MUTUAL FEEDBACK SHOCKS BETWEEN ICT AND POVERTY IN SOUTH AFRICA

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ABSTRACT

This study delves into the intricate relationship between information and communication technology (ICT) and poverty in the context of South Africa, exploring the mutual feedback shocks that dynamically shape both domains using data from World Development Indicators for the period 1990-2021. Employing a comprehensive analytical framework, the study investigates how advancements in ICT, an index of computers, mobile phones and internet, influence poverty rates, proxied by head count ratio, in the short run and long run and, conversely, how the socio-economic conditions associated with poverty feedback into the ICT landscape. Correlation test, granger causality test, co-integration test and VAR/VECM models were utilised in an endeavor to seek answers to the questions. The empirical results showed that there is a relationship, with ICT truly causing poverty in South Africa. The VAR/VECM established that there exists a long run relationship between ICT and poverty in South Africa, at 10% significance level, and the variance decomposition further confirmed some significant short run feedback shocks between ICT and poverty. It is highly recommended that the South African government put in place sound and friendly ICT policies, more especially to the marginalised and poor townships where a lot of SMMEs are trying to thrive. Skills development and an increase in public expenditure on ICT is recommended, as an effort to eradicate poverty through ICT. Through empirical analysis, the complex dynamics that underscore this mutual feedback loop were exposed, shedding light on the potential mechanisms for breaking the cycle of poverty through strategic ICT interventions. This research not only contributes to the academic discourse on technology and development but also provides practical insights for policymakers and stakeholders seeking sustainable strategies to address poverty challenges in South Africa.

1. INTRODUCTION

The global challenge of extreme poverty, affecting approximately 9.2% of the world's population, resonates profoundly in sub-Saharan Africa, notably in South Africa, where a significant portion of this burden is felt (World Bank, 2020). Amidst this socioeconomic landscape, the transformative impact of information and communication technology (ICT) emerges as a beacon of hope in the post-2000 era. The escalating significance of ICT as a driver of economic development has garnered considerable attention, emphasising its potential role in poverty alleviation (Masango, Van Ryneveld & Graham, 2022). Recognising this potential, the Southern African Development Community (SADC) took a decisive step in 2001 by endorsing regional ICT policies and strategies. This commitment was fortified by substantial investments aimed not only at harnessing ICT for economic growth but also as a tool to mitigate the pervasive challenge of poverty (Olamide et al., 2022). This study embarks on a comprehensive exploration to discern the intricate relationship between ICT and poverty. Beyond establishing a correlation, our focus extends to unraveling the existence of mutual feedback shocks between ICT and poverty. By delving into this dynamic interplay, the study aims to provide valuable insights that can inform and shape effective policies for sustainable development, with a dual objective of poverty reduction and economic advancement.

Against this background, the objectives of the study henceforth are to find out if there is a relationship between ICT and poverty in South Africa and also determine the causal relationship between the two. The study aims to find out if there is a long run and short run equilibrium between ICT and poverty in South Africa as well as to find out if there are mutual feedback shocks between ICT and poverty in the same country.

The rest of the paper is structured as follows: section 2: overview of ICT and poverty in South Africa, section 3 reviews the materials and methods, while section 4 presents the results. Section 5 details discussions and conclusions while section 6 is recommendations.

2. OVERVIEW OF ICT AND POVERTY IN SOUTH AFRICA

The historical underpinnings of poverty in South Africa are deeply rooted in the Apartheid Era, characterised by systemic racial segregation and discrimination. While the post-apartheid era witnessed significant socio-political changes, poverty has persisted, prompting a closer examination of its contemporary manifestations.

Statistical evidence underscores the gravity of the poverty challenge in RSA. According to StatsSA (2022a, 12), an estimated 46% of South Africans experienced poverty between 2010 and 2014. World Bank (2020) data paints a stark picture, revealing that 55.5% of the population (30.3 million people) lived in poverty at the national upper poverty line (ZAR 992). Concurrently, 13.8 million people (25%) grappled with food poverty in post-2015. International poverty standards of $1.90 and $3.20 per person per day (2011 PPP) depict escalating trends, further emphasising the multifaceted nature of poverty in the nation.

South Africa's Gini score of 63 in 2022 signifies its status as one of the most unequal nations globally. Since 1994, income polarisation has intensified, characterised by high levels of chronic poverty, a limited middle class, and a concentration of high earners. This socio-economic context sets the stage for an exploration of how ICT intersects with and potentially influences these existing dynamics.

Against this backdrop, the South African government has grappled with the challenge of incorporating ICT into its developmental agenda. Early critiques, such as those by Moodley (2005), pointed to rigidity and hegemony in the government's approach toward ICT. Subsequent assessments by Masango (2017) underscored a perceived negligence in ICT policies, particularly in the promotion of small, micro and medium enterprises (SMMEs) in crucial urban centers like Soweto. These insights illuminate the complexities of integrating ICT as a catalyst for economic development and poverty reduction.

The overarching debate on the role of ICT in poverty reduction in RSA is dichotomous. Left-leaning perspectives, typified by scholars like Thabo (2003), Erum and Hussain (2019), and Raheem, Tiwari & Balsalobre-Lorente (2020), express reservations about the potential adverse effects of ICT on poverty alleviation. Conversely, right-leaning scholars, including David (2019), Fernandez-Portillo et al. (2019), Akinboade et al. (2022), Masango, Van Ryneveld & Graham (2022), and Olamide et al. (2022), advocate for the positive contributory role of ICT in fostering economic growth and development.

Within this dynamic landscape emerges the research gap, which is the need for a nuanced investigation into the relationship between ICT and traditional poverty indicators. This study aims to explore causal mutual shocks between ICT and poverty, providing a robust foundation for the formulation of targeted policies and measures aimed at addressing the persistent challenge of poverty in the RSA context.

3. MATERIALS AND METHODS

This study hinges its theoretical literature on the efforts by Schumpeter's Technological Theory. According to Schumpeter (1928), the economy undergoes a process of "creative destruction" whereby weaker sectors are eliminated and new ones are created as a result of the diffusion of new ideas and technology. Thus, according to Schumpeter's theory, the concept of technological evolution goes beyond the straightforward implementation of novel processes to include the development of new markets, distribution networks, and raw material sources. However, a number of other theories such as Romer (1986), Landau and Rosenberg (1986) were able to build on Schumpeterian theory.

A number of theoretical studies such as leftists believe that ICT constitutes additional expenses to the poor and therefore adds to their level of poverty (Thabo, 2003). They found a direct relationship between a low level of poverty and higher usage of ICT and vice versa (May, 2012 and Howard & Horn, 2014). Erum and Hussain (2019) noted that ICT plays a significant contribution in nexus between corruption and economic growth within Organisation of Islamic Countries (OIC). However, rightists such as Spiezia (2013), Ishida (2015), Saidi and Mongi (2018), David (2019), Fernandez et al, (2019), Masango, Van Ryneveld & Graham (2022) and Olamide et al (2022) supported the notion that there is a relationship between ICT and poverty in South Africa.

The variables contained in this study, their description and their sources are expressed in the Table 1 below:

Table 1: Variable descriptions and source

Variable	Description/measurement	Source of data
Information and Communication Technology (ICT)	Index of mobile phone, landline phone and internet penetration	
Poverty (POV)	Headcount ratio	
Economic Growth (EG)	Real Gross Domestic Product	
Human Development (Index) (HD)	Composite summary of a country's average achievements in three basic aspects of human development: health, knowledge and standard of living.	World Development Indicator (2022)
Income (INC)	Income earned per average household	
Inequality (INEQ)	Gini coefficient	
Unemployment (UNEMP)	Percentage of people in the labour force who are unemployed	

Source: World Development Indicators (2022)

Poverty (POV): This study will use the headcount ratio as a proxy for poverty. National poverty headcount ratio is the percentage of the population living below the national poverty line(s). In South Africa, the poverty headcount ratio at National Poverty Lines is a percentage of population data which is updated yearly, averaging 58.800 % from Dec 2005 to 2014, with 4 observations. The data reached an all-time high of 66.6 % in 2005 and a record low of 53.2 % in 2010

Information and Communication Technology (ICT): Moodley (2005) has since indicated that ICT is best measured with an index of mobile phone, landline phone and internet penetration, which was adopted in this study. Caceres (2007) used mobile phone, computers and internet as proxy for ICT. In this study, landline has been factored in instead of computers. Mobile phones, landline phones, and the internet are regarded as general purpose technologies (GPTs) and are considered engines of long-term growth and sources of economic transformation and sustainability due to their everyday use. The significance of using the three GPTs lies in the fact that all other devices, applications, mechanical systems, and ICT-related knowledge converge upon these three, making ICT effective.

Control Variables: In this study, control variables were harnessed, and these include economic growth (EG), human development (HD), income (INC), inequality (INEQ) and unemployment (UNEMP). Economic growth, human development, and income have traditionally been found to have an inverse relationship with poverty. However, unemployment and inequality have positive relationship with poverty. The significance of control variables is to enhance the internal validity of the study by limiting the influence of confounding and other extraneous variables

Model Estimation

In order to address these specified research areas in South Africa from 1990 to 2021, this study used the correlation, Granger causality and VAR(VECM) instruments. Both the development of ICT and the fourth economic revolution, marked by the digital explosion, occur during this time. The variables are poverty (POVT), information and communication technology (ICT), economic growth (EG), human development (Index) (HD), income (INC), inequality (INEQ), unemployment (UNEMP). The main core variables of concern are poverty and information and communication technology. However, an array of control variables have been included too, such as economic growth (EG), human development (HD), income (INC), inequality (INEQ) and unemployment (UNEMP). The significance of control variables is to enhance the internal validity of the study by limiting the influence of confounding and other extraneous variables.

By facilitating the estimation of short- and long-term correlations and model parameters, the VECM model was instrumental in achieving the second empirical objective of this study (Tripathi, 2011; Bennet, Kallus & Schnabel, 2019). The model used to investigate relationship ICT and poverty in South Africa is specified below:

$$Y_{it} = X_{it}\beta_1 + X_{it}\beta_2 + X_{it}\beta_3 + X_{it}\beta_p + u_{it} + \varepsilon_{it} \quad \text{.....(1)}$$

Where Y_{it} represents the endogenous variable, poverty. Exogenous variables in the model were: ICT, economic growth, human development, income, inequality and unemployment. These variables are vital when it comes to poverty and are supported by the fact that all of them have an impact on the wellbeing of people. X_{it} represents vector of exogenous covariates. X_{it} represents external variables that influence the dependent variable but are not influenced by it within the model's framework. These covariates are crucial for controlling external factors that may affect the model's accuracy. The variables u_{it} and ε_{it} denoted vectors of dependent variables, specific fixed effects and idiosyncratic errors. Since the research used the VAR model, it is essential to present the model.

$$\begin{aligned}\Delta POVT_{it} &= \gamma_0 + \gamma_1 \Delta ICT_{it-1} + \gamma_2 \Delta EG_{it-1} + \gamma_3 \Delta HD_{it-1} + \gamma_4 \Delta INC_{it-1} \\ &\quad + \gamma_5 \Delta INEQ_{it-1} + \gamma_6 \Delta UNEMP_{it-1} + \varepsilon_{it} \quad \text{.....(2)}\end{aligned}$$

Where POVT is represented by head count ratio, ICT represents information and communication technology, EG = economic growth, HD = human development, INC = income, INEQ = inequality, UNEMP = unemployment

The null hypothesis is there is no relationship between ICT and poverty in South Africa, while the alternative hypothesis is that there is a relationship between ICT and poverty in South Africa. Further hypotheses assess the causal relationship, long-run and short-run equilibrium, as well as mutual feedback effects between ICT and poverty, in line with Mateko (2024). The research concentrated on the resulting impulse-response functions, which estimated how certain system variables would respond to changes in another system variable while holding all other shocks at zero. To isolate the shocks to one of the VAR errors, it was required to divide the residuals in a way that makes them orthogonal because the variance-covariance matrix of the errors was unlikely to be diagonal.

The current VAR model utilises a Cholesky decomposition of the residual variance-covariance matrix to achieve this (Seleteng, 2016). It is customary to use a certain ordering and assign any correlation between the residuals of

any two items to the variable that appears first in the ordering. The underlying premise is that variables in the beginning of the ordering have a simultaneous and delayed impact on variables that follow them, while the latter variables only have a delayed impact on the former.

Correlation, causality, unit root, lag selection, co-integration, VAR estimation, impulse response and variance decomposition tests were performed while the VAR model was used. To identify statistical differences, t-tests were also used. All of these tests were conducted to determine the direction of causality, determine whether the variables had a short term and/or long-term link, and determine whether the time series variables or factors were non-stationary.

4. RESULTS

The empirical results were analysed and presented, following the series of tests performed. The researcher, in attempt to answer the research questions, performed correlation analysis, causality test, unit root test for stationarity, lag selection test, co-integration test, VAR modelling, impulse responses test and lastly variance decomposition.

An ordinary covariance analysis was carried out using correlation of the variables. The variables of interest being ICT and poverty, and the results showed a correlation coefficient of -0.74 between ICT and POVT. This means that there is a negative moderately strong relationship between poverty and ICT. The results may mean that an increase in ICT may actually mean a decrease in poverty, which is a plausible gesture from the results. However, correlation analysis alone may not give us a true picture of what causes what, and degree of causation, hence further statistics have to be checked too.

The order of integration of each variable was carried out, since the ARDL uses each variable at the level at which it is stationary. To test the stationarity of the series, the study uses the Augmented Dickey Fuller (ADF) unit root testing procedure (Dickey and Fuller, 1979). After testing for unit root, the results were presented in the table below. The results will communicate on whether the variables are non-stationary or stationary. If they are non-stationary, then a vector autoregressive model will be utilised to check the impact of ICT on POVT in South Africa.

Table 2: Unit root tests (ADF Tests)

Series	Prob.	Lag	Max Lag	Obs
D(EG)	0.0050***	0	6	30
D(HD)	0.0046***	5	6	25
D(ICT)	0.0076***	0	6	30
D(INC)	0.0196**	0	6	30
D(INEQ)	0.0257**	0	6	30
D(POVT)	0.0871*	0	6	30
D(UNEMP)	0.0707*	0	6	30

***, **, * indicates being significant at 1%, 5% and 10% respectively

Source: Author's calculation (2023)

Of the seven variables tested for stationarity, they were all found to be significant at least at 10% level. Since all are only significant at first difference, vector autoregressive (VAR) model will be appropriate for evaluation the impact of ICT on poverty in South Africa.

4.1 Lag selection criterion

Using the AIC, symmetric lag VAR models are easily estimated. Since the specification of all equations in the model is the same, estimation via ordinary least squares yields efficient parameter estimates. The table below shows results from lag selection conducted.

Table 3: Lag selection tests

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1644.408	NA	1.53e+39	110.0939	110.4208	110.1985
1	-1408.192	346.4495*	6.39e+33*	97.61282*	100.2284*	98.44957*

VAR Lag Order Selection Criteria
Endogenous variables: POVT ICT EG HD INC INEQ UNEMP
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)

Source: Author's calculation (2023)

Using the data from South Africa, with 31 observations from 1990 to 2021, a lag selection criterion was used and the results showed that lag 1 is optimum and appropriate.

Gujarati (2022) noted that Granger causality tests whether one variable in a linear relationship can be meaningfully treated as the dependent variable and the other as the independent variable, whether the relationship is bidirectional, or

whether no functional relationship exists at all. A pairwise granger causality test was carried out to check for causality between ICT and poverty using stationary data.

Table 4: Causality tests

Null Hypothesis:	Observations	F-Statistic	Prob.
POVT does not Granger Cause ICT	31	1.22770	0.31
ICT does not Granger Cause POVT		4.14111	0.028

Source: Author's calculation (2023)

Using data from South Africa covering the period from 1990 to 2021, with a sample of 31 observations, Granger causality testing between POVT and ICT revealed a p-value of 0.028, which is below the 0.05 significance level. This result indicates that ICT Granger-causes poverty in South Africa, as the null hypothesis—that ICT does not Granger-cause POVT—can be rejected.

Yucel (2022) defined co-integration as a technique used to find a possible correlation between time series processes in the long term. In this context, the co-integration test was applied and the results showed that all P values of the seven variables were below 0.1, or were significant at 10% level. The results showed that, there is a presence of long-run relationships since most of the tests are significant at least at 10% and restricted VECM used, as shown in Table 5 below:

Table 5: Co-integration results

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen/Statistic	Critical Value	Prob.**
None *	0.991487	142.9853	50.59985	0.0000
At most 1 *	0.930920	80.17450	44.49720	0.0000
At most 2 *	0.894368	67.43375	38.33101	0.0000
At most 3 *	0.847581	56.43369	32.11832	0.0000
At most 4 *	0.755900	42.30526	25.82321	0.0002
At most 5 *	0.649327	31.43707	19.38704	0.0006
At most 6 *	0.349425	12.89694	12.51798	0.0432

Max-eigenvalue test indicates 7 cointegrating eqn (s) at the 0.05 level,

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's calculation (2023)

Vector error estimates

Table 6: VECM results

VEC Estimates	Coefficient	P-value	T-Statistic
POVT (-1)	1		
ICT (-1)	0.140127	(0.03715)**	[3.77217]
EG (-1)	1.12E-11	(3.5E-11)***	[0.321421]
HD (-1)	-1.70E-11	(5.3E-07)***	[-3.21421]
INC (-1)	-0.016804	(0.00167)***	[-10.0726]
INEQ (-1)	1.047404	(0.08743)*	[11.9796]
UNEMP (-1)	-2.698636	(0.14377)	[-18.7710]
C	85.68509		

Note: (*), (**) and (***) indicate 1%, 5% and 10% significance level, respectively

Source: Author's calculation (2023)

The Table 6 above shows that a percentage change in ICT associated with a 0.14 % increase in POVT on average in the short run. A percentage change in EG associated with a 1.12 % increase in POVT on average in the short run. A percentage change in HD associated with a 1.7 % decrease in POVT on average in the short run. A percentage change in INC associated with a 0.01 % decrease in POVT on average in the short run. A percentage change in INEQ is associated with a 1.04% increase in POVT on average in the short run. A percentage change in UNEMP associated with a 02.69 % decrease in POVT on average in the short run. The constant or intercept is 85.68. ICT is statistically significant at 5% significant level, while EG, HD and INC are all significant at 1% level of significant. INEQ is significant at 10% while UNEMP is not significant at 10% or less. This model aligns to Mateko (2024) and David (2023).

The VECM empirical model

$$\Delta POVT_{it} = 85.68 + 0.14\Delta ICT_{it-1} + 1.1\Delta EG_{it-1} - 7\Delta HD_{it-1} + -0.02\Delta INC_{it-1} + 1.04\Delta INEQ_{it-1} - 2.69\Delta UNEMP_{it-1} + \varepsilon_{it}$$

Impulse response

The measurement of the unit shock imparted to each series, as well as its overall impact on the VAR system, can be done using impulse response (David, 2017). In this study, impulse response analysis was employed to gauge how endogenous variables in the VAR model reacted. The VAR model's responses to standard deviation are depicted in the figures below.

The response of POVT to ICT innovation impulse showed that in the period 1-4, the figure shows a decrease in ICT innovation and that the variable shows a negative trend but without any fluctuations. This indicates that POVT reacted negatively to a single standard innovation shock, both in the short term and long term. In simpler terms, when there was a push or change introduced through ICT innovation, POVT's performance or results were declined consistently over time, showing no signs of recovery or improvement during this period, as aligned to Chang et al (2022).

The response of ICT to POVT innovation impulse showed that in the period 1-4, the figure shows a decrease in ICT innovation and that the variable shows a negative trend but without any fluctuations. This shows a negative response to one standard shock of innovation given to POVT both in the short-run and the long-run period. In other words, when POVT implemented an innovation, it led to a consistent decline in ICT performance over this time frame.

Variance decomposition

The variance decomposition was carried out using the impulse response analysis of the unrestricted VAR estimation process and the orthogonalised Cholesky ordering technique. This was done for the variables below: poverty, ICT, economic growth, human development, income, inequality and unemployment. Period 1 is assumed to be the short-run period while period 4 is assumed to be the long-run period.

Table 7: Variance decomposition: poverty

Period	S.E.	POVT	ICT	EG	HD	INC	INEQ	UNEMP
1	0.705802	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.181809	93.36325	3.874980	0.409316	0.334274	1.867270	0.140889	0.010022
3	1.650751	87.05661	4.758151	0.211580	0.241456	7.492583	0.081154	0.158468
4	2.061242	82.61788	4.660436	0.142432	0.160550	12.11072	0.056923	0.251054

Source: Researcher's construct (2023)

Table 7 shows that in the short run, shocks to poverty account for 100% variation of the fluctuation in poverty, while in the long-run it accounts for 82.62%. In the short run, shocks to ICT account for 0.00% variation of the fluctuation in poverty while in the long run it accounts for 4.66%. In the short run, shocks to economic growth account for 0.00 % variation of the fluctuation in poverty, while in the long run it accounts for 0.14%. In the short run, shocks to human development account for 0.00% variation of the fluctuation in poverty while in the long run it accounts for 0.16%. In the short run, shocks to income account for

0.00% variation of the fluctuation in poverty while in the long run it accounts for 0.16%. In the short run, shocks to inequality account for 0.00% variation of the fluctuation in poverty while in the long run its accounts for 0.05%. In the short run, shocks to unemployment account for 0.00% variation of the fluctuation in poverty while in the long run it accounts for 0.25%.

Information and communication technology (ICT)

Table 8: Variance decomposition of ICT

Period	S.E.	POVT	ICT	EG	HD	INC	INEQ	UNEMP
1	4.591275	5.029364	94.97064	0.000000	0.000000	0.000000	0.000000	0.000000
2	7.369523	9.076104	81.47909	5.639825	0.128689	1.544377	1.640308	0.491609
3	9.240887	10.95034	78.56699	4.519904	0.286122	2.304968	2.941356	0.430317
4	10.80401	11.79346	75.73352	4.410074	0.236683	2.987414	4.459010	0.379836

Source: Author's calculation (2023)

Table 4 shows that in the short run, shocks to poverty account for 5.03% variation of the fluctuation in ICT while in the long-run it accounts for 82.62%. In the short run, shocks to ICT account for 94.97% variation of the fluctuation in ICT while in the long run it accounts for 75.73%. In the short run, shocks to economic growth account for 0.00 % variation of the fluctuation in ICT while in the long run it accounts for 4.41%. In the short run, shocks to human development account for 0.00% variation of the fluctuation in ICT while in the long run it accounts for 0.24%. In the short run, shocks to income account for 0.00% variation of the fluctuation in ICT while in the long run it accounts for 2.99%. In the short run, shocks to inequality account for 0.00% variation of the fluctuation in ICT while in the long run its accounts for 4.46%. In the short run, shocks to unemployment account for 0.00% variation of the fluctuation in ICT while in the long run it accounts for 0.37%.

Post estimation results

The post-estimation tests carried out produced results, which had all eagen values less than 1, meaning that the VEC model is stable. The post estimation tests carried out also included Sargan test for indogeneity, Wald test for panel significance and Arellano Bond tests for serial autocorrelation which all produced plausible results.

5. DISCUSSIONS AND CONCLUSIONS

This section discusses the conclusions from results obtained, aligning the objectives, results and hypothesis outcomes. The first objective of the research was to find out if there is a relationship between ICT and poverty in South Africa. Using the correlation coefficient analysis, the results showed that there was a relationship between ICT and poverty. The nature of relationship which was discovered was that, there is a negative relationship between ICT and poverty, meaning to say, an increase in ICT will result in a decrease in poverty, which is a plausible gesture. The strength of the relationship was found out to be moderate at 74%. These results agree with researchers done by Masango (2017) and Moodley (2005) who discovered that South African policies towards ICT were subdued and that caused poverty to increase in the form of less access to ICT (Masango, 2017) and less access to food (Moodley, 2005). These results regarding the relationship between ICT and poverty lead to the acceptance of the alternative hypothesis (H_1) of the first hypothesis, which states that there is a relationship between ICT and poverty in South Africa.

The second objective of the study was to determine the causal relationship between ICT and poverty in South Africa. A granger causality test was conducted for the data which had 30 observations from 1990 to 2020. The results clearly indicate that ICT Granger-causes poverty in South Africa, as the null hypothesis—which stated that ICT does not Granger-cause poverty—was correctly rejected. The results were produced on lag 2 and had a probability of 0.028 which was less than 0.05. This means that, surely ICT causes poverty, which is in line with other researchers who have explored and found out that South Africa's ICT policies are actually causing poverty.

In the third objective, there was quest to discover if there is long-run and short-run equilibrium between ICT and poverty in South Africa. To arrive at the decision, the researcher diagnostically tested for stationarity, selected the best lag and used co-integration to find out if there were any short run and long run equilibria. The results showed that data possessed only long run equilibrium whereby the presence of long-run relationships was pronounced since most of the tests were significant at least at 10% using the restricted VECM model. In this case, we accept H_1 (alternative hypothesis) which points out that, there is a long-run and short-run equilibrium between ICT and poverty in South Africa.

The last objective was to find out if there is a mutual feedback shock between ICT and poverty in South Africa. The results showed that, in the short run, shocks to poverty account for 100% variation of the fluctuation in poverty, while in the long-run it account for 82.62%. But on the other side, in the short run, shocks

to poverty account for 5.03% variation of the fluctuation in ICT while in the long-run it accounts for 82.62%. Indeed, there are some mutual feedback shocks between ICT and poverty, though the feedback shocks from ICT to poverty were more than feedback shocks from poverty to ICT. In this regard, we accept H_1 (alternative hypothesis) which stipulates that there is a mutual feedback shock between ICT and in South Africa.

The following are the recommendations emanating from results obtained:

- It is recommended that the South African Government must increase the portion of national budget attributable to ICT. The increase in public expenditure in ICT will result in capacitation of entities receiving the investment so that systems, hardware and software, ICT skills development and engagement of all the ICT related aspects can be bankrolled and effectively produced. However, evaluation and monitoring mechanisms must be established to ensure that the outcomes of such efforts can be properly assessed and made visible.
- The researcher recommends that friendly and flexible ICT policies much be prioritised from national government level down to local councils and households, and that inclusion criterion of the ICT policies should simply include everyone. By friendly policy the researcher means that that the goal and response characteristics of the policy must be approachable to the ever-changing business environment, as opposed to being hegemonic and rigid, as previously noted by Masango et al. (2017) and Akinboade et al. (2022)
- The Government of South Africa is recommended to provide affordable ICT gadgets such as cellphones, computers, affordable mobile subscriptions and internet subscription. Affordability is explained by prices which the poor to middle income earners can manage to pay for the ICT gadgets. This entails the government putting subsidies towards the prices of the GPTs in ICT. When the ICT user is incapacitated, then access and use are compromised.
- It is recommended that ICT subject/module be a compulsory subject/module in all educational spheres, from preschool up to tertiary, from a training seminar to a symposium, from a conference to a roadshow. The focus objectives should be on contemporary ICT skills such as programming, digitalisation, online business and disruptive technologies (crypto-markets, social media, e-business etc.), over and above the simple knowledge of knowing Microsoft packages. The emphasis should be on ICT for productivity, rather than on the mere acquisition of ICT gadgets

and perceived entitlement, which many economic agents ultimately use as a basis for comparing idle forms of wealth (symbols/toys of wealth).

- Inclusive ICT provision is recommended. A significant proportion of the South African population consists of dependents, including young children (under the age of 10), the elderly (over the age of 65), and persons living with disabilities. It is encouraged that specialised ICT devices—both hardware and software—be made affordably available. These may include televisions, radios, assistive response systems, and speech-enabled devices to support individuals with physical and cognitive impairments.
- Digital inclusion should be enhanced across all business entities—whether in the private sector, public sector, or semi-public/private organisations. ICT knowledge is a valuable asset; however, the effective and inclusive use of ICT is essential so that its benefits can contribute to reducing poverty in all its forms.
- The government should liberalise the industry for both Mobile Network Operators (MNOs) and Virtual Mobile Network Operators (VMNOs), in order to increase the availability of mobile networks, foster competition, and thereby improve affordability.
- Digital poverty should be treated as a priority, especially considering that the UNDP has identified education, health, and standard of living (income) as the three core dimensions of poverty. The premise is that, with the advent of the Fourth Industrial Revolution, failure to define, recognise, and explain digital poverty will result in the digitally excluded remaining within the poverty bracket. Government policies on ICT must be grounded in a comprehensive understanding of ICT—its impact, effects, causality, and implications for poverty.

Conflict of interests

Authors declare there is no conflict of interest.

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УЗАЈАМНИ ПОВРАТНИ ШОКОВИ ИЗМЕЂУ ИНФОРМАЦИОНИХ И КОМУНИКАЦИОНИХ ТЕХНОЛОГИЈА И СИРОМАШТВА У ЈУЖНОАФРИЧКОЈ РЕПУБЛИЦИ

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САЖЕТАК

Ова студија се бави сложеним односом између информационо-комуникационих технологија (ИКТ) и сиромаштва у Јужноафричкој Републици, те истражује међусобне повратне шокове који динамички обликују оба домена користећи податке из Свјетских индикатора развоја за период од 1990. до 2021. године. Користећи свеобухватни аналитички оквир, студија истражује како напредак у ИКТ-у, индекс рачунара, мобилних

телефона и интернета, утиче на стопе сиромаштва, изражене односом броја становника, на краћи и дужи рок, те обрнуто: како социо-економски услови повезани са сиромаштвом утичу на ИКТ. Тест корелације, Грејнџеров тест узрочности, тест коинтеграције и VAR/VECM модели коришћени су у настојању да се пронађу одговори на питања. Емпиријски резултати су показали да постоји веза, при чему ИКТ заиста узрокује сиромаштво у Јужној Африци. VAR/VECM је утврдио да постоји дугорочна веза између ИКТ-а и сиромаштва у Јужној Африци, на нивоу значајности од 10%, а декомпозиција варијансе је додатно потврдила неке значајне краткорочне повратне шокове између ИКТ-а и сиромаштва. Препоручује се да влада Јужноафричке Републике успостави квалитетне и инклузивне политике у области ИКТ-а, посебно према маргинализованим и сиромашним општинама у којима многа мала и средња предузећа покушавају да напредују. Препоручује се развој вјештина и повећање јавних издатака за ИКТ, као напори за искорјењивање сиромаштва путем ИКТ-а. Кроз емпиријску анализу откривена је сложена динамика која подвлачи ову међусобну повратну спрегу, бацајући свјетло на потенцијалне механизме за прекидање циклуса сиромаштва кроз стратешке ИКТ интервенције. Ово истраживање не само да доприноси академском дискурсу о технологији и развоју, већ пружа и практичне увиде креаторима политике и заинтересованим странама које траже одрживе стратегије за рјешавање изазова сиромаштва у Јужноафричкој Републици.

Кључне ријечи: *информационо-комуникациона технологија, сиромаштво, узрочност, метода корекције векторских грешака, декомпозиција варијансе.*