tax harmonization within the region. Additionally, the presence of spatial dependence in fiscal variables highlights the necessity for coordinated mechanisms to enhance regional integration efforts. Policy harmonization is crucial to mitigate competition arising from differing policies, ultimately aimed at boosting local economies.

This rigorous analysis presents several key policy recommendations for the SADC region. First, it advocates for comprehensive tax harmonization among member states to create a cohesive, integrated economic landscape. Given the interconnectedness of SADC economies, coordinated fiscal policies are vital to mitigate negative spillover effects from tax competition and uncoordinated government spending. Additionally, tailored fiscal policies should be developed to stimulate local economic growth. SADC governments must enhance overall expenditures, focusing strategically on productive investments that promote growth. Such targeted measures will be crucial in alleviating regional public debt burdens. Furthermore, the study emphasises that efforts to control budget deficits should involve simultaneous and coordinated decisions regarding both spending and taxation.

This study provides valuable insights into the relationship between fiscal policy and economic growth within the Southern African Development Community (SADC). However, several limitations should be acknowledged. Firstly, data gaps were encountered, particularly concerning tax revenue figures for several key SADC countries. A multi-pronged approach was employed to address these gaps, including cross-referencing with alternative datasets and extrapolating from the most recent available data. While this methodology aimed to maintain the integrity of the analysis, it may still introduce biases, mainly if the extrapolated data does not accurately reflect the true fiscal conditions of those countries. Secondly, the spatial econometric methods used, while robust, may not fully capture all nuances of the complex fiscal interactions within the region. The assumptions inherent in these

models could potentially overlook local variations or unique country-specific factors that influence economic outcomes.

Future research could build upon this foundation by incorporating more recent data as it becomes available, exploring a broader range of fiscal variables (e.g., deficit financing, public investment), and applying the spatial econometric methodology to other developing regions for comparative analysis. Such extensions would further enhance our understanding of the complex fiscal policy-growth dynamics and their spatial implications, ultimately informing more effective and coordinated policymaking within regional economic communities like the SADC. Overall, this study contributes to the growing body of literature on the spatial aspects of fiscal policy and economic growth, with relevance for policymakers in the SADC region as they navigate the challenges of post-pandemic recovery and long-term sustainable development.

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