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Does Private Investment Granger-Cause Economic Growth in the Presence of Dependencies? Panel Evidence from SADC Countries

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Abstract

This study examines the Granger-causal relationship between private investment and economic growth, accounting for cross-sectional dependencies in a panel of SADC countries from 1990 to 2022. Using disaggregated data and advanced panel econometric methods, including quantile causality tests, we find evidence of bidirectional causality among growth, private investment, foreign direct investment, and domestic credit. However, this relationship is heterogeneous and varies across the conditional distribution of growth. Sensitivity analyses confirm that the results are robust but contingent on institutional factors such as governance and the level of development. The findings suggest that policymakers should adopt integrated strategies that combine investment promotion with institutional and financial development to maximize growth benefits.

Keywords

Private Investment, Economic Growth, Granger Causality

1. Introduction

Does private investment Granger-cause economic growth in the presence of dependencies? How does private investment Granger-cause economic growth in the presence of dependencies? Statistics tell us puzzle stories (e.g., see Acemoglu et al., 2001; Berg et al., 2019; Cavallo & Daude, 2011; Dawson, 1998).

Descriptive statistical analyses show that private investment has mixed effects on GDP growth.

For instance, although during the period 1990-2022, the economic growth is negative for SADC taken as a whole (−1.6%), private investment growth is positive (1.9% growth rate). This trend is observed for DRC with −1.3% for economic growth rate and 2.4% for private investment growth rate. In contrast, the situation is different in Botswana (1.6% economic growth rate), Mauritius (3.2% economic growth rate), Namibia (1.4% economic growth rate), Seychelles (1.4% economic growth rate), South Africa (0.8% economic growth rate) and Zambia (1.2% economic growth rate) with corresponding positive private investment growth rate of 4%; 3.3%; 5.5%; 3.4%; 3.4%; 8.3% respectively. When we analyze the data by decades we get: on the three decades [1991-200], [2001-2010] and [2011-2020] results are unchanged for SADC as a whole; all the growth rates are negative. In the same decades, economic growth rates and private investment growth rates are all positive for Botswana. The two growth rates are mixed for DRC, Mauritius, Namibia, Seychelles, South Africa and Zambia. The above figures are valid at aggregate as well as disaggregate levels, particularly when we disaggregate private investment in domestic credit and foreign domestic investment (FDI).

We now ask the following question: Does private investment Granger-cause economic growth in the presence of dependencies (with a special focus on SADC countries)? To what extent?

This is not the first paper on private investment and economic growth. Acemoglu et al. (2001) and Afonso and Aubyn (2019) dealt with a closely related issue and found some mixed results. Agénor and Neanidis (2015), Aschauer (1989a), and Bahal et al. (2018) found some conflicting results on a closely related issue.

The main objective of the current paper is to analyze the link from private investment to economic growth in the presence of dependencies. There are three specific objectives. The first is to determine the nature of the link from private investment to economic growth in the presence of dependencies. The second is to test the causal relationship from private investment to economic growth in the presence of dependencies based on aggregate data. The third is to assess the same causal link using disaggregate data. Related hypotheses are:

i) There is no link from private investment to economic growth in the presence of dependencies;

ii) There is no causal link from private investment to economic growth in the presence of dependencies at aggregate level;

iii) There is no causal link from private investment to economic growth in the presence of dependencies at disaggregate level.

The contributions of the current paper are fourth fold: i) we investigate the causal link between private investment and economic growth using SADC data in the presence of dependencies; ii) the investigation is done at aggregate as well as disaggregate levels; iii) we use new panel data econometric methods to investigate the causal link in the presence of dependencies; iv) we conduct some sensitivity analyses to examine how some uncertainties can affect our results.

The remainder of the paper is as follows: in Section 2, we briefly review existing literature. Section 3 lays out the econometric method employed. A description of data and preliminary analyses is presented in Section 4, while econometrics results are reported and discussed in Section 5. Section 6 is devoted to sensitivity analyses. Section 7 concludes the paper.

2. Related Literature Review

The link between private investment and economic growth has been investigated by many researchers since the 1970s. For instance, Buiter (1977) found the existence of a complementary relationship between public and private investment, and a probable link between the composition of public investment productivity growth. Aschauer (1989a, 1989b) indicates that public investment policy affects capital accumulation and thereby economic growth. These findings were further supported by Munnell (1990), Khan and Reinhart (1990), and Greene and Villanueva (1991).

Erenburg (1993) obtained a statistically significant inverse relationship between private investment activity and public investment flow but a direct relationship with public capital stock. Erenburg and Wohar (1995) studied the causal linkage among private investment and public capital stock and government investment spending. They found that there is a feedback effect between public and private investment rather than a unidirectional causality. However, Voss (2002) examined private and public investment by employing an unstructured vector autoregression (VAR) model and found a conflicting result that there is no "crowding in" effect due to complementarities between public and private investment. Erden and Holcombe (2005) investigated the relationship between public and private investment by applying an investment model to panel data of developed and developing countries. Their result revealed that public investment crowds in private investment in developing countries while crowding out private investment in developed countries.

Ari et al. (2019) analyzed the nonlinear relationship between public and private investment for the hydrocarbon-based rentier states in the case study of GCC countries. They illustrated that public investment leads to private investment in those countries because of the lack of economic diversification. Afonso and St. Aubyn (2019) investigated the economic growth effects of public and private investment in seventeen OECD countries by a linear VAR analysis. They found that public investment crowded-in economic growth in many countries and crowded-out in Japan, UK, Canada, Sweden, and Finland. Besides, they showed that private investment induced a positive growth path in all sample countries. While a substantial body of literature examines the public-private investment nexus, a distinct strand directly investigates the causal relationship between private investment—both in aggregate and its components (FDI and domestic credit)—and economic growth. For instance, studies on developing regions often find a bidirectional causality, suggesting that growth fosters an environment conducive to private capital formation, which in turn fuels further expansion (Ben Addallah & Meddeb, 2001;

Durham, 2004). However, this relationship is not uniform and can be contingent on factors such as financial market depth and institutional quality (Levine & Zervos, 1998; Alfaro et al., 2004). Crucially, there is a scarcity of evidence applying advanced panel causality tests that account for cross-sectional dependencies—a common feature in regional blocs like SADC—to this specific question. This paper aims to fill this gap by directly testing the private investment-growth causal link within such a framework.

In summary, many studies in the literature have investigated the interrelations among economic growth and private investment with various methods such as embedding these variables into production function, employing various investment models, and performing causality tests. However, there are still gaps in the literature. For instance, almost nothing is known about this issue for developing countries, particularly SADC countries in particular in the presence of dependencies. Also, recent advanced in causality testing have not recent attention in most papers. Finally, for reliable conclusions, sensitivity analyses should be conducted as a final stage to validate causality results. There is an attempt to fill these gaps in the current paper.

3. Econometric Methodology

We begin by checking the time series properties.

3.1. Unit Roots Tests

We used the pth order augmented Dickey Fuller regression model described as,

$$\Delta q_{it} = a_i + b_i q_{i,t-1} + c_i t + \sum_{j=1}^{p} d_{ij} \Delta q_{i,t-j} + u_{it} \tag{1}$$

where q_{it} in this case is the logarithm of real GDP capita or real private investment per capita; u_{it} are errors; we assume that they have a single factor structure, where the idiosyncratic component follows a spatial autoregressive process. The unit root test hypothesis is,

$$H_0 : b_i = 0, \quad i = 1, \cdots, N \tag{2}$$

$$H_1 : \quad b_i < 0;\ i = 1, \cdots, N_1; \quad b_i = 0, i = N_1 + 1, \cdots, N \tag{3}$$

where N_1 is such that N_1/N is nonzero and tends to a fixed constant as N goes to infinity. In addition, Pesaran (2007) introduced a direct and easier method, the cross sectionally augmented Dickey-Fuller (CADF) test that focuses on the issue of cross sectional dependence that arises due to the common factor. This method relies on the usual ADF regression, augmented with the lagged cross sectional mean and its first difference $\bar{q}_{t-1}$ and $\Delta \bar{q}_{t-j}$ for $j = 0, \cdots, p$. The CADF test is specified as,

$$\Delta q_{it} = a_i + b_i q_{i,t-1} + c_i t + \sum_{j=1}^{p} d_{ij} \Delta q_{i,t-j} + g_i' \bar{z}_t + e_{it} \tag{4}$$

where $\bar{z}_t = \left(\bar{q}_{t-1}, \Delta \bar{q}_t, \Delta \bar{q}_{t-1}, \cdots, \Delta \bar{q}_{t-p} \right)'$. Pesaran (2007) endeavors to test (2) against (3) by computing the simple average of the t-ratios of the OLS estimates of b_i in Eq. (3), i.e.

$$\text{CIPS} = \frac{1}{N}\sum_{i=1}^{N}\tilde{t}_i \tag{5}$$

where $\tilde{t}_i$ is the OLS t-ratio of b_i. The CADF and the CIPS tests have reasonable size and power for small samples of N and T.

3.2. Cross Section Dependence Tests

The CIPS test is based on the fact that u_{it} follows a single factor structure. Therefore, cross section dependence test for the data is one of the necessary steps. In addition, using only one global shock might not be enough to correct for correlation in the data; thus, we also use the following average pairwise correlation coefficient,

$$\bar{\rho}_{AVPC} = \frac{2}{N(N-1)}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\rho_{ij} \tag{6}$$

where ρ_{ij} is given by,

$$\rho_{ij} = \frac{\sum_{t=1}^{T} q_{it} q_{jt}}{\left(\sum_{t=1}^{T} q_{it}^2\right)^{1/2}\left(\sum_{t=1}^{T} q_{jt}^2\right)^{1/2}} \tag{7}$$

Two diagnostic tests for cross section dependence, based on the above pairwise correlation coefficients can be obtained. The CD_p test, developed by Pesaran (2004) which is described as,

$$CD_p = \sqrt{\frac{1}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\rho_{ij} \tag{8}$$

And the CD_{LM} test which is an LM test. Its statistic is,

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\rho_{ij}^2 - 1\right) \tag{9}$$

Under the null hypothesis of no cross section dependence, the $CD_p \to N(0,1)$ for $N,T \to \infty$ in any order; and $CD_{LM} \to N(0,1)$ with $N,T \to \infty$. Note that, while the CD_p uses the pairwise correlation coefficients, the CD_{LM} rather uses their squares. This leaves open the possibility of the CD_p test to yield misleading results in particular when the cross correlations coefficient have values that range from negative to positive. On the other hand, the CD_{LM} is likely to exhibit some size distortions for large N and small T (see, Frees, 1995).

We also tested for spatial correlation, controlling for long-range dependence represented by the common factors structure. That is, we compute the following Moran's I test statistic (e.g., see Kelejian & Prucha, 2001),

$$I = \frac{1}{T}\sum_{t=1}^{T}\frac{\sum_{t=1}^{N}\sum_{j=1}^{N} w_{ij}\hat{e}_{it}\hat{e}_{ij}}{s_t^2\sum_{t=1}^{N}\sum_{j=1}^{N} w_{ij}} \quad (10)$$

where $s_t^2 = \frac{1}{N}\sum_{t=1}^{N}\left(\hat{e}_{it} - \overline{e}_t\right)^2$ and $w_{i,j}; i, j = 1,\cdots,N$ are spatial weights. This statistic is asymptotically normally distributed and tends to infinity for fixed T. Moran's I explores information on the spatial ordering of the data and takes into account the proximity of countries; a measure of local cross section dependence (e.g., see, Baltagi & Moscone, 2010). Furthermore, since the Moran's I test is parametric, we complement it with the Mantel test which is semiparametric (e.g., see Sokal & Rohlf, 1995).

3.3. Westerlund Co-Integration Panel Test

The model used by Westerlund (2007) is described as,

$$\begin{aligned}\Delta y_{it} = {} & c_i + a_{i1}\Delta y_{1,t-1} + \cdots + a_{ip}\Delta y_{1,t-p} + b_{i0}\Delta x_{1t} + b_{i1}\Delta x_{1,t-1} + \cdots + b_{ip}\Delta x_{1,t-p} \\ & + a_i\left(y_{i,t-1} - b_1\Delta x_{i,t-1}\right) + \mu_{it}\end{aligned} \quad (11)$$

Westerlund (2007) introduced four different co-integration tests that were an extension of Banerjee et al. (1998) using the Fisher effect. These tests are based on structural dynamics; all variables should be $I(1)$ series. The four tests (G_a, G_t, P_a and P_t) are based on the error correction model (ECM); the first test G_a and G_t statistics test H_0: $a_i = 0$ for all i versus H_1: $a_i < 0$ for at least one of the series; the other tests P_a and P_t statistics test H_0: $a_i = 0$ for all i versus H_1: $a_i < 0$ for all cross-section units for the following ECM model (e.g., see Westerlund, 2007).

G_t and P_t tests are obtained with the standard errors of a_i by a standard way, while G_a and P_a used the Newey and West's (1994) standard errors. These four tests are used to examine whether the co-integration relationship in a panel data is present or not by determining whether ECT (Error Correction Term) is present for all panel individuals or only for some individuals (e.g., see Westerlund, 2007).

3.4. Dumitrescu-Hurlin Causality Panel Test

Dumitrescu and Hurlin (2012) developed a panel causality test. The procedure is based on the following regression model,

$$y_{i,t} = a_i + \sum_{k=1}^{K} a_{ik} y_{i,t-k} + \sum_{k=1}^{K} b_{ik} x_{i,t-k} + v_{i,t};\quad i = 1,\cdots,N \text{ and } t = 1,\cdots,T \quad (12)$$

where $x_{i,t}$ and $y_{i,t}$ are the observations of two stationary variables for individual i in period t. Coefficients are allowed to differ across individuals but are assumed to be time-invariant. The panel is assumed to be balanced. The existence of causality is tested by,

$$H_0: b_{i1} = \cdots = b_{iK} = 0,\quad \forall i = 1,\cdots,N \quad (13)$$

(absence of causality for all individuals in the panel). There could be causality for some individuals but not necessarily for all. Thus, the alternative hypothesis is,

$$H_1: \begin{cases} b_{i1} = \cdots = b_{iK} = 0, & \forall i = 1, \cdots, N_1 \\ b_{i1} \neq 0 \text{ or } \cdots \text{ or } b_{iK} \neq 0, & \forall i = N_1 + 1, \cdots, N \end{cases} \tag{14}$$

where $N_1 \in [0, N-1]$ is unknown. If $N_1 = 0$, there is causality for all individuals in the panel. We have $N_1 < N$; otherwise, there is no causality for all individuals, and H_1 reduces to H_0.

To perform the test, Dumitrescu and Hurlin (2012) propose the following procedure: run the N individual regressions implicitly enclosed in (12); then perform F tests of the K linear hypotheses, $b_{i1} = \cdots = b_{iK} = 0$ to retrieve the individual Wald statistic W_i and finally get the average Wald statistic $\bar{W}$,

$$\bar{W} = \frac{1}{N}\sum_{i=1}^{N} W_i \tag{15}$$

In case the Wald statistic W_i are iid across individuals, it can be shown that,

$$\bar{Z} = \sqrt{\frac{N}{2K}} \times \left(\bar{W} - K\right) \xrightarrow[T,N\to\infty]{d} N(0,1) \tag{16}$$

Also, for a fixed T dimension with $T > 5 + 3K$,

$$\tilde{Z} = \sqrt{\frac{N}{2K} \times \frac{(T-3K-5)}{(T-2K-3)}} \times \left(\frac{(T-3K-3)}{(T-3K-1)} \times \bar{W} - K\right) \xrightarrow[N\to\infty]{d} N(0,1) \tag{17}$$

The testing procedure of the null hypothesis in (13) is finally based on $\bar{Z}$ and $\tilde{Z}$.

3.5. Testing for Non-Causality with Cross Sectional Dependencies

We now consider a more complex causality testing procedure based on the following model,

$$x_{i,t} = \delta_{i,0} + \sum_{p=1}^{P} \delta_{i,p} x_{i,t-p} + \eta_{i,t} \tag{18}$$

$$y_{i,t} = \theta_{i,0} + \sum_{p=1}^{P} \theta_{i,p} y_{i,t-p} + \sum_{p=1}^{P} \beta_{i,p} x_{i,t-p} + \varepsilon_{i,t} \tag{19}$$

where P is the time lag order, and δ, η and β are coefficients. The assumptions about the coefficient vectors, δ, η and β depend on the hypotheses made about the type of causality to deal with. In the current approach, we take a different route compared to that of Dumitrescu and Hurlin (2012). In particular, we assume that there are interactions between the innovation processes and these need to be accounted for. Therefore, we consider a new approach that relies on a *p*-value aggregation idea for high dimensional regression.

3.5.1. A *p* Value Aggregation Method from High-Dimensional Regression

The setup is based on the model defined by Meinhausen et al. (2009). Let Z be an n-dimensional response vector and W a $n \times k$ dimensional design matrix such that,

$$Z = Wb + \tau \tag{20}$$

with τ being an iid n-dimensional random vector with $\tau_i \sim N\left(0, \sigma^2\right)$ for some $\sigma^2 > 0$ and $b \in \mathbb{R}^k$. Meinhausen et al. (2009) and Dezeure et al. (2015) consider the following problem: find all j such that $b_j > 0$. Assign *p*-values for the null hypotheses,

$$H_{0,j} : b_j = 0 \tag{21}$$

3.5.2. Quantile *p*-Value Panel Adjustment (QPPA)

The QPPA test here differs from that of Dumitrescu and Hurlin (2012). It is based on an aggregate *p*-value of different bootstrap samples. The QPPA relies on two steps:

Step 1: Individual *p*-values

Compute a *p*-value for every member of the panel. This first step is similar to that of Dumitrescu and Hurlin (2012). Then, we apply Granger Non-Causality test to each individual panel member, and we use a Wald statistic to test for the presence of Granger causality. Corresponding to these statistics, we obtain an asymptotically correct *p*-value $p_{X \to Y}^{(i)}$ for each panel member. For instance, an F-statistic can be used to calculate the corresponding *p*-values.

Step 2: Aggregate *p*-values

We can now aggregate the computed *p*-values as follows. For $\gamma \in (0,1)$, we can define,

$$Q_{X \to Y}(\gamma) := \min\left\{1, emp.\gamma\text{-}quantile\left\{ p_{X \to Y}^{(i)} \middle| \gamma; i = 1, \cdots, N \right\}\right\} \tag{22}$$

$Q_{X \to Y}(\gamma)$ is an asymptotically correct *p*-value, i.e.,

$$\limsup_{T \to \infty} P\left(Q_{X \to Y}(\gamma) \le \alpha\right) \le \alpha \tag{23}$$

where T denotes the number of timestamps.

This test is particularly well-suited for detecting causal relationships that may exist in the tails of the distribution (e.g., during severe recessions or expansions) but not in the center. The results of this procedure are reported in Section 5 under the heading "Granger causality test with quantiles".

4. Data and Preliminary Analyses

4.1. The Data

The empirical analysis is based on panel data for 11 SADC member countries for the period 1990 to 2022, obtained from the International Monetary Fund's investment and capital stock dataset (2021) and development indicators in the World Bank database (2022). The definition of the variables can be found in **Table 1**:

Table 1. Variable description.

Variables	Variable description
Growth	GDP per capita, PPP (constant 2017 international dollars)
Private investment	Private investment (gross fixed capital formation), in billions of constant 2017 international dollars.
Domestic credit	Domestic credit to private sector (% of GDP)
FDI	Foreign direct investment, net inflows (% of GDP)
List of 11 SADC countries included in the Panel:	Bostwana, Eswatini, DRC, Madagascar, Mauritius, Seychelles, South Africa, Tanzania

4.2. Preliminary Analysis

We performed some preliminary tests, including cross-sectional dependence tests. Indeed, to avoid shock transitions between countries in our panel data sample, it is important to carry out these tests. To test for cross-sectional dependence in our data, we used the Breusch.

Pagan LM test, the Pesaran CD test, and the Friedman test. The Pesaran CD test is the most important of the tests proposed by Pesaran (2004), which is based on the average of the pairwise correlation coefficients on the residuals of the ordinary least squares of the individual country regressions in the full sample.

Table 2 above shows the results of the three tests, and it is clearly established that both variables suffer from cross-sectional dependence depending on the rejection of the null hypothesis. In other words, there is a cross-sectional correlation between pairs of countries. This is valid for aggregate as well as disaggregate data. These results suggest that the correlation between pairs of countries be taken into account in order to avoid biased results.

Table 2. Cross-sectional dependence test.

Tests	Breusch Pagan LM		Pesaran CD		Friedman test	
	Stat	Prob	Stat	Prob	Stat	Prob
Growth	155.200	0.000	13.180	0.000	22.872	0.000
Private investment	306.353	0.000	13.350	0.000	8.021	0.000
Domestic credit	129.166	0.000	18.060	0.000	26.163	0.000
Fdi	90.910	0.000	5.640	0.000	53.981	0.000

Table 3 reports the results of the average pairwise correlation coefficient tests between the variables. The comparison between off-diagonal values indicates that the correlation between private investment and growth is greater than that between growth and FDI.

Table 3. Average pairwise correlation matrix.

	Growth	Private investment	Domestic credit	FDI
Growth	1.000			
Private investment	0.305	1.000		
Domestic credit	0.733	0.757	1.000	
FDI	−0.012	−0.138	−0.118	1.000

5. Results and Discussion

In Table 4 we report the results of the Cross-Sectionally Augmented IPS (CIPS) unit root test (e.g., see Pesaran, 2007), a method used to detect the presence of roots in panel data where cross sections may be correlated, for growth, private investment, domestic credit to private sector and the FDI (domestic credit and FDI are used as disaggregated data representing private investment) for lags 0, 1, 2 and 3. The inclusion of lags allows us to control for possible serial correlation in the data. The variables are non-stationary with the intercept, as well as with the intercept and linear trend in CADF regression.

Table 4. CIPS panel units roots tests.

	CADF(0)	CADF(1)	CADF(2)	CADF(3)
With intercept only				
Growth	−2.999[a]	−2.292[c]	−2.403[b]	−2.139
Private investment	−1.766	−2.399[b]	−2.429[b]	−2.473[b]
Domestic credit	−4.394[a]	−3.079[a]	−2.397[b]	−2.054
FDI	−1.717	−2.014	−1.730	−2.052
With intercept only and linear trend				
Growth	−3.229[a]	−2.350	−1.912	−1.947
Private investment	−1.870	−2.443	−2.440	−2.303
Domestic credit	−4.705[a]	−3.331[a]	−2.633	−2.295
FDI	−2.114	−2.422	−2.033	−2.569

Notes: [a] and [b] indicate statistical significance at 1 and 5 percent levels of significance, respectively.

Detection of cross-sectional dependence in the residuals of a CADF regression before and after controlling for common factors can be done using several tests. The results of some of these statistics are given in Table 5. In case A of Table 5, the cross-sectional dependence test is based on the residuals $\hat{u}_{it}$ while in case B, the residuals $\hat{e}_{it}$ have been defactored. Moreover, in case A, the reported CD statistics are derived from the residuals,

$$\hat{u}_{it} = \Delta q_{it} - \hat{\alpha}_i - \hat{b}_i q_{i,t-1} - \hat{c}_i t - \sum_{j=1}^{p} \hat{d}_{ij} \Delta q_{i,t-1} \quad (24)$$

while in case B the residuals used are defactored, i.e.,

$$\hat{e}_{it} = \Delta q_{it} - \hat{\alpha}_i - \hat{b}_i q_{i,t-1} - \hat{c}_i t - \sum_{j=1}^{p} \hat{d}_{ij} \Delta q_{i,t-1} - \hat{g}_i \bar{z}_t \quad (25)$$

Table 5 also shows that when comparing cases A and B, most CD statistics show a significant reduction in the level of dependency. The average even correlation coefficient varies from around 20% for growth, 30% for private investment, 16% for foreign private investment and 3% for domestic credit to almost 0% respectively. This implies that the inclusion of the mean $\bar{z}_t$ could have solved the problem. This suggests the effectiveness of CIPS in correcting the dependence between units. We calculated the Moran'I statistic on the residuals. This statistic confirms the presence of a spatial correlation both in the residuals of growth, private investment, domestic credit and incoming foreign direct investment, controlling for common factors.

Table 5. Cross section dependence in residuals from CADF regression.

	CADF(0)	CADF(1)	CADF(2)	CADF(3)
Case A: use of $\hat{u}_{it}$				
$\hat{\rho}_{AVPC}$				
Growth	0.173	0.109	0.317	0.264
Private investment	0.381	0.325	0.291	0.275
FDI	−0.165	0.178	0.168	0.146
Domestic credit	0.066	0.055	0.013	0.022
CD_P				
Growth	11.930	11.740	11.600	11.190
Private investment	1.490	2.030	1.840	1.690
FDI	1.630	0.630	0.500	0.460
Domestic credit	2.910	3.360	3.200	3.310
CD_{LM}				
Growth	11.900	11.530	12.490	12.140
Private investment	3.322	2.807	2.756	3.313
FDI	1.078	0.644	0.457	0.086
Domestic credit	3.380	3.452	3.280	2.764
Case B: use of $\hat{e}_{it}$				

Continued

$\hat{\rho}_{AVPC}$				
Growth	−0.039	−0.010	−0.020	−0.005
Private investment	−0.008	−0.007	−0.076	−0.004
FDI	−0.075	−0.022	−0.067	−0.006
Domestic credit	−0.071	−0.074	−0.041	−0.041
CD_P				
Growth	−1.900	−0.670	−1.010	−0.840
Private investment	−0.200	−0.130	−0.230	−0.840
FDI	−0.590	−0.560	−0.350	−0.270
Domestic credit	−1.590	−0.760	−0.690	−0.330
CD_{LM}				
Growth	12.000	8.984	13.510	11.770
Private investment	2.703	1.270	1.549	3.338
FDI	1.218	0.736	0.496	0.131
Domestic credit	3.507	2.782	2.597	2.459
Moran				
Growth	−0.004	−0.005	−0.002	−0.003
Private investment	−0.003	−0.006	−0.008	−0.009
FDI	−0.004	−0.000	−0.000	−0.000
Domestic credit	−0.004	−0.001	−0.002	−0.002
Standardized Moran				
Growth	−0.005	−0.007	−0.002	0.005
Private investment	−0.002	−0.004	−0.005	−0.005
FDI	−0.009	−0.000	−0.000	−0.000
Domestic credit	−0.009	−0.004	−0.004	−0.004

Case B also shows Moran's I statistic and its standardized version on the error term that checks for the presence of geographical concentration, both in the residuals of GDP growth, private investment, FDI and domestic credit, controlling for common factors. The results indicate significant amount of geographical concentration—existence of spatial correlation—in the former, compared to the latter. This is consistent with our earlier tests for the presence of geographical concentration in the above-mentioned variables.

We note the presence of cross-sectional dependence in the series and confirm the absence of cross-sectional dependence in first difference from the unit root tests. We then carry out the Westerlund test (2007) to test the co-integration between the variables. The and tests examine alternative hypotheses that at least one unit is cointegrated, and the and tests examine alternative hypotheses that the panel is cointegrated as a whole. The results in **Table 6** show that there is no long-term relationship between the variables either for the normal probability value or for the robust probability value with 1000 replications at the 5% level of significance.

Table 6. Westerlund co-integration test.

Test	Statistic	Z-value	Probability	Robust *p*-value
G_t	−1.371	0.935	0.825	0.340
G_a	−2.685	2.321	0.990	0.227
P_t	−3.023	0.536	0.704	0.073
P_a	−2.497	0.794	0.786	0.833

Note: Here the computation of a robust *p*-value is based on confidence distribution.

The results of the Dumitrescu and Hurlin (2012) test in **Table 7** reveal that growth is driven homogeneously by private investment, foreign direct investment (FDI) and domestic credit at the 5% level of significance by a bidirectional relationship. This result is supported by economic theory (Keynes' theory of economic cycles, endogenous growth models) (e.g., see Romer, 1998; Lucas, 1988), the Solow-Swan model, Borensztein, 1998, etc.) and by empirical studies (e.g., see Ben Addallah & Meddeb, 2001; Durham, 2004; Alfaro et al., 2004).

Table 7. Dumitrescu Hurlin causality test.

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	20.002	7.335	0.000	0.577	0.563	9
Private investment does not cause Growth	6.346	2.346	0.018	1.460	0.144	4
Growth does not cause FDI	2.754	3.508	0.013	2.955	0.131	1
FDI does not cause Growth	102.710	62.473	0.000	10.127	0.000	9
Domestic credit does not cause Growth	55.397	30.931	0.000	4.664	0.000	9
Growth does not cause Domestic credit	16.659	5.106	0.000	0.191	0.848	9

Do the previous causality results remain unchanged in the quantiles? To investigate this question, we conduct some panel quantile causality tests (e.g., see Meinshausen et al., 2009; Dezeure et al., 2015). To investigate whether the causality structure varies across different states of the economy (e.g., recessions vs. booms), we employ a panel quantile Granger causality test. This test is implemented using the Quantile *p*-value Panel Adjustment (QPPA) procedure described in Section 3.5. This method allows us to test for non-causality at different points (quantiles) of the conditional distribution of economic growth, providing a more nuanced view than the mean-based Dumitrescu-Hurlin test. Results are reported in Table 8. It should be noted that except in very small cases, causality results from private investment to economic growth remain valid.

Table 8. Granger causality test with quantiles.

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	4933.555	0.000	NA	NA	NA	NA
Private investment does not cause Growth	NA	NA	0.170	0.679	NA	NA
Growth does not cause FDI	1351.600	0.000	NA	NA	NA	NA
FDI does not cause Growth	NA	NA	13.647	0.000	58.283	0.000
Domestic credit does not cause Growth	NA	NA	NA	NA	761.816	0.000
Growth does not cause Domestic credit	12.960	0.000	68.452	0.000	NA	NA

Granger causality in the context of quantiles, often called "quantile Granger causality', is an extension of the traditional Granger method that allows one to examine causal relationships at different points in the conditional distribution of the dependent variable, rather than focusing solely on the mean. This is particularly useful in situations where causal effects may differ across quantiles (e.g., at the extremes of the distribution).

When you apply Granger causality to quantiles in a panel data setting, you combine the advantages of conditional distribution analysis (using quantiles) with those of panel data analysis (which incorporates both time and individual variation). The Granger causality test, obtained using the likelihood ratio test statistic which is calculated manually by comparing the sums of squares of the residuals of the two models i.e. the restricted model and the full model, indicates that there is a unidirectional causal relationship between growth, private investment, foreign direct investment and domestic credit at the 1% threshold for the 0.1 quantile. But this relationship is only maintained between growth, foreign direct investment and domestic credit at the 1% threshold for the 0.1 and 0.9 quantiles.

6. Sensitivity Analysis

We now investigate several issues that may affect our causal results.

6.1. Does the Period of Analysis Matter?

How does the period of analysis affect our causal results? To examine this question, we split the data sample in two sub periods: first sub period [1990-2005];

second sub-period [2006-2022]. We then compare the fit of the two sub-models, each estimated on a different sub-sample of the data. Results indicate that:

Using the sub-period 1990 to 2005, we still observe a causal relationship between the different variables. This causality is bidirectional between domestic credit and growth. On the other hand, it is unidirectional between growth and the other variables. In other words, private investment and foreign direct investment have an impact on growth. Significantly identical results are obtained using the period 1990 to 2022. This may be an indication that the two sets of data clearly lead to the same conclusions (Table 9).

Table 9. Dumitrescu Hurlin causality test (1990-2005).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	7.110	12.220	0.000	8.400	0.000	1
Private investment does not cause Growth	4.608	1.857	0.063	0.044	0.964	3
Growth does not cause FDI	1.740	1.481	0.138	0.768	0.442	1
FDI does not cause Growth	4.730	1.998	0.045	0.095	0.924	3
Domestic credit does not cause Growth	11.779	10.137	0.000	2.995	0.002	1
Growth does not cause Domestic credit	6.206	3.702	0.000	0.702	0.482	3

When we use quantiles, the causal relationship is unidirectional between growth and domestic credit at the 1% threshold for quantiles 0.1 and 0.5. For quantiles 0.9 this relationship is only established between growth and foreign direct investment, which does not fully confirm the previous results over the same period (Table 10).

Table 10. Granger causality test with quantiles (1990-2005).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	NA	NA	NA	NA
Private investment does not cause Growth	NA	NA	0.490	0.483	NA	NA
Growth does not cause FDI	NA	NA	NA	NA	NA	NA
FDI does not cause Growth	0.018	0.890	1.870	0.171	73.480	0.000
Domestic credit does not cause Growth	NA	NA	NA	NA	NA	NA
Growth does not cause Domestic credit	7.920	0.004	28.965	0.000	NA	NA

The estimation results on the sample from 2006 to 2022 confirm the causal relationship in both directions between growth and private investment and between growth and domestic credit and a unidirectional relationship between growth and foreign direct investment. The same results are substantially obtained using the period from 1990 to 2022. Once again, the two datasets have a clear and identical message (Table 11).

Table 11. Dumitrescu Hurlin causality test (2006-2022).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	10.126	8.228	0.000	2.993	0.002	3
Private investment does not cause Growth	11.087	9.338	0.000	3.478	0.000	3
Growth does not cause FDI	6.231	10.462	0.000	7.400	0.000	1
FDI does not cause Growth	1.043	0.087	0.930	−0.202	0.839	1
Domestic credit does not cause Growth	4.215	3.132	0.001	1.502	0.132	2
Growth does not cause Domestic credit	4.161	6.322	0.000	4.366	0.000	1

The consistency of the results over the two sub-periods may indicate that private investment, domestic credit and foreign direct investment may be a prerequisite for growth (OCDE, 2005). But also that growth may also attract more foreign direct investment by the fact that it constitutes a strong signal for foreign investors because of the market it creates (Asiedu, 2002), favoring private investment as well as domestic credit (Table 12).

Table 12. Granger causality test with quantiles (1990-2005).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	NA	NA	NA	NA
Private investment does not cause Growth	1.565	0.210	2.991	0.083	NA	NA
Growth does not cause FDI	570.985	0.000	586.986	0.000	NA	NA
FDI does not cause Growth	13.478	0.000	3.921	0.047	74.525	0.000
Domestic credit does not cause Growth	NA	NA	3686.363	0.000	5115.942	0.000
Growth does not cause Domestic credit	13.611	0.000	NA	NA	26.812	0.000

The causality test with quantiles confirms the results only of causality between growth, foreign direct investment and domestic credit whatever the quantiles chosen.

6.2. Does Governance Matter?

How does governance issues affect our results? The Worldwide Governance Indicators (WGI) feature six aggregate governance indicators for over 200 countries and territories over the period 1996-2022: i) Voice and accountability; ii) political stability and absence of violence/terrorism; iii) government effectiveness; iv) regulatory quality; v) rule of law; and vi) control of corruption.

For SADC as developing countries, political stability and absence of violence/terrorism; and control of corruption seem to be very relevant and appealing. We now re-investigate causal relationships under these prisms. Political stable and less corrupt SADC countries are: [Botswana, Mauritius, Seychelles, South Africa]. Political unstable and relatively corrupt SADC countries are: [DRC, Eswatini, Madagascar, Tanzania]. Results obtained can be summarized as follows:

The models were re-estimated based on these two new classifications of political regimes. Therefore, focusing on the type of political stability and their effects. Re-estimating the models, we observed the following:

The Dumitrescu-Hurlin causality test reveals that the institutional context significantly modifies the nature of the causal links. In politically stable and less corrupt countries (**Table 13**), we find strong evidence that domestic credit Granger-causes growth, but we cannot reject the null hypothesis of no causality from private investment to growth at conventional significance levels (*p*-value 0.180). In contrast, in unstable and more corrupt regimes (**Table 14**), a strong bidirectional causality is evident between growth and private investment. Furthermore, the causality from FDI to growth, which is absent in stable countries, becomes highly significant in unstable environments. These findings suggest that in settings with weaker institutions, the growth process is more tightly and mutually linked with fluctuations in private investment and external capital flows, whereas in stable settings, the financial sector (domestic credit) plays a more distinct leading role (**Tables 13-15**).

Table 13. Political stable and less corrupt.

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	24.229	7.179	0.000	0.753	0.451	9
Private investment does not cause Growth	1.948	1.340	0.180	1.087	0.276	1
Growth does not cause FDI	2.474	2.085	0.037	1.742	0.081	1
FDI does not cause Growth	0.279	−1.019	0.308	−0.988	0.322	1
Domestic credit does not cause Growth	87.896	37.192	0.000	5.952	0.000	9
Growth does not cause Domestic credit	18.018	5.009	0.000	1.473	0.140	8

Table 14. Dumitrescu Hurlin causality test (2006-2022).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	25.076	9.662	0.000	4.779	0.000	7
Private investment does not cause Growth	7.204	8.773	0.000	7.626	0.000	1
Growth does not cause FDI	34.362	11.956	0.000	1.581	0.113	9

Continued

FDI does not cause Growth	199.477	89.792	0.000	15.062	0.000	9
Domestic credit does not cause Growth	23.898	7.023	0.000	0.726	0.467	9
Growth does not cause Domestic credit	12.572	1.684	0.092	−0.198	0.842	9

The causal relationship confirms the causal relationship for quantiles 0.5 and 0.9. But does not confirm the relationship between growth and private investment (Table 15).

Table 15. Granger causality test with quantiles (Political stable and less corrupt).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	97.712	0.000	1841.826	0.000
Private investment does not cause Growth	1.580	0.208	0.791	0.373	NA	NA
Growth does not cause FDI	NA	NA	NA	NA	NA	NA
FDI does not cause Growth	22.483	0.000	10.255	0.001	NA	NA
Domestic credit does not cause Growth	NA	NA	1296.896	0.000	692.814	0.000
Growth does not cause Domestic credit	NA	NA	1.930	0.164	93.327	0.000

The causal relationship, for unstable policies, is established only between growth and private investment for the 0.5 quantile at the 1% threshold and between growth and foreign direct investment in both directions (Table 16).

Table 16. Granger causality test with quantiles (Political unstable and relatively corrupt).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	68.927	0.000	NA	NA
Private investment does not cause Growth	NA	NA	0.339	0.560	NA	NA
Growth does not cause FDI	NA	NA	NA	NA	NA	NA
FDI does not cause Growth	23.803	0.000	NA	NA	138.037	0.000
Domestic credit does not cause Growth	1332.047	0.000	NA	NA	473.814	0.000
Growth does not cause Domestic credit	NA	NA	NA	NA	0.719	0.396

6.3. Does the Type of "Democratic" Regime Matter?

How does the type of "democratic" regime matter? We check the robustness of the results according to the political regime in place. Of course, we are not expecting full democracies in SADC as it is conceived in the US or Europe. At the best, we can have flawed democracies where elections are fair and free and basic civil liberties are honoured but may have issues (e.g., media freedom infringement). These nations experienced significant flaws in other democratic aspects such as underdeveloped political culture, low levels of participation in politics, and issues in the functioning of governance. Within SADC, we have Panel A: [Botswana, Mauritius, Seychelles, South Africa and Tanzania] are strong representatives. The second group of countries can be called "authoritanian regimes". The key feature here is that political pluralism has vanished or is extremely limited. These nations are more or less absolute monarchies or dictatorships. Of course, these countries may have some conventional institutions of democracy for distraction but with meager significance, infringements and abuses of civil liberties are commonplace, elections (if they take place) are not fair and free, the media is often state-owned or controlled by groups associated with the ruling regime, the judiciary is not independent, and they are characterised by the presence of omnipresent censorship and suppression of governmental criticism. Authoritarian regimes in SADC are composed of Panel B: DRC, Eswatini and Madagascar to quote a few.

Based on those two panels "Panel A: flawed democratic regimes" and "Panel B: authoritarian regimes', we re-estimate our causal relationships and compare the results. These results can be summarized as follows:

The initial models are then reestimated based on the new classifications. For panel A with "middle-income countries', the Dumitrescu Hurlin test confirms the results obtained for the total sample. As for panel B, the causality is unidirectional between growth, private investment and foreign direct investment, but bidirectional for domestic consumption (Table 17, Table 18).

Table 17. Dumitrescu Hurlin causality test (panel A).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	22.592	7.163	0.000	0.693	0.488	9
Private investment does not cause Growth	6.870	9.282	0.000	8.062	0.000	1
Growth does not cause FDI	2.034	1.636	0.101	1.336	0.181	1
FDI does not cause Growth	161.347	80.293	0.000	13.359	0.000	9
Domestic credit does not cause Growth	79.024	36.906	0.000	5.844	0.000	9
Growth does not cause Domestic credit	16.788	4.912	0.000	1.371	0.170	8

Table 18. Dumitrescu Hurlin causality test (panel B).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	15.687	2.730	0.006	0.048	0.961	9
Private investment does not cause Growth	6.002	1.226	0.220	0.732	0.464	4
Growth does not cause FDI	23.349	5.858	0.000	0.590	0.554	9

Continued

FDI does not cause Growth	3.243	1.076	0.281	0.791	0.428	2
Domestic credit does not cause Growth	16.019	2.865	0.004	0.072	0.942	9
Growth does not cause Domestic credit	15.427	2.624	0.008	0.030	0.975	9

The Granger causality test, obtained using the likelihood ratio test statistic which is calculated by comparing the sums of squares of the residuals of the two models, i.e. the restricted model and the full model, indicates that there is a bidirectional causal relationship between growth, private investment, foreign direct investment and domestic credit at the 5% threshold for the 0.5 quantile. This confirms our previous results. But this relationship becomes unidirectional between growth and the other variables at the 1% threshold for the 0.9 quantile (Table 19, Table 20).

Table 19. Granger causality test with quantiles (panel A).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	1069.664	0.000	7403.347	0.000
Private investment does not cause Growth	NA	NA	5.468	0.019	NA	NA
Growth does not cause FDI	NA	NA	448.450	0.000	NA	NA
FDI does not cause Growth	NA	NA	5.164	0.023	51.781	0.000
Domestic credit does not cause Growth	NA	NA	2512.937	0.000	790.937	0.000
Growth does not cause Domestic credit	62.113	0.000	10.639	0.001	NA	NA

Table 20. Granger causality test with quantiles (panel B).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	1870.327	0.000	230.571	0.000	160.994	0.000
Private investment does not cause Growth	NA	NA	0.116	0.733	3.825	0.050
Growth does not cause FDI	NA	NA	609.056	0.000	128.037	0.000
FDI does not cause Growth	3.610	0.057	NA	NA	NA	NA
Domestic credit does not cause Growth	NA	NA	487.873	0.000	280.428	0.000
Growth does not cause Domestic credit	33.214	0.000	NA	NA	38.279	0.000

The 0.9 quantile allows us to establish a bidirectional causal relationship between the variables with the exception of the relationship between foreign direct investment and growth which is unidirectional. As for the other two quantiles we have unidirectional causalities between growth and the other variables except

for the 0.1 quantile where this relationship does not exist for foreign direct investment.

6.4. Does the Level of Development Matter?

According to the World Bank standards, in the context of SADC, we can adopt the following classification: (i) SADC advanced countries are, Panel A: [Botswana, South Africa, Seychelles, Mauritius] vs. (ii) SADC less advanced countries which are, Panel B: [DRC, Eswatini, Madagascar and Tanzania]. The question now is: Does the level of development matter? In other words, does the level of development affect causal relationships? Results can be summarized as follows:

The causal relationship in the most advanced SADC countries is mostly unidirectional between growth and other variables. Indeed, this relationship teaches us that private investment, foreign direct investment and domestic consumption promote growth as suggested by the literature. It should be noted that this relationship is bidirectional in the case of domestic consumption (Table 21, Table 22).

Table 21. Dumitrescu Hurlin causality test (SADC advanced countries).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	24.229	7.179	0.000	0.753	0.451	9
Private investment does not cause Growth	1.948	1.340	0.180	1.087	0.276	1
Growth does not cause FDI	2.474	2.085	0.037	1.742	0.081	1
FDI does not cause Growth	0.279	−1.019	0.308	−0.988	0.322	1
Domestic credit does not cause Growth	87.896	37.192	0.000	5.952	0.000	9
Growth does not cause Domestic credit	18.018	5.009	0.000	1.473	0.140	8

Table 22. Granger causality test with quantiles (SADC advanced countries).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	NA	NA	97.712	0.000	1840.826	0.000
Private investment does not cause Growth	1.580	0.208	0.791	0.373	NA	NA
Growth does not cause FDI	NA	NA	NA	NA	NA	NA
FDI does not cause Growth	22.483	0.000	10.255	0.001	NA	NA
Domestic credit does not cause Growth	NA	NA	1296.896	0.000	692.814	0.000
Growth does not cause Domestic credit	NA	NA	1.930	0.164	93.327	0.000

These cases are confirmed when we carry out the estimates with 50% of the sample (the 0.5 quantile). We obtain similar results with 90% of the sample except for foreign direct investment where we have an absence of relationship. The least developed countries of the zone confirm the results obtained from the total sample (Table 23).

Table 23. Dumitrescu Hurlin causality test (SADC less advanced countries).

Direction of causality	W-bar	Z-bar	*p*-value	Z-bar tilde	*p*-value	lags
Growth does not cause Private investment	15.776	3.194	0.001	0.063	0.949	9
Private investment does not cause Growth	7.804	2.690	0.007	1.823	0.068	4
Growth does not cause FDI	3.033	2.876	0.004	2.438	0.014	1
FDI does not cause Growth	198.075	89.131	0.000	14.948	0.000	9
Domestic credit does not cause Growth	22.898	6.552	0.000	0.644	0.519	9
Growth does not cause Domestic credit	13.276	2.016	0.043	−0.140	0.888	9

The causality test with quantiles confirms the results obtained with the Dumitrescu Hurlin causality test when using 10% and for 50% of the sample we find a unidirectional relationship with the exception of domestic consumption (Table 24).

Table 24. Granger causality test with quantiles (SADC less advanced countries).

	Quantile 0.1		Quantile 0.5		Quantile 0.9	
	LR-test	*p*-value	LR-test	*p*-value	LR-stat	*p*-value
Growth does not cause Private investment	1497.717	0.000	56.296	0.000	213.490	0.000
Private investment does not cause Growth	NA	NA	NA	NA	NA	NA
Growth does not cause FDI	166.207	0.000	248.388	0.000	53.977	0.000
FDI does not cause Growth	21.011	0.000	NA	NA	−14.350	NA
Domestic credit does not cause Growth	66.383	0.000	17.408	0.000	−39.601	NA
Growth does not cause Domestic credit	203.018	0.000	352.590	0.000	−172.704	NA

6.5. What Did the Literature Say?

Overall, the literature emphasizes that private investment, foreign direct investment (FDI), and domestic credit are all potential drivers of economic growth, but their impact depends on various factors, such as the level of financial development, the institutional framework, and the absorptive capacity of local economies. The causal relationships between these variables can be bidirectional, and their effectiveness may be conditioned by the simultaneous presence of other favorable factors (Levine & Zervos, 1998; Borensztein, De Gregorio, & Lee, 1998; Dunning, 1993; Levine et al., 2000; Alfaro et al., 2004).

These findings have important implications for policymakers, who must not only focus on increasing investment and FDI but also on improving the institutional framework and financial development to maximize the benefits of these capital flows.

7. Final Remarks

This study provided an in-depth empirical analysis of the causal relationships between economic growth, private investment, foreign direct investment (FDI), and domestic credit in SADC countries. The results show that private investment and FDI are key drivers of growth, as is domestic credit, while growth itself stimulates these investments, creating a virtuous cycle.

For policymakers, these findings suggest that policies aimed at improving access to credit and attracting FDI could be essential for sustainable growth in SADC economies. It would be interesting to compare the findings from SADC with those observed in other contexts, such as developed or emerging economies. This would allow for a better understanding of how institutional and financial contexts influence the relationship between growth, private investment, FDI, and domestic credit.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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