Establishing the Effects of Internet Users on Inclusive Growth for the SADC Members States: Panel ARDL Approach

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ABSTRACT

Inclusive growth initiatives had an influence on benefits-sharing, distributions, and participation to accumulate income growth and income distributions in both regional and global economies. This study intended to establish the effects of internet users on inclusive growth focusing on the selected Southern African Development Community (SADC) countries which are Botswana, Eswatini, Mauritius, Namibia, and South Africa. Even though the association between information and communication technology (ICT) and economic growth has been investigated, a literature search shows that there is diminutive attention in establishing the effects of internet users on inclusive growth. The panel autoregressive distributed lag (ARDL) approach was employed from 2000 to 2020. The study discovered that internet users' coefficient is positive and makes statistically insignificant contribution in both the short-run and long-run period by repeating the same sluggish coefficient of (0.00). The findings of this study contribute to the understanding that internet usage is not a natural supporter of inclusive growth in the selected SADC countries. The study further discovered that there is dearth of literature to support internet users and inclusive growth studies. The novelty of this study was established by connecting the neo-realist, the disappearing digital joint and digital differentiation theories to the effects of internet users on inclusive growth. This study aspires to urged policymaker's perceptions to increases the understanding and resonance of internet usage to respond to inclusive growth channels. Although there is a positive link but the benefits to promote inclusive growth are misdirected because of insignificant status.

Keywords: Inclusive Growth, Internet Users, Wellbeing and Poverty, Technology, PARDL, Economic Growth
JEL Classifications: O1, O2, O33, H53

1. INTRODUCTION

According to Kabeer (2021) and Bacchetta et al. (2021), inclusive growth refers to the measure used to create opportunities, on benefits-sharing, distributions, and participation to accumulate income growth and income distribution per person employed in order to improve well-being. In the new global economy approach, inclusive growth is believed to have a central initiative for improving living standards and sharing benefits across social groups (Arabiyat et al., 2020). Even though the association between digitalisation and economic growth has been tremendously investigated, limited attention was given to the effects of internet users on inclusive growth (Solomon and Van Klyton, 2020).

Although, inclusive growth recognition has been apprehended by institutions and governments, however, it has failed to maintain equal distribution channels due to inconsistent social patterns (Adeleye et al., 2015; Sarpong and Nketiah-Amponsah, 2022). The regional interval has expanded inclusive distribution challenges and miscarried inclusive growth terms that should enhance welfare (SADC, 2018; 2019). This practice has contributed to lowering the Southern African Development Community (SADC), regional growth sustainability. Moreover, SADC prosperity is not shared equally since the region's inclusive growth drivers continues to suffer unceasing major drawbacks as also highlighted in the Global Sustainable Development Goals (GSDGs), like issues of poverty, well-being, decent work, and economic growth, to mention a few (Afolabi, 2020; Olayiwola, 2022).

Therefore, there is a need to strengthen and shape policymakers' perceptions of inclusive growth through internet users. The current study saw a necessity to adopt the third industrial/digital revolution which was first introduced during the 1960s. The uprising of this digital domains was selected since it utilised and relied on the electronics and information technology to touch the world as itemised by Xu et al. (2018) and Palla et al. (2023). For instance, in terms of digitalisation, particularly internet users, inclusive growth is the use of a general, powerful, and accessible collection of networks or cables which can be connected to computers or other automated gadgets to cover specific distance or location as confirmed by World Bank (2019), ITU (2020) as well as Roos and Kazemi (2022). As a result, this study intends to contribute by bringing a balance to inclusive growth through internet usage participation. Several studies such as Sarpong and Nketiah-Amponsah (2022) and Jiang et al. (2022) are of the opinion that unresponsive inclusive growth strategies segregate equal distribution efforts. That being the case, the SADC member states struggle from one approach to the other in pursuit of improved wellbeing. There is a consensus that SADC has ignored different inclusive dimensions from sharing benefits and prosperity among member states' countries (McInroy, 2016a). These challenges continue to marginalize some member-states and making them fail to access essential services. This study anticipates highlighting the importance of inclusive growth among the selected member states through internet usage.

The SADC region consists of 16 members, this study sample focus on the selected five SADC countries (even though, the status and ranking of countries keep on changing, the selected five were among middle income during the study proposal stage of this study). These are regarded as the middle-income countries which are Botswana, Eswatini, Mauritius, Namibia and South Africa as also itemised by the UNCTAD (2019) and SADC (2019). The selected member states countries have been preferred because of their improved accessibility of data and information concerning the variables of interest. Therefore, there is necessity to establish the effects of internet users in order to increase inclusive growth competence.

Globally, it is believed that digital technological expansion has saved lives even though numerous countries are still characterized by a gap of under-connected and hyper digitalized (Wang and Choi, 2019). Apart from that, the digital power of new technologies has awaited across regions to bring huge and small inclusive changes in human life including the SADC region. It is worth noting that, a ratio of 1:5 people use the internet, compared to the 4:5 ratio of internet subscription in developing countries has been reported by the United Nations (2019). For instance, this indicates the lagging of countries in inclusive growth based on their level of enthusiasm. Hence, the current study is significant to reveal the level of SADC inclusiveness based on internet users.

Table 1, display the ICT readiness and global ITU index of some countries as follows; Mauritius leaded ICT penetration while Seychelles have none during 2017 (ITU, 2017). Mauritius is positioned at 65 over 136 countries for ICT readiness. In 2015 ICT readiness was 4.22 and escalate to 4.54 in 2017. South Africa followed by 4.4% of ICT penetration and the least was Madagascar

which recorded 2.1%. In the period of 2 years 7.6% improvement on ICT readiness was revealed. Furthermore, Mauritius occupies a leading role in Africa and was stated as the first country who have secured ICT levels. In 2019 ITU reported 14.3% of households with access to the internet versus 57.4% of internet users around the globe. Africa attained 28.6% of internet users in 2019. Major participants of internet users were found to be male over female. Mauritius and South Africa internet usage was above 51.4% or world's average as alluded by Roopchund (2020) and ITU (2021).

SADC like any other region globally, is faced with a fast-paced and interconnected world which results in new regulatory challenges that arise from digital disruptions such as connectivity problems (SADC, 2019; Lefophane and Kalaba, 2020). As a result, there is dearth of proliferation studies that would promote inclusive growth, especially in the SADC member states. This study aspires to bridge the inclusive growth gap through internet users. In addition, this study is novel and different from other empirical studies that incorporates ICT, institutional quality, and inclusive growth. This study focuses on establishing the effects of internet users on inclusive growth using panel ARDL data from 2000 to 2020. As far as the methodological aspect is concerned, researched studies such as Malefane (2020), and Shahzad et al. (2022) to name a few, has used panel data, the Generalised Method of Moments (GMM) and Ordinary Least Squares (OLS) unlike this study where Panel Autoregressive Distributed Lag (PARDL) bounds testing approach was executed to estimate the long-run relationship among the variables. The purpose of this study was to establish the effects of internet users on inclusive growth in the selected five SADC member's countries from 2000 to 2020. This was achieved by answering the following question: Does internet users have effects on SADC member states inclusive growth? It is against this background, that a study of this nature establishes the effects of internet users on inclusive growth to improve equity within member states.

This study is comprised of five sections as follows; Section one: shows relevant introduction about the aim and inspiration for conducting the study. The problem statement and significance were also presented under this section. Section two: Established the theoretical and empirical literature of internet users on inclusive growth. Section three: Methodology and relevant econometrics tests were discussed to back up the literature and to make contribution to new knowledge. Section four: Econometrics tests analysis and data interpretations were performed to achieve the aim of the study. Section five: Provide summary, conclusions and recommendations contributions.

2. LITERATURE REVIEW

This section discusses the theoretical and empirical literature which guided the researcher to locate and position relevant variables used in the study.

2.1. Theoretical Literature
This section covered the neo-realist theory, the disappearing digital joint and digital differentiation theories. The theories were chosen due to their advantage of linking the inclusive growth and internet usage. The theoretical model was introduced by Solow in 1956,

while other scholars extended the knowledge until, they finish by following Cobb-Douglas function as revealed by Ajide et al. (2021). To merge the selected theories with the proposed aim, Equ (1) was presented as follows.

$$Y_t = f(K_t)(L.T_t) \qquad (1)$$

The economic output Y- is based on Labor (L), and Capital (K), an increase of technology was denoted by the letter T. (Wall-Cook and Morris, 2017). The above shown equation was utilised effectively to adopts that the study independent variables, internet users can be used as substitutes for either K, L, or technology to clarify its functional meaning in relation to dependent variable, inclusive growth. Moreover, Y, as the dependent variable, depends on expansion of the independent variables L and K, which also presents constant returns to scale, to balance production function in a model. According to Oluwadamilola et al. (2018) and Munguía et al. (2019), the changes of the long-run growth, as a result of investment made on capital, labor or population growth are used to analyse the increase of productivity, known as technological growth. Furthermore, the adopted estimated equation played a crucial role in formation of the current study to further link the variables relationship.

Neo-realist theory was constructed on sweet-smooth-talking to satisfy the minimum requirement necessary to achieve results based on structured rules. Furthermore, this theory exposed human behaviour and demonstrated their flexibility and quick reaction in unnecessary decision making which involve making sacrifice that impacts the majority eventually (Van Niekerk, 2019; Ofori and Asongu, 2022). This theory values individual choices, and over authoritative decision-making with the belief that different self-betterment strategies need to be implemented and monitored to improve welfare, security, safety, prosperity, and fortune in order to improve wellbeing.

The study also applied the disappearing digital dive and digital differentiation theories to establish the internet users and inclusive growth association. Although digital technology transformation has been distributed across the globe to advance growth accumulation, interconnection, and output. Hence, according to Van Dijk and Hacker (2003), and Ştefăniţă and Ivan (2018), the technological role can be influenced by the disappearing digital dive and digital differentiation tactics among other theories. People application of analogous in the digital gadgets to be granted access is referred as the disappearing digital dive. Whereas the digital differentiation is a breakdown of the connection differences in terms of the usage and circumstances. The theoretical literature of this study has trusted upon the above-mentioned theories to link the variables.

2.2. Empirical Literature

This section has established the effects of internet users on inclusive growth linkage to form the basis and alert the reader about which direction the study may take.

2.2.1. The effects of internet users on inclusive growth

Wang and Choi (2019) and Maurya and Lal (2020) studies revealed that in Brazil, Russia, India, China and South Africa which are known as (BRICS), countries, their ICT has spurred a positive inclusive growth using data from 2000 up to 2016. Assuredly, ICT has promoted international trade through internet subscription and lower cost of information search while advancing inclusive growth.

Ozcan (2018) revealed a significant correlation that links the usage of the internet and inclusive growth. Ozcan's findings resonate with the study of United Nations (UN) (2019) and Maurya and Lal (2020), who also reported similar findings; that the digital economy mechanism brings a set of parties together to interact on online platform and enable the use of major syndicates including Amazon, Takealot, Alibaba, Uber, WhatsApp, Tiktok and Facebook as well as those sectors that favours digital accreditation. Furthermore, confirmation was made by Abeliansky et al. (2020) and Abendin and Duan (2021) who argued that internet subscriptions positively influence international and regional inclusive growth.

The enormous growth of the internet statistics showed that households growth rises by 23% in 1993 and reach 80% by the year 2012. Between 1997 and 2016 the US reported an increase in internet usage from 18% to 76% (World Bank, 2018). Banga et al. (2018) certainly confirmed the correlation in the middle of internet subscription and growth. In additionally, developed country's internet diffusion curves reflections are steeper and limited while developing countries have unlimited delays. However, some imposed restrictions that are against democratic freedom on ICT access and Internet cessation were more exercised towards the control and monitoring of population. Besides, the African continent has refrained from creating innovation hubs, shutdowns of the internet subscriptions was applied to undermine economic growth and to hinder inclusive growth (West, 2016; Ayalew, 2019; Parks and Thompson, 2020). However, Remmert (2019) highlighted that Africa was ranked among the highest internet users from 2012 until 2015.

Zhang et al. (2023) investigated the effects of internet technologies on China's financial inclusion. The study utilised the principal component analysis method to assemble the financial inclusion index (IFI) and the internet development index (INT) proportions based on the provincial panel data from 2006 to 2016. Internet development was tested by the fixed-effect panel threshold model, the fixed-effect estimate, and the 2SLS estimate on inclusive finance. The study discovered that there is positive and statistically significant relationship between China's financial inclusion and internet development. Furthermore, this relationship was indirectly affected by the threshold percentage of internet users. The strength of internet usage determines the expansion of financial inclusion.

According to Pushp et al. (2023), India is utilising financial inclusion as an initial economic growth paradigm for all, to embrace financial growth of a country. The study utilised secondary data from 16 states covering the period from 2017 to 2019. The data was sourced from the NITI Aayog and PMFBY ("Pradhan Mantri Fasal Bhima Yojana") reports. The study reveals the positive and statistically significant relationship between financial inclusion and sustainable development goals (SDG) in India which is dependent on internet subscribers. Furthermore, it was also shown that high levels of internet reduce the financial inclusion and SDG positive association.

Kouladoum (2023) assessed the effects of digital infrastructural development on inclusive growth through the Driscoll-Kraay strategy to address cross-sectional dependence among 44 Sub-Saharan African countries. The findings of the study revealed that from 2000 to 2020 inclusive growth was enhanced by the number of individuals using the internet, the number of fixed broadband subscribers, fixed telephone, and mobile cellular subscriptions per 100 adults. Moreover, the findings reveal that digital infrastructures were used to enhances the confident level of inclusive growth from the lower, middle and to the upper-income groups. Gati and Khoirunurrofik (2023) examined the influence of telecommunications infrastructure on inclusive economic growth in Indonesia. The study employed the Fixed Effect Model (FEM) procedure to analyse panel data for 34 provinces covering the period from 2011 to 2021. The study findings established that cellular telephone usage, and internet connectivity display a positive stimulus which at the same time support the per capita income growth and raises the inclusive economic development index. Adeleye et al. (2023) utilised panel spatial correlation consistent (PSCC-FE), instrumental variable generalized method of moments (IV-GMM), and simultaneous quantile regressions (SQREG) models over 193 countries covering the period from 2010 to 2019, to investigates the impact of institutional quality index (IQI) and information and communication technology (ICT) on inclusive growth. The study outcome revealed that ICT is heterogeneous.

According to Behera et al. (2024), there is positive and statistically significant relationship between ICT usage and economic growth. The study outcomes were based on the 13th emerging economies from the year 2000 to 2020. Furthermore, Dossou et al. (2024) studied the moderating effect of internet and mobile usage on the democracy-economic growth among 26 African economies. The study applied the panel corrected standard errors (PCSE) estimation technique and cover the period from 2000 to 2020. The study revealed the significant relationship between the internet usage in African economies and economic growth which was fostered by ICT interactions. Higher internet usage increases the impact of financial technology (Fin Tech), on economic growth over 193 countries covering the period between 2018 and 2021 as alluded by Liu and Chu (2024). The study utilised approximately 778 annual country-based observations to show that FinTech plays and embraces significant role on economic growth depending on the extent of local or country internet usage. In contrast, Işık et al. (2024) conducted a panel quantile regression approach to investigate the impacts of renewable energy consumption, internet usage, mineral rent, and economic growth on CO_2 emissions across 27 OECD countries between 2001 and 2020. The study reported that there is negative relationship between internet usage and CO_2 emissions. Furthermore, internet usage improvement on environmental quality is assigned to a more resourceful, sustainable, and eco-responsive practices, in order to increase the level of productivity.

In view of all that has been mentioned so far, the theoretical literature contributes by strengthening the inclusive wellbeing benefits and digital power or access to access common goals. Moreover, these theories contributions are vital to improve and

deliver inclusive growth. One may suppose that the empirical findings detected that internet has a significant effect on inclusive growth depending on their level of development and structured policy reform. Based on the above factual findings, a conclusion can be drawn from the fact that the above studies have provided inadequate links. For instance, in India, and China, the internet was used as a moderating variable between financial inclusion, financial technology and SDG as debated by Pushp et al. (2023), Zhang et al. (2023) and Liu and Chu (2024). In Sub-Saharan African and Indonesia digital infrastructural development and telecommunications infrastructure were used to explain inclusive economic/inclusive growth as alluded by Gati and Khoirunurrofik (2023) and Kouladoum (2023). For the current year 2024, refreshing literature confirms that OECD countries economic growth was explained by renewable energy consumption, internet usage, mineral rent not inclusive growth as itemised by Işık et al. (2024). Dossou et al. (2024) studied the moderating effect of internet and mobile usage on the African economies to elucidate democracy-economic growth. Furthermore, Kouladoum (2023) utilised four digitalisation proxies unlike the current study that focused only on internet users.

Previous studies also applied various methodologies which includes the FEM, PCSE, fixed-effect panel threshold model, the fixed-effect estimate, and the 2SLS estimate, PSCC-FE, IV-GMM, and SQREG models. These methods were also based on the type of data availability and nature of variables under investigations, unlike the current study that opted for PARDL to match the selected SADC members states effects of internet users on inclusive growth status. There is an aperture about the effects of internet users on inclusive growth in the SADC countries using the PARDL bounds test approach. For this reason, this study serves to bridge that gap through the selected SADC countries.

3. RESEARCH METHODOLOGY AND DATA

This section presents the data sources and estimation methodologies related to the study.

3.1. Data
A panel data from 2000 to 2020 for Botswana, Eswatini, Mauritius, Namibia, and South Africa were used. For instance, it is worth noting that the literature reveals variation of approaches and measurement applied on inclusive growth by numerous scholars such as Aoyagi and Ganelli (2015); Dollar et al. (2016); Tella and Alimi (2016); Whajah et al. (2019); Adeleye et al. (2023); Kouladoum (2023) and Sathya et al. (2023). Inclusive growth was associated with development of the weighted average of growth using an average income and the change in an equity index. Furthermore, the average income of the lowest 20% income quantile, GDP per person employed (a combination of income growth and income distribution) and other factors such as infrastructure, education, health, and unemployment data were used as inclusive growth measurement.

The study selection of proxies was strengthened by Ngepah (2017) view, who confirmed that the published index which includes economic, social, special, political, and ecological factors to

achieve fairness in economic progress and the distribution of economic development may be used to measure the dependant variable based on the nature of the study. The study adopted published data from World Bank's World Development Indicators (WBWDI) database to measure the dependent variable, inclusive growth for this study. The study followed the footprint of Tella and Alimi (2016) who used the GDP per person employed as a proxy for inclusive growth. GDP per person employed is a combination of income growth and income distribution. Although digitalisation has lot of proxies such as mobile subscriptions, internet users and broadband subscriptions to list some, for this study internet users was used as a proxy following the footprints of Myovella et al. (2020). On top of these, some control variables such as population growth and GDP per capita growth were added to backup theory. The WBWDI database direct link is displayed under Table 2.

Where,

μ_i = Country specific effect

ε_{it} = Error term

3.2. Model Specification

This study follows the footprint of Moyo and Khobai (2018) which is attributable to social opportunity function. Therefore, the functional relationship of this study was expressed as,

Inclusive growth = f (Internet users)   (2)

In line with establishing the effects of internet users on inclusive growth, the following model was adopted:

$$GDPPPE_{it} = \beta_0 + \beta_1 INTERu_{it} + \beta_2 POPG(Annual\ \%)_{it} + \beta_3 GDPPCG(Annual\ \%)_{it} + \mu_i + \varepsilon_{it} \quad (3)$$

The above equations have taken the linear format. The inclusive growth variable was logged to improve standardization in the equations as also documented by Letsoalo (2021). Some variables such as internet users, population growth annual percent and GDP per capita growth annual percent were not logged, since were

recorded in percentage. After logging the dependent variable, and in line with the aim of the study (Equ 3) is presented as follows:

$$LGDPPPE_{it} = \beta_0 + \beta_1 INTERu_{it} + \beta_2 POPG(A\%)_{it} + \beta_3 GDPPCG(A\ \%)_{it} + \mu_i + \varepsilon_{it} \quad (4)$$

The logged variable is denoted with symbol L in the (Equ 4). The conversion of variable into logarithm was done to improve the study lags behaviour in econometric interpretation to provide accurate and smooth results from logged data as recognised by Letsoalo (2021). Based on the reviewed literature, the prior expectations are that digitalisation (in particular internet users) variable have a significant and positive influence on inclusive growth. The control variables such as *POPG(Annual)*, and *GDPPCG(Annual)*, may have positive or negative contribution on country's inclusive growth.

3.3. Estimation Techniques

E-views 12 analytical software was employed to run the econometric test.

3.3.1. Descriptive statistics analysis

Descriptive statistics were applied to measure the central tendency of the mean by focusing on and considering the minimum and maximum values. Moreover, this test was appropriate to quantify and measure the position or rank of the variables' skewness and kurtosis that is provided by the Jarque-Bera normality test (Chirwa and Odhiambo, 2020). This is a continuous distribution process for unknown real values and standard deviations of the mean which covers the skewness and kurtosis to flow easily. The Jarque-Bera tests hypothesis are made based on the assumptions that, at H_o, this paper does not reject the null since residuals are normally distributed, (if P-value is more than 0.05), level of significant and H_1, accept the alternative if residuals are not normally distributed (if P-value is lower than 0.05) level of significant. The Jarque-Bera test outcome were used to reflect if residual distribution is normal or nonstandard. Whereas insignificant probability signifies normal distribution of residual throughout the stated study.

Table 1: ICT readiness and global ITU index

Countries	Mauritius	Seychelles	South Africa	Madagascar	India
ICT Penetration Index (2017)	4.54	N/A	4.4	2.1	3.2
Global ITU Index by 2017	5.88	5.03	4.96	1.68	3.08

Source: ITU, 2017

Table 2: Source of data and operationalization of the variables

Variables and abbreviation form	Definition of variables	Measurement
Gross domestic product per person employed (GDPPPE)	GDP per person employed is gross domestic product (GDP) divided by total employment in the economy.	Constant 2017 PPP$
Internet users (INTERU)	Internet users are individuals who have used the Internet (from any location) in the last 3 months.	Percentage of individuals using the internet
Population growth (POPGA)	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage.	Annual %
GDP per capita growth (GDPPCG)	Annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population.	Annual%

Link: Individuals using the Internet (% of population) - South Africa | Data (worldbank.org) World Development Indicators | DataBank (worldbank.org)

Source: A summary of the data information taken from the World Bank computation

3.3.2. Panel unit root test

The panel unit root data dimensions have been popular with numerous researchers as noticed by Arabiyat et al. (2020) and Ajide et al. (2021). Unit root test is crucial for the selection and detection of non-stationary panels. According to Arabiyat et al. (2020); and Ajide et al. (2021), panel data is preferred as it analyses both time and non-time dimensions and increases flexibility among estimated variables unit root.

The panel unit root is used to set and increase unit root power on single generated series (Khraief et al., 2020). Apart from that, panel unit root is useful for individual tests, to further improves the level of stationarity in results and lead to best forecasting. Some statistical procedure of conducting formal stationarity or unit root test were performed through the Levin et al. (1988/2002), Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Before estimating the panel ARDL estimators, the formal unit root test was conducted to ascertain stationarity and to classify the order of integration among the variables as also stated by Pamba (2020). According to the LLC (1988/2002), unit root is executed to test each variable, uplifts the test power, and allows for the pooling approach. According to the Dickey and Fuller (1981) and Gatsi and Owusu Appiah (2020), the stated hypothesis is applied within the t-statistics and various critical values by comparing (1%, 5% and 10%), levels of significant. The Phillips and Perron (1988) test used the stationarity process by reflecting a constant mean and variance over time. However, the non-stationary process is identified by a stochastic trend which reveal changes in the mean and variance over time. In such instances, the first differencing is applied to correct a non-stationary process to be stationary.

3.3.3. The optimal lag length

According to Chandio et al. (2019) and Pamba (2022), appropriate model should be selected to prevent biased outcomes when fitting the long run equation. The suitable and most accurate model is reflected by the smallest predictor of the error criterion. The accurate model is usually crowded by lot of asterisks (*).

3.3.4. Cointegration analysis

The cointegration analysis was used to dictate and display model empirical and meaningful relationships (Alam and Sumon, 2020). The Johansen-Fisher (1992) test was executed to reveal cointegration outcome for the panel data. The presence of cointegration symbolises that there is a direct, balanced and secured long-run correlation of parameters encircling zero means. The Johansen-Fisher test endorsed that the trace statistics and the maximum-eigen value test statistics are applied to test for the number of panels cointegrating vectors (Apostolos and Yeoryios, 2020). The cointegration test results of variables was applied as a classification to escorts the long run and short run to PARDL procedure.

3.3.5. Panel autoregressive distributed lag (PARDL)

The panel ARDL was employed to verify and interpret the long-run relationships and short-run dynamic of interactions among the variables of interest as confirmed by Menegaki (2019), and Letsoalo (2021). The well-known Pesaran et al. (2001) tests were considered to set the groundwork. This approach was preferred due to its several benefits. Basically, it is used for a small or a minimum of 21 observations and is useful or designed for pairing or grouping critical values, and to classify lower and upper bounds values. Moreover, the PARDL technique is considered for purely I(0) and pure I(1). This procedure was also employed to outline, maintain, and improve appropriateness between the variables in the long-run. That being said, the inclusive growth PARDL model of this study is presented as follows,

$$\Delta LGDPPPE_{tt} = \beta_0 + \sum_{p}^{i=1} \Delta\beta_1 LGDPPPE_{t-i} + \overset{i=1}{\underset{p}{\Sigma}} \Delta\beta_2 INTERu_{t-i}$$
$$+ \sum_{i=1}^{p} \Delta\beta_3 POPG_{t-i} + \sum_{i=1}^{p} \Delta\beta_4 LGDPPCG_{t-i} + \beta_5 LGDPPPE_{t-1}$$
$$+ \beta_6 INTERu_{t-1} + \beta_7 POPG_{t-1} + \beta_8 LGDPPCG_{t-i} + \mu_t + E_{2it} \quad (5)$$

Where, Δ stands for first differenced operator, μ_t is the error term. P represents the optimal lag length, and β indicate both long-run, and short-run measurements. The short-run parameters ranges from β_2 to β_4, while parameters of the long-run range between β_5 to β_8. β_0 is the constant estimator. The PARDL hypothesis is illustrated as thus:

H_0: $a_1 = a_2 = a_3 = a_4 = a_n = 0$

$H_1 = a_1 \neq a_2 \neq a_3 \neq a_4 \neq a_n \neq 0$

H_0 is the null hypothesis and it denotes that there is no cointegration, while H_1, implies that there is cointegration.

3.3.6. Stability testing and forecasting

To detect the unknown and unexpected changes over time in the parameters of the regression equation instead of the slope coefficient, the AR inverse polynomial, and Generalised Impulse Respond Function tests were preferred (Nadeem et al., 2020). These tests were utilised to detect the strength and fastness in the long-run. Furthermore, the test was applied to see if regressand or independent variables of the stated model are notable.

4. RESULTS AND DISCUSSION

The previous section discussed the study methodology. This section presents various econometrics outcomes of the study.

4.1. Empirical Tests Results

The empirical test results are presented as outlined in the previous section.

4.1.1. Descriptive statistics test results

Descriptive statistics analysis helped the research readers to gain a brief, accurate and logical understanding of the variables' order and score distribution. The Jarque-Bera tests hypothesis was based on the assumptions that was stated under section 3.3.1. Moreover, the Jarque-Bera test was concluded based on the dependent variable residual distribution as stated in Menegaki (2019) and Chirwa and Odhiambo (2020).

The descriptive statistics test results have assisted in distinguishing unusual distances between the variables of the estimated model.

Table 3: Formal unit root test results, 2000-2020

Unit root tests	LLC			ADF			PP		
Variables	Level	First-difference	Order	Level	First-difference	Order	Level	First-difference	Order
LGDPPPE	−0.49	−2.82***	(1)	6.63	28.1***	(1)	3.77	30.3***	(1)
	(0.31)	(0.00)		(0.75)	(0.00)		(0.95)	(0.00)	
INTERNu	−1.08	−2.94***	(1)	5.70	24.1***	(1)	5.08	22.0***	(1)
	(0.13)	(0.00)		(0.83)	(0.00)		(0.88)	(0.00)	
POPGA%	12.0	−7.20***	(1)	14.6	64.5***	(1)	19.5**	20.9**	(1)
	(1.00)	(0.00)		(0.14)	(0.00)		(0.03)	(0.02)	
GDPPCGA%	−0.00	−4.24***	(1)	15.7*	46.3***	(1)	11.8	58.9***	(1)
	(0.49)	(0.00)		(0.10)	(0.00)		(0.29)	(0.00)	

*** denote level of significant @ 1%, ** denote level of significant @ 5% and * denote level of significant @ 10%. Probability values are displayed inside the brackets, while statistics values were shadowed with asterisk to display level of significant and lastly (0) and (1) denote the order of integration. L denote logged variables

Source: Authors' own computation

The results interpretation was based on the common sample option since the collected data has complete values or observations. The mean reflected the average value of the coefficient in the series. LGDPPPE convey the mean value of 4.58, the minimum value of 4.39 and the maximum value of 4.39. The standard deviation shows that the LGDPPPE display a nonconformity of 0.08. INTERNU displays a massive deviance of 19.8 followed by POPGA% value, which accounts for 0.61 in deviation and GDPPCGA% with 3.79 deviation. The standard deviation confirms that these variables were divergent or moving far away from the mean during the study period. This deviation indicates that a rise in LGDPPPE was explained in numerous ways in the selected SADC member states countries. The expected deviations were dynamic to assist in determining the short-run parameter differences in the PARDL model to impose long-run equality of coefficients in the selected SADC member states.

Based on the achieved results, the current study reflects the positive and negative skewness. The LGDPPPE (−0.12 < 0) is negatively skewed, meaning it has a long-left tail. The INTERNU with a value of 0.77 displays a positive skewness with a long right tail. However, this study indicates a normal distribution. It also means that the selected SADC member states distribution for the current study is diverse. The study reveals that LGDPPPE (1.94 < 3) and INTERNU (2.35 < 3) are Platykurtic. Jarque-Bera normal distribution display that LGDPPPE (0.07 > 0.05), which impose that residuals are normally distributed in the inclusive growth variable. Furthermore, the LGDPPPE probability value is more than 0.05 level of significance, which implies normal distribution. The study fails to reject H_0, for LGDPPPE, since the residual distribution is normal. Meaning that the study has a positive balance, because of an insignificant probability value for a dependent variable during residual distribution as also itemized by Menegaki (2019).

4.1.2. Unit root tests results

The study executed the LLC, ADF and PP - Fisher Chi-square tests to determine variables order of integration. Variables were differenced once to maintain consistency in the panel unit root test as stated under section 3.3.2 above and these outlined is stated in Table 3 below.

Table 3 presents the outcomes of stationarity in level, and first difference which satisfies the condition of using PARDL as noted

Table 4: Lag length test results

Lag	Log L	LR	FPE	AIC	SC	HQ
0	−596.2	NA	7.29	13.3	13.4	13.3
1	−78.7	977.4	0.00	2.19	2.75	2.41
2	−22.3	101.6*	4.31*	1.29*	2.29*	1.69*
3	−7.59	25.2	4.45	1.32	2.76	1.90

*indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Source: Authors' own computation

by Menegaki (2019), who argued that dependent variable results should always be integrated as I(1) not I(0). Although, the unit root was conducted in level and first difference, observation was done in the individual intercept, individual intercept and trend, and none. Yet, this study reported only the individual intercept, and trend outcome and utilizes the other fields as validation of the stationarity of the variables in level and in first difference. Variables were differenced once to maintain consistency in the panel unit root test as detailed in section 3.3.2 above. After differencing all the unit root outcome were statistically significant at the 1% level. Meaning that the null hypothesis of sequence uncertainty was disproved (Menegaki, 2019, and Pamba, 2020).

4.1.3. Lag length test results

Table 4 presents summary of the lag length. Although five criterions were selected, then, the lag two has lot of asterisks which made it to be the most suitable lag under AIC criterion. The AIC display the lower value of (1.29*). Meaning the dependent variable does not respond immediately. The study level of consistency was also supported by Menegaki (2019) and Pamba (2022).

4.1.4. Cointegration tests results

The execution of cointegration test helped to advance and identify association among parameters in the long-run. Cointegration test assist to detect equilibrium between LGDPPPE, INTERNU, POPGA% and GDPPCGA% under the study. Furthermore, cointegration was applied to reveal causal relationship among variables and to provide country specific results as alluded by Menegaki (2019). The Johansen Fisher test was executed.

- Johansen Fisher panel cointegration test results

Table 4 below summarizes the Johansen Fisher panel cointegration results. The Johansen fisher uses the 2 tests to decide on

cointegration (the trace and max-eigen test). The test results were extracted from linear deterministic trend. According to the Johansen Fisher test, the null hypothesis denotes no cointegration and the alternative suggests that there is cointegration (Table 5).

The Johansen Fisher panel cointegration tests conclusion shows that both the trace test statistic and the maximum-eigen test are cointegrated, since they display the likelihood values which are lower than 0.05 level of significant. The study rejects the null hypothesis of no cointegration in favour of the alternative hypothesis that affirms that there is cointegration flowing from none, at most 1, at most 2 and at most 3. The study reveals that there is long-run association and some of its parameters are cointegrated more than thrice, while others are cointegrated more than twice. The study results fulfil the requirement of the Johansen cointegration test regarding economic theory. The Johansen Fisher individual cross section summary was also displayed to back up cointegration outcome. The individual cross section results were conducted to detect any contamination effect that could hinder individual countries cointegration (Menegaki, 2019). Furthermore, this test encourages the interpretation of individual cross-sectional results prior the PARDL approach to strengthen cointegration outcomes.

Table 6 individual cross section outcomes were relevant to reveal specific level for the selected SADC member states. These outcomes from the trace test statistics and the max-eigen test statistics focused on the no cointegration and the at most 1 cointegration relationship. The hypothesis of no cointegration results reflects that Botswana, Eswatini, Namibia and South Africa are all cointegrated under the trace and max-eigen test results with their likelihood values below 0.05. While Mauritius displays nonexistence of cointegration association to other selected SADC member states countries. This imply that the study rejects the null hypothesis of no cointegration in favour of the alternative hypothesis, that states that there is long-run cointegration. The five selected SADC member states countries show a long-run link on four countries. The absence of cointegration was noticed only in Mauritius.

The hypothesis of at most 1 cointegration relationship reflects that apart from Mauritius, Eswatini was also not cointegrated under the max-eigen test statistic results while the long-run cointegration at 5% level of significant was noted in Botswana, Namibia and South Africa for both test statistics. Failure to attain cointegration in Mauritius may be based on that its inclusive development bears a unique experience that varies from many African countries' procedures as recognized by Fauzel (2020). This confirms that there is long-run cointegration for the duration of this study and that their disturbance can be recovered every time as also mentioned by Menegaki (2019).

4.1.5. PARDL long-run and short-run test results

According to Menegaki (2019), the panel data reveal adequate information for both the long-run and short-run equilibrium by adjusting the error term. The PARDL procedure was appropriate to bring the long-run and short-run estimations into line with the opted hypotheses without reducing important information. The PARDL model assisted the researchers to make accurate predictions and it was consistent on providing stable and negative error term results in the short-run period of the study. This study articulates the long-run pooled estimates prior the short-run or mean group coefficients. The long-run equation also identifies the influence of independent variables on the dependant variable. The long-run results are also known as the pooled coefficients. The short-run results were executed to detect the level of significant obtained in the reduced period. Thus, this study also classifies its short-run results as the mean-group coefficients. The long-run and

Table 5: Johansen Fisher test results

Hypothesized No. of CE (s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	176.4	0.00*	137.1	0.00*
At most 1	72.7	0.00*	52.0	0.00*
At most 2	36.0	0.00*	31.6	0.00*
At most 3	17.8	0.05*	17.8	0.05*

*Indicates that the null hypothesis is rejected at 5 % level of significance. **MacKinnon-Haug-Michelis (1999) P-values
Source: Authors' own computation

Table 6: Individual cross-sectional trace and max-eigen test results

Cross section	Trace Test Statistics	Probability**	Max-Eigen Test Statistics	Probability**
Hypothesis of no cointegration				
Botswana	99.7	0.00	66.1	0.00
Eswatini	123.6	0.00	92.6	0.00
Mauritius	39.2	0.24	16.3	0.63
Namibia	138.1	0.00	75.7	0.00
South Africa	113.8	0.00	48.7	0.00
Hypothesis of at most 1 cointegration relationship				
Botswana	33.5	0.01	26.9	0.00
Eswatini	30.9	0.03	17.2	0.16
Mauritius	22.9	0.24	10.9	0.65
Namibia	62.3	0.00	38.7	0.00
South Africa	65.1	0.00	38.4	0.00

Source: Authors' own computation

short-run PARDL technique was useful to assess the model results following Bentzen and Engsted method, which was established by the year 2001 (Letsoalo, 2021).

The parameters used to estimate the model are LGDPPPE, INTERNU, POPGA% and GDPPCGA%. The long-run elasticity is displayed on Table 7 above as follows:

$$LGDPPPE = 0.000 \ INTERNU -0.054 \ POPGA\% + 0.008 \ GDPPCGA\% \tag{6}$$

The selected SADC member states countries long-run and short-run results reflect that internet user's is positively and statistically insignificant. The model results identify that a 1% increase in internet users lead to an increase in inclusive growth by 0.00. This implies that internet users do not have any long-run nor short-run influence related to inclusive growth for the selected member state. The probability value of 0.06 is above 0.05 level of significant. This means that during the study period internet usage displayed statistically insignificant record or was not yet bring into line. The short-run results demonstrate that inclusive growth insignificant was not experienced overnight as displayed by the sluggish probability value of 0.28 which is more than the 5% level of significant. This insignificant flow from the short-run until it was a step closer to the stated level of significant (0.06 > 0.05) as displayed in the long-run period. This implies that internet users connectivity challenges lags or lasts for a while in the African continent not only in the selected SADC member states as also alluded by West (2016), Kathuria et al. (2018), and Parks and Thompson (2020). There is a need to breed existing hubs and to modernize networks to have direct relationship to inclusive growth that will be responsible for welfare (West, 2016, Friederici, 2016, Kathuria et al., 2018 and Parks and Thompson, 2020). The INTERNU variable standard deviations of (19.8) display a huge deviance from other variables stated within one model as shown

under Table 8, descriptive statistics test results. This assisted the researchers to detect that the higher level of deviation may result to a reduced amount of difference between PARDL during the short-run and long-run coefficients estimation. The noted deviation in Table 8, was clarified by the abnormal speed which internet users displayed on its short-run P-value until it rests on 0.06 which was closer to stated level of significance during its long-run period.

The creation of enough and relevant opportunities or distribution channels to improve well-being are delayed based on some imposed restrictions that are against democratic freedom of access to ICT (Ayalew, 2019). Internet intervals and power failure were exercised to undermine economic growth, impeded enterprises from start-up and to refrain the African continent from creating innovation hubs that have direct link to inclusive growth (West, 2016, Friederici, 2016, Kathuria et al., 2018 and Parks and Thompson, 2020). Such delays in ICT on country's context, level, and framework lead to a 0.00% which implied that there is sluggishness or intermission of internet usage in response to selected members inclusive growth.

The study findings agree with Banga et al. (2018) who undoubtedly confirm that there is correlation in the middle of internet subscription and growth. Even though, developing countries have unlimited delays on internet diffusion when compared to the developed country's internet access. According to the UN (2019) and Maurya and Lal (2020), the digital economy mechanism has brought a set of parties together to interact on online platforms. The use of internet has supported and empowered the major syndicates on profit-generating ideas and digital accreditation.

Apart from that, Ozcan (2018), Abeliansky et al. (2020) and Abendin and Duan (2021) has argued that internet subscriptions have positive influence on international and regional inclusive growth. Moreover, their studies also revealed that significant

Table 7: PARDL long-run and short-run test results estimation

Variable	Coefficient	Standard Error	t-Statistic	Probability
INTERNU	0.00	0.00	1.85	0.06
POPGA%	−0.05	0.01	−3.73	0.00
GDPPCGA%	0.00	0.00	6.71	0.00
D (INTERNU)	0.00	0.00	1.07	0.28
D (POPGA%)	0.03	0.02	1.63	0.10
D (GDPPCGA%)	−0.00	0.00	−1.34	0.18
COINTEQ01	−0.35			0.00

Source: Authors' own computation

Table 8: Descriptive statistics test results

Variables	LGDPPPE	INTERNU	POPGA%	GDPPCGA%
Mean	4.58	22.6	1.20	1.75
Minimum	4.39	0.92	0.00	−14.8
Maximum	4.72	70.0	2.19	10.5
Standard Deviation	0.08	19.8	0.61	3.79
Skewness	−0.12	0.77	−0.34	−1.61
Kurtosis	1.94	2.35	1.93	7.60
Jarque-Bera	5.16	12.3	7.08	138.5
Probability	0.07	0.00	0.02	0.00
Observations	105	105	105	105

Source: Authors' own computation

correlation that links the usage of the internet and inclusive growth depends on each country operation and centralisation. The study findings are also supported by Wang and Choi (2019) and Maurya and Lal (2020) studies that revealed that in BRICS countries, the ICT has spurred undeniably positive inclusive growth during the year 2000 until 2016. The ICT was used to promote international trade through internet subscription and lower cost of information search while advancing numerous inclusive growths. Meaning the BRICS countries positive association between internet and inclusive growth are linked to international trade not welfare, as the current study intends.

These studies findings are also noted globally, as all countries are characterized by a gap of under-connected and hyper digitalized. However, these challenges are approached differently and spontaneously (Wang and Choi, 2019, UN, 2019 and Maurya and Lal, 2020). It was spotted that developed countries has higher ratios of internet subscription compared to developing countries. As far as these results indicates, the lagging of countries in internet usage/subscriptions and their gap to inclusive growth is still uninhabited. For that reason, this study come in to detect the status of the selected SADC member state countries only, and to also suggest ways to minimize this gap.

The current study finding is in line with the neo-realist and the digital differentiation theories that documented that better performances are noticed in societies where standards are consistent in terms of the usage and circumstances. Furthermore, this theory emphasized that different self-betterment strategies should be executed, supervised, and linked to inclusive growth benefits to expands welfare (Van Niekerk, 2019 and Ofori et al., 2024). The study findings are in line with the study prior expectation that digitalisation variables have positive impact on inclusive growth, although this study fails to provide direct influence in the selected SADC member states long-run for the period investigated. Absence of long-run influence on the two variables uncovers that there is still inaccessibility of INTERNU in the selected SADC member states countries. This require enhancement to be practiced and influenced until the provision stage in the selected SADC member states countries.

The findings contradict with the empirical expectation as debated but is in line with the Johansen Fisher cointegration test employed. This symbolizes that, although there is a positive link between internet users and inclusive growth but the benefits to promote the selected SADC member states countries are misdirected. Moreover, the findings do not support the internet users' definition suggested by the World Bank (2019), ITU (2020) and Roos and Kazemi (2022) who emphasized that internet refers to the network capacity that provides a general, powerful, and accessible collection of networks to computers and individuals for central connection.

The population growth annual percent coefficient is negative and statistically significant. This reflects that a 1% increase in the population growth annual percentage decreases inclusive growth by −0.05. This concludes that the selected SADC member states population growth annual percent is significant in the long-run.

However, the population growth annual percent coefficient is positive and statistically insignificant during the short-run period. This reflects that a 1% increase in the population growth annual percentage increases inclusive growth by 0.03. This concludes that the selected SADC member states population growth annual percent is irrelevant in the short-run and relevant in the long-run. In the short-run it has positive incentive while, in the long-run is not worthy to be given attention due to its negative incentive. The long-run findings are in accord with Ibukun and Aremo (2017), who uncovered that the selected SADC member states have not dealt with inclusive growth challenges nor resolve population growth challenges that grows faster than their level of income.

The GDP per capita growth annual percent coefficient is positive and statistically significant. This reflects that a 1% increase in the GDP per capita growth annual percentage increases inclusive growth by 0.00. This determines that GDP per capita growth annual percent is statistically significant in the selected SADC member states in the long-run and is well-intentioned. However, the study reported that GDP per capita growth annual percent coefficient is negative and statistically insignificant in the selected SADC member states countries inclusive growth during the short-run. The results imply that the long-run should be given more attention to display its positive enthusiasm and to support Njoh (2017) notion, who discussed that the African continent GDP was utilized to convert people's lives within the selected SADC member states countries besides its low statistically significant probability of 0.00. Inconsistency of GDP per capita was discovered by Raheem et al. (2018) who captured that inclusive growth has a higher wage rate when compared to per capita income (GDP per capita), and/or economic growth that eradicate the rate of poverty and narrow disparities slot. Additionally, inclusive/economic growth has been used as a key prerequisite for reaching out to the most vulnerable people of societies for the provision of essential economic amenities for all.

The error correction model is statistically significant at 1% level of significant and it fulfils economic theory requirement for the

Figure 1: Inverse AR roots illustration for internet users on inclusive growth for general model 1
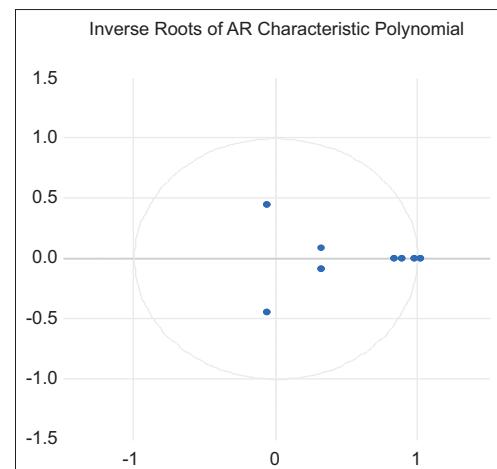
No root lies outside the unit circle. VAR satisfies the stability condition. Source: Authors' own computation

Figure 2: Generalised Impulse Response Function illustration for internet users on inclusive growth for general model 2
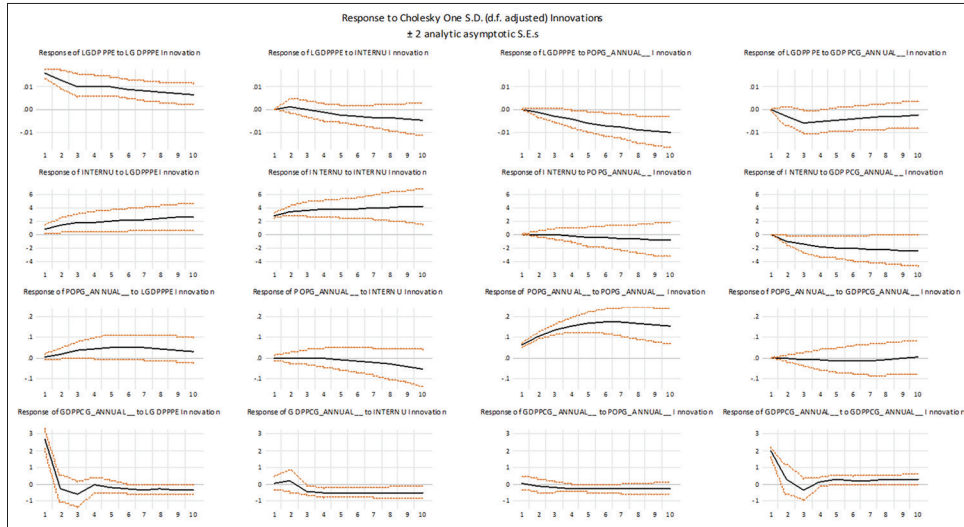
Source: Authors' own computation

PARDL. The error term will adjust back to balance by −0.35. This indicates that chosen SADC member states countries inclusive growth will use 35.2% speed of adjustment each year to return to equilibrium. A negative error correction term has detected that the level of significant of obtained at (0.00) which correspond to the stated 5% level of significant. This model fulfils the PMG/ARDL condition for long-run or pooled coefficients and has also outlined how its disequilibrium movement will be corrected over some period. This permits the PARDL short-run results to be performed to reveal its coefficients and probability movement prior Granger causality test results.

4.1.6. Stability and forecasting tests results
The AR inverse polynomial test was preferred to perceive the unnamed and the unforeseen changes which may occur in the selected parameters of the regression equation over time (Nadeem et al., 2020). The generalised impulse respond function test was used to identify any movement of shock in response to the observed zero level. These tests were also used to rate the regressand or independent variables significance.

The study vector autoregressive (VAR) satisfies the stability condition because all roots lie within the unit circle based on Figure 1 results. Meaning that all the results of the coefficient of elasticity are stationary as also resonated by Nadeem et al. (2020) findings that confirmed that the active equilibrium is achieved when the all the inverse roots results lie inside the unit circle. This test confirms the stationarity outcome achieved under the formal unit root test. This test gives consents for the GIRF to be executed based on its stability outcomes.

The GIRF presented in Figure 2 test was useful to trace inclusive growth consistency and dynamic impact to a system or change in an input in relation to economic theories to make improvement. The shock results based on the first row of the Figure 2 above show that inclusive growth own shock or response is described from LGDPPPE-to-LGDPPPE graph. There is positive and statistically significant response on the inclusive growth graph as

the line is above the zero mean. The inclusive growth displayed the exact response to internet users from the first period to third period. Henceforth, from the 4th period to the 10th period inclusive growth shocks the selected SADC member's states internet users negatively. The shock deceases little by little as an impression that INTERNU and LGDPPPE fails to come together to a zero mean during the study estimated period. The study results are consistent with the neo-realist theory demonstrated that human beings are quick to react in decision making and they usually make unnecessary sacrifice that impacts the majority in the long-run (Van Niekerk, 2019; Ofori et al., 2024).

This study has uncovered that the internet usage is not entertaining the selected SADC member states inclusive growth during the year 2000 to 2020. However, the study findings are in accord with UN (2019) and Maurya and Lal (2020) who emphasized that under-connected and hyper digitalized is a global challenge. This study outcome also shows that in the selected SADC member states countries, internet usage is not a natural supporter of inclusive growth as it does to numerous economic growths. Meaning that the internet users and inclusive growth positive association was used to inconvenience welfare during the study period.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions
The previous chapter analysed different econometrics tests. This section summary the study findings by concluding and making recommendations based on the results and contributions acquired. The study established the effects of internet users on inclusive growth in the top five SADC members countries from 2000 to 2020. The aim was achieved by means of the PARDL techniques with suitable data from WBWDI database. The reviewed theoretical and empirical literature were notably linked to the study estimated model through the descriptive statistics, unit root test, lag length and cointegration test. Henceforth, stability

and forecasting tests outcomes was revealed. The conclusion is aligned with the objectives and research questions from the first section. The results reflected that internet users are positively and statistically insignificant. A 1% increase in internet users leads to an increase in inclusive growth by 0.00 in both periods. The study findings are in agreement with Ozcan (2018), Abeliansky et al. (2020) and Abendin and Duan (2021) who argued that internet subscriptions have positive influence on international and regional inclusive growth.

The current study finding is in line with the neo-realist different self-betterment strategies to be executed, supervised and linked to inclusive growth benefits to expands welfare (Cox, 2019, Van Niekerk, 2019; Ofori and Asongu, 2022). Moreover, the findings are in line with the study prior expectation that digitalisation variables have positive impact on inclusive growth. Yet, this study fails to provide direct influence in the selected SADC member states long-run outcome, inferring that internet users and inclusive growth positive association does not reach the provision stage. The outcome symbolizes that, although there is a positive link between internet users and inclusive growth but the benefits to promote the selected SADC member states/countries are misdirected because of insignificant status. It can be assumed that some of the selected SADC member states are trying to link INTERNU with LGDPPPE, since the long-run and short-run coefficient is the same. Moreover, their probabilities reveal that there is some effort to make improvement among some of the top five selected members.

The population growth annual percent and the GDP per capita growth annual percent coefficients are statistically significant. This concludes that even though population growth annual percent is significant in the selected SADC member states in the long-run but is not worthy to be given attention meaning that it has negative incentive while the GDP per capita growth annual percent coefficient has positive incentive towards inclusive growth. The error correction model is statistically significant at 1% level of significant and this implies that inclusive growth will adjust back to balance by -0.35. This study outcome also shows that internet usage is not a natural supporter of inclusive growth. Although internet users have maintained the same coefficient during the study long-run and short-run period, but its probability fluctuation has been impressive. Internet users moved quickly from being statistically insignificant in the short-run, to be a step closer to the stated level of significant during PARDL. The model displays the positive strength that the variables shares and their importance to be linked to inclusive growth to enhance desire welfare.

5.2. Recommendations
The study recommends that SADC policymakers make readjustments to link internet user's effects to inclusive growth to instil well-being. There is a need for the selected SADC member state to create numerous internet portal that will be redirected to inclusive growth. The study also recognized insufficient and misuse of inclusive growth channels that divert the process from reaching the provision stage. It is recommended that the selected SADC member states undertake research before adopting Internet channels to enhance inclusive growth distribution.

5.3. Contributions and Limitations
The study novel contribution can also be celebrated globally, since all countries are characterized by a gap of under-connected and hyper digitalized. However, these challenges are approached differently, and their spontaneous application can bring diversity (Wang and Choi, 2019; UN, 2019; Maurya and Lal, 2020). As a results, the lagging of countries in internet subscriptions and their gap to inclusive growth is uninhabited within country context. The study has shared unique knowledge about internet users and inclusive growth sensitivities by focusing only on the selected SADC top five middle-income countries covering the period from 2000 to 2020, unlike other studies, which combined developing and developed countries. Due to diverse digitalisation upgrades which are linked to technological renovations, this approach may be revisited to include the fourth industrial revolutions aspects such as the artificial intelligence and robotics in all the 16 members states. The study focused on establishing the effects of internet users on inclusive growth of the SADC member states only from 2000 to 2020 using annual data from WBWDI. Hence, the current study limitations do not influence the outcome presented.

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