Corruption and Poverty Reduction in Zimbabwe: Evidence from a Symmetric and Asymmetric ARDL Co-integration Approach

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ABSTRACT

The study examines the impact of corruption, measured by the corruption perception index (CPI) and corruption control (*coc*), on poverty reduction in Zimbabwe from 2000 to 2022. The aim of this paper is twofold: Firstly, to examine corruption's direct and conditional effects on poverty reduction; and secondly, to evaluate the asymmetric impact of corruption, institutional quality, and ICT on poverty reduction in Zimbabwe. The study employs the autoregressive distributed lag (ARDL) and the non-linear autoregressive distributed lag (NARDL) estimation techniques to assess the asymmetric effects of corruption on poverty reduction. The results indicate that corruption indicators have disparate direct effects on poverty reduction in Zimbabwe. Institutional quality is found to hinder poverty reduction, while ICT enhances it. Furthermore, the analysis shows that both institutional quality and ICT significantly moderate the relationship between corruption and poverty reduction. An asymmetric analysis demonstrates that both positive and negative shocks to corruption perception impede poverty reduction, as do the negative changes in the control of corruption. Moreover, the positive and negative shocks of institutional quality are shown to increase and reduce poverty reduction, respectively, while positive shocks of ICT enhance it. The findings provide a basis for policy recommendations.

Keywords: Corruption, Poverty Reduction, ICT, Institutional Quality, ARDL, NARDL, Zimbabwe
JEL Classifications: C32, D02, D73, I32, O33

1. INTRODUCTION

Despite an inquiry into the sustainable development goals (SDGs) 1 (to end poverty) and 16.5 (to reduce corruption and bribery) (Trapnell et al., 2017; Sengupta, 2018; Hope, 2020; Filho et al., 2021), the pervasive challenges of systemic corruption and persistent poverty present significant impediments to sustainable socio-economic development globally, particularly within the nascent economies of the Global South. Corruption is characterised by the misuse of designated authority for personal enrichment (Transparency International, 2022), undermines the efficacy of public institutions (Carrión-Barco et al., 2024), distorts resource allocation (Tacconi and Williams, 2020), deter investments (Dedho et al., 2025), and exacerbates inequality (Berggren and Bjørnskov, 2020; Wong, 2025) thereby directly impeding progress towards poverty reduction objectives outlined in the international development agendas.

Notwithstanding strenuous global efforts, multidimensional poverty continues to afflict billions, manifesting not only as an income deficit but also as limited access to essential services, diminished human capabilities and vulnerability to shocks (Zhang, 2025). For decades, poverty has been an endemic social problem in African countries, marked by a critical lack of basic needs, insufficient resources and income and inadequate access to essentials like nutrition, food, financial means, clothing, housing, clean water, education and health services (Szeftel, 2000). While these challenges are universal, their manifestation and impacts are often acutely pronounced in specific national contexts.

Zimbabwe, a Southern African economy, presents a compelling case study characterised by a complex interplay of economic volatility, developmental aspirations and governance challenges (Muzurura, 2019b; Bonga, 2021). Despite its rich natural resources, Zimbabwe has experienced persistent levels of poverty, worsened by fluctuating economic conditions and a legacy of socio-political dynamics (Mhlanga and Ndhlovu, 2021). Consequently, poverty rates in Zimbabwe have been on an upward trajectory. The World Bank reported that extreme poverty, measured by national poverty, rose from 23% of the population in 2011 to 38% in 2019 (Global Economy Database [GED], 2020). Furthermore, the Macro Poverty Outlook report by the World Bank indicates that approximately 9.9 million Zimbabweans are currently living on <\$3.65/day (World Bank, 2025). More so, Chivandire et al. (2023) report that half of Zimbabwe's population, estimated at 15 million, experiences extreme poverty, subsisting on an income below US\$29.80/month. This increasing poverty level manifests across various dimensions, including food security, low infrastructure, limited access to health, education, financial products, and services, insecurity of life and property, poor voice accountability, and poor economic freedom and political rights (Phiri et al., 2020).

Furthermore, this pervasive poverty severely challenges the Zimbabwean economy, manifesting as significant brain drain and capital flight due to the exodus of skilled professionals and investors (Agrawal et al., 2008; Crush and Tevera, 2010). More so, this dire economic state, coupled with the humiliating and dehumanising effects of poverty (Kaufman et al., 2011; Pilapil, 2020), severely impairs health and human capital development, ultimately leading to low productivity (Ching et al., 2019; Phiri et al., 2020). As a result, widespread poverty compels individuals to prioritise immediate survival over long-term progress, fostering desperation, undermining national culture and impeding sustainable development efforts (Lötter, 2007; Crush and Tevera, 2010; Muzvidziwa, 2010; World Bank, 2015).

In addition to the pervasive poverty, governance indices consistently reveal deep-seated concerns regarding corruption within the Zimbabwean economy. The Transparency International Corruption Perception Index concretely illustrates this, showing Zimbabwe scoring 23 points in 2022 and ranking 158 out of 180 countries (Global Economy Database [GED], 2023), reflecting an enduring perception of widespread corruption. Moreover, in an evaluation of the impact of corruption on the expansion of entrepreneurship in Zimbabwe, Muzurura (2019b) states that Zimbabwe has been ranked by the Transparency International Perception of Corruption Index as one of the most corrupt countries in sub-Saharan Africa. Despite corruption's deteriorating effects (Jones et al., 2023), it is often perceived as an ingrained aspect of daily operation (Nyoni, 2019; Zinyama, 2021). This paradox has led to a contentious academic and policy discourse, where stakeholders, analysts, and policymakers hold divergent views on the magnitude of the corruption's effect on economic development and socio-economic factors such as poverty in the country.

The existing body of knowledge broadly converges on the detrimental effect of corruption on economic growth and poverty. Nevertheless, a significant proportion of these studies implicitly assume a symmetric relationship, where increases and decreases in corruption exert commensurate effects. More so, corruption in Zimbabwe is widely considered a normal part of life because it has always existed and is a global phenomenon. For instance, Nyoni (2019) argued that corruption is not always harmful but a normal aspect of life, as it has been and is happening worldwide. Consistently, Zinyama (2021) also indicated that corruption in Zimbabwe is progressively being normalised as a way of life, having become institutionalised. This breakdown of systemic checks and balances has led certain individuals to adopt corrupt practices as a primary mode of subsistence. These traditional assumptions may overlook critical nuances; for instance, it is plausible that the economic and social consequences of escalating corruption differ quantitatively or qualitatively from those of declining corruption. An explicit assessment of these potential asymmetric impacts on poverty reduction, therefore, constitutes a significant analytical gap. In addition to that, while the individual contributions of Information and Communication and Technology (ICTs) to development and the crucial role of robust institutional quality are well documented (Ullah et al., 2021; Kumba and Olanrewaju, 2023; Mateko, 2024; Jula et al., 2025), their specific mediating roles within the symmetric and asymmetric dynamics of corruption and poverty reduction in developing countries like Zimbabwe remain largely unexplored. This study seeks to bridge this specific empirical void.

Against this backdrop, this research endeavours to address a crucial question: How do symmetric and asymmetric changes in corruption influence poverty alleviation in Zimbabwe, and what are the moderating effects of ICT and institutional quality in this relationship? Thus to address this inquiry, the specific objectives of this research are: To econometrically assess the short-run and long-run symmetric effects of corruption on poverty reduction in Zimbabwe; to empirically examine the presence and magnitude of the asymmetric impact of corruption on poverty reduction using non-linear modelling techniques; to analyse the moderating effect of ICT development on poverty reduction-corruption nexus; and to quantify how institutional quality influences the transmission channel through which corruption impacts poverty reduction.

The current research contributes to the extant literature by moving beyond a linear conception of corruption's effect, offering a more nuanced understanding of its asymmetric effects on poverty reduction. The study extends the empirical evidence by integrating the underexplored roles of ICT and institutional quality as critical determinants within the complex relationship, particularly within the context of a Southern African economy. Understanding the asymmetric impacts offer key insights for the development of effective anticorruption strategies. Recognising the asymmetric effects of corruption on poverty reduction could inform targeted interventions, guiding policymakers in the country and similar economies on resource allocation for governance reform and digital infrastructure development. The findings of the study will thus offer actionable insights for enhancing poverty reduction efforts through improved governance and digital technological integration.

The following section presents a literature review pertinent to poverty, corruption, ICT and institutional quality. The third

section delineates the data sources, theoretical model and the methodology employed for the analysis. The fourth section details the presentation and analysis of the empirical findings. Subsequently, the concluding section of the study offer policy implications, provides recommendations, and suggests areas of future research.

2. LITERATURE REVIEW

The influence of corruption on poverty is accounted for by several theoretical models, predominantly those in neoclassical economic growth and governance. More so, the empirical literature regarding the impact of corruption on poverty remains inconclusive, as most existing research has predominantly concentrated on direct, linear relationship.

2.1. Theoretical Literature

The predominant theoretical position on the corruption-poverty relationship is that corruption exacerbates poverty by impeding economic growth (Chetwynd et al., 2003), exacerbating inequality (Tanzi and Davoodi, 1998) and eroding effective governance (North, 1990). These detrimental effects are consequently linked to phenomena such as rent-seeking behaviours, the diversion and misallocation of public resources, the generation of disincentives for investment (Murphy et al., 1993), the undue advantage afforded to wealth and well-connected groups and the resultant weakening of legitimacy, effectiveness, and accountability of state institutions.

2.1.1. Corruption reduces economic growth and increases inequality

The economic growth theoretical framework posits that corruption exerts its influence on poverty through its effects on the determinants of economic growth, which in turn modulates poverty rates. Therefore, a rise in corruption leads to less economic investment (Solow, 1956; Swan, 1956; Tanzi & Davoodi, 1998), distorted and reduced competition. This creates inefficiencies by raising business costs and also increases income inequality (Murphy et al., 1993; Ndikumana, 2006). By undermining the key economic factors, poverty levels increase. This is also supported by the rent-seeking theory by Tullock (1967) and Krueger (1974) who suggest that groups or individuals engage in rent-seeking activities, which involve manipulating the economic environment to gain unearned income or rent at the expense of others.

2.1.2. Public theory

The effect of corruption on poverty is explained by the public theory, which applies economic principles to political decision-making (Buchanan and Tullock, 2003). This theory posits that politicians and bureaucrats, like individuals in the private sector, act in their self-interest (Zamir & Sulitzeanu-Kenan, 2018). This leads to fiscal leakages where public funds are siphoned off through embezzlement, procurement fraud and illicit fees, reducing the resources available for poverty alleviation programs and essential public services. Also, it leads to regressive taxation and pending, where tax systems favour the wealthy and connected individuals, while spending programs are poorly targeted or diverted, disproportionately harming the poor (Ndikumana, 2006).

2.1.3. New institutional economics theory

This theory posits that corruption exacerbates poverty by weakening governance. Thus, corruption erodes the institutional capacity of government to provide quality public services and diverts public investment from essential needs toward capital projects, which consequently increase budgetary pressures (North, 1990; North, 1993; Klitgaard, 1998). It erodes the legitimacy, effectiveness and accountability of state institutions, which are crucial for a fair and functioning society (North, 1993; Caiden, 1997). Thus, when key governance indicators such as the rule of law are selectively applied or ignored due to bribery and favouritism, legal protections for property rights and contracts diminish, discouraging investment and disproportionately affecting the poor who lack connections (Mauro, 1998; Szeftel, 1998).

2.1.4. The principal-agency theory

Considering the influence of ICT in the corruption-poverty nexus, the current study incorporates Principal-Agency theory, which attributes corruption to information asymmetry and divergent incentives between agents (for example, public officials) and principals (such as citizens or the government), consequently fostering opportunistic behaviour (Jensen and Meckling, 1976). Thus, as the world transitions into the digital era, the use of ICT can mitigate corruption by reducing this information asymmetry. For example, e-governance initiatives, online public services and digital transparency platforms (such as open data portals, online reporting mechanisms) enhance the visibility of government operations, making corrupt practices harder to conceal (Bertot et al., 2010). This heightened accountability curbs corruption, redirecting resources toward public services and poverty alleviation programs that directly benefit the impoverished.

2.2. Empirical Literature

While corruption is broadly recognised as a contributor to poverty, a definitive empirical consensus among scholars regarding its direct causality remains elusive. Early proponents of the greasing hypothesis of corruption (Leff, 1964; Huntington, 1968) contend that it facilitates bureaucratic process by serving as a remedy for inefficiency. However, McMullan (1961) postulates that corruption sands the wheels of business and the broader economy. Several complexities stemming from corruption are inefficiency, injustice, political instability, a lack of public trust in the government, and limitations on policy implementation (Rothstein and Uslaner, 2006). Again, Mauro (1995) and Kamiti (2000) opine that as corruption represents the misappropriation of public authority for private advantage, it systematically denies the social, economic, and political benefits that should be conferred upon the impoverished, the marginalised, and the least educated segments of society. Even though corruption is highly recognised as a clog in the wheels of business and the economy, other scholarly work posit that corruption can be a catalyst for economic growth and development. For example, Palash (2018) and Nyoni (2019) argued that corruption is not always harmful. It streamlines trade and accelerates economic growth by promoting entrepreneurship and assisting the private sector in bypassing a restrictive regulatory landscape.

The empirical evidence regarding the association between poverty and corruption is in consensus that corruption has a significant

influence on poverty levels. Specifically, numerous studies are in consensus that corruption, particularly indicated by the corruption perception index, exacerbates poverty and impedes poverty reduction initiatives. For example, studies in Africa (Eshun & Baah ,2020) developed (Martinez, 2024), less developed and developing (Arslan, 2025) reveal that corruption distorts governance capacity and credibility, undermines investments, increases unequal distribution of resources and public goods and services, and exacerbates poverty.

Similarly, regardless of research methodologies (ADRL, mixed method, literature survey) incorporated, studies on individual African countries, including Egypt (Emara, 2020), Nigeria (Idehen and Oriazowanlan, 2020; Urien, 2024) and South Africa (Salahuddin et al., 2020; Mabitsela, 2024), postulate that corruption aggravates poverty. The above-mentioned scholars explicitly articulate that the debilitating effect of corruption on poverty is intrinsically linked to its detrimental effects on economic growth and development, domestic and foreign investment, government revenue, public resource allocation, management of public funds, and trust in institutions and governments, thereby worsening poverty. Moreover, individual Asian country analysis accords with that in Africa. For example, in Indonesia, Rizki and Solihati (2022) postulates that corruption diverts funds specifically allocated for improving education quality, providing health facilities, developing infrastructure, and expanding employment opportunities, thereby promoting poverty. In parallel, Abdulwasaa et al. (2024) observes that corruption exacerbates poverty by negatively impacting growth and government expenditure in Yemen.

A substantial body of scholarly findings indicate that the influence of corruption is dependent on the specific indicators employed. Consequently, studies utilising corruption perception indicators generally concur that corruption worsens poverty, whereas those focusing on control of corruption measures do not consistently yield the same conclusion. For instance, the system generalised methods of moments (SGMM) analysis by Nugroho et al. (2022) indicate that control of corruption minimises food poverty in 57 developing economies between 2002 and 2018. Paralleling this, the pooled mean group technique used by Vinayagathasan and Ramesh (2022) reveals that corruption control enhances poverty reduction in the South Asian Association of Regional Countries (SAARC) between 1996 and 2019. Consistently, the China Family panel data studies by Han et al. (2022) posit that households with exposure to the anti-corruption campaign demonstrate a significant correlation with higher income levels and a reduced likelihood of living in poverty.

Previous studies have commended that institutional quality and ICT are upcoming factors potentially influencing poverty. This implies that institutional quality and ICT are imperative in poverty reduction analysis. A notable void exists in scholarly discourse regarding the moderating influence of ICT or institutional quality on the relationship between corruption and poverty. Nonetheless, studies on ICT or institutional quality on poverty focused on the direct impacts. Those that assessed the impact of ICT on poverty, regardless of methodology, region or period of study, are in consensus that ICT enhance poverty reduction. For example, Afzal et al. (2022) examined the influence of ICT measured by internet penetration on poverty and income inequality using system generalised methods of moments (SGMM) in 86 economies from 2005 to 2020. The study reveals that ICT technologies, such as internet and cellular phone, have a stronger impact on poverty reduction. Similar results were found in India (Das and Chatterjee, 2023) and Mexico (García-Mora & Mora-Rivera, 2023). This analysis, regardless of the different estimation techniques (quasi-experimental technique, quasi-experimental technique), indicates that the adoption of digital technology directly mitigates the perpetuation of poverty in both metropolitan and non-metropolitan environments.

Nevertheless, in sub-Saharan countries, the ICT pact depends on the ICT modalities. For example, Dzator et al. (2023) assessed the impact of leveraging digital technology on poverty reduction in 44 sub-Saharan countries between 2010 and 2019 using the dynamic SGMM. The study demonstrated that ICT modalities such as mobile phone and ICT goods imports reduce poverty reduction, while internet usage, fixed broadband subscription and ICT goods exported worsens poverty.

The empirical literature on poverty effects of institutional quality is disparate across countries and regions. For instance, Ullah et al. (2021) examined the sustainable use of financial and institutional resources to reduce income inequality and poverty in One Belt One Road countries from 2003 to 2018. The system GMM indicates that institutional quality is associated with increased income inequality, which subsequently drives up poverty. Similarly, a quantile regression study by Goh et al. (2024) on institutional quality, FDI, humana capital growth and poverty shows that the poor institutional quality hampers efforts to reduce poverty in Indonesia between 1984 and 2019. Contrariwise, the Dynamic Ordinary Least Squares (DOLS) analysis in Fagbemi et al. (2020) indicate that institutional quality, specifically rule of law and democratic accountability, exhibits a substantial effect on reducing poverty in Nigeria between 1984 and 2017. Consequently, the GMM and PMG studies by Kouadio and Gakpa (2022) and Jula et al. (2025) reveal that improvements in institutional quality enhance poverty reduction in Nigeria, West Africa (1984-2015) and 29 European countries (2004-2023).

In Zimbabwe, studies on effects of corruption focused much on its impact on economic growth and entrepreneurship (Muzurura, 2019a) and FDI (Muzurura, 2016; Chamisa, 2020). Other studies focused on the status of corruption (Bonga, 2014; Moyo, 2014) in the country, while others concentrated on surveys and literature analysis on the determinants of poverty (Phiri et al., 2020). Thus, Makumbe (2011), Bonga (2014), Moyo (2014), and Muzurura (2017) observed that corruption has a sanding effect as it redirects resources towards unproductive activities. Muzurura (2017) used OLS to evaluate the influence of corruption on economic growth in Zimbabwe. The study argued that corruption obstructs investment and economic development through the mechanism of increased business costs for firms. The study advocates for good governance, positing that it would ensure the accountability of both citizenry and their leaders, thereby fostering enhanced transparency, fiscal

responsibility and economic development. In analysing the drivers, pathways, and outcomes of corruption, Muzurura (2019a) argues that corruption in Zimbabwe results from political instability, weak public institutions, cultural tolerance, poverty, the shadow economy, and the level of education. Moreover, attributes the significant reduction in entrepreneurial activities in Zimbabwe (1998-2016) to a combination of regressive tax regimes and enfeebled public institutions.

A literature survey by Phiri et al. (2020) indicates that the foundational causes of poverty within Zimbabwe are multifaceted, encompassing systemic corruption, elevated unemployment, a underperforming financial framework, a deficit in foreign direct investment, inadequate infrastructure, and stagnant economic sectors.

Nyabunze and Siavhundu (2020) used the Ordinary Least Squares (OLS) to analyse the effect of corruption on tax revenues in Zimbabwe between 1998 and 2018. The study indicates that corruption is a substantial factor impeding the efficient collection of state revenue in Zimbabwe. In an analysis of systemic corruption in Zimbabwe, Zinyama (2021) posit that lack of political commitment from government officials has exacerbated corruption in the country. Consequently, it creates and increases poverty and exclusion.

Mateko and David (2022) assessed the effect of development Aid and ICT on poverty reduction in Zimbabwe using the ARDL method from 1989 to 2019. The study used the Human Development Index (HDI) to measure poverty alleviation. The study indicates that development aid has an insignificant effect on poverty reduction, while ICT increases poverty reduction in Zimbabwe. Consequently, the present study considers ICT as the moderating effect of poverty reduction and corruption, following Mateko and David (2022), who argue that ICT is a poverty reduction factor in Zimbabwe. Furthermore, this paper departs from previous research, which focuses on the direct effect of institutional quality on poverty, by instead considering it as a complementary factor in the link between poverty reduction and corruption.

The existing body of literature predominantly assesses the direct and aggregate effects of corruption on poverty, with consistent findings that corruption, particularly as measured by perception indices, is detrimental to poverty across various countries and regions. Concurrently, an improvement in control of corruption is demonstrably linked to poverty reduction. While ICT and institutional quality are recognised for their impact on poverty levels, existing studies primarily focus on their direct influence. Empirical evidence suggests that ICT development contributes to poverty reduction, yet the effect of institutional quality on poverty remains disparate across national and regional contexts. Within the Zimbabwean academic landscape, research on corruption has largely concentrated on its effects on other macroeconomic factors such as tax revenue and foreign direct investment. Furthermore, numerous studies in Zimbabwe have adopted qualitative approaches and literature surveys to examine the incidence and widespread circumstances of corruption. Critically, there is a conspicuous absence of rigorous econometric assessments of the direct and conditional effects of corruption on poverty in Zimbabwe. This significant void necessitates urgent scholarly attention.

Addressing the aforementioned research gaps, the current study makes several significant contributions to the existing body of literature on corruption and poverty, specifically within the Zimbabwean context. First, it undertakes a comprehensive econometric assessment of the influence of corruption on poverty reduction in Zimbabwe, utilising both corruption perception and control of corruption indicators. Secondly, this research delves into the crucial but underexplored area of mediating effects, examining how ICT and institutional quality influence the nexus between corruption and poverty in Zimbabwe. Thirdly, the study employs a nuanced approach by assessing the asymmetric impacts of both positive and negative changes in corruption, as well as the asymmetric effects of ICT and institutional quality, on poverty. This analysis provides a clearer understanding of whether corruption in Zimbabwe is merely a pervasive circumstance or, as is sometimes colloquially suggested, a "blessing in disguise." By shedding light on the varying effectiveness of increases and decreases in corruption on poverty, and by considering the moderating roles of governance and digital technologies, this study aims to offer policymakers and the government invaluable insights, enabling them to leverage effective governance strategies and digital advancements in their poverty reduction initiatives in Zimbabwe.

Subsequently, the study first examines symmetric effects, including the direct impact of corruption on poverty reduction, while considering the moderating roles of institutional quality and ICT on the Poverty reduction-corruption nexus using the ADRL. Secondly, the study checks the asymmetric effects of corruption, institutional quality, and ICT on poverty reduction in Zimbabwe using the NARDL estimation technique. The NARDL technique facilitates analysis of both the positive and negative impacts of the independent variable on the outcome variable. Therefore, the testable propositions for this study are as follows:

H_1: Corruption has a significant negative effect on poverty reduction.

H_2: ICT and institutional quality moderate the relationship between corruption and poverty reduction.

H_3: The effect of corruption perception on poverty reduction is asymmetric

H_4: The effect of control of corruption on poverty reduction is asymmetric

H_5: The moderating effects of factors (ICT; institutional quality) on poverty reduction are asymmetric

The following section presents the data and methodology used to evaluate the influence of corruption on poverty reduction in Zimbabwe.

3. DATA AND METHODOLOGY

The study utilised data from the Global Economy database from 2000 to 2022. This is because the data for the primary variable,

institutional quality, is only available from 2000. The dependent variable is poverty reduction *(povr)*, proxied by the Human Development Index (HDI). This study utilises the HDI because poverty is generally measured by the deprivation of necessities that people require for basic living standards. A higher HDI indicates that the GDP per capita is higher, the education level is higher, and the lifespan is longer (Kelikume, 2021). Other studies that use HDI as a proxy for poverty include Ezzat (2018), Emara (2020) and Mateko and David (2022). The main explanatory variable is corruption, indicated by two indicators: Corruption perception *(cpi)* and control of corruption *(coc)*. The paper employed the principal component analysis (PCA) to generate the institutional quality and information and communication technology (ICT) indices. The institutional quality index was generated from five components: regulatory quality, the rule of law, government effectiveness political stability, voice accountability (Chinoda and Kwenda, 2019). The said institutional quality scores range from -2.5 (weak) to $+2.5$(strong). The ICT index was also generated using PCA from three ICT components: Fixed broadband subscription, internet usage, and mobile phone usage. The PCA reduces the number of variables in a dataset while retaining the most important underlying patterns (Dutta et al., 2019). As a result, the PCA simplifies the analysis and can improve computational efficiency (Greenacre et al., 2023). Institutional quality and ICT are both regressors and interaction variables. Real gross domestic product *(rgdp)* and unemployment rate *(unem)* are taken as explanatory variables.

3.1. Model Specification
A simple linear model for this study takes the form:

$$povr_t = \beta_0 + \beta_1 corr_t + \beta_2 inst_t + \beta_3 ict_t + \beta_4 corr \times inst_t + \beta_5 corr \times ict_t + \beta_6 rgdp_t + \beta_7 unem_t + \varepsilon_t \qquad (1)$$

Where $povr_t$ is the poverty reduction variable is the outcome variable, and it is proxied by the human development index based on Kelikume (2021) and Mateko and David (2022). t denotes the period. $corr_t$ represents corruption, which is the main explanatory variable. Corruption is measured by two indicators, corruption perception *(cpi)* and control of corruption *(coc)*, and are treated separately since they have different measurements and meanings. The *cpi* is expressed as a value scaled from 0 to 100, with 0 representing the highest corruption and 100 representing the lowest or no corruption. The control of corruption value ranges from -2.5 (weak) to $+2.5$ (strong). $inst_t$ denotes the institutional quality index. ict_t represents the information and communication technology index The $corr \times inst_t$ and $corr \times ict_t$ are the interaction terms that multiply corruption and institutional quality and corruption and ICT. Thus, the effect of corruption on poverty reduction, conditional on institutional quality and ICT is derived as follows.

$$\frac{\partial povr}{\partial corr} = \beta_1 + \beta_4 inst \qquad (2)$$

$$\frac{\partial povr}{\partial corr} = \beta_1 + \beta_5 ict \qquad (3)$$

The variables *rgdp* and *unem* represent real GDP and unemployment rate, respectively. β_0 is the constant, and $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 are the coefficients of the predictor variables to be estimated to be

the same in each period. ε_{it} is the disturbance term. The definitions and sources of variables of interest are presented in Table 1.

The study includes economic growth following growth proponents (Škare & Družeta, 2016; Erlando, Riyanto & Masakazu, 2020) who argue that economic growth constitutes the most effective mechanism for poverty alleviation and for realising the broader socio-economic objectives of an enhanced standard of living. For example, the rapid economic growth between 1985 and 2001 in China played a crucial role in reducing poverty, with approximately 450 million people lifted out of poverty. Accordingly, Phiri et al. (2020) indicate that unemployment is a major factor in poverty.

The study assesses corruption's symmetric and asymmetric effects on poverty reduction using the ARDL technique and the non-ARDL (Shin et al., 2011; Ahmed et al., 2020) techniques. Therefore, the ARDL model is specified in Equation 4 as:

$$\Delta lpovr_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta lpovr_{t-1} + \sum_{i=1}^{q} \beta_{2i} \Delta lcorr_{t-1} +$$
$$\sum_{i=1}^{q} \beta_{3i} \Delta linst_{t-1} + \sum_{i=1}^{q} \beta_{4i} \Delta lict_{t-1} + \sum_{i=1}^{q} \beta_{5i} \Delta lcorr \times linst_{t-1}$$
$$+ \sum_{i=1}^{q} \beta_{6i} \Delta lcorr \times lict_{t-1} + \sum_{i=1}^{q} \beta_{7i} \Delta lrgdp_{t-1} +$$
$$\sum_{i=1}^{q} \beta_{7i} \Delta lunem_{t-1} + \zeta_1 lpovr_{t-j} + \zeta_2 lcorr_{t-j} + \zeta_3 linst_{t-j} +$$
$$\zeta_4 lict_{t-j} + \zeta_5 lcorr * linst_{t-j} + \zeta_6 lcorr * lict_{t-j} + \zeta_7 lrgdp_{t-j}$$
$$+ \zeta_8 lunem_{t-j} + \varepsilon_t \qquad (4)$$

Where:

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 represents the short-run dynamics coefficients while $\zeta_1, \zeta_2, \zeta_3, \zeta_4, \zeta_5, \zeta_6$ and ζ_7 represents the long-run parameters. p and q denote the lag length of the outcome and predictor variables, respectively. j is the lag order. All the variables are expressed in logarithm form (l) to enable the interpretation of the regression coefficients as elasticities. To assess the short-run dynamics, the study follows the Error Correction Model, which is expressed in Equation 5 in the form:

$$\Delta lpovr_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta lpovr_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta linst_{t-1} +$$
$$\sum_{i=1}^{q} \alpha_{3i} \Delta lict_{t-1} + \sum_{i=1}^{q} \alpha_{4i} \Delta lcorr \times linst_{t-1} +$$
$$\sum_{i=1}^{q} \alpha_{5i} \Delta lcorr \times lict_{t-1} + \sum_{i=1}^{q} \alpha_{6i} \Delta lrgdp_{t-1} +$$
$$\sum_{i=1}^{q} \alpha_{7i} \Delta lunem_{t-1} + \delta ECT_{t-1} + \varepsilon_{it} \qquad (5)$$

Where:

δ is the speed of adjustment, ECT_{t-1} is the error correction term. $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ and α_7 are the short-run coefficients. Table 1 presents the definitions and sources of the variables of concern.

3.2. Non-Linear Autoregressive Distributed Lag (NARDL) Model
Even if the study assesses the direct and indirect short and long-run impact of corruption on poverty reduction using the ARDL and

Table 1: Definitions and sources of variables

Variable	Definition	A priori expectations	Citation	Source
povr	Is the poverty reduction proxied by the Human Development Index measures three basic dimensions of human development: long and healthy life, knowledge, and a decent standard of living. Four indicators are used to calculate the index: Life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita.	Dependent variable	Ezzat (2018), Emara (2020), Mateko and David (2022) and Vinayagathasan and Ramesh (2022)	Global Economy Database (GED)
cp	The Corruption Perceptions Index which ranges from 0 (corruption) to 100 (no corruption)	positive	Yusuf et al., 2014; Gossel (2018) Salahuddin et al. (2020)	GED
coc	The Control of Corruption Index: Ranges from−2.5 (weak) to 2.5 (strong)	positive	Taylor et al. (2022)	GED
inst	The institutional quality composite index. The index values range from−2.5 (weak) to+2.5 s (strong).	positive	Alhassan and Kilishi (2019), Rodríguez-Pose and Zhang (2020), Fagbemi et al. (2020), Singh (2021)	Authors PCA calculations with five institutional quality indicators from the GED
ict	Is the information and communication and technology (ICT) index generated using principal component analysis (PCA) from three components of ICT indicators.	positive	Adeleye and Eboagu (2019), Rizqulloh and Firmansyah (2021), Dzator et al. (2023)	Author's calculation with the PCA using the ICT data from GED
rgdp	Annual percentage growth rate of GDP at market prices based on constant local currency.	positive	Ajisafe (2016), Yunan and Andini (2018)	GED
unem	Unemployment rate (%)	negative	Phiri et al. (2020)	GED

error correction model (ECM), the stated estimation techniques lack the capacity to adequately model the nonlinear relationships between the variables of concern. Thus, the study utilised the NADRL estimation technique developed by Shin et al. (2011) to assess the asymmetric or nonlinear effects of corruption on poverty reduction. The NARDL estimation method decomposes the changes in any variable into two parts by analysing the different impacts of positive and negative changes in that variable on the outcome variable (Shin et al., 2011; Dukic, Ozer and Dukic, 2023). Before presenting the NARDL model specification, the paper presents a simple asymmetric regression model developed by Shin et al. (2011) as follows:

$$y_t = \beta^+ x_t^+ + \beta^- x_t^- + \mu_t \tag{6}$$

$$\Delta x_t = v_t \tag{7}$$

Where y_t and x_t are scalar I (1) variables and x_t is decomposed as $x_t = x_0 + x + x_t^-$, where x_t^+ and x_t^- are partial sum processes of positive and negative changes in x_t (Shin et al., 2011). Given the nonlinear of the variables, the model is structured a follows:

$$lpovr_t = \zeta_0 + \zeta_1^+ lcorr_t^+ + \zeta_2^- lcorr_t^- + \zeta_3^+ linst_t^+ + \zeta_4^- linst_t^- + $$
$$\zeta_5^+ lict_t^+ + \zeta_6^- lict_t^- + \zeta_7 lrgdp_t + \zeta_8 lunem_t + \varepsilon_t \tag{8}$$

Where *corr*, *inst* and *ICT* are partitioned into the positive and negative ζ_0, ζ_1^+, ζ_2^-, ζ_3^+, ζ_4^-, ζ_5^+ and ζ_6^- are parameters while $corr_t^+$, $corr_t^-$, $inst_t^+$, $inst_t^-$, ict_t^+ and ict_t^- are the unobserved long-run parameter vectors and ε_t is the disturbance term. The aggregation of the decomposed positive and negative variations of *corr*, *inst* and ict is expressed as:

$$corr_t^+ = \sum_{i=1}^{t} \Delta corr_i^+ = \sum_i^t Max(\Delta corr_i, 0)$$

$$corr_t^- = \sum_{i=1}^{t} \Delta corr_i^- = \sum_i^t Max(\Delta corr_i, 0)$$

$$inst_t^+ = \sum_{i=1}^{t} \Delta ins_i^+ = \sum_i^t Max(\Delta inst_i, 0)$$

$$inst_t^- = \sum_{i=1}^{t} \Delta inst_i^- = \sum_i^t Max(\Delta inst_i, 0)$$

$$ict_t^+ = \sum_{i=1}^{t} \Delta ict_i^+ = \sum_i^t Max(\Delta ict_i, 0)$$

$$ict_t^- = \sum_{i=1}^{t} \Delta ict_i^+ = \sum_i^t Max(\Delta ict_i, 0)$$

Thus, the NARDL model for the positive and negative effects of *cpi coc, inst*, and *ict* on *povr*, based on Shin et al. (2011) methodology, is written in Equation 9 as:

$$\Delta povr_t = \zeta_0 + \zeta_1 povr_{t-1} + \zeta_2^+ corr^+ + \zeta_3^- corr_t^- + \zeta_4^+ inst_t^+ + $$
$$\zeta_5^- inst_t^- + \zeta_6^+ ict_t^+ + \zeta_7^- ict_t^- + \zeta_8 rgdp_t + \zeta_9 unem_t + $$
$$\sum_{i=1}^{p} \omega_i \Delta povr_{t-i} + \sum_{i=0}^{q} \left(\lambda_i^+ \Delta corr_{t-i}^+ + \lambda_i^- \Delta corr_{t-i}^- \right) + \sum_{i=0}^{q} $$
$$\left(\sigma_i^+ \Delta inst_{t-i}^+ + \sigma_i^- \Delta inst_{t-i}^- \right) + \sum_0^q \left(\varphi_i^+ \Delta ict_{t-i}^+ + \varphi_i^- \Delta ict_{t-i}^- \right) + \varepsilon_t \tag{9}$$

Where *p* and *q* are lag orders for the dependent and independent variables, respectively. The $\sum_{i=0}^{q} \lambda_i^+$, $\sum_{i=0}^{q} \sigma_i^+$ and $\sum_{i=0}^{q} \varphi_i^+$ estimate the short-term effect of the increase in *corr, inst*, and *ict* on povr while $\sum_{i=0}^{q} \lambda_i^-$, $\sum_{i=0}^{q} \sigma_i^-$ and $\sum_{i=0}^{q} \varphi_i^-$, estimate the short-run impact of the decrease in *corr*, *inst*, and *ict* on *povr*. The error correction model of Equation 9 takes the form:

$$\Delta povr_t = \alpha_0 + \sum_{i=1}^{p} \omega_i \Delta povr_{t-i} + \sum_{i=0}^{q} \left(\lambda_i^+ \Delta corr_{t-i}^+ + \lambda_i^- \Delta corr_{t-i}^- \right)$$
$$+ \sum_{i=0}^{q} \left(\sigma_i^+ \Delta inst_{t-i}^+ + \sigma_i^- \Delta inst_{t-i}^- \right) + \sum_{0}^{q} \left(\varphi_i^+ \Delta ict_{t-i}^+ + \varphi_i^- \Delta ict_{t-i}^- \right)$$
$$+ \sum_{i=1}^{q} \alpha_1 \Delta rgdp_{t-1} + \sum_{i=1}^{q} \alpha_3 unem_{t-1} + \text{ø} ECT_{t-1} \varepsilon_t \qquad (10)$$

The $\lambda_i^+, \lambda_i^-, \sigma_i^+, \sigma_i^-, \varphi_i^+$ and φ_i^- denote asymmetric short-term effects, while ψ represents the error correction term, which indicates the speed of adjustment. The non-linear framework posits that the relationship between variables is not symmetric, suggesting that the response of the outcome variable to fluctuations in the regressor may vary over time (Shin et al., 2011). The current paper also utilises the NARDL cumulative dynamic multiplier to account for the persistence of the impact of changes in the independent variables on the dependent variable over multiple periods (Shin et al., 2011). The Multiplier effect graphically depicts the transition between short- and long-run dynamics, a property with fundamental and profound theoretical implications. It enables the visualisation of asymmetric adjustment patterns following positive and negative shocks to the explanatory variables (Ahads and Anwer, 2020). Thus, the asymmetric cumulative multiplier effect of a 1% change in the change in $corr_{t-i}^+$, $corr_{t-i}^-$, $inst_{t-i}^+$, $inst_{t-i}^-$ and ict_{t-i}^+, ict_{t-i}^- are derived as:

$$m_k^+ = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta corr_{t-1}^+}, \quad m_k^- = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta corr_{t-1}^-}$$

$$m_k^+ = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta inst_{t-1}^+}, \quad m_k^- = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta inst_{t-1}^-}$$

$$m_k^+ = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta ict_{t-1}^+}, \quad m_k^- = \sum_{i=0}^{k} \frac{\Delta povr_{t+i}}{\Delta ict_{t-1}^-}$$

Where k→∞, $m_k^+ \to \beta^+$ and $m_k^- \to \beta^-$ where $\beta^+ = -\theta^+/\rho$ and $\beta^+ = -\theta^-/\rho$ are the asymmetric long-run coefficients.

Table 2: Descriptive statistics

Variable	Obs	Mean	Standard deviation	Min	Max
povr	23	0.4885652	0.0608634	0.414	0.564
cpi	23	23.08696	2.661391	18	29
coc	23	−1.300435	0.0883422	−1.43	−1.13
inst	23	7.13e-09	1.763253	−2.953673	2.307141
ict	23	−2.59e-09	1.67246	−1.942262	2.276653
rgdp	23	0.7630435	9.794655	−17.67	21.45
unem	23	5.66913	1.147748	4.39	8.07

4. EMPIRICAL RESULTS

A crucial assumption underlying the ARDL bounds testing approach is that the variables are integrated of order 1(0) or 1(1), thereby precluding the inclusion of any 1(2) series (Ghouse et al., 2018). Thus, the study performs the unit root tests to determine the appropriate variables for the ARDL Bound approach. Stationary data also ensures reliable estimates and eliminates spurious inferences. The paper also presents the descriptive statistics (see Table 2) and the correlation coefficient test (see Appendix 1).

The study utilizes the Augmented Dickey-Fuller (ADF) and the Phillips Perroni (PP) (Table 3) to check stationarity in the series. Studies that used ADF and PP unit root tests include Mateko and David (2022).

The ADF test results indicate that *povr*, *coc, inst*, *rgdp*, and *unem* are integrated of order one, while *cpi* and ICT are stationary at levels and first difference. The PP test shows that *cpi* and *inst* are integrated of order 1(0) and 1(1), while the remaining variables are confirmed to be integrated of order 1(1). However, in the event of a structural break, the abovementioned may provide misleading results (Perron, 1989; Perron, 2006). Thus, to control that, the study uses the Zivot-Andrews unit root test (Table 4), which checks the series' integration order in the presence of structural breaks (Zivot and Andrews, 1990). Studies such as Ahmed et al. (2020) used the Zivot-Andrews test for unit root tests.

The Zivot-Andrews stationarity test indicates that only coc and ICT are stationary at the first difference, while the remaining variables are stationary at both levels and first difference. Thus, the three tests confirm that all the variables are integrated at order 2. This confirms the use of the ARDL bound test, which is applicable when the series has different levels of integration. The ADRL bound test detects long-run cointegration among variables, demonstrating a notable advantage in its ability to produce efficient and consistent estimates from limited data (Nkoro and Kelvin, 2016) The ARDL bound test controls for endogeneity and reverse causality (Salahuddin and Gow, 2016; Ahmed et al., 2020; Mateko and David, 2022). The Bound test results for the ARDL and NARDL models are presented in Table 5.

The cointegration results indicate that the F-statistics and t-statistics are more significant than the lower and upper bounds. Thus, a null hypothesis of no cointegration is rejected, which implies that long-run cointegration exists among the variables.

Table 3: Stationarity test: ADF and PP tests

Variable	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	1 (0)	1 (1)	1 (0)	1 (1)
povr	−1.396808	−3.055391**	−0.599280	−3.043834**
cpi	−3.238546**	−5.797805***	−4.068716***	−4.135267***
coc	−2.023773	−4.601749***	−2.026308	−4.601749***
inst	−3.061442	−4.65113***	−3.35117*	−4.653274***
ict	−3.933579**	−3.033028**	−0.081731	−2.954840**
rgdp	−2.723371	−4.939629***	−2.719482	−5.385904***
unem	1.687123	−1.95714***	1.091350	−1.991515**

***P<0.01, **P<0.05, *P<0.1

The study presents the long-run coefficients of the ARDL and NARDL (Table 6). The short-run coefficients will be provided upon reasonable request.

Table 6 indicates the ECT is negative and highly significant, implying that any deviation from the long-run equilibrium is corrected at 100% adjustment speed.

The long-run coefficients in Table 6 indicate that corruption perception hinders poverty reduction, while control of corruption facilitates it. Thus, a percentage rise in corruption perception corresponds to a 0.001% reduction in poverty ($P < 0.05$). This result aligns with Salahuddin et al. (2020) and Rizki and Solihati (2022), Martinez (2024), Mabitsela (2024), Arslan (2025) and Urien (2024) who contend that corruption aggravates poverty.

The findings indicate that control of corruption contributes to a 0.4% increase in poverty reduction ($P < 0.05$). This suggests that effective control of corruption is a crucial determinant of poverty reduction outcomes in Zimbabwe. This result is consistent with Nugroho et al. (2022) and Vinayagathasan and Ramesh (2022), who suggest that control of corruption enhances poverty reduction in developing economies and SAARC countries in the long run.

Table 6 reveals that institutional quality exerts a negative effect on poverty reduction in the long run. The observed outcome deviates from the *a priori* expectations. The detrimental effect of institutional quality on poverty reduction can be attributed to institutional deficiencies in the country (Makumbe, 2011). This result accords with Ullah et al. (2021) who posits that institutional quality exacerbates poverty in One Belt One Road countries. The results also indicate that a 1% increment in ICT increases poverty reduction by 0.05% ($P < 0.01$). This implies that ICT has the potential to minimise poverty. This result is consistent with Mateko and David (2022), Das and Chatterjee (2023), García-Mora and Mora-Rivera (2023) and Dzator et al. (2023), who acknowledged that the advancement of ICT lessens poverty.

The study's findings indicate that economic growth has a negative long-term impact on poverty reduction in Zimbabwe. This suggests that economic growth in Zimbabwe does not substantially aid in the alleviation of poverty. The result contradicts the *a priori* expectation. The observed inverse relationship between GDP on poverty reduction implies that economic growth in Zimbabwe could be non-inclusive, primarily benefiting particular sectors and individuals; thus, if economic growth is concentrated in the hands of the few, the benefits do not trickle down to the poor, worsening income inequality, exacerbating poverty (McKnight, 2019).

The findings demonstrate that a one percent increase in unemployment is associated with a 0.03% reduction in poverty reduction ($P < 0.05$), underscoring unemployment as a key driver of poverty in Zimbabwe. The result is consistent with Phiri et al. (2020), who argue that unemployment is one of the significant factors that promote poverty in Zimbabwe.

The interaction effects show that the influence of institutional quality on the corruption-poverty reduction relationship is disparate across corruption indicators. Thus, the interaction variable of corruption perception and institutional quality (*lcpinst*) is negatively signed, while the main effect is negative and insignificant. This indicates a worsening of the impact of corruption perception on poverty reduction when institutional quality is poor.

Table 4: Stationarity test: Zivot Andrews

Variable	Zivot–Andrews test		Break point
	1 (0)	1 (1)	
povr	−3.605939***	−7.311435***	2009
cpi	−6.165656***	−6.166258**	2006
coc	−2.951854	−5.43519***	2004
inst	−3.553568**	−4.917057**	2004
ict	−4.784329	−5.140856***	2012
rgdp	−5.066703***	−5.877252**	2009
unem	−3.541054***	−2.521660**	2015

***P<0.01, **P<0.05, *P<0.1

Table 5: Bound tests

Test-statistic	ARDL		Test-statistic	NARDL	
	Value	k		Value	k
F-statistic			F-statistic		
Long-run	18.43570	4	Long-run	13.92965	5
ECR	18.43570	4	ECR	13.92965	5
Significance (%)	**Lower bound**	**Upper bound**	**Significance (%)**	**Lower bound**	**Upper bound**
10	2.45	3.52	10	2.26	3.35
5	2.86	4.01	5	2.62	3.79
2.5	3.25	4.49	2.5	2.96	4.18
1	3.74	5.06	1	3.41	4.68
Test-statistic	**Value**		**Test-statistic**	**Value**	
T-statistic			T-Statistic		
Long-run	−4.400104		Long-run	4.313708	
ECR	−14.66571		ECR	12.92887	
Significance (%)	**Lower bound**	**Upper bound**	**Significance (%)**	**Lower bound**	**Upper bound**
10	−2.57	−3.66	10	−2.57	−3.86
5	−2.86	−3.99	5	−2.86	−4.19
2.5	−3.13	−4.26	2.5	−3.13	−4.46
1	−3.43	−4.6	1	−3.43	−4.79

The extant literature demonstrates that institutions and governance serve as conduits through which corruption influences poverty levels. Nonetheless, the findings of this paper show that institutional quality or governance also determines how corruption influences poverty. This indicates that as governments and policymakers strategise corruption-poverty reduction policies, they need to consider the quality of the institutions in the country. This result corroborates Makumbe (2011) and Moyo (2014), who argue that the quality of institutions is thus critical for the development process and that more efficient institutions lower the degree, severity, and incidence of corruption, which in turn reduces poverty.

The results demonstrate that the interaction of control of corruption with institutional quality (*lcocinst*) is positively signed, whereas the main effect of control of corruption is negatively signed. This implies that institutional quality provides a mitigating effect, thereby decreasing the long-run negative impact of corruption control on poverty reduction. Thus, a duo of control of corruption within institutional quality has a beneficial impact on poverty reduction in the long run in Zimbabwe. This result substantiates the findings of Taylor et al. (2022) who opine that bolstering institutional quality leads to more effective control of corruption, which ultimately contributes to a higher quality of life for a broad citizenry.

As for the moderating effect of ICT on the corruption-poverty reduction relationship, the findings suggest that the combined effect of corruption perception and ICT (*lcpilict*) and control of corruption with ICT (*lcoclict*) is positively signed. This suggests that ICT enhances the positive effect of corruption perception and the impact of corruption control on poverty reduction in the long run in Zimbabwe. This observed outcome suggests that the improvement in ICT development has the potential to reduce and control corruption, ultimately enhancing poverty reduction. This result accords with Rizqulloh and Firmansyah (2021) and Dzator et al. (2023) postulate that burgeoning digital technology has the power to increase access to information and the dissemination of new knowledge and ideas, which in turn enhance the awareness and engagement of citizens, thereby increasing the likelihood of controlling corruption and ultimately improving people's well-being in developing economies. The ensuing section presents the asymmetric effects of corruption as well as the complementary factors (*inst*, ICT) on poverty reduction in Zimbabwe.

4.1. Asymmetric Effects of Corruption on Poverty Reduction in Zimbabwe

The NARDL Bound tests (Table 5) show that long-run cointegration exists among the variables, confirming the use of short and long-run NARDL. Thus, the study uses NADRL to assess the asymmetric effects of corruption on poverty reduction. The study considers institutional quality and ICT as moderating or complementary factors in the nexus between poverty reduction and corruption. It is essential to examine the asymmetric effects of these complementary factors to derive more explicit policy implications and implementation strategies. Subsequently, the study examines the asymmetric effects of institutional quality and ICT on poverty reduction in Zimbabwe. The long-run asymmetric

effects of corruption, institutional quality, and ICT on poverty reduction are presented in Table 7.

Empirical findings in Table 7 demonstrate that a positive shock to corruption perception decreases poverty reduction, while a negative shock hinders poverty reduction in the long run. The results suggest that both the positive and negative shocks to corruption perception negatively impact poverty reduction. Even if the magnitude of the effect of the positive shock to corruption perception is greater ($\beta = 0.01^*$) than the impact of the negative shock to *cpi* on poverty reduction ($\beta = 0.004^{***}$), the effect of the negative shock on *cpi* is highly significant. This implies that poverty reduction policies should consider corruption reduction for sustained poverty reduction policies, and stabilising policies should focus on mitigating the negative impacts of corruption perception. This result is consistent with Lewis (2017) and Salahuddin et al. (2020), who argue that the eradication of corruption is a major prerequisite to the initiative of poverty reduction.

The results show that only the impact of negative shocks on control corruption is statistically significant, whereas the impact of positive shocks is insignificant. Thus, the effect of a negative shock in controlling corruption decreases poverty reduction. This result accords with Bonga (2014), Moyo (2014) and Muzurura (2017; 2019a), who argued that the anti-corruption bodies in the country focus primarily on minor issues and the lowest levels of corruption, which makes them inefficient and gives them very little authority to take steps aimed at stopping corruption. This suggests that there is still more work to be done in Zimbabwe to combat corruption. Once more, to reduce poverty in the country, stabilising policies pertaining to corruption control should emphasise strengthening and optimising current corruption control measures from ineffective to effective ones.

The findings demonstrate that any increase in institutional quality leads to increased poverty reduction, while any decrease in institutional quality results in decreased poverty reduction in the long run. The results reveal that even if both coefficients have the same significance level, they have a different level of impact. Thus, the magnitude of the effect of the negative shock to *inst* on *povr* ($\beta = 0.018^*$) surpasses the effect of the positive shock to *inst* on *povr* ($\beta = 0.015^*$). This suggests that although the government and policymakers prioritise strengthening and optimising institutional quality to reduce poverty, they should also concentrate more on minimising the adverse effects. This corroborates Alhassan and Kilishi (2019), Singh (2021) and Kouadio and Gakpa (2022), Jula et al. (2025) who postulate that enhancing and entrenching the institutional quality framework is essential to improving living standards and reducing poverty rates.

Regarding ICT, the results indicate that only a positive shock to ICT increases poverty reduction, while negative shocks are insignificant in the long run. This implies that ICT development in Zimbabwe is a poverty-reduction-promoting factor. This result aligns with Israel (2022), Dzator et al. (2023), Das and Chatterjee (2023) and García-Mora and Mora-Rivera (2023), who acknowledged that the advancement of ICT can lessen poverty.

Table 6: ARDL Long-run coefficients

ARDL (4,2,1,2,2, 0, 1,2, 0,2, 2)			
Dep. Var: povr			
Variable	**Coefficient**	**SE**	**t-statistic**
lcpi	−0.005899**	0.001944	−3.034941
coc	0.416622**	0.132150	3.152645
linst	−0.021611*	0.008740	−2.472780
lict	0.046646***	0.005775	8.077960
lrgdp	−0.001312***	0.000155	−8.480825
lunem	−0.003339**	0.000919	−3.634510
ECT (−1)	−1.496126***	0.102015	−14.66571
C	1.736336***	0.118463	14.65720
Interaction terms	**Corruption perception**		
lcpi	−0.007687	0.003797	−2.024597
lcpilinst	−0.016652*	0.006572	−2.533958
lcpilict	0.019761*	0.007772	2.542606
ECT (−1)	−1.420463***	0.204916	6.931935
C	−1.448569***	0.209269	−6.922033
	Control of corruption		
lcoc	−0.067187*	0.032479	−2.068631
lcoclinst	0.115276***	0.012245	9.413750
lcoc	0.086024**	0.035631	2.414302
lcoclict	0.043525*	0.022049	1.973982
C	1.385938***	0.214460	6.462469
Model specifications and sample information			
Sample (adjusted)	2004-2022		
Include observations	19 after adjustments		
Max dependent lags	4		
Dynamic regressor lag	2lag		
Model selection method	Akaike info criterion (AIC)		

***P<0.01, **P<0.05, *P<0.1

Table 7: Long-run coefficients

NARDL (3,1,1,1,1,1,1)				
Dep. Var: povr				
Variable	**Coefficient**	**SE**	**t-statistic**	**WALD**
cpi_pos	−0.007106*	0.002773	−2.563000	1.1023
cpi_neg	0.003582***	0.000337	10.62132	(0.0201)
coc_pos	0.045599	0.071107	0.641276	Not applicable
coc_neg	0.060895*	0.030413	2.002290	
inst_pos	0.015086*	0.007157	2.107925	6.943800
Inst_neg	0.017571*	0.008578	2.048361	(0.0000)
ict_pos	0.027065***	0.004852	5.577558	Not applicable
ict_neg	0.717209	0.457166	1.568815	
ECT (−1)	−2.151027***	0.280940	−7.656533	
C	1.091987***	0.142841	7.644746	
Sample (adjusted)	2004-2022			
Include observations	19 after adjustments			
Max dependent lags	4			
Dynamic regressor lag	1lag			
Model selection method	Akaike info criterion (AIC)			

***P<0.01, **P<0.05, *P<0.1

Therefore, the Zimbabwean government and other responsible policymaking bodies should consider increasing investments in ICT development as it lowers transaction and transportation costs, promotes awareness, provides new job opportunities, and disseminates new knowledge. Ultimately, this will raise people's living standards and lessen poverty in Zimbabwe.

To capture the non-linearity of long-term positive and negative impact changes of the explanatory variables under consideration, the current paper presents the NARDL cumulative dynamic multiplier, which accounts for the persistence of changes in the predictor variables on the outcome variable over multiple periods. The multiplier effects graphs are in Appendix 2. The x-axis represents the period, while the y-axis shows the magnitude of the positive and negative effects on the dependent variable. The positive and negative impacts on the outcome variable increase with increasing distance from zero and decrease with increasing proximity to zero. The multiplier effect graph for *cpi* indicates that the positive and negative shocks to *cpi* are more or less not showing prominently in the short run up to 10 or 11 years. The positive

Table 8: Residual diagnostics

Test specification	ARDL	NARDL	DECISION
Adjusted R-squared	0.981971	0.943842	The models are a is a good fit for the data
F-Statistic	90.12481 (0.000002)	28.50202 (0.000094)	Models have explanatory power
Durbin-Watson Statistic	3.428668	3.036554	No autocorrelation
Jarque-Bera Normality Test	0.311262 (0.855875)	0.926246 (0.629315)	Residuals in all models are normally distributed
LM Serial Correlation Test	5.492330 (0.2889)	4.5127373 (0.1676)	There is no serial correlation
Breusch-Pagan Heteroscedasticity Test	0.351387 (0.9271)	1.150219 (0.5214)	No heteroscedasticity
Ramsey RESET Test	0.380054 (0.7405)	0.139517 (0.9018)	Models are correctly specified

*Probability values in parentheses. Source: Author

and negative shocks are more pronounced in the long run, yet the negative shock is more prominent. As for controlling corruption, the multiplier graph shows that positive and negative shocks to *coc* are more pronounced over the long term. The institutional quality multiplier effect graph illustrates that both positive and negative shocks to institutional quality have a substantial impact on short- and long-term poverty reduction. The ICT multiplier effect indicates that negative shocks to ICT have a more substantial impact on poverty reduction.

4.2. Diagnostic Tests

The paper employed several diagnostic checks to assess the validity and reliability of the study models. The diagnostic test results for the ARRDL and NARDL models are presented in Table 8.

A statistically significant F-statistic in Table 8 validates the model's overall fit. The probability values of the Lagrange Multiplier (LM) and Breusch Pagan test for the ARDL and NARDL are insignificant. This implies that serial correlation and heteroscedasticity do not exist in the models. Again, the Durbin-Watson statistic with a value exceeding 2 suggests no serial correlation in the residuals. The insignificant p-values from the Jarque-Bera test (see Appendix 4) indicate that the residuals are normally distributed. The insignificant probability values from the Ramsey RESET test suggests that the ARDL and NARDL models are correctly specified. Furthermore, the cumulative sum (CUSUM) and CUSUM of squares tests for the ARDL and NARDL models (see Appendix 3) lie within the 5% significance bounds, indicating the stability of the model's parameters and variance.

5. CONCLUSION

The study examines the impact of corruption on poverty reduction in Zimbabwe in two ways. Firstly, the paper used the ARDL estimator to examine the direct and conditional effects of two indicators of corruption (corruption perception and control of corruption) on poverty reduction. Secondly, the paper also checks the asymmetric effects of corruption and the mediating variables (inst, ict) on poverty reduction using the NARDL estimation technique. The direct effect analyses reveal that corruption perception is inimical to poverty reduction in the long run. Conversely, control of corruption increases poverty reduction over a similar timeframe. The results also indicate that institutional quality negatively affects poverty reduction over time, whereas ICT has a positive and significant effect. Moreover, the findings show that economic growth exerts a negative impact on poverty reduction in the long run. Concurrently, the results demonstrate that unemployment remains detrimental to poverty alleviation efforts within the Zimbabwean context.

Looking at interaction terms, the findings suggest that institutional quality exacerbates the detrimental impact of corruption perception on poverty reduction. Concurrently, the institutional framework mitigates the detrimental impact of control of corruption on poverty reduction. The corruption and ICT interaction effects indicate that ICT enhances the impact of corruption perception on poverty reduction. In parallel, ICT augments the positive effect of control of corruption on poverty reduction.

Regarding the asymmetric effects, the results demonstrate that poverty reduction is negatively impacted by both increases and decreases in corruption perception. The positive shock to control corruption is insignificant in explaining poverty reduction, while a negative shock exerts an adverse effect on poverty reduction. The findings suggest that a positive shock to institutional quality enhances poverty reduction, while a negative shock attenuates it. The results indicate that positive shocks to ICT augment poverty reduction, while negative shocks have an insignificant long-term effect.

The empirical results indicate that even if economic growth alleviates poverty in the near term, it does not dent poverty in the long run. Again, the findings infer that unemployment in Zimbabwe is a poverty-promoting factor. The policy implications and recommendations are articulated in the subsequent section.

5.1. Policy Implications and Recommendations

Empirical results indicate that corruption perception is detrimental to poverty reduction in Zimbabwe. Therefore, the Zimbabwean government should establish a robust anti-corruption framework to support the implementation of effective poverty-reduction strategies. This can be achieved by bolstering the capacity and independence of anti-corruption bodies, such as the Zimbabwean Anti-Corruption Commission. Ensure the anti-corruption commission has sufficient funding and resources to operate effectively. Again, to enhance the deterrent effect of legal frameworks, it is imperative to increase the stringency of anti-corruption regulations by implementing heightened statutory penalties for corruption-related offences.

As the results indicate that control of corruption can potentially increase poverty reduction, there is a need to enhance the intensity and reach of anti-corruption measures to maximise

their effectiveness by entrenching investigative capacities and ensuring timely penalties for corruption cases. Again, effective control of corruption can be maintained by encouraging greater public involvement in anti-corruption efforts through systems that facilitate citizen input and engagement in government decision-making. Moreover, the control of corruption can be achieved by ensuring the independence and impartiality of the judiciary to handle corruption without political interference.

The detrimental effect of institutional quality on poverty reduction in Zimbabwe suggests that current institutional structures and practices might be inefficient. This calls for the Zimbabwean government and policymakers to focus on fundamentally reforming and improving institutional quality to foster a more positive impact on poverty reduction. The Zimbabwean government and policymakers should overhaul existing institutions to improve efficiency, transparency, and accountability by appointing competent, ethical, and experienced leaders to key institutional positions. Moreover, the Zimbabwean government should provide specialised training programs to enhance the leadership skills and professional integrity of institutional leaders.

Policymakers should focus on expanding and leveraging ICT to maximise its benefits for poverty alleviation. Invest in and develop ICT infrastructure to ensure widespread access and connectivity. For example, increasing broadband infrastructure can extend internet access to rural and underserved areas. Again, government policymakers and stakeholders can harness the full potential of ICT to drive poverty reduction by implementing e-government platforms that deliver essential services in key sectors, such as education, social services, and healthcare.

Moreover, efforts should be directed toward promoting good governance practices by appointing competent, ethical leaders and conducting regular audits. Additionally, digital literacy training should be provided to public officials and citizens to enhance their ability to utilise ICT tools effectively. Even if institutions remain weak at mitigating the adverse effects of corruption on poverty reduction, the findings suggest that improvements in institutional quality could amplify the positive impact of corruption perceptions on poverty reduction. This calls for measures to strengthen the capacity, transparency, and accountability of key institutions. For example, independent oversight bodies should be established to monitor institutional performance and investigate misconduct.

As the positive and negative shocks to corruption perception reduce poverty reduction, the Zimbabwean government needs to implement long-term, consistent anti-corruption strategies that are resilient to political and economic changes. Considering that a positive shock to control of corruption increases poverty reduction, while a negative shock reduces poverty over the long term, the Zimbabwean government and anti-corruption institutions should ensure continuous and positive anti-corruption efforts to maximise short-term gains and prevent long-term setbacks. Moreover, the government should implement continuous anti-corruption programs supported by strong political and institutional commitment to maintain the progress achieved.

Since the asymmetric effects results indicate that ICT is beneficial to poverty reduction in Zimbabwe, there is a need for the government to increase investment in ICT infrastructure by expanding and modernising it to ensure widespread and reliable access across the country. Again, providing digital literacy training to public officials and citizens is crucial to enhancing their ability to use ICT tools effectively.

Given that economic growth does not necessarily alleviate poverty in the long run, the government and policymakers need to shift their focus toward policies that ensure inclusive economic growth, especially for the poor and marginalised. For example, promote job creation and income-generating opportunities for vulnerable populations and enhance cash transfer programs, food assistance, and healthcare subsidies to provide immediate relief to people experiencing poverty.

The detrimental effect of unemployment on poverty reduction calls for increased investment in labour-intensive sectors such as agriculture, manufacturing, and construction, as well as the development of public works programs that create immediate employment opportunities in infrastructure and community projects.

Based on the empirical results of the current paper, the study recommends that the government of Zimbabwe, policymakers, and relevant policy authorities work vigilantly and closely to mitigate corruption and establish effective control of corruption. Furthermore, the government should focus on improving operational efficiency and effectiveness while establishing rigorous mechanisms to monitor the quality of national institutions. Moreover, it is imperative to increase investments in ICT infrastructure, as it holds greater promise for sustained poverty reduction in the country. Further studies should examine the influence of corruption and poverty at the provincial level.

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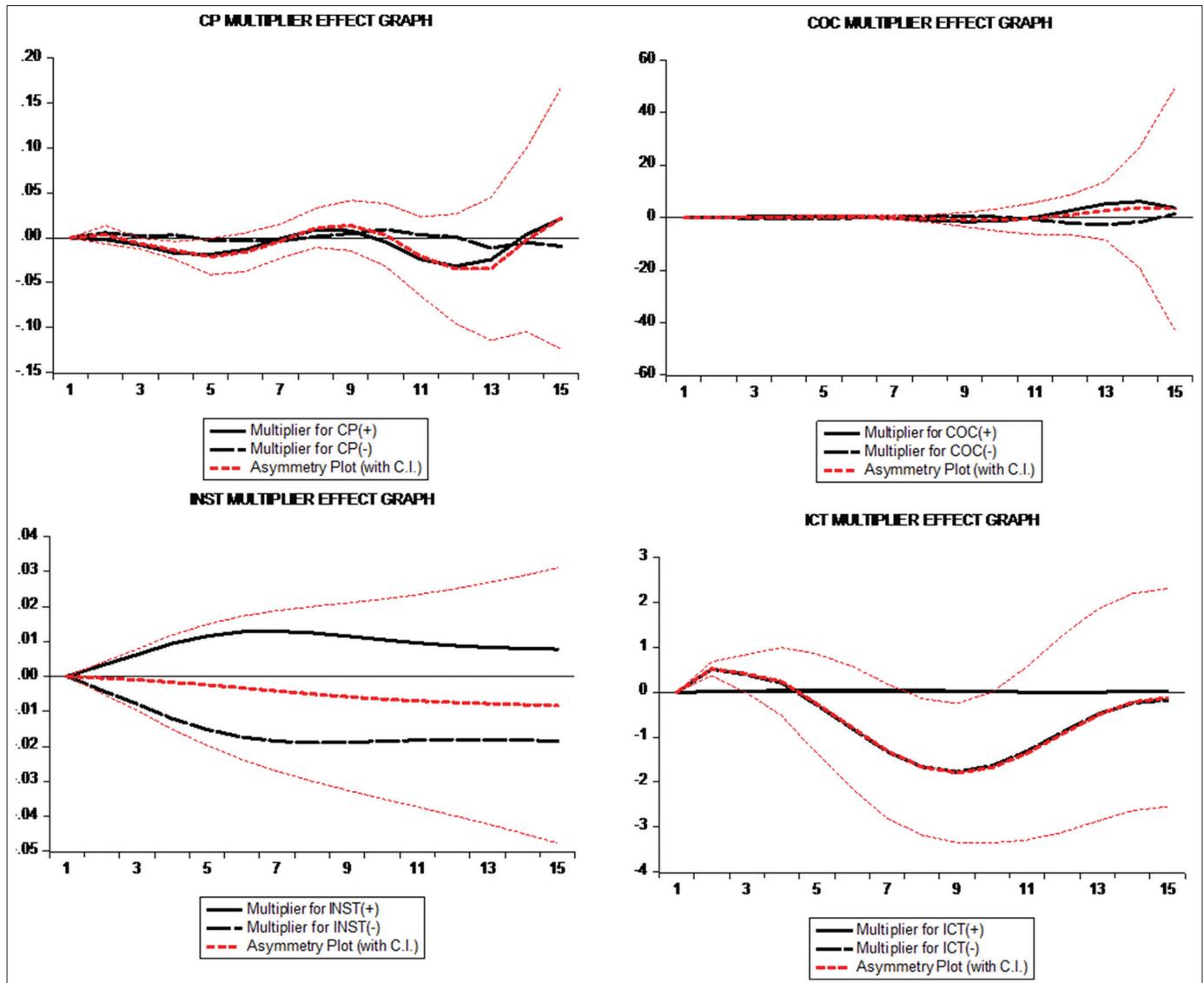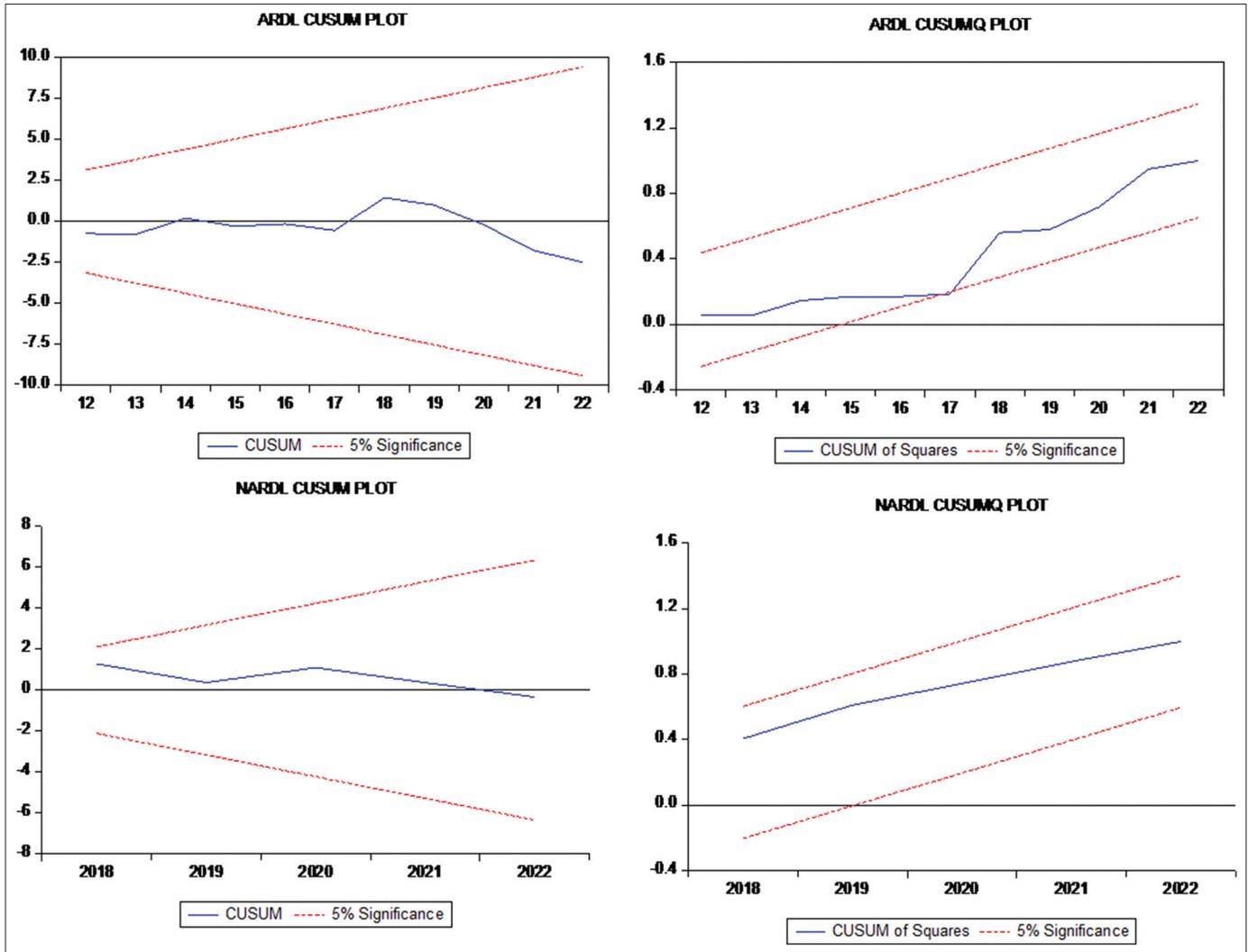
APPENDICES

Appendix 1: Correlation coefficients

	lhdi	lcp	lcoc	linst	lict	lrgdp	lunem
lpovr	1.0000						
lcpi	−0.3350*	1.0000					
lcoc	−0.2554*	0.7172*	1.0000				
linst	0.6277*	0.2610*	0.5043*	1.0000			
lict	0.9847*	−0.3408*	−0.1995*	0.6747*	1.0000		
lrgdp	0.5397*	−0.2189*	−0.3530*	0.1471	0.4668*	1.0000	
lunem	0.6902*	0.0810	0.2515*	0.7518*	0.7260*	0.2184*	1.0000

***P<0.01, **P<0.05, *P<0.1

Appendix 2: NARDL multiplier graphs

Appendix 3: CUSUM and CUSUMQ plots

Appendix 4: Histograms