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The Impact of Corruption on Economic Growth in Namibia: An ARDL Analysis in the Context of the Sustainable Development Goals

Charles Tuiuane Karita[ab]
[a]*Department of Economic Engineering, Kyushu University, Fukuoka, Japan*
[b]*Directorate of Policy, Planning and Research, Ministry of Gender Equality, Poverty Eradication and Social Welfare, Windhoek, Namibia E-mail: charles.karita13@gmail.com*

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Abstract: Corruption seriously challenges economic growth, especially in developing countries like Namibia. While many studies have explored its impact, few have examined the issue within the Sustainable Development Goals (SDGs) framework. This study analyses the relationship between corruption and economic growth in Namibia using the Autoregressive Distributed Lag (ARDL) model with annual data from 2000 to 2022. The findings show that corruption significantly negatively affects economic growth, measured by GDP per capita. Although investment in education and healthcare appears to support growth, the effect is not statistically significant. On the other hand, infrastructure investment has a more dynamic influence, while foreign direct investment (FDI) unexpectedly shows a negative correlation with growth contrary to common assumptions. Unemployment, however, does not show a meaningful impact. These results highlight the need for stronger governance, transparency, and well-targeted investments in key sectors to build economic resilience. Aligning anti-corruption strategies with SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 16 (Peace, Justice, and Strong Institutions) can help Namibia drive sustainable development and institutional stability. The study concludes with policy recommendations to combat corruption and support long-term economic progress.

Keywords: Corruption, Economic Growth, Sustainable Development Goals (SDGs), ARDL modelling

JEL Codes: O55, C22, D73

1. Introduction

Corruption remains a significant challenge globally, particularly in developing nations like Namibia, where it threatens economic stability, investment confidence,

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and sustainable development. Transparency International (2024) ranks Namibia 58th out of 180 countries on its Corruption Perceptions Index (CPI), reflecting persistent governance challenges. One of the most notable cases illustrating the economic cost of corruption is the 'Fishrot' scandal in 2019, which involved the illicit allocation of fishing rights to foreign entities. Namibia's Financial Intelligence Centre flagged approximately US$650 million in suspicious transactions linked to the scandal, highlighting the magnitude of corruption-related financial mismanagement (Links & Mbathera, 2024). These realities raise urgent questions: How does corruption specifically affect economic growth in Namibia? What policies can effectively mitigate its impact and that are aligned with national development priorities?

While corruption is widely studied, existing research primarily focuses on its global and regional impacts, often overlooking country-specific contexts. In Namibia, corruption interacts with a unique set of economic and governance factors, including resource dependence, income inequality, and institutional inefficiencies. It is necessary to examine its effects within this specific setting. Although the country possesses significant natural wealth, diamonds, uranium, and fisheries, structural weaknesses such as high unemployment, economic inequality, and overreliance on extractive industries leave it vulnerable to external shocks (Sherbourne, 2022b).

These vulnerabilities are worsened by fluctuating commodity prices, recurring droughts, and the lingering economic effects of the COVID-19 pandemic, all of which have hindered growth (Bank of Namibia, 2024). Addressing corruption is critical for Namibia's long-term development, as it weakens institutions, reduces public trust, and introduces inefficiencies in service delivery. Research by Sherbourne (2022a) and Sachs and Warner (1997) underscore the importance of institutional reforms in promoting economic resilience. Namibia's economic trajectory may remain constrained without strengthened governance and anti-corruption mechanisms.

Understanding corruption's consequences on economic growth requires engagement with the Sustainable Development Goals (SDGs), which serve as benchmarks for global progress. Corruption undermines SDG 8, which promotes decent work and economic growth, by discouraging investment and hampering job creation. It also affects SDG 3, which focuses on good health and well-being, and SDG 4, which promotes quality education by diverting resources away from essential public services. Furthermore, SDG 16, which emphasizes peace, justice, and strong institutions, highlights the importance of transparency and accountability in fostering sustainable development. By addressing corruption within the framework of the SDGs, Namibia can develop more targeted strategies to enhance governance and economic performance.

While international studies provide valuable insights, Namibia's economic structure, policy landscape, and governance challenges require a localized approach. For instance, the dominance of a single political party and limited institutional oversight mechanisms can hinder anti-corruption efforts, necessitating a more tailored response (Yikona et al., 2011).

This study employs a quantitative analysis using time-series data to evaluate the economic impact of corruption. The Autoregressive Distributed Lag (ARDL) model explores short- and long-term relationships between corruption and economic performance. Key variables include investment levels, public expenditure, foreign direct investment (FDI), infrastructure development, and unemployment. The study's findings suggest that corruption negatively impacts Namibia's economic growth. While government spending in sectors such as education and health shows potential benefits, these gains are often offset by inefficiencies in resource allocation. Infrastructure investment yields mixed results, with some infrastructure contributing positively to economic performance while others suffer from mismanagement and inefficiency.

A particularly unexpected finding is the inverse relationship between foreign direct investment and GDP growth. While FDI is traditionally associated with economic expansion, its effectiveness in Namibia appears contingent on governance quality and investment oversight. These results suggest that attracting investment alone is insufficient, and the nature and governance of investments must align with national development priorities. Additionally, while unemployment remains a critical issue, its relationship with economic growth appears more complex than conventional theories suggest, warranting further examination of labour market dynamics.

The findings emphasise the pressing need for governance reforms, stronger oversight mechanisms, and improved policy frameworks to reduce corruption's economic impact. Strengthening anti-corruption institutions, enhancing public finance transparency, and ensuring that foreign investment contributes effectively to sustainable growth are essential steps in mitigating corruption's economic consequences.

This study provides a Namibia-specific analysis of corruption's impact on economic growth, offering empirical insights and policy recommendations. Filling a crucial research gap contributes to the broader literature on corruption and economic development, particularly in resource-dependent developing nations.

The paper is structured as follows: Section 2 reviews the literature on corruption and economic growth, placing Namibia within a global and regional context. It then outlines the research methodology and data sources in Section 3, followed by an empirical analysis of the findings. Finally in Section 5, the study concludes with policy

recommendations to foster sustainable economic growth through improved governance and anti-corruption measures. Thus, this research aims to provide valuable insights for policymakers, scholars, and development practitioners seeking to enhance economic resilience and institutional effectiveness.

2. Literature Review

2.1. Theoretical Framework

The framework allows the understanding of corruption's flow, its impact on economic growth, and its relation to the Sustainable Development Goals (SDGs). By integrating economic theories and governance concepts, this framework aims to depict the multidimensional phenomena in the interrelation of corruption, economic growth, and sustainable development.

2.1.1. Economic Growth Theories

Solow-Swan Growth Model: It draws on the roles that capital accumulation, labour, and technological progress play in the process of economic growth. Corruption can have a negative effect on growth by reducing investment, misusing resources, and hindering technological development (Solow, 1956; Swan, 1956).

Endogenous Growth Theory: Introduces the concept of human capital, innovation, and knowledge as the main factors of economic growth. Corrupt behaviour can destroy these drivers by creating a climate of insecurity and decreasing the willingness of entrepreneurs to set out on an inventive, learning, and innovation journey (Lucas, 1988; Romer, 1986).

2.1.2. Corruption and Governance Theories

The Principal-Agent Theory: Explains corruption as a problem resulting from incentive issues between the principal (citizens and government) and the agent (public officials). Unstable management systems and the lack of responsibility can worsen the issue of corruption and lead to both inefficiency and the hampering of economic growth (Klitgaard, 1988; Rose-Ackermann, 1999).

Public Choice Theory: This view of corruption considers it the result of behaviour of public officials directed by self-interest. The theory implies that minimized rent-seeking and increased transparency are the keys to reducing corruption's negative effects on economic growth. (Buchanan & Tullock, 1960; Niskanen, 1971).

The impact of corruption on economic growth is a debatable issue in economic literature; some studies show both positive and negative effects. According to some

studies, corruption is bribing bureaucrats to avoid bureaucratic procedures. Thus, it is good in some cases, but most evidence suggests that it affects institutional systems and resource utilization. Furthermore, it is a crucial manifestation of attempts to extract personal gains from public resources.

This study will dive into these complex effects by examining corruption's role from a global perspective, focusing on developing countries, and taking a closer look at specific country case studies.

2.2. Global Perspective on Corruption and Economic Growth

Corruption has been a major barrier to economic growth for a long time, with much research ever since the 1970s demonstrating a negative link between corruption and economic development, mainly in poor or developing countries. Afonso and de Sá Fortes Leitão Rodrigues (2021) revealed that corruption is the cause of the decrease in the Gross Domestic Product (GDP) per capita, and it leads to a negative impact seen more in larger governments. In the same way, Ahmed and Asmaa (2016) observed that high corruption rates are negatively associated with GDP per capita in the Arab region, thus giving more evidence to the "sanding the wheels" hypothesis. Baklouti and Boujelbene (2020) supported these views by demonstrating that corruption and a shadow economy constitute barriers to growth in the Organisation for Economic Co-operation and Development (OECD) economies.

Corruption is an investment deterrent. Cieślik and Goczek (2018) argue that it repels the inflow of foreign investments, thereby hampering economic development. Pellegrini (2011) also stressed that corruption impacts investment, trade policy, education, and political stability, resulting in declining economic growth. Gründler and Potrafke (2019) further showed how more corruption can lead to lower real GDP per capita.

Moreover, corruption aggravates political instability; thus, it also causes harm to economic growth. As per the study conducted by Mo (2001), a 1% increment in the level of corruption reduces the growth of GDP by 0.72%, predominantly due to political instability. Corruption can have different effects in high-income countries as well. Swaleheen and Stansel (2007) dispute that corruption is stunting growth in countries where economic freedom is limited.

The persistent occurrence of corruption in economic systems poses long-term challenges. According to Blackburn et al. (2006), corruption in underdeveloped economies tends to diminish the rate of development. Ertimi et al. (2016) identified an equivalent problem in countries participating in the Organisation of Islamic Countries (OIC).

On the other hand, one group of researchers suggests that corruption can enhance cases that would never have appeared otherwise, and they call it the "grease the wheels" hypothesis. However, it should be noted that Leff (1964) asserted that corruption can help negotiate through strict administrative obstacles. Ondo (2017) also backed up this claim, which revealed a strong connection between corruption and growth in the Economic and Monetary Community of Central Africa (EMCCA). Swaleheen and Stansel (2007) emphasized the idea of corruption as a catalyst for growth in high economic freedom contexts. The analyses Tseng (2020) developed also revealed that corruption had different or varied effects on growth in developed and developing countries.

Corruption's connection to economic growth is a tricky subject that is dependent on the context of the country or region. A nonlinear relationship that showed that a high level of corruption helps the economy only up to a certain point, and then it starts having the opposite impact was identified by Trabelsi and Trabelsi (2020). Saha and Gounder (2013) showed that corruption increases at the early development stages but then it goes down when the country becomes advanced.

The pervasive view in much of the global literature is that, often, corruption adversely affects growth due to the fear of investors, political instability, and economic inefficiencies. However, in specific situations, corruption, in fact, can be a factor of economic advancement, as it helps to avoid some bureaucratic issues. For Namibia, understanding these interactions is crucial in designing effective anti-corruption policies and promoting sustainable development in line with the Sustainable Development Goals (SDGs).

2.3. Corruption in Developing Nations

Corruption significantly impedes economic growth, especially in developing countries. Gyimah-Brempong (2002) demonstrated that corruption reduces economic growth by decreasing physical capital investment in 21 African countries, lowering Gross Domestic Product (GDP) and per capita income growth rates by 0.75 to 0.9% and 0.39 to 0.41 percentage points per year, respectively. Farooque et al. (2022) in addition also posit that corruption in Sub-Saharan and Middle East and North Africa (MENA) countries has the effect of not only overshadowing the development of the region but also pointing to the need for anti-corruption campaigns and improved governance should be taken up not only to attract foreign direct investment but also to boost economic growth.

Ibrahim et al. (2015) discovered that corruption impedes economic development in Sub-Saharan Africa by decreasing the Gross fixed capital formation (GFCF) and the

employment of human resources. Their research conducted with a pooled Estimated Generalized Least Squares (EGLS) and the Two-Stage Least Squares (2SLS) methods revealed that government spending alleviates the adverse impact of corruption on growth. Spyromitros and Panagiotidis (2022) concur with the idea, indicating that corruption very much hampers economic growth in 83 developing countries but has various effects on different regions, especially outside Latin America.

Corruption's negative aspects are not only limited to the economic sphere. According to Bayley (1966), those effects can be further divided into direct and indirect ones, which, in turn, involve inefficiencies, increased administrative costs, erosion of public trust, and social and economic costs. Obamuyi and Olayiwola (2019) argue that corruption slows down the development of the economy both in Nigeria and India because it undermines human capital development, political stability, and capital formation.

In developing countries, the detrimental influence of corruption on economic growth has been established without doubt; nonetheless, again, some studies propose the argument that under some circumstances, corruption can have a positive effect. This "grease the wheels" theory argues that corruption can make business transactions easier and bypass the bureaucratic bureaucracy. Bayley (1966) observes that bribery can ensure the adoption of better policies and investment in business by freeing resources from those that can produce less sustenance to those with more operational potential.

Nevertheless, the notable effects of corruption are dependent on the context in which they occur, and they are mostly short-term. The long-term results usually reflect weakened institutional integrity and economic stability. Although corruption can bring very short-term benefits by simplifying administrative procedures and homing in on certain economic activities, in the end, its effects on sustainable development are generally adverse.

2.4. Country-Focused Case Studies

Some corruption-related studies at country-level explain that there are specific cases where corruption can be not only negative but sometimes have positive economic growth effects, especially in certain contexts or conditions. For instance, Wang (2016) reported that fighting corruption in China brought about temporary economic depressions, which took place because officials in high positions were immediately accused of being corrupt; therefore, the argument has been made that corruption is a way of driving economic activities by releasing them from the position of overregulation. At the same time, in Nigeria, Aliyu and Elijah (2011) discovered that it is possible that corruption

would lead to economic activities taking place more rapidly in the short term by further improving the decision-making system within administrative structures that are complex and require longer periods.

Besides, Alfada (2019) found that in Indonesia, areas whose corruption levels were higher than a certain threshold suffered from more severe economic impacts. In other words, under conditions where corruption is minimal, it may not even be a significant obstacle to economic growth. What these findings indicate is that even though corruption has potential negative effects, its influence might be significantly reduced, or it may even have some positive outcomes in environments that are strictly regulated, thereby making it easier to avoid inefficiencies.

In contrast to the transient beneficial impact, a rich body of literature proves that corruption contributes negatively to economic growth mostly through different channels. These adversities are mostly occurring in a long-term manner and are relatively stronger.

Numerous studies have consistently shown that corruption reduces investment and creates inefficiencies in public spending. For example, Ghalwash (2014) demonstrated that in Egypt, corruption increases inefficiencies in government expenditures and reduces investment in human capital, negatively impacting output. Nwankwo (2014) similarly found that corruption has significantly thwarted economic progress in Nigeria by diverting resources away from productive uses and undermining institutional integrity.

Additionally, corruption undermines financial development and trade openness. Farooq et al. (2013) saw in Pakistan that corruption impedes economic growth by slowing financial development and creating a negative feedback loop with trade openness. This hinders the country's ability to integrate into the global economy and benefit from international trade. In Bangladesh, it was observed by Pulok and Ahmed (2017), who gave long-term evidence that corruption negatively affects the development of economies. Their research also discovered a very significant negative relationship between corruption and Gross Domestic Product (GDP) per capita, showing the continuing effects of corruption on the economic base and the blockage of the development drive.

Lisciandra and Millemaci (2017) discovered that in Italy, corruption had a significantly negative impact on long-term growth in all their regions. Based on the regional panel they conducted; such an assessment proves that corruption's detrimental effects are experienced all over Italy and not just in a particular area. Zouaoui et al. (2018) researched the effect of corruption on economic development in Tunisia and found that

there is a significant discrepancy between the predicted and real GDP per capita, which stands for the cost of corruption. This discrepancy emphasizes the enormous economic damage that can be attributed to corruption and thus proves the negative consequences that have been noticed in different settings.

Although sometimes the idea of corruption might seem to be a forward, short-term driver of the economy by bypassing bureaucratic red tape, it is a generally accepted point of view in the economic literature that corruption is a negative occurrence for economic growth. The lack of investment indicates this adverse effect, the decline in public sector productivity, and the long-run absence of reliable financial functionality. For Namibia, it is crucial to understand these dynamics to develop better and more sustainable anti-corruption policies and strategies that will reflect progress toward the Sustainable Development Goals (SDGs). A higher level of control over corrupt practices and specific interventions are the keys to achieving these goals.

Contextual Analysis of Corruption and Economic Growth in Namibia

Even though there have been some great achievements in political stability and economic growth, the issue of corruption still poses a serious obstacle, encompassing different critical areas of the country's progress. This paper explores the relationship between corruption and economic growth in Namibia from a different point of view considering historical, sociological, and economic contexts.

Shortly after gaining independence in 1990, Namibia adopted a democratic system of government, a move that has enhanced its political peace and stability. Nevertheless, the legacy of colonialism and apartheid has created economic inequalities on a large scale. The ruling party, SWAPO (South West Africa People's Organization), has been in power since 1990 till today, thus causing fear that corruption is rampant due to unchecked power (Yikona et al., 2011).

In Namibia, corruption manifests itself in several ways, including bribery, embezzlement, nepotism, and the exploitation of public resources. The Namibian Institute for Public Policy Research has expressed worry that the country has grown less efficient and responsive in combating corruption, as reported by (United Nations, 2024). Transparency International's Corruption Perceptions Index (CPI) consistently ranks Namibia as moderately corrupt, with a score of 49 out of 100 in 2023 being one example (Transparency International, 2024)[1]. Corruption significantly influences the economy, particularly in public procurement, land management, and natural resources.

According to Sherbourne (2022a), Namibia's economy mainly depends on extracting and exporting natural resources, especially diamonds, uranium, and fisheries. Namibia has been facing varying growth rates due to a wide range of factors,

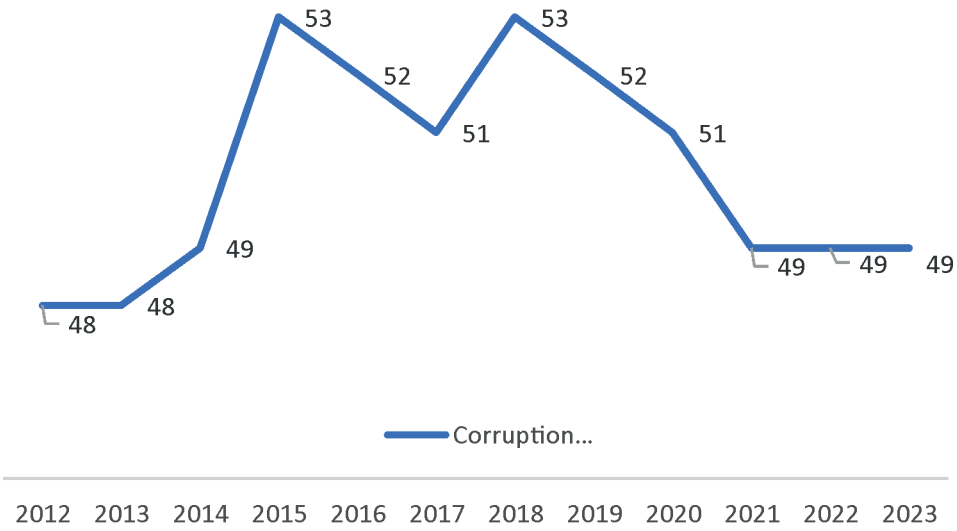

Figure 1: Namibia's Corruption Perception Index (CPI) Score 2012-2023

Source: Transparency International (2024)

such as global commodity prices, climatic conditions that affect agricultural output, and domestic policy decisions.

To counter corruption and bolster the economy Namibia has introduced various policy measures and reforms:

- The Anti-Corruption Commission (ACC): Established mainly to investigate and prevent corruption (Anti-Corruption Act, 2003). Although the effectiveness of the ACC is often questioned. The task of performing such investigations is made hard by the lack of autonomy and lack of political will in the country (Amupanda, 2019; Links, 2020; Weylandt, 2017).
- Public Procurement Act: Aimed at enhancing transparency and accountability in public procurement procedures (Public Procurement Act 2015, 2015). The effective implementation of the act remains a challenge.
- Whistleblower Protection Act: The act was enacted to legally protect those reporting corruption. Encouraging a culture of whistleblowing is important for exposing corrupt practices, although implementation is costly and is slow-paced (Matthys, 2022; Tjihumino, 2023).

To combat corruption is very important for Namibia to achieve its Sustainable Development Goals (SDGs) (United Nations, 2024). Key areas include:

- Goal 3 (Good Health and Well-being): Fighting corruption in healthcare leads to better resource allocation and improved health services for all.
- Goal 4 (Quality Education): Reducing corruption in the education sector ensures fair allocation of resources, improving the quality of education.
- Goal 8 (Decent Work and Economic Growth): Reducing corruption can improve the business environment, leading to job creation and sustainable economic growth.
- Goal 9 (Industry, Innovation, and Infrastructure): Transparent governance in infrastructure projects ensures efficient use of funds and better development outcomes.
- Goal 16 (Peace, Justice, and Strong Institutions): Strengthening institutions to fight corruption is essential for promoting inclusive and accountable governance.
- Goal 17 (Partnerships for the Goals): Tackling corruption boosts investor confidence, leading to increased Foreign Direct Investment (FDI) and enhanced global partnerships for sustainable development.

Governance structures, economic dependence on natural resources, and institutional responses to corruption shape the relationship between corruption and economic growth in Namibia. While corruption typically undermines growth by discouraging investment and reducing institutional efficiency, its effects are not uniform across all sectors. Namibia's reliance on extractive industries makes it particularly vulnerable to corruption, as these sectors are prone to rent-seeking behaviour and inefficiencies Sherbourne (2022a). Public procurement, land management, and natural resource governance are key areas where corruption significantly distorts competition and inflates costs (Matthys & Petersen, 2024).

Given these complexities, integrating anti-corruption strategies with Sustainable Development Goals (SDGs) provides a structured approach to mitigating corruption's economic impact and identifying priority intervention areas for Namibia's long-term stability and development (United Nations, 2024).

3. Methodology

This study examines how corruption affects economic growth in Namibia, considering additional factors such as education, health, infrastructure, employment, and foreign direct investment (FDI). These variables align with Sustainable Development Goals (SDGs) to provide a broader development perspective.

GDP per capita is used as a proxy for economic growth, as it reflects economic output per person and is widely accepted in economic research (Barro, 1991). Studies such as Mauro (1995), Mo (2001), Pellegrini (2011), Gründler and Potrafke (2019), and Ertimi et al. (2016) confirm that corruption negatively affects GDP per capita by reducing investment efficiency and weakening governance structures.

This study employs the Autoregressive Distributed Lag (ARDL) model to capture both short-term and long-term dynamics. This model allows for a more detailed analysis of fluctuations in economic relationships. Using annual data from 2000 to 2022, the model provides insights into how corruption and key economic factors interact over time, guiding policy strategies aligned with Namibia's SDG targets.

3.1. Data Description and Sources

- Economic Growth: The variable of economic growth is measured with the GDP per capita (current USD). GDP per capita is an important indicator that presents the average economic output per person, and thus it offers a comprehensive visualization of the economic wealth and the average living standards of a country. A larger GDP per capita is most often accompanied by more favourable economic circumstances and ensuing positive changes in the economy (World Bank, 2024).
- Corruption: The World Bank measures corruption through the Corruption of Control estimate. The loss of efficiency of public spending due to corruption, and the limited ability for the state to attract foreign investment works as a drag on the economic growth process. It is observed that less corrupt countries manifest a higher degree of economic prosperity because of the quality of governance and more careful expenditure of the funds received from different sectors (Mauro, 1995).
- Education: The variable for education is represented by government expenditure on education as a percentage of Gross domestic product (GDP). Education is crucial to the economic development process because it creates human capital, increases yields, and stimulates creativity. Progressively, more funds allocated to education will likely result in a more skilful workforce and, consequently, facilitate technological and scientific growth that impacts overall economic output (Barro, 1991).
- Health: Health is measured by government expenditure on health as a percentage of Gross domestic product (GDP). A healthier population can produce more and so bring an enhanced contribution to the economy. The healthcare sector deserves investment since it can mediate the economic losses that result from illnesses and same time it upgrades the overall economic productivity. (Bloom et al., 2004).

- Unemployment: Unemployment is measured by the unemployment rate, which represents the percentage of the jobless labour force. While traditional macroeconomic models often assume that GDP influences unemployment (Okun's Law), high unemployment can constrain GDP growth by reducing consumer demand, lowering productivity, and discouraging investment (Kingdon & Knight, 2007). Lancaster and Tulip (2015) further highlight that labour market inefficiencies and weak employment growth can reinforce economic stagnation, preventing GDP from recovering in downturns. Unemployment is a critical variable in Namibia's economic landscape, as evidenced by the latest data from the Namibia Statistics Agency (NSA). The NSA's Labour Force Survey reports that Namibia's unemployment rate rose to 36.9% in 2023, up from 33.4% in 2018, reflecting a worsening labour market (Namibia Statistics Agency, 2025). This increase highlights the need for policy interventions to address joblessness and its broader implications on economic growth and social stability.
- Unemployment is a persistent challenge in Namibia due to skills mismatches, reliance on extractive industries, and slow job creation rates (Bank of Namibia, 2024).
- Infrastructure: Infrastructure investment is measured by the Gross fixed capital formation (GFCF). For economic development to be possible, an economy needs to have well-developed infrastructure which can support a variety of economic activities (Aschauer, 1989).
- Foreign Direct Investment (FDI): FDI is represented by the net inflows as a percentage of Gross domestic product (GDP). FDI is an essential driver of economic growth as it brings in capital, technology, and expertise. It also creates jobs and improves the productivity of the host economy (Borensztein et al., 1998).

3.2. Econometric Model and Analytical Techniques Used

The use of the Autoregressive Distributed Lag (ARDL) model facilitates the examination of the dynamic interconnections amongst GDP per capita and its influencing variables which are corruption, education expenditure, health, foreign direct investment (FDI), Gross fixed capital formation (GFCF), and the unemployment rate.

The ARDL model is particularly useful given its capability to handle variables of different integration orders i.e., they can be integrated variables I(0) and I(1) (Shrestha & Bhatta, 2018).

The general form of the ARDL model can be specified as follows:

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{j=0}^{q} \gamma_j X_{t-j} + \epsilon_t \quad (1)$$

where:

- Y_t is the dependent variable (GDP per capita)
- X_{t-j} are the independent variables (i.e., Corruption, Education, Health, FDI, infrastructure and unemployment).
- α is the constant term.
- β_i and γ_j are the coefficients of the lagged dependent and independent variables, respectively.
- p and q are the lag lengths of the dependent and independent variables, respectively.
- ϵ_t is the error term.

According to Shrestha and Bhatta (2018), the application of Autoregressive Distributed Lag (ARDL) involves the following steps:

- Unit Root Test: Perform unit root tests such as the Augmented Dickey-Fuller (ADF) tests, to find the order of integration of each variable. This is important to check whether the variables are stationary of order I(0) or I(1) but not I(2).
- Lag Length Selection: Determination the optimal lag length for the ARDL model using information criteria such as the Akaike Information Criterion (AIC).
- Model Estimation: Estimation of the ARDL model, implementing the chosen lags for the dependent and independent variables as well. The model will depict the relationship between the variables in short-run and in long-run.
- Bounds Testing for Cointegration: Conduct the bounds test to ascertain whether there is a long-term relationship among the variables. If the F-statistic from the bounds test exceeds the critical value, then it infers the cointegration is present.
- Long-Run and Short-Run Estimates: When the cointegration is established, then estimation of the long-run coefficients is performed to understand the long-term equilibrium relationship. In addition, it is important to derive the short-run Error Correction Model (ECM) to gauge the short-term dynamics and the speed of adjustment to the long-run equilibrium.
- Diagnostic Tests: Diagnostic tests are then conducted to ensure the robustness and reliability of the model. These tests include checking for serial correlation (Breusch-Godfrey test), heteroscedasticity (Breusch-Pagan test), a test for normality and model stability (CUSUM and CUSUMSQ tests).

- The ARDL model is a comprehensive framework that gives us the opportunity to analyze the dynamic interactions between economic growth (GDP per capita) and its determinants, which offer valuable insights into the impact of corruption and other key variables on economic growth.

3.3. Justification for Chosen Methodology

As mentioned, there are several reasons for using an Autoregressive Distributed Lag (ARDL) model for this study (Hashem Pesaran et al., 2001; Nkoro & Uko, 2016):

- Suitable due to its ability to handle mixed orders of integration.
- Provide both short-run and long-run estimates. This helps in understanding the stability and resilience of economic relationships.
- Addresses endogeneity by the incorporation of lagged values. This makes the ARDL approach particularly robust in empirical applications.
- An ARDL model can reliably estimate small and large sample sizes.
- Allows for the examination of dynamic relationships between variables, capturing both immediate and delayed effects, which is essential for understanding the multifaceted impacts of corruption, economic policies, and investments in sustainable development goals.

By applying the Autoregressive Distributed Lag (ARDL) model, the study gets a detailed and dynamic analysis of the relationships between GDP per capita and its determinants. The method tackles the complexities of mixed integration orders. It portrays both the short-run and long-run effects, making this method a solid basis for the comprehensive understanding of corruption, education, health, infrastructure, unemployment, and foreign direct investment (FDI) and their impact on Namibia's economic growth.

The results of this analysis are important for policymakers, giving them the possibility to make appropriate decisions and plan targeted interventions to encourage the country's sustainable economic growth. In the end, this work contributes to the bigger aim of achieving the SDGs by highlighting the areas to focus on and the means to allocate resources.

4. Empirical Findings

The results of the relationship between corruption and economic growth with the inclusion of health, education, unemployment and foreign direct investment in Namibia using the Autoregressive Distributed Lag (ARDL) are as follows:

4.1. Unit Root Testing

As a pre-requisite, the order of integration of each variable is tested using the Augmented Dickey-Fuller (ADF) test. The null hypothesis for the ADF test is that the variable has a unit root (non-stationary), while the alternative hypothesis is that the variable is stationary.

Table 1: Unit Root Results

Variable	*ADF Test Statistic*	*Critical Value (5%)*	*Order of Integration*
GDP per capita	-1.8525	0.347	I(1)
Corruption	-3.6427	0.0132	I(0)
Education	-0.5195	0.8695	I(1)
Health	-2.1879	0.2157	I(1)
Unemployment	-2.7586	0.0813	I(1)
Infrastructure	-1.7349	0.4003	I(1)
Foreign Direct Investment	-2.949	0.0558	I(1)

Source: Author's estimation using Eviews12

Table 1 shows that corruption is stationary at level I(0), however, the other variables as well as dependent variable are stationary at first difference I(1). Accordingly, fulfilling the requirements for the implementation of the Autoregressive Distributed Lag (ARDL) model.

4.2. Lag Length Selection

To determine the optimal lag length for the model, the Akaike Information Criterion (AIC) was used.

Table 2: Lag Length Selection

Lag Length	*AIC Value*
0	-7.809711
1	-8.228338*

Source: Author's estimation using Eviews 12

The optimal lag length chosen from Table 2. for the Autoregressive Distributed Lag (ARDL) model is 1 based on the lowest AIC value.

4.3. Autoregressive Distributed Lag (ARDL) Model Estimation

In Table 3., the ARDL model is estimated with an automatic lag selection using the Akaike Information Criterion (AIC):

Table 3: Variable Coefficients and Statistical Significance

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*p-Value*
GDP(-1)	0.402	0.185	2.176	0.0546
CORRUPTION	-0.136	0.058	-2.328	0.0422
EDUCATION	0.697	0.360	1.934	0.0818
INFRASTRUCTURE	0.635	0.197	3.229	0.0090
INFRASTRUCTURE(-1)	-0.516	0.181	-2.859	0.0170
HEALTH	0.765	0.388	1.973	0.0767
HEALTH(-1)	0.587	0.367	1.598	0.1412
FDI	-0.184	0.043	-4.329	0.0015
FDI(-1)	-0.120	0.037	-3.221	0.0092
UNEMPLOYMENT	-0.094	0.355	-0.265	0.7962
C	-0.162	0.084	-1.932	0.0821

Source: Author's estimation using Eviews 12

- GDP(-1): The coefficient indicates a positive relationship between past and current GDP per capita. A 1-unit increase in GDP per capita in the previous period is associated with a 0.402-unit increase in the current period.
- Corruption: The negative coefficient suggests that higher corruption levels are associated with lower GDP per capita.
- Education: The coefficient shows a positive impact of education on GDP per capita, though it is marginally insignificant.
- Infrastructure and Infrastructure (-1): The positive coefficient for the current period and negative for the previous period indicates a significant but dynamic relationship between infrastructure development and GDP per capita.
- Health and Health (-1): The coefficients point to an expected positive relationship, but the past period's health expenditure is not statistically significant.
- FDI and FDI(-1): Both current and past foreign direct investments have significant negative coefficients, suggesting a surprisingly inverse relationship with GDP per capita.

- Unemployment: The coefficient is not significant, implying no substantial effect on GDP per capita in this model.
- C (constant): The negative constant term suggests a baseline decrease in GDP per capita when all other variables are zero.

Table 4: Model Fit and Diagnostic Statistics

Statistic	*Value*
R-squared	0.8089
Adjusted R-squared	0.6178
F-statistic	4.2323
Prob(F-statistic)	0.0162
Durbin-Watson stat	1.8968

- The R^2 value indicates that about 80.89% of the variation in GDP per capita can be explained by the independent variables.
- The Adjusted R^2 shows the number of predictors in the model is the primary cause of the goodness of fit.
- The F-Test having a p-value of 0.0162 suggests that the model is statistically significant, i.e. the independent variables together have a significant effect on GDP per capita.
- The Durbin-Watson statistic gives an indication of no autocorrelation in the residuals with the value of 1.8968.

The estimated Autoregressive Distributed Lag (ARDL) model shows significant relationships between GDP per capita and the independent variables (corruption, infrastructure, and FDI) in the model. The general model is a good fit and statistically significant, thus bringing valuable aspects of the dynamics concerning GDP per capita and these three variables.

4.4. Bounds Testing for Cointegration

The F-Bounds test is applied to establish the long-term equilibrium relationship among the variables in the model, often in the context of the Autoregressive Distributed Lag (ARDL) framework (Hashem Pesaran et al., 2001; Nkoro & Uko, 2016).

Null Hypothesis: The null hypothesis of the F-Bounds test is that there is no levels relationship.

Here are the results and interpretations from Table 5:

Table 5: Bounds Test

F-statistic	*Upper Bound Critical Value (5%)*	*Decision*
7.378918	3.28	Long-run relationship exists

Source: Author's estimation using Eviews 12

Since the F-statistic exceeds the upper bound critical value at 5%, the null hypothesis is rejected. This indicates that there is a statistically significant long-run equilibrium relationship between the variables in the model.

4.5. Long-Run and Short-Run Estimates

Long-Run Coefficients:

Table 6: Levels Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Corruption	-0.227221	0.110669	-2.053152	0.0672
Education	1.166312	0.749478	1.556166	0.1507
Infrastructure	0.19882	0.313907	0.63337	0.5407
Health	2.260959	1.311196	1.724349	0.1154
FDI	-0.508405	0.211104	-2.408311	0.0368
Unemployment	-0.157543	0.577737	-0.27269	0.7906
C	-0.270412	0.158462	-1.706483	0.1187

Source: Author's estimation using Eviews 12

- Corruption: The negative coefficient suggests that higher levels of corruption are associated with lower GDP per capita. A 1-unit increase in the corruption index is associated with a 0.227221-unit decrease in GDP per capita, although this relationship is marginally insignificant at 5% but significant at 10%.
- Education: The positive coefficient shows a positive impact of education on GDP per capita. A 1-unit increase in the education index is associated with a 1.166312-unit increase in GDP per capita, though it is not statistically significant.
- Infrastructure: The positive coefficient indicates a positive relationship between infrastructure development and GDP per capita. A 1-unit increase in the infrastructure index is associated with a 0.198820-unit increase in GDP per capita, but this relationship is not statistically significant.
- Health: The coefficient shows a positive impact of health on GDP per capita. A 1-unit increase in the health index is associated with a 2.260959-unit increase in GDP per capita, though it is not statistically significant.

- FDI: The negative coefficient suggests an inverse relationship between foreign direct investment (FDI) and GDP per capita. A 1-unit increase in FDI is associated with a 0.508405-unit decrease in GDP per capita, and this relationship is statistically significant.
- Unemployment: The negative coefficient indicates that higher unemployment rates are associated with lower GDP. A 1-unit increase in the unemployment rate is associated with a 0.157543-unit decrease in GDP, but this relationship is not statistically significant.
- Constant (C): The intercept term has a coefficient of, representing the expected value of GDP when all independent variables are zero. This term is not statistically significant.

The long-term estimates provide significant evidence that FDI and GDP per capita are clearly related negatively, while corruption shows a marginally significant negative impact at 10% level of significance. Education, infrastructure, and health are among the key factors that have a positive but not statistically significant impact on GDP per capita.

Short-Run Error Correction Model (ECM):

Table 7: Error Correction Form

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(Infrastructure)	0.635154	0.103193	6.155022	0.0001
D(Health)	0.764758	0.168676	4.533888	0.0011
D(FDI)	-0.184131	0.019245	-9.5676	0.0000
CointEq(-1)*	-0.597814	0.059676	-10.01765	0.0000

Source: Author's estimation using Eviews12

- D(Infrastructure): The positive coefficient indicates a significant positive relationship between changes in infrastructure and GDP per capita. A 1-unit increase in the change of the infrastructure index is associated with a 0.635154-unit increase in GDP per capita with a p-value of 0.0001.
- D(Health): The positive coefficient suggests that improvements in health lead to an increase in GDP per capita. A 1-unit increase in the change of the health index is associated with a 0.764758-unit increase in GDP per capita with a p-value of 0.0011.
- D(FDI): The negative coefficient of -0.184131 indicates a significant inverse

relationship between changes in FDI and GDP per capita. A 1-unit increase in the change of FDI is associated with a 0.184131-unit decrease in GDP per capita a p-value of 0.0000.

- CointEq(-1): The negative coefficient of -0.597814 for the error correction term, indicates a strong adjustment back to long-run equilibrium. A 1-unit deviation from the long-run equilibrium in the previous period is corrected by approximately 0.597814 units in the current period with a p-value of 0.0000.

Table 8: Error Correction Model (ECM) Model Fit and Diagnostic Statistics

Statistic	*Value*
R-squared	0.879371
Adjusted R-squared	0.858083
Durbin-Watson stat	1.8968

Source: Author's estimation using Eviews 12

- The R^2 of 0.879371 indicates that approximately 87.94% of the variability in GDP is explained by the independent variables in the model. This high R-squared value suggests a good fit of the model to the data.
- The adjusted R^2 of 0.858083 adjusts the R-squared value for the number of predictors in the model. This value also indicates a high level of explanatory power, confirming the model's robustness.
- The Durbin-Watson statistic tests for the presence of autocorrelation in the residuals. A value close to 2 suggests no significant autocorrelation. The value of 1.896829 is very close to 2, indicating that there is no significant autocorrelation in the residuals.

In the short-run, changes in infrastructure and health positively affect GDP, while changes in FDI have a significant negative impact. The error correction term is significant and negative, indicating a strong adjustment towards long-run equilibrium.

4.6. Diagnostic Tests

To ensure robustness and reliability of the model, diagnostic tests including Breusch-Godfrey for serial correlation, Breusch-Pagan for heteroscedasticity, and CUSUM/CUSUMSQ for model stability were conducted.

Below is a summary:

Table 9: Robustness Tests

Test	*Test Statistic*	*p-Value*	*Decision*
Breusch-Godfrey Serial Correlation	3.006548	0.2224	No serial correlation
Breusch-Pagan Heteroscedasticity	6.439644	0.7771	No heteroscedasticity
Normality	0.631037	0.729411	Normal distribution
CUSUM Stability	Stable		Model is stable
CUSUMSQ Stability	Stable		Model is stable

Source: Author's estimation using Eviews 12

The Breusch-Godfrey Serial Correlation Test revealed no issues with serial correlation, as indicated by a test statistic of 3.006548 and a p-value of 0.2224. Similarly, the Breusch-Pagan Heteroscedasticity Test confirmed the absence of heteroscedasticity, with a test statistic of 6.439644 and a p-value of 0.7771.

A normality test showed that the residuals follow a normal distribution, supported by a test statistic of 0.631037 and a p-value of 0.729411. Furthermore, stability tests, namely the CUSUM and CUSUMSQ tests, indicated that the model remains stable over time. Overall, these diagnostic results affirm the model's validity and reliability.

5. Summary of Key Findings

This study looks to investigate the relationship between corruption and economic growth in Namibia. The study also attempts to comprehend the synergy of control variables with their relevant Sustainable Development Goals (SDGs) - like health, education, unemployment, and foreign direct investment (FDI) to the economic growth of Namibia. Ultimately, the study aims at the formulation of policy recommendations that provide insight into how to enhance economic growth through improving the control of corruption and through targeted interventions.

To achieve such purposes, the Autoregressive Distributed Lag (ARDL) model was performed, which is indeed an appropriate and robust econometric tool.

Here is a detailed sum up of the key findings: The Autoregressive Distributed Lag (ARDL) model provided several significant insights into the relationship between various factors and economic growth in Namibia:

- GDP(-1): The positive coefficient indicates that past GDP per capita positively influences current GDP per capita, suggesting a significant inertia effect in GDP growth.
- Corruption negatively impacts economic growth. The negative coefficient indicates that higher levels of corruption are associated with lower GDP per

capita. This finding aligns with extensive literature that consistently reports a detrimental effect of corruption on economic growth. For instance, Mauro (1995) found that corruption lowers investment, which in turn reduces economic growth, while subsequent studies like those by Haque and Kneller (2005) also support this negative relationship.

- Even though the effect of education on GDP per capita is marginally insignificant, it overall has a positive influence on it. Thus, to earmark the country's main resources for the sphere of education may predominantly end up clearing the way for the sustainable growth of the economy. In accordance with the previous studies, it is much the same as for the importance of education in the economy to be a human resource increasing tool. (Barro, 1991; Mankiw et al., 1992).
- Infrastructure has a mixed impact on GDP per capita. While new investments boost economic activity, past investments show a negative relationship, suggesting that older projects may not sustain long-term benefits. This could be due to poor maintenance, inefficiencies, or declining productivity from outdated infrastructure. This finding aligns with Canning and Pedroni (2008), who argue that infrastructure requires careful planning and upkeep to remain a driver of growth rather than a financial burden over time.
- Like education, health expenditures have a positive but statistically insignificant relationship with GDP per capita. The positive impact of health on economic growth is supported by studies such as Bloom et al. (2004), which argue that better health improves productivity and economic performance.
- Both current and past coefficients of foreign direct investment (FDI) have a direct effect on GDP per capita, negatively. This unlikely outcome indicates the need to do further research about the nature and consequences of FDI in Namibia. Some studies, however, have found that FDI may exhibit negative-positive outcomes within the country depending on the underlying institutional quality and prevailing economic conditions (Alfaro et al., 2004; Borensztein et al., 1998).
- Unemployment: This variable shows no substantial effect on GDP per capita within the model.

Overall, the model explained about 80.89% of the variability in GDP per capita, as indicated by an R-squared value of 0.8089. The adjusted R-squared of 0.6178 further confirmed the good fit of the model. The F-statistic of 4.2323 with a p-value of 0.0162 points to the independent variables collectively having a significant impact on GDP per capita.

The F-Bounds test revealed a long-term equilibrium relationship between the variables. The F-statistic of 7.378918 exceeded the upper bound critical value, leading us to reject the null hypothesis and confirm the existence of a significant long-term relationship.

In the long run:

- Corruption continues to show a negative relationship with GDP per capita, albeit marginally significant.
- Education, infrastructure, and health have positive but statistically insignificant impacts on GDP per capita.
- Foreign direct investment (FDI) has a significant negative impact on GDP per capita.
- Unemployment has a negative but statistically insignificant effect.

In the short run:

- Changes in infrastructure and health positively influence GDP per capita, while changes in foreign direct investment (FDI) have a significant negative impact.
- The error correction term indicates a strong adjustment towards long-term equilibrium, signifying that deviations from the long-run path are corrected quickly.

Altogether, the results make clear the adverse effects of corruption on economic growth in Namibia and underpin the relevance of the investment in education and health services regardless of their statistically non-significant impacts. Unanticipatedly, the adverse effect of foreign direct investment (FDI) on GDP per capita also passes on the need for future research where a comprehensive analysis of the types and sources of foreign direct investments is considered.

Infrastructure development is an important, although not straightforward, contribution to economic growth. It requires a holistic and well-thought-out approach. The most effective policy interventions that cover these subjects are imperative to achieving sustainable economic growth in Namibia.

6. Conclusion

This is a practical study in which the relationship between corruption and economic growth in Namibia was examined in tandem with the influence of control variables with their respective Sustainable Development Goals (SDGs). The findings using the Autoregressive Distributed Lag (ARDL) model give valuable insights into how Namibia

can strategically advance its economy by eradicating corruption as well as the influences of other significant factors.

Relationship Between Corruption and Economic Growth (Sustainable Development Goal 16: Peace, Justice, and Strong Institutions)

Namibia's economic growth is noticeably disrupted by corruption. This claim is consistent with numerous studies that, without exception, identify corruption as a drag on the economy.

Policy recommendations

- Strengthen existing laws and implementation of anti-corruption policies in Namibia.
- Re-instate good governance and transparency in organizations both in public and private sectors.
- Ensure a streamlined network of anti-corruption agencies that are independent in practice and not only on paper, and well-resourced to combat corruption effectively.

Influence of Education on Economic Growth (Sustainable Development Goal 4: Quality Education)

Education has a positive, albeit marginally insignificant, impact on GDP per capita. Investing in education can yield substantial economic benefits by enhancing human capital.

Policy recommendations

- Allocate more funding to the education sector so that the infrastructure, the quality of the teachers, and the learning materials are improved on simultaneously.
- These policies are the first steps to getting all children into school and helping them succeed in life.

Influence of Health on Economic Growth (Sustainable Development Goal 3: Good Health and Well-Being)

While there is a positive relationship between health expenditures and GDP per capita, it is not strong enough for this to be statistically significant. Better health is what enhances the productivity of workers and economic growth happens because of such gains.

Policy recommendations

- Invest more in the healthcare sector and focus on the services that are required and more so that the poor can access essential medicines.
- *Influence of Infrastructure on Economic Growth (Sustainable Development Goal 9: Industry, Innovation, and Infrastructure)*
- Investment in infrastructure is significantly related to the GDP per capita. Immediate investments bring about positive effects, while past investments show a negative impact, highlighting the complexity of infrastructure's role in economic growth.

Policy recommendations

- Ensure targeted infrastructure across the board is prioritized with sustainable and high-impact projects.

Influence of Foreign direct investment (FDI) on Economic Growth (Sustainable Development Goal 8: Decent Work and Economic Growth)

Both the existing and the historical values of FDI were found to have significant negative effects on the GDP per capita. Consequently, this calls for future investigation into the nature and effects of FDI in Namibia.

Policy recommendations

- Attract FDI that aligns with national development goals and contributes to sustainable economic growth.
- Create a system that not only follows but also checks the success of the FDI initiatives by making them accountable for socio-economic development.

Therefore, the study revealed that to achieve a sustained level of economic growth and to progress towards the Sustainable Development Goals (SDGs), Namibia must fight against corruption, invest more in education and healthcare, develop strategic infrastructure, and effectively manage foreign investments. These are actions that should be taken during which Namibia will be able to create a more efficient and robust economy while at the same time achieving its development goals in the long run. It is also beneficial for Namibia to be cognizant of its policies and consider global sustainability issues.

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