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Article

External debt, corruption control, and economic prosperity in the SADC region

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Abstract: This study investigates the impact of external debt and corruption control on the economic prosperity of Southern African Development Community (SADC) countries, using the Legatum Prosperity Index as a comprehensive measure encompassing nine dimensions. The study employs various estimation techniques, including Driscoll-Kraay, instrumental variables, quantile-on-quantile regressions, and the Granger causality test. The findings indicate that external debt positively influences economic prosperity in the SADC region. Additionally, effective corruption control enhances this prosperity. Causality tests reveal a bidirectional relationship between external debt, economic prosperity, and corruption control. The study recommends strengthening anti-corruption agencies, initiating open data policies, implementing market reforms, and pursuing fiscal consolidation to promote debt sustainability and foster prosperity within the SADC region.

Keywords: external debt, control of corruption, economic prosperity, Driscoll-Kraay technique, SADC

JEL Classification: H63, O11, D73.

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1. Introduction

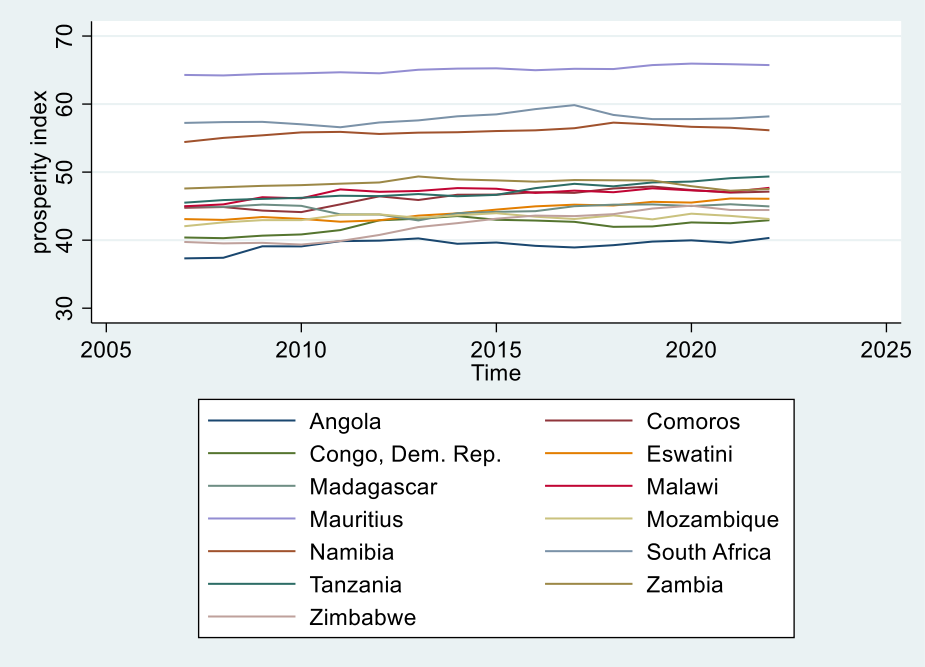
The global striving to achieve and boost economic prosperity by nations remains a leading debate among scholars in the 21st century. While advanced economies are preoccupied with sustaining achieved prosperity, the case of developing nations still centres around battling the barriers to attaining reasonable and actual economic development. Global efforts through the Sustainable Development Goals have been a working document for nations globally to evaluate their development strides. However, stylised facts from the different United Nations (UN) reports illustrate that though nations are making key progress, developing economies, especially those around Sub-Saharan Africa (SSA), remain lagging (Sachs et al., 2022). A more significant percentage of developing nations have an abundance of resources, but due to financial constraints and a lack of technological expertise, they cannot utilize them (David et al., 2021). The capital constraint for the past decades has forced developing economies to seek external sources of capital to match the domestic capital needed for developmental endeavours (Cubeddu et al., 2023). Globally, external funding for development is an essential source of funding for many nations, particularly those in the emerging world (Kapur, 2003).

External debt is one of the significant sources of external capital at a nation's disposal. Historically, third-world countries' external indebtedness increased dramatically in the 1970s due to the availability and abundance of inexpensive foreign loans (Ajab & Audu, 2006). This constrains emerging countries from importing investible funds in the form of capital to support domestic resources. Due to this, the economy slowed down in the subsequent decades, and significant structural and management issues have been

highlighted (Teke & Timur, 2014). Global and developing economies' different structural and mismanagement problems have continually caused external debt to surge, leading to diverse impacts on the country's economic prosperity endeavours (World Bank, 2023). Specifically, by the end of 2022, the nominal public debt had more than tripled from 2010 to almost $1.14 trillion (World Bank, 2023) in SSA. Corruption and mismanagement are impeding factors identified by extant literature that shape the effect of debt on development, especially in developing countries (World Bank, 2023). Corruption can lead to the misallocation of funds due to the diversion of funds and higher borrowing costs since borrowers and international lenders view corrupt nations as riskier nations, and such dynamics can lead to discouragement of investment, inefficient resource allocation, and dampening of investment endeavour.

The Southern African Development Community (SADC) sub-region within sub-Saharan Africa (SSA) has shown wide dynamics in debt and corruption in the past decades. Stylised facts demonstrate that, before the early 2000s, Many SADC nations had heavy foreign debt loads, often surpassing 100% of GDP, and many of them were eligible for debt alleviation programs such as the Highly Indebted Poor Countries Initiative (HIPC). The period from 2004 to 2010 witnessed a drastic reduction in the average debt of SADC member countries from an initial 80% to about 40%. By 2018, the average debt-to-GDP ratio was approximately 30% (Mupunga et al., 2019). During the same period, Transparency International (CPI, 2022) noted that the SADC region's economic and social progress is still severely hampered by corruption, with a relatively low perception index for the past 15 years, indicating high levels of perceived corruption. Amidst these, anti-corruption agencies and collaborative efforts between member states are committed to continually enhancing a corruption-free climate within the sub-region. Equally, Bonga (2021) noted that corruption is highly prevalent in the SADC region compared to other economic zones. Observing data trends from the Legatum Prosperity Index presented in Figure 1, it can be deduced that from 2007 to 2022, there has been a steady but slow increase in the rate of economic prosperity for the observed 13 economies presented. However, disparity exists among the economies, with Mauritius showing the highest rate of prosperity on average, while Angola demonstrates the lowest trend.

Figure 1. Prosperity trend across countries.



Authors' computation from STATA 17.

From 2007 to 2022, external debt increased mildly in most economies within the SADC region, with countries like South Africa and Angola leading (See Appendix 1). In a similar period, corruption control was higher in some economies within the SADC zone, notably Namibia, Mauritius, and South Africa; however, the trend of corruption control remains low in countries like Madagascar, Zimbabwe, and Angola (Appendix 2).

Judging from the trends and stylized facts presented, understanding the role of debt on corruption remains debatable in the economic literature that lacks a global or sub-regional consensus. Most studies within the extant literature have focused on examining GDP growth (Baklouti & Boujelbene, 2020; Kasuni et al., 2020; Trabelsi, 2024; Spyromitros & Panagiotidis, 2022), with little focus on real economic prosperity, especially within the SADC zone. Equally, the direction of the literature shows that examining corruption in terms of economic growth has remained predominant without considering real economic prosperity. In this regard, we employ the Legatum Prosperity Index to measure economic prosperity. This index explains and captures prosperity in nine dimensions: Social capital, natural environment, education, health, safety and security, business environment, governance, economic quality, and personal freedom. Methodological approaches are equally a call for concern, with many studies applying conventional techniques that do not account for cross-sectional dependence (CD). This study adds to the extant literature by first employing a more robust measure of real economic prosperity to examine progress within the SADC region. Equally, second-generation econometric techniques (Driscoll-Kraay estimation technique and the Juodis et al., 2021 causality test) are employed, which provide more robust and policy-friendly outcomes. Finally, examining the two indicators of debt and corruption within the SADC zone makes this study stand out.

This study addresses critical research gaps by analysing two key objectives within the Southern African Development Community (SADC) region: (1) the impact of external debt on economic prosperity, and (2) the influence of corruption control on economic prosperity. The research employs advanced econometric techniques to ensure robust and comprehensive insights. These include the Driscoll-Kraay (DK) method, which accounts for cross-sectional dependence and serial correlation in panel data; the instrumental variable (IV) technique, mitigating endogeneity issues to establish causal relationships; the quantile-on-quantile (QQ) approach, which examines how effects vary across different levels of debt and prosperity; and the Granger causality test by Juodis et al. (2021), identifying causal relationships between variables. The findings reveal that external debt positively contributes to economic prosperity in SADC nations. This suggests that, contrary to concerns about debt sustainability, strategic borrowing may finance infrastructure, social programs, or productive investments that stimulate growth. Additionally, effective corruption control amplifies economic prosperity, underscoring the importance of governance reforms in unlocking economic potential. For instance, reducing embezzlement or bribery may enhance public trust, attract foreign investment, and improve resource allocation efficiency. Notably, the Granger causality tests uncover bidirectional relationships: higher external debt and improved corruption control drive prosperity and reinforce it. For example, prosperous economies may access debt on better terms, while growth-driven institutional reforms could further curb corruption. These interdependencies highlight the region's dynamic interplay between fiscal policy, governance, and economic outcomes. Overall, the study advocates for balanced debt management aligned with development goals and strengthens anti-corruption frameworks to sustain growth in SADC. Policymakers must recognise these feedback loops to design holistic strategies that leverage debt responsibly while prioritising transparency and accountability.

The remaining sections of this study are organised as follows: Section 2 provides the theoretical and empirical perspectives, Section 3 outlines the methodology, Section 4 presents the results and discussion, and Section 5 concludes the study.

2. Theoretical and empirical perspective

2.1. Theoretical view

This section focuses on the existing theoretical and empirical literature on debt, corruption, and economic prosperity. Theoretically, the economic prosperity debt nexus can be established within the framework of the debt overhang theory, the liquidity constraint hypothesis, and the Debt-Laffer Curve. The debt overhang argument contends that a high level of current debt deters investment in the future, stifling economic expansion and making debt repayment even more challenging (Krugman, 1988). The liquidity constraint hypothesis posits that financial resources are frequently inaccessible to emerging nations. This limitation can be overcome, and development projects that might otherwise be postponed can be accelerated with the help of borrowing (Tobin, 1956). The Debt-Laffer Curve (DLC) theorises the possibility that there is an "optimal" debt level that promotes economic growth (Sachs, 1989). Very low debt levels may make it more difficult for the government to fund initiatives that will spur growth. In contrast, high debt levels may have unfavourable effects, such as discouraging private investment. The DLC principally illustrates that foreign debt can benefit the development of economies. However, such benefits should be checked since they can be constrained when the debt levels are too high (This is equally in line with the debt overhang perspective).

Regarding economic prosperity and corruption, two theories elaborate on how these variables correlate notably, the Sand in the Wheels theory (SWT) and the Grease the Wheels theory (GWT). The SWT posits that corruption limits economic growth through discouraging investment, reducing efficiency, and resource misallocation (Aidt, 2009; Hoinaru et al., 2020). On the other hand, the GWT hypothesises that in the short run, corruption can, in some instances, enhance growth via access to resources and speed up the process (Gründler & Potrafke, 2019). This theoretical perspective demonstrates a two-way relationship between corruption and economic prosperity.

2.2. Empirical perspective

From an empirical perspective, several studies have examined debt in different aspects of economic prosperity and its many diverse outcomes. Heimberger (2023) conducted a meta-analysis encompassing 47 studies and concluded that an increase of 10% in the debt-to-GDP ratio is associated with a decline in growth, as indicated by the unweighted mean. However, when accounting for publication bias, a zero effect is found. Triatmanto et al. (2023) used the panel vector autoregressive (VAR) model to investigate the impact of foreign debt, foreign investment, and human capital on economic development for OECD nations. The conclusion showed that total debt has a detrimental impact on economic expansion. Similarly, Lee and Ng (2015) concluded that public debt has a detrimental impact on Malaysia's economic growth. The role of external debt on growth in SSA was examined by Daba et al. (2023), and their outcome demonstrated that external debt hurts growth both in the short and the long run. Likewise, Epaphra and Mesiet (2021) conducted a study on the impact of external debt on growth for 45 African nations between 1990 and 2017. The study employed the fixed effect (FE) and random effect (RE) panel technique. The study's findings demonstrated that although high debt levels inhibit growth, low levels promote it. Equally, Bakarr et al. (2021) concluded that external debt nonlinearly affects economic growth in ECOWAS economies.

Makhoba et al. (2022) analysed the nonlinear impact of public debt on economic development for SADC economies between 2000 and 2018 using the smooth transition regression (STAR) method. Their results show South Africa has an inverted U form, but Zambia, Namibia, Zimbabwe, and Botswana have a U-shaped relationship. Mumba and Li (2020) examined the effect of debt on growth in nine southern African economies and concluded that short-term and long-term debt hurt economic growth. Using a panel Vector autoregressive model to analyse the impact of fiscal policy and debt within

the SADC region, Makhoba and Kaseeram (2022) demonstrated that GDP growth responds positively to shocks from fiscal policy and debt. Zhanje and Jeke (2022) resolute from a panel of SADC economies that external debt and official development aid negatively affect growth within the SADC zone, while foreign direct investment and remittance positively affect economic growth. The non-linear autoregressive distributed lag (NARDL) was employed by Mosikari and Eita (2021) to investigate the asymmetric impact of government debt on GDP growth in the Namibian economy. Their findings demonstrate that lowering debt increases economic growth.

Concerning the effect of corruption on economic progress, the empirical outcomes have equally been seen as wanting over the past decades. The effect of governance indicators on economic growth within 47 SSA economies was examined by Omoteso and Ishola (2014) using the fixed effect (FE), random effect (RE), and maximum likelihood. They concluded that while political stability and regulatory quality boost growth, corruption control has no lasting impact. Spyromitros and Panagiotidis (2022) employed fully modified ordinary least squares (FMOLS) within a panel of 8 developing countries and concluded that corruption enhances growth in Latin America and reduces growth in other sub-regions. Sharma and Mishra (2022) showed that corruption hinders economic growth by using the GMM system in a global panel. Afonso et al. (2022) found a significant adverse effect of corruption on economic growth for 48 economies from 2012 to 2019. Heckelman and Powell (2010) empirically pointed out that corruption will enhance growth when economic freedom is restricted, but as economic freedom becomes more present, corruption will reduce economic growth. Within a panel of 34 OECD (Organisation for Economic Cooperation and Development) countries from 1995 to 2014, Baklouti and Boujelbene (2020) employed the OLS, FE, and System GMM to examine the shadow economy, corruption, and growth nexus. They settled that corruption is detrimental to economic growth. Trabelsi (2024) employed a panel of 65 economies observed from 1987 to 2021 and resolved that corruption can positively affect growth; however, above a threshold, the effect can be negative for both low and high-level corruption.

Kasuniet al. (2020) examined the effect of corruption on economic growth in 16 SADC countries from 2000 to 2024 and found that corruption significantly reduces economic growth. Similarly, Akmal et al. (2025) have equally concluded for democratic and non-democratic countries that corruption control enhances economic growth. Using the generalised Method of moment (GMM) for SADC economies, Mbulawa (2015) observed, among others, that while political stability and government effect were positive and significant on economic growth, control of corruption was negative and insignificant. However, institutional quality was seen to have an indirect effect on growth. Malindini (2021) analysed the impact of institutional quality on economic performance using the system GMM technique. Among other conclusions, the study found that poor governance hinders economic growth. According to David et al. (2024), corruption and oil rent boost Nigeria's economic expansion.

It can be determined from the various theoretical and empirical works described above that the majority of studies (Baklouti & Boujelbene, 2020; Kasuni et al., 2020; Trabelsi, 2024; Spyromitros & Panagiotidis, 2022) have employed economic growth as a measure of progress to examine the relationship between debt and corruption on economic dynamics. Secondly, most studies have focused on conventional empirical techniques like the FE, RE, GMM, and OLS that do not account for cross-sectional dependence (CD) among the economies. It can equally be established within the outlined extant literature that the effect of corruption and external debt varies among countries and regions in terms of positive, negative, and no discernible effects. Within the backdrop of these identified gaps, this study examines corruption and external debt and their effect on real economic prosperity within the SADC region.

3. Methodology

3.1. Model and data sources

The paper estimates the following empirical model utilising panel data of 13 SADC countries (Angola, Democratic Republic of the Congo, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania, Zambia, Zimbabwe, and Eswatini). Nations covering the period from 2007 to 2022 in order to investigate the relationship between external debt, corruption, and economic development.

$$\text{PROSPX}_{it} = \partial_0 + \partial_1 \text{XDBTTOT}_{it} + \partial_1 \text{CORUPTC}_{it} + \partial_j CV_{it} + \varepsilon_{it} \quad (1)$$

where: PROSPX denotes the economic prosperity index, XDBTTOT stands for total external debt, CORUPTC is the corruption control index, and CV is a vector of control variables, which include official development aid, export, import, and domestic investment. Note that the study period is chosen based on the availability of data. The final equation employed in this study can be written as follows.

$$L\text{PROSPX}_{it} = \partial_0 + \partial_1 L\text{XDBTTOT}_{it} + \partial_2 \text{LCORUPTC}_{it} + \partial_3 LODA_{it} + \partial_4 \text{LIMPT}_{it} + \partial_5 \text{LEXPT}_{it} + \partial_6 \text{LDINV}_{it} + \varepsilon_{it} \quad (2)$$

where *i* denotes the individual countries and *t* stands for the time dimension. All the variables in equation 2 are in their natural log form. This is done to moderate probable heteroscedasticity and moderate outliers if they exist. LODA, LIMPT, LEXPT, and LDINV are the respective logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively. The unobserved country-specific effect is denoted by ∂_0, and the vector of coefficients for each variable is represented by ∂_1–∂_6. The description and measurability of the different variables are presented in Table 1.

Economic prosperity is captured using the Legatum Prosperity Index. This is done in line with the study of Alshamrani and Hezam (2023), Budsaratragoon and Jitmaneeroj (2021), and Büyüksarıkulak and Kahramanoğlu (2019). Numerous aspects of prosperity, including economic quality, business environment, and health, among others, are accounted for by this index. External debt is captured using total external debt stock, which is in line with Triatmanto et al. (2023), Ayana et al. (2023), and Fionchamnyo et al. (2021). The corruption control index captures corruption control; a similar approach has been employed within extant literature (Omoteso & Ishola, 2014; David et al., 2024). Control variables like official development aid, domestic investment, export, and import are defined in Table 1.

3.2. Brief overview of analysis technique

The empirical approach commences with the preliminary test. The database is first examined for cross-sectional dependence (CD) using the Pesaran (2015) CD test. The CD test assists in determining whether the panel's independence of residuals assumption has been distorted and directs the choice of the most suitable estimate method. Slope homogeneity is equally performed using the Pesaran and Yamagata (2008) homogeneity test to ascertain homogeneity and heterogeneity within the panel. We further examine the panel for unit root test using the second-generation cross-sectional augmented Dickey-Fuller (CADF) test (Pesaran, 2004) to establish the stationarity level of the variables. The Kao cointegration test is employed to test for cointegration and establish a long-run relation (Kao, 1999). Guided by the preliminary test employed, the baseline model is then estimated using the Driscoll-Kraay standard error technique developed by Driscoll and Kraay (1998). According to Wang (2019), the method yields a reliable and consistent result that considers cross-sectional dependence. The method works equally well for balanced and unbalanced panels, considers missing values, and is appropriate when the temporal dimension exceeds the individual dimension. The approach accounts for the panel data's

heteroscedasticity and spatial and serial dependence (Sarkodie & Strezov, 2019). To ensure the obtained outcome does not suffer from endogeneity problems, the panel instrumental variable technique is further employed in this study to correct for possible endogeneity from external debt. This study further employs the quantile-on-quantile (QQ) regression technique for robustness checks. The QQ technique examines the conditional distribution of the estimated model and is equally capable of controlling for outliers. The study finally examines the causal relation between economic prosperity and the variables of interest using the recently developed Granger non-causality test developed by Juodis et al. (2021). The Granger causality test is chosen based on its ability to account for CD.

Table 1. Definition and measurability of variables

Variable	Explanation	Data type	Source
Economic prosperity	The framework that rates nations according to how well they support the prosperity of their citizens, taking into account both social and economic well-being	Constructed index by the Legatum Institute	Lagatum Property Index (LPI)2023
External debt stock	Total external debt is debt owed to nonresidents repayable in currency, goods, or services. It is the sum of public, publicly guaranteed, and private nonguaranteed.	Current US dollars	World Development Indicators (2023)
Control of corruption	Perceptions of the degree to which public power is used for personal benefit, including both small-scale and large-scale corruption, as well as the "capture" of the state by elites and special interests, are captured by the concept of Control of Corruption.	Constructed index by WGI	World Governance Indicator (WGI) (2023)
Official development aid	Net official development assistance per capita is the disbursement flows (net of principal repayment) that meet the DAC definition of ODA.	Current US dollars	World Development Indicators (2023)
Import of goods and services	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world.	Constant 2015 US dollars	World Development Indicators (2023)
Export of goods and services	Imports of goods and services represent the value of all goods and other market services from the rest of the world.	Constant 2015 US dollars	World Development Indicators (2023)
Domestic Investment	Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, and hospitals.	Constant 2015 US dollars	World Development Indicators (2023)

4. Presentation of outcomes

As with any scientific inquiry, we begin with a descriptive appraisal of the study's data. The descriptive outcome presented in Table 2 demonstrates that economic prosperity within the SADC region had a mean value of 47.969 and a standard deviation of 7.148, with maximum and minimum values of 37.322 and 65.952, respectively. This implies that on a scale of 100, mean economic prosperity for selected SADC economies stood at 47.969 for the past decade. The low standard deviation shows the disparity in prosperity among SADC economies during the period under consideration. Similarly, the mean external debt stock stood at 23.78 billion, with a corresponding minimum value of

125.6 million and a maximum value of 190.7 billion. The standard deviation of 4.003e+10 is equally reported for external debt. This indicates that SADC economies have high external debt, a significant income source. The control of corruption had a minimum and maximum value of -1.592 and 0.641, respectively. The standard deviation and mean for corruption control stand at 0.573 and -0.578, respectively. This shows that much effort is needed to enhance corruption control to reach the maximum value of 2.5, following the World Governance Indicator approach.

Table 2. Descriptive statistics and pairwise correlation matrix

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Prosperity index	208	47.969	7.148	37.322	65.952
External debt stock	192	23.78(B)	40.03(B)	125.6(M)	190.7(B)
Control of Corruption	208	-0.578	0.573	-1.592	0.641
Net ODA received	208	61.015	40.173	0.647	264.705
Imports of goods and services	161	16.85(B)	26.85(B)	159.6(M)	105.7(B)
Exports of goods and services	161	15.23(B)	26.39(B)	56576856	98.86(B)
Gross fixed capital formation	161	11.95(B)	17.54(B)	78899896	62.44(B)

NOTE : (B) denotes billions, (M) standd for millions

Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) LPROSPX	1.000						
(2) LXDBTTOT	0.204	1.000					
(3) LCORUPTC	0.723	-0.069	1.000				
(4) LODA	0.264	-0.419	0.257	1.000			
(5) LIMPT	0.733	-0.291	-0.463	-0.050	1.000		
(6) LEXPT	0.185	0.693	0.005	-0.505	-0.196	1.000	
(7) LDINV	0.076	0.612	-0.078	-0.526	-0.140	0.743	1.000

Table 2 further shows that control variables like official development aid, export, import, and domestic investment equally show significant disparity and variations in terms of their mean (61.015, 15.23 billion, 16.85 Billion, and 11.95 billion, respectively) and standard deviation (40.173, 26.39 Billion, 26.85 Billion, and 1.754 Billion, respectively). This shows that the SADC economies have had varying levels of official development aid, export, import, and domestic investment during the past decades.

Table 2 also shows the correlation matrix between the variables. The correlation results show that economic prosperity and foreign debt, corruption control, development assistance, import, export, and domestic investment are positively correlated. However, the degree of the correlation varies, with control of corruption and import showing a high correlation coefficient of 0.72 and 0.73, respectively, while external debt, domestic investment, and export present a weak correlation of below 0.30.

Table 3. CD and slope homogeneity test

Test	Test statistics	Value
Pesaran 2015 CD test	24.000	0.000
Delta	4.597	0.000
Adjusted Delta	6.501	0.000

After the descriptive analogy of the data, we proceed to present some preliminary test outcomes. Table 3 presents the outcomes of the panel CD and slope homogeneity tests. The Pesaran (2015) CD test shows a test coefficient of 24.000 and a probability value 0.000. This shows that the null hypothesis of weak CD is rejected, implying the existence of CD.

The slope homogeneity test by Pesaran and Yamagata (2008) yields statistically significant delta and adjusted delta coefficients of 4.597 and 6.501, respectively. This suggests that, at the 1 percent significance level, the slope homogeneity null hypothesis is rejected. Therefore, heterogeneity is present in the panel being examined.

Table 4. CADF unit root test

Variables	Without trend		With trend		Decision
LPROSPX	-2.171	0.068	-2.135	0.699	
D(LPROSPX)	-3.239	0.000	-3.311	0.000	I(1)
LXDBTTOT	-0.996	0.997	-1.731	0.986	
D(LXDBTTOT)	-3.684	0.000	-3.986	0.000	I(1)
LCORUPTC	-1.397	0.917	-1.906	0.946	
D(LCORUPTC)	-3.967	0.000	-3.991	0.000	I(1)
LODA	-3.091	0.001	-3.168	0.001	I(0)
LIMPT	-4.010	0.000	-4.008	0.000	I(0)
LEXPT	-4.401	0.000	-4.660	0.000	I(0)
LDINV	-4.311	0.000	-4.366	0.000	I(0)

LPROSPX denotes the log of the economic prosperity index, LXDBTTOT stands for a log of external debt, LCCORUPTC represents the logs of corruption control; LODA, LIMPT, LEXPT, and LDINV are the logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively.

The Pesaran (2003) CADF unit test is utilised to determine the order of integration of the variables under consideration to prevent biased estimates and spurious regression. The findings of the Unit root test, which are displayed in Table 4, demonstrate that the null hypothesis of the panel containing a unit root could not be rejected for economic prosperity, external debt, and corruption control variables at both levels, with and without trend. However, the null hypothesis is rejected at the first difference, implying that economic prosperity, external debt, and corruption control are stationary at the first difference and therefore follow an I(1) process. The null hypothesis of the panel containing the unit root is rejected at the level concerning official development aid, import, export, and domestic investment, demonstrating that the variables are stationary at the level and, as a result, follow an I(0) process.

Table 5. Cointegration test

Kao test variants	Test statistics	P value
Modified Dickey–Fuller t	-1.8484	0.0481
Dickey–Fuller t	-1.9926	0.0365
Augmented Dickey–Fuller t	-0.9077	0.1820
Unadjusted modified Dickey–Fuller	-2.1759	0.0148
Unadjusted Dickey–Fuller t	-1.9113	0.0280

Given that our variables exhibit stationarity at the level and first difference, we examine cointegration within the panel to determine the presence of a long-term relationship. In light of this, the Kao cointegration test is used. Table 5 displays the results of the cointegration test, which indicate that for four test statistics (Modified Dickey-Fuller, Dickey-Fuller, Unadjusted Modified Dickey-Fuller, and Unadjusted Dickey-Fuller), the null hypothesis of no cointegration is rejected. This suggests that cointegration and long-run relationships among the study's variables exist. Based on the different preliminary tests employed, we empirically estimate our model.

The empirical estimation commences with the baseline model using the Driscoll-Kraay (DK) technique. The outcome from the Driscoll and Kraay (DK) estimation reported in Table 6 illustrates that external debt stock positively affects economic prosperity. This suggests that a surge in foreign debt will increase economic prosperity within the SADC

region, and all else will be equal. This finding is statistically significant and consistent with the DK-FE, DK-RE, and DK pooled (PL) estimate at the one percent significance level. It was found that a 1% increase in external debt stock would lead to a 0.0269% increase in economic prosperity within the SADC zone, with other things remaining the same. This outcome is similar to those of Makhoba et al. (2022) and Epaphra and Mesiet (2021) for low levels of debt and is consistent with the liquidity constraint hypothesis that explains that seeking external funds like debt will help solve the domestic financial constraint and lead to prosperity. The outcome contradicts the findings of Triatmanto et al. (2023), Daba et al. (2023), Makhoba and Kaseeram (2022), Zhanje and Jeke (2022), and Mosikari and Eita (2021). This can be partially explained by the different writers' emphasis on GDP rather than other aspects of prosperity.

Table 6. DK Regression

	(1)	(2)	(3)
VARIABLES	FE	RE	PL
LXDBTTOT	0.0269***	0.0257***	0.0494***
	(0.00272)	(0.00329)	(0.0155)
LCORUPTC	0.0442***	0.0442***	0.162***
	(0.00472)	(0.00862)	(0.00707)
LODA	0.00392***	0.00479**	0.0519***
	(0.00101)	(0.00203)	(0.0107)
LIMPT	0.0232***	0.0260***	0.196***
	(0.00465)	(0.00603)	(0.0368)
LEXPT	0.0241***	0.0189**	-0.115***
	(0.00611)	(0.00824)	(0.0199)
LDINV	0.0192***	0.0166	-0.0704***
	(0.00505)	(0.0112)	(0.00559)
Constant	1.749***	1.881***	2.262***
	(0.131)	(0.256)	(0.0741)
Observations	145	145	145
Number of groups	10	10	10
chi2 stata		2156	
		[0.000]	
F stat	418.03		4239.13
	[0.000]		[0.000]

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. LPROSPX denotes the log of the economic prosperity index, LXDBTTOT stands for a log of external debt, LCCORUPTC represents the logs of corruption control; LODA, LIMPT, LEXPT, and LDINV are the logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively.

The reported outcome of control of corruption in Table 6 shows a positive effect on economic prosperity. This indicates that, on average, a 1% increase in the rate of corruption control will lead to a 0.044% increase in economic prosperity within the SADC economies, everything being equal. The effect is consistently positive and significant for all three DK models' estimates. These findings may suggest that SADC economies are better equipped to combat corruption and have more robust legal frameworks, sound policies, stable economies, excellent governance, public services, and infrastructure. This empirical finding agrees with the studies of Kasuni et al. (2020), Mbulawa (2015), Sharma and Mishra (2022), and Trabelsi (2024). However, the outcome contradicts Omoteso and

Ishola (2014), Mbulawa (2015), and Akmal et al. (2025). This shows that corruption control greases the wheels of economic prosperity.

The different control variables considered in this study equally provide an interesting outcome. Official development aid (ODA), export, and import positively and significantly affect economic prosperity within the SADC sub-region. This implies that, everything being equal, an increase in ODA, export, and import will augment economic prosperity. This further reveals the benefits of openness and bilateral relations between SADC economies and the world. Though the results are consistent for ODA and import for the DK-FE, DK-RE, and DK-PL, the export estimate shows a negative sign. Finally, domestic investment has a positive and significant effect on the economic prosperity of SADC economies. However, the effect becomes harmful when we consider the DK-PL estimate. The different models are equally globally significant, given that the F statistics for DK-FE and DK-PL are all significant at 1%. Equally, the Chi2 statistics for the DK-RE are significant at 1%.

Table 7. Panel IV Regression

	(1)	(2)
VARIABLES	IV-FE	IV-RE
LXDBTTOT	0.0367**	0.0362**
	(0.0164)	(0.0158)
LCORUPTC	0.0459***	0.0458***
	(0.0101)	(0.0102)
LODA	0.00485	0.00556
	(0.00418)	(0.00419)
LIMPT	0.0306***	0.0331***
	(0.00787)	(0.00787)
LEXPT	0.0185	0.0141
	(0.0120)	(0.0111)
LDINV	0.0149*	0.0128*
	(0.00804)	(0.00768)
Constant	1.575***	1.674***
	(0.463)	(0.398)
Observations	144	144
Number of countries	9	9
r2_w	0.582	0.583
chi2	1554	276.3
	[0.000]	[0.000]

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. LPROSPX denotes the log of the economic prosperity index, LXDBTTOT stands for a log of external debt, LCCORUPTC represents the logs of corruption control; LODA, LIMPT, LEXPT, and LDINV are the logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively.

To check our estimated results for robustness, we use two empirical techniques. The panel instrumental variable (IV) technique controls for potential endogeneity, and equally, the quantile-on-quantile technique accounts for variations in the distribution of economic prosperity across different quartiles. The outcomes of panel IV are presented in Table 7 for the IV-FE and IV-RE. The outcome demonstrates an augmenting impact of external debt on economic prosperity for the IV-FE and IV-RE within the SADC region. The outcomes are equally significant at the 5% level of significance. Comparatively, when we account for possible endogeneity of debt using internal instruments (past values or

lags), the outcome obtained from the DK model remains consistent, though with a reduction in the significance level. The control of corruption output remains positively significant at the 1% level amidst endogeneity control. This shows that our initial positive outcome is consistent and robust to endogeneity problems. Other control variables, such as ODA, export, import, and domestic investment, are favorable. However, only import and domestic investment showed a 1% and 10% significance, respectively. The outcome equally points to the fact that, amidst control of endogeneity, the heterogeneity in terms of the level of significance is noticeable, mainly for export and ODA, compared to the DK estimates.

Table 8. QQ Regression

	(0.25)	(0.50)	(0.75)
VARIABLES	QQ	QQ	QQ
LXDBTTOT	0.0272***	0.0269***	0.0267***
	(0.00654)	(0.00422)	(0.00474)
LCORUPTC	0.0475***	0.0437***	0.0406***
	(0.0124)	(0.00796)	(0.00895)
LODA	0.00248	0.00414	0.00549*
	(0.00395)	(0.00254)	(0.00286)
LIMPT	0.0159	0.0243	0.0312*
	(0.0234)	(0.0151)	(0.0169)
LEXPT	0.0362*	0.0223	0.0109
	(0.0214)	(0.0138)	(0.0154)
LDINV	0.0191*	0.0192***	0.0193**
	(0.0114)	(0.00732)	(0.00823)
Observations	145	145	145

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1. LPROSPX denotes the log of the economic prosperity index, LXDBTTOT stands for a log of external debt, LCCORUPTC represents the logs of corruption control; LODA, LIMPT, LEXPT, and LDINV are the logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively.

The quantile-on-quantile (QQ) regression output accounts for variations in the distribution of economic prosperity across different quartiles, that is, the 25th, 50th, and 75th in this study. The QQ outcome presented in Table 8 shows that the positive impact of external debt on economic prosperity established in the DK and IV regressions is reaffirmed for all the quantiles (25th, 50th, and 75th) of the QQ regression. This outcome reaffirms the arguments of Makhoba et al. (2022). Equally, the positive effect of corruption control on economic prosperity for SADC economies obtained from the IV and DK techniques is confirmed for all three quantiles of the QQ regression. The outcomes of external debt and corruption control are significant at the 1% significance level. Hence, the variation of economic prosperity across different quartiles is positively and significantly explained by external debt and corruption control for the SADC economies under consideration. The initial positive effects of ODA, import, export, and domestic investment established in the DK and IV estimations techniques are equally observed for the QQ output. However, ODA and import are only significant at the 75th quantile, export is only significant at the 25th quantile, while domestic investment is significant across all quantiles, though at different significant levels.

The Granger causality test by Juodis et al. (2021) is another tool used in this study to look into the causal relationship between the model's various variables. Table 9 presents the results of the causality test. The outcome of the causality test demonstrates that the

null hypothesis of external debt, not Granger causing economic prosperity, and economic prosperity not Granger causing external debt are all rejected at the 1% significance level. This demonstrates a bidirectional association between external debt and economic prosperity within the SADC economies. The result ties in with the conclusion of Triatmanto et al. (2023). On a similar note, the null hypothesis of corruption control Granger causing economic prosperity and economic prosperity Granger causing control of corruption are all rejected at the 1% level, thereby confirming a bidirectional relationship between corruption and economic prosperity. The outcome aligns with Omoteso et al. (2014). This generally shows information about economic prosperity and the future trend of controlling corruption and external debt. Equally, information about the future economic prospects of SADC economies is contained in the path of corruption control and external debt. With regard to the control variables under consideration, causality outcome ascertains a bidirectional relationship between economic prosperity and official development aid, export, and import of goods and services. Finally, there is a unidirectional relationship between domestic investment and economic prosperity.

Table 9. JKS (2021) Granger causality test

Test hypotheses	JKS test coefficient	P value.
LXDBTTOT ≠ LPROSPX	32.3802	0.000
LPROSPX ≠ LXDBTTOT	16.0815	0.001
LCORUPTC ≠ LPROSPX	87.4618	0.000
LPROSPX ≠ LCORUPTC	11.6447	0.000
LODA ≠ LPROSPX	59.9837	0.000
LPROSPX ≠ LODA	16.7136	0.0008
LIMPT ≠ LPROSPX	10.7754	0.0046
LPROSPX ≠ LIMPT	6.77391	0.0795
LIMPT ≠ LPROSPX	32.1784	0.000
LPROSPX ≠ LIMPT	69.6713	0.000
LIMPT ≠ LPROSPX	14.01156	0.001
LPROSPX ≠ LIMPT	2.83301	0.2426

≠ denotes lack of the Granger-cause condition, LPROSPX denotes the log of the economic prosperity index, LXDBTTOT stands for a log of external debt, LCCORUPTC represents the logs of corruption control; LODA, LIMPT, LEXPT, and LDINV are the logs of official development aid, importation of goods and services, exportation of goods and services, and domestic investment, respectively.

5. Conclusion

This study examined the effect of external debt stock and the control of corruption on economic prosperity for 13 SADC economies from 2007 to 2022. For this purpose, different estimation techniques were adopted, such as the Driscoll-Kraay technique, The Instrumental variable technique, the quantile-on-quantile technique, and, equally, the recent Juodis et al. (2021) Granger causality test. The findings show that the level of external debt and the fight against corruption both significantly and favourably impact the economies of SADC. Furthermore, the findings show that factors contributing to economic prosperity include official development assistance, exports of products and services, and domestic investment; however, the degree of these effects varies depending on the estimation methodology used. Furthermore, the Granger causality test by Juodis et al. (2021) demonstrates a reciprocal association between economic prosperity and external debt and between economic prosperity and corruption control.

Based on the different findings, the study put forth different policy recommendations. Though corruption control enhances economic prosperity within the SADC zone, the reported index remains very low, as such, reform efforts that seek to reduce corruption like freedom of information laws, open data policies, asset disclosures

and the strengthening of anti-corruption agencies should be promoted within the SADC economies to reduce corruption to its bare minimum. Secondly, sustainable debt reforms, such as market reforms and fiscal consolidation, should be adopted by different countries of the SADC region to enhance the effect of debt on economic prosperity.

Finally, this research has some caveats. Firstly, the research is limited by data availability, constraining us to work only with 13 SADC economies and for 2007 to 2022, which may not reflect the characteristics of other economies and periods not considered. Other variables that may be of interest for economic prosperity are not equally considered, like FDI, human capital, the role of law, and sociocultural factors, among others.

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Data Availability Statement: All data used in this study are publicly available online, from the Lagatum Property Index (2023) database, the World Development Indicators (2023) database, and the World Governance Indicators (2023) Database.

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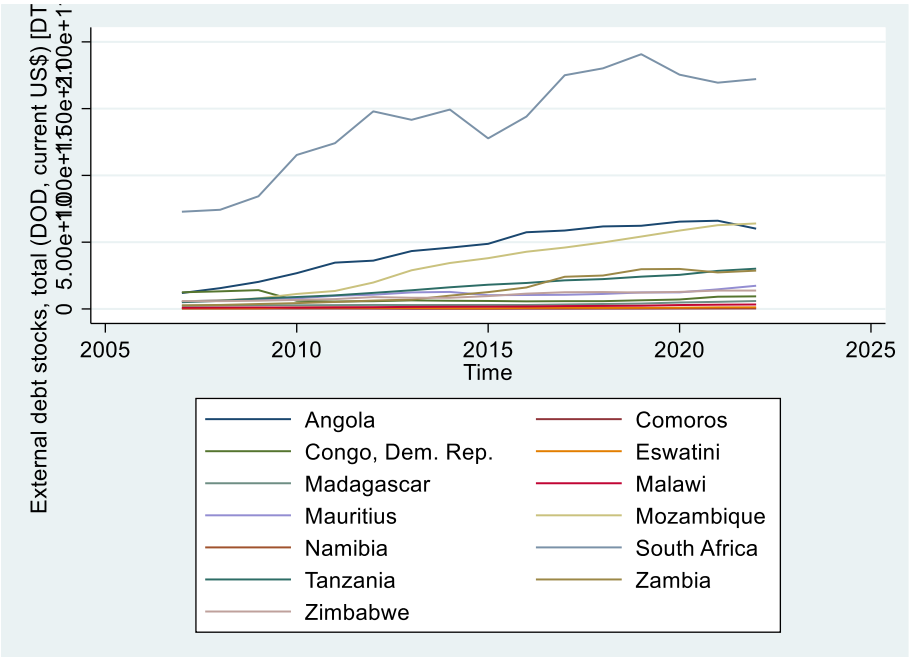
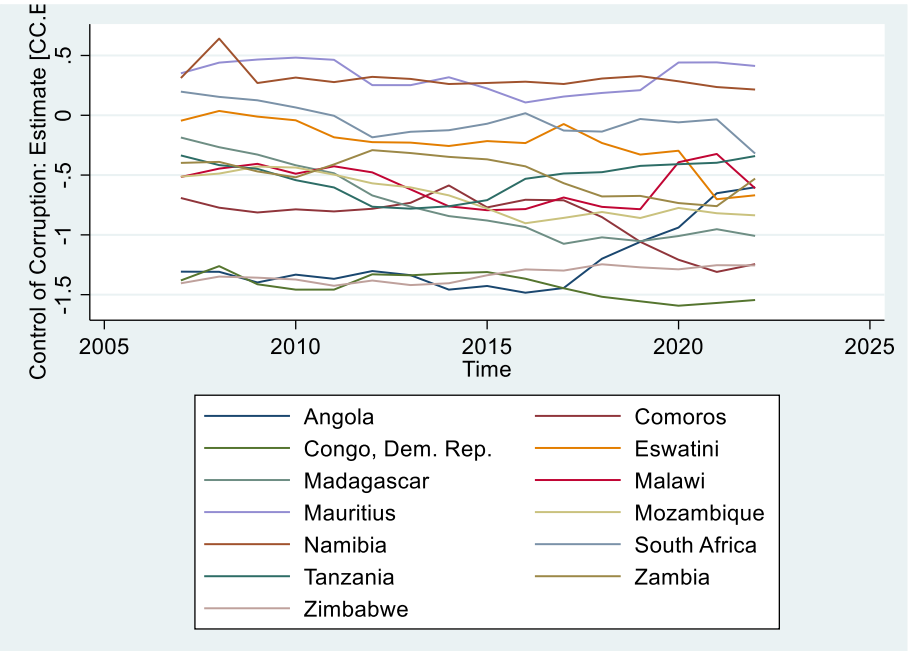
Appendix A

Figure 2. The trends in external debt



Appendix B

Figure 3. The trends in the control of corruption



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