

Adeleke, Omolade; Josue, Mbonigaba

Article

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*Corresponding author: Omolade Adeleke, School of Accounting, Economics and Finance, University of KwaZulu-Natal, Durban, South Africa
E-mail: adelekeomolade@yahoo.com

Reviewing editor:
Christian Nsiah, School of Business,
Baldwin Wallace University, USA

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Poverty and green economy in South Africa: What is the nexus?

Omolade Adeleke^{1*} and Mbonigaba Josue¹

Abstract: The study investigates the relationship between the green economy and poverty in South Africa from 1990 to 2017. Data on green economy indicators such as share of clean energy, CO₂ emissions, human development index, secondary school enrolment, life expectancy at birth and access to electricity are extracted from United Nations Development Programme database, while data on per capita income and percentage of population living below the poverty line, which is used as the dependent variable, are collected from Statistics South Africa. Based on the statistical properties of the data, the Auto-Regressive Distributed Lags approach is used to analyse the short- and long-run influences of the green economy on poverty reduction in South Africa. The results show that the green economy has more of significant long-run impact than short run. It also shows that share of clean energy, CO₂ emissions, human development index, secondary school enrolment, life expectancy at birth and access to electricity are the most important green economy indicators that have a significant impact on poverty reduction, while levels of income appear to have a weak impact. As a result, efforts should be more focused on improving the indicators of the green economy and sustainable development in South Africa if the increasing poverty level in the country is to be restrained.

Subjects: Economics and Development; Economics; Environmental Economics

Keywords: Green economy; poverty; clean energy; human development index

ABOUT THE AUTHORS

Dr Omolade Adeleke holds PhD degree in Economics from University of KwaZulu-Natal, South Africa. He is currently a Post-Doctoral Research Fellow of the same University. He lectures in Federal University Oye Ekiti, Nigeria. He is a post graduate examiner to School of Accounting, Economics and Finance, University of KwaZulu-Natal, and has published articles in recognised journals in the field of monetary, industrial and development economics.

Prof. Josue Mbonigaba is a Professor of Economics in the School of Accounting, Economics and Finance, University of KwaZulu-Natal. He holds a PhD degree in Economics with a bias for health and development economics. He is a reviewer to many notable journals including *South African Journal of Economics* and an examiner to many universities across the globe. He has published several articles in many recognised journals.

PUBLIC INTEREST STATEMENT

Green economy is the new paradigm shift in economic growth theories as it encompasses inclusive growth and sustainability. This is why research on it is very scarce, especially on sub-Saharan African economies. South Africa being one of the largest economies in the sub-region has started mapping out strategies to make economic growth has a significant impact on poverty reduction among the citizens. This is where the green economy comes in because it brings in variables of sustainability and inclusiveness that will engender the kind of growth, which can translate into poverty reduction. This paper offers an avenue for the policymakers in South Africa to identify those green economy variables that are significant to poverty reduction. Identification of these variables will enable them to prioritise them in their policy framework designed to reduce the current rising level of poverty in the country.

Subjects: O10; O11; O13

1. Introduction

In recent years, efforts have shifted to the attainment of green growth by African countries, especially the sub-Saharan Africa (SSA), which is among the most backward regions in the world in terms of human quality of life and productivity (Africa Development Bank, AFDB, 2016). The report of World Bank (2014) termed “Growth is not Working” emphasised that the outstanding economic growth rates recorded by some SSA countries in recent years have failed to have any reflection on the human quality of life as well as on the general human development index (HDI) in the region. Consequently, the need for a paradigm shift from economic growth assessment via macroeconomic indicators to inclusive growth that is built on a green economy has occupied recent research.

A “green economy” gives the impression of an economy that is environmentally friendly, is sensitive to the need to conserve natural resources, minimises pollution and emissions that damage the environment in the production process and produces products and services that does not harm the environment. It is accepted that embracing a green economy will ensure reduction in poverty levels in many developing SSA countries where poverty has been on the rise within the last two decades (see Organization for Economic Cooperation and Development [OECD], 2012, 2013).

As other SSA countries, poverty has become an endemic phenomenon in South Africa with its continued upsurge in recent times, and it has become a serious social menace. Poverty in South Africa has noticeably increased for decades. However, recent data provided by Statistics South Africa show that more than 50% of South Africa’s population is currently affected by poverty. According to Statistics South Africa (2017), the statistics pertaining to the number of people who were living under the poverty line (R441 per person per month) increased from about 7.4 million in 2000 to 13.8 million in 2015 (SSA, 2016). One of the most dangerous aspects of poverty that constitute a social menace is the food poverty, which has also been on the rise in the country. According to the United Nations Commission on Sustainable Development (UNCSD, 2016), one in seven South Africans (13.4%) is affected with extreme food poverty or survival on R441 or less per person per month in 2015. Effectively, this appears to be a return to the poverty levels of 2007. A decade ago, 13.7% of South Africans were extremely vulnerable to hunger, although at the time this marked significant progress as the number of those living in extreme poverty had been halved in just 5 years from 29.3% in 2002. Progress since then has stalled (SSA, 2016).

All these trends in poverty show that the renewed attention given to green economy within the last two decades appears not to be yielding the desired effort. Advocates of a green economy held that increased attention to a green economy would significantly reduce environmental hazards and promote human health, which will stimulate them to contribute more productively to the economy and improve their individual quality of lives in the long run (Klaus, Rainer & Holger, 2015). However, the link between poverty and a green economy has generated controversies in recent years. The protagonist of a green economy as a countermeasure to poverty hinged their discussions on the promotion of a safe environment, which improves human quality of lives and enables them to contribute more to the economy in general and uplift themselves from poverty (see OECD, 2012).

The opponents of this position explained that for a green economy to be relevant to developing countries, it has to be reconciled with the two key structural features of natural resources use and levels of poverty in these countries. First, primary products account for the majority of their export earnings, and they are unable to diversify from primary production. Second, many economies have a substantial share of their rural population located on less favoured agricultural land and in remote areas, thus encouraging “geographic” poverty traps. If green growth is to be a catalyst for economy-wide transformation and poverty alleviation in developing countries, then it must be accompanied by policies aimed directly at overcoming these two structural features. These groups

of authors further argued that a “one-size-fits-all” approach, which is usually applied, to implementation of a green economy in which all countries are treated in the same manner, might not have a significant impact on poverty reduction. According to them, this would lead to failures for environment, development or both. The levels and stages of development of countries must be fully considered, and the priorities and conditions of developing countries taken into account. The principle of common but differentiated responsibility should be respected and operationalised. Thus, in considering various principles, policies and targets, adequate flexibilities and special treatment should be provided for developing countries, such as exemptions, allowance for more lenient obligations and the provision of finance, technology and capacity building (see Edward, 2015; Martin, 2016).

The oscillating arguments identified above are indications that there is a lack of consensus on the relationship between green economy and poverty. However, OECD (2012) advocated for the inclusion of sustainable development with a green economy before the effects can trickle down to the poor. The ingredients of sustainability, which involve indicators of HDIs such as education, health and income, among others, are accepted to have a more significant impact on poverty, but this remains to be investigated in South Africa.

Consequently, the main objective of this study is to investigate the nexus between a green economy and poverty in South Africa. The remaining aspects of the article are divided into the methodology, results and discussion, followed by a set of conclusions and recommendations.

2. Literature review

Despite the fact that studies on the green economy are because it is a new contemporary issue in development economies, the study was able to leverage on some past studies as a guide for both methodology and variable selection. Some of these studies are discussed briefly as follows.

Zeb, Salar, Awan, Zaman, and Shahbaz (2014) investigated the short-run and long-run causality relationship among energy (electricity production from renewable sources), carbon dioxide emissions, natural resource depletion, gross domestic product (GDP) and poverty in selected SAARC countries, namely, Bangladesh, India, Nepal, Pakistan and Sri Lanka, over a period of 1975–2010. The results showed that there is bidirectional Granger causality between carbon dioxide emissions and natural resource depletion in Nepal and between energy production and poverty in Pakistan. For the other three countries, the Granger causality runs from energy production to poverty in Bangladesh and India and from poverty to energy production in Sri Lanka. The results of the panel group fully modified ordinary least square (OLS) indicated that GDP and poverty have a positive impact, while carbon dioxide emission has a negative impact on energy production. The study concluded that an increase in energy production leads to a decrease in carbon emissions, whereas natural resource depletion increases carbon emissions in selected SAARC countries. Subsequently, an increase in energy production leads to an increase in GDP which further increases carbon dioxide emission in the SAARC region.

Smit and Musango (2015) explored the connection between green economy and informal sector in South Africa. They assessed the ways in which the green economy and the informal economy may be connected by establishing the extent to which policies and plans relating to green economy connect with the informal economy and recognising several informal green activities. The barriers and opportunities for connecting the two spheres were also explored as well as possible ways in which such activities may be supported at different levels of organisation. In the case of South Africa, many informal green activities that contribute to sustainable livelihoods are recognised. However, issues pertaining to procedure, process and participation hinder the transition to a truly inclusive green economy. The paper revealed a number of possible connections between the green economy and the informal economy in the form of green activities, indicating that the informal economy may add much value to an inclusive green economy in the context of sustainable development and poverty

eradication. The results also indicated a number of opportunities and benefits related to connecting the green economy to the informal economy which warrants further investigation.

Anda et al. (2018) used the 2011 South African population census; they provided income and multidimensional poverty and inequality estimates at the municipal level. They went on to estimate a spatial econometric model to identify the correlates of poverty across municipalities in South Africa. Their results showed that both income and multidimensional poverty and inequality vary significantly across municipalities in South Africa. In general, areas that are historically characterised by low economic and welfare outcomes still experience significantly higher poverty and deprivation levels. Using both global and local spatial autocorrelation measures, they found significant and positive spatial dependence and clustering of regional development indicators. They concluded that the situation of poverty is both spatially unequal and autocorrelated.

Kaggwa et al. (2013) provided an overview of South Africa's attempts to migrate to a green economy. They specifically looked at the domestic and continental implications of South Africa's reorientation of its economy towards a low-carbon growth path. However, the country has managed to put together impressive policies meant to steer it onto a trajectory of low-carbon economic growth. However, findings from the research showed that the realities facing South Africa point to an opposite direction.

3. Method

This aspect of the article describes the theoretical underpinnings/model specification, estimating techniques, definition of variables and sources of data.

3.1. Theory and model specification

From the macro-perspective consideration of poverty, Keynesian and neoclassical models pointed out that to reduce poverty, growth must be sustainable (green growth). It should be if a rise in demand is accompanied by aggregate supply in terms of growth in labour and capital. However, often demand accelerates ahead of supply, leading to unsustainable booms followed by deep recessions (Philip & Miguel, 2014). Maltida (2013) adopted this theory and used a multivariate linear regression model based on a cross-sectional study design for 123 countries under the period 2000–2009. The model expressed a change in poverty as follows:

$$\Delta pov = f(\text{growth}, \text{pov}, \text{gdp}, \text{ind}, \text{edu}, \text{gov}) \quad (1)$$

where Δpov is change in poverty, *growth* is the rate of growth of per capita income, *pov* is poverty head count, *gdp* is per capita gdp, *ind* is employment in industry, *edu* is average years of schooling for adults and *gov* is the government expenditure on education.

Equation (1) is adopted for this study because most of the variables used are independent and describe sustainable growth, which defines green economy. As a result, the regression model to be estimated include the variables of a green economy as defined by OECD (2013). Consequently, the model for the study is stated as follows:

$$pvtyr = f(\text{cleaneg}, \text{CO2pci}, \text{hdi}, \text{electases}, \text{edu}, \text{lifexp}, \text{pci}) \quad (2)$$

The natural log of the variables is used and the linear regression is expressed as follows:

$$\ln pvtyr_t = \beta_0 + \beta_1 \ln \text{cleaneg} + \beta_2 \ln \text{CO2pci} + \beta_3 \ln \text{hdi} + \beta_4 \ln \text{electases} + \beta_5 \ln \text{edu} + \beta_6 \ln \text{lifexp} + \beta_7 \ln \text{pci} \quad (3)$$

3.2. Definition and measurement of variables

3.3. Estimating technique: Auto-Regressive Distributed Lags (ARDL) model

The choice of this estimation procedure is primarily informed by the fact that it passes the fitness-for-the-purpose-test. For example, one option available to perform the cointegration test is the

Engle–Granger approach, but its weakness lies in the fact that it is only able to use two variables. A multivariate analysis, such as that considered in this study, leads to the use of the Johansen and Juselius cointegration analysis (Johansen & Juselius, 1990) or ARDL model. The statistical equivalence of the economic theoretical perception of a stable long-run equilibrium is provided by these two models, but the choice will depend on the characteristics of the data. The guide that is followed in this study is that if all variables are stationary, $I(0)$, an OLS model is appropriate, and if all variables integrated of the same order, say $I(1)$, Johansen’s method is suitable. But when there are fractionally integrated variables, variables at different levels of integration which comprise $I(0)$ and $I(1)$ variables (but not at $I(2)$ level), then ARDL is the best model.

This study is unable to use the Johansen procedure (an option) as all the variables used in this study are not completely $I(1)$, that is, integration of order one. This assumption is a pre-condition for the validity of the Johansen procedure. Alternatively, the ARDL model is appropriate to run the short-run and long-run relationships (Shin et al., 2014). The choice of ARDL is further informed by the advantages it portends. First, it is not as restrictive in terms of the meeting of integration of the same order as in Johansen. Second, it is not sensitive to the size of the data as small sample sizes can also be efficiently accommodated. However, this is subject to non-compromise of the optimal lag-length selection affecting estimation efficiency owing to the consumption of the degree of freedom, and it produces unbiased estimates even in the presence of endogenous covariates (Harris & Sollis, 2003).

The study uses ARDL since not all the variables are $I(1)$, and there is no $I(2)$ among them. The guide that is followed to test for the cointegration is bound test (Pedroni, 2004). Under the bound testing, a set of critical values are based on the assumption that variables are $I(0)$, while the other set is based on the assumption that variables are $I(1)$ in the model. The selection criterion is that H_0 is rejected if the F -statistic is greater than the upper boundary, and it was concluded that there is a long-run relationship. But the study shall fail to reject H_0 if the F -statistic is lower than the lower boundary (Pedroni, 2004). The cointegration test is deemed inconclusive when the F -statistic value falls within the two boundaries.

3.4. Data

Poverty is measured by the percentage of people living below equivalent of 1 USD per day and sourced from the United Nations Development Programme (UNDP) database. CO_2 emission is measured by carbon dioxide emission per capita and sourced from United Nations Environmental Programme (UNEP). Clean energy is measured by the share of clean energy and sourced from UNEP. Per capita income is measured by GDP per capita purchasing power parity and sourced from the World Bank. Education is measured by secondary school enrolment and sourced from the World Bank. Life expectancy is used as a proxy for health and sourced from Global Economic Indicator Index. Electricity access measures the percentage of the population with access to electricity. It is sourced from the World Development Indicators. HDI is sourced from the Global Economic Indicator Index.

4. Results and discussion

This aspect of the research work presents and discusses the results from the analysis explained in the methodology. According to the methodology, the model to be estimated is mainly on the effect of green economy indicators on poverty in South Africa.

The discussion of the results commences with the exploration of the time series property of the variables included in the ARDL model to assess their suitability for the chosen estimating technique. Therefore, the unit root test, which tests each variable for stationarity, is presented in Table 1.

4.1. Unit root test

The augmented Dickey–Fuller (ADF) test is applied to ascertain the order of integration of each variable in the model.

Table 1. ADF unit root test

Variables	ADF statistics	Order of integration
Log of poverty rate LPVTYR	-3.188936*	I(1)
Log of clean energy LCLEANEG	-4.346691**	I(1)
Log of CO ₂ per capita LC02PCI	-5.133169***	I(1)
Log of human development index LHDI	-5.705683**	I(0)
Log of access to electricity LELECTACES	-9.100025***	I(1)
Log of education LEDU	-3.570693**	I(1)
Log of life expectancy LLIFEEEXP	-3.570693**	I(0)
Log of per capita income LPCI	-2.828742**	I(1)

Notes: *Statistical significance at 10%, **statistical significance at 5% and ***statistical significance at 1%.
 Source: Authors computation.

The results of the unit root test indicate that two of the variables are stationary, while others are non-stationary. However, the ones that are non-stationary are eventually stationary after the first deference, thereby they are integrated of order one I(1). Only HDI and life expectancy are stationary at levels. The findings under the unit root test show that ARDL approach will be more effective to estimate the relationship between a green economy and poverty in South Africa and will examine the extent of co-movement between them as well. As a result, examining the presence of cointegration between them is the next task.

4.2. Cointegration test

ARDL cointegration test uses the bound testing, which is conducted to confirm or refute the existence of cointegration or long-run relationship. Thereafter, there will be an estimation of the long- and short-run relationships. The results of the ARDL bound test are presented in Table 2.

The null hypothesis under the bound test is that there is no long-run relationship between a green economy and poverty in South Africa (H0: No long-run relationship). The result shown in Table 2 is an indication that a long-run relationship exists among the green economy indicators and poverty rate in South Africa because the *F* statistics value of 6.767133 is greater than both the lower and upper bound of Narayan (2005) critical values. The implication is that a green economy can co-move with the poverty rate. After establishing cointegration, the estimation of the long- and short-run relationships is presented in Table 3.

4.3. ARDL regressions estimation

Table 3 explains the impacts of a green economy on poverty in South Africa during both long- and short-run periods.

Table 2. ARDL bound test for cointegration

Test statistic	Value	k
<i>F</i> -statistic	6.767133**	7
Critical value bounds Narayan: critical values		
	NN	
Significance	Lower bound I(0)	Upper bound I(1)
10%	4.437	5.377
5%	5.360	6.373
1%	7.317	8.720

Note: Source: Authors' computation.

Table 3. ARDL short- and long-run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Cointegrating form				
D(LCLEANEG)	0.151027	0.098817	1.528350	0.2239
D(LCLEANEG(-1))	0.569516	0.185609	3.068365	0.0546
D(LCO2PCI)	1.889869	0.948374	1.992747	0.1403
D(LCO2PCI(-1))	-0.319253	0.254269	-1.255572	0.2982
D(LHDI)	-6.536301	2.999189	-2.179356	0.1174
D(LHDI(-1))	21.246732	11.035853	1.925246	0.1499
D(LELECTASES)	-0.450371	0.308821	-1.458355	0.2408
D(LELECTASES(-1))	-0.495155	0.283075	-1.749202	0.1786
D(LEDU)	2.803551	1.020742	2.746582	0.0709
D(LEDU(-1))	-2.782247	1.551584	-1.793165	0.1708
D(LLIFEEEXP)	-51.912439	29.018095	-1.788968	0.1716
D(LPCI)	2.652210	2.346500	1.130284	0.3406
D(LPCI(-1))	4.020091	1.579383	2.545356	0.0843
CointEq(-1)	-0.066444	0.505546	-4.087551	0.0265
Long-run coefficients				
LCLEANEG	-0.520183	0.185040	-2.811193	0.0472
LCO2PCI	1.573218	0.604284	2.603443	0.0401
LHDI	-10.289605	1.857750	-5.538745	0.0116
LELECTASES	-1.004737	0.292805	-3.431416	0.0415
LEDU	-1.405711	0.275694	-5.098816	0.0146
LLIFEEEXP	7.405018	1.145542	6.464204	0.0075
LPCI	-0.179493	0.783600	-0.229062	0.8335
C	-44.056626	12.316598	-3.577013	0.0374

Note: Source: Authors' computation.

The results shown in Table 3 explain the relationship between green economy indicators and poverty. According to the coefficients and their probabilities, none of the variables of the green economy have a significant impact on poverty in the short run. The implication of this result is that there exists a weak relationship between poverty and green economy indicators in the short-run period. However, the opposite is the case in the long-run period where the result indicates that many of the indicators of the green economy are significant, corroborating the results of the cointegration test affirming the existence of a long-run relationship between the two.

First, clean energy is one of the key variables used to proxy a green economy, and the coefficient is negative and significant. The implication is that the more clean energy is consumed the less the poverty level. It would be recalled that poverty is proxied with the percentage of people living below 1USD per day. Clean energy has been found to have a significant inverse relationship with poverty rate. The more clean energy is consumed the less the percentage of people living below poverty line. This result is similar to the findings of Jacqueline, Borel-Saladin and Ivan (2013) on South Africa who identify the trade-off between the job loss in the fossil fuel industry and job gains in the green industry as an important aspect of assessing the effects green economy has on poverty in South Africa. The findings of the study show that job gains when attention is shifted to the green industry will be more than the job loss in the fossil fuel industry. This conclusion further strengthens the findings from this study that the green economy has a significant impact on poverty reduction in South Africa.

Second, the CO₂ consumption per capita is an indicator of a green economy. The coefficient is positive and significant also. The implication is that less consumption of CO₂ per capita will also lead to a decline in the level of poverty. The result further underscores the importance of environmental hazards in determining poverty levels in South Africa. The UNEP (2018) research also supported this result from the perspective of the toxic and harmful effect of carbon emission in the society. The outcome of the research showed that the less the people have to spend tackling health challenges from carbon pollution and other greenhouse emissions, the more their tendency of escaping from the menace of poverty. Third, the coefficient of the HDI is negative and significant. Consequently, an increase in the HDI in South Africa will lead to a decline in the number of people living below the poverty line.

Access to electricity is used as part of the predictors in the model that describes the relationship between a green economy and poverty in South Africa. The ARDL regression shows that the coefficient is negative and significant. This indicates that the more the people have access to electricity supply, the less the number of people living below the poverty line. Oosthuizen (2016) concluded from his study of four provinces in South Africa that the poverty situation in South Africa could have been worse if not for the edge the country has over other SSA countries in terms of access to electricity. According to the study, the fulcrum of rural entrepreneurial development and SMES which are antidote to the menace of poverty in the provinces investigated is impressive access to electricity in South Africa.

The number of secondary school enrolment is used to proxy education, and it is used as one of the indicators of green economy. The coefficient in the ARDL estimated model is negative and significant also. This implies that as the number of secondary school enrolment rises, the number of people living below the poverty line will be declined. This is fundamental because it has shown that education is significantly linked to poverty in South Africa.

Life expectancy at birth is used as a proxy for health. This is also used as one of the variables of a green economy. The result indicates that life expectancy at birth has significant impact on poverty rate. However, it shows a positive relationship, which suggests that the higher the rate or percentage of life expectancy at birth, the higher the number of people living below the

poverty line. This emphasises the significance of health indicators as a key factor influencing poverty levels in South Africa.

Per capita income is the final variable in the model that is used to indicate a green economy. The impact of this is not significant from the estimated ARDL model although it shows an inverse relationship which can be interpreted that the more the per capita income, the less the poverty rate is. However, it does not have a significant impact on the poverty rate in South Africa as the coefficient of the Per Capita Income (PCI) fails to pass the test of statistical significance.

The error correction term is -0.066444 and is significant. This shows that there is a disequilibrium in the past, which is corrected with a feedback of approximately 6%. The implication is that the adjustment to equilibrium is in the right direction.

4.4. Diagnostic tests

Three tests are conducted to assess the validity of the ARDL regression results. They are the test of serial correlation, the heteroscedasticity test and the normality test. Their results are presented as follows:

The null hypothesis shown in Table 4 is that there is no serial correlation. Considering the probability of the *F*-statistics, there is a noticeable indication that there is no serial correlation problem in the estimated ARDL model as the null hypothesis is accepted.

Similarly, on Table 5 the null hypothesis is “no heteroscedasticity” as all the probabilities of the test statistics are greater than 5%, indicating that the null hypothesis is accepted. In this context, it can be concluded that there is no heteroscedasticity.

The Jarque-Bera statistics is used to assess the normality of the estimated ARDL model, and the results are presented in Figure 1. The Jarque-Bera probability is 0.734082, which shows that the model is normally distributed. The implication is that the inferences drawn from the ARDL estimated model are valid.

The results of the stability test are presented in Figure 2. This is done to ensure the robustness of our results. The study employs structural stability tests on the parameters of the long-run results based on the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests. The plots of both remain within the 5% critical bound. This signifies the parameter constancy and the model stability. Therefore, these statistics confirm the

Table 4. Serial correlation test			
Breusch–Godfrey serial correlation Langragean Multiplier (LM) test:			
<i>F</i> -statistic	38.70977	Prob. <i>F</i> (2,1)	0.11729
Obs* <i>R</i> -squared	24.68120	Prob. Chi-Square(2)	0.0634

Note: Source: Authors' computation.

Table 5. Test for heteroscedasticity			
Heteroskedasticity test: Breusch–Pagan–Godfrey			
<i>F</i> -statistic	0.321049	Prob. <i>F</i> (21,3)	0.9520
Obs* <i>R</i> -squared	17.30139	Prob. Chi-Square(21)	0.6927
Scaled explained Statistical Significance (SS)	0.174937	Prob. Chi-Square(21)	1.0000

Note: Source: Authors' computation.

Figure 1. Normality test.

Source: Authors' computation.

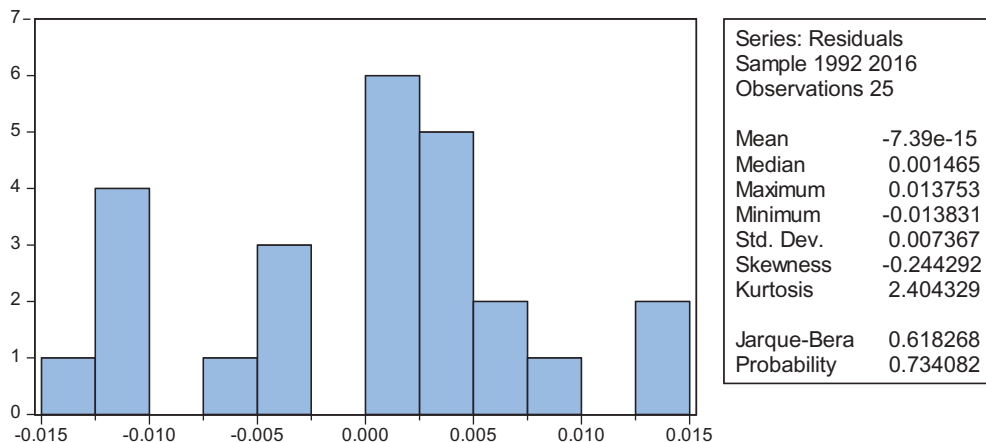
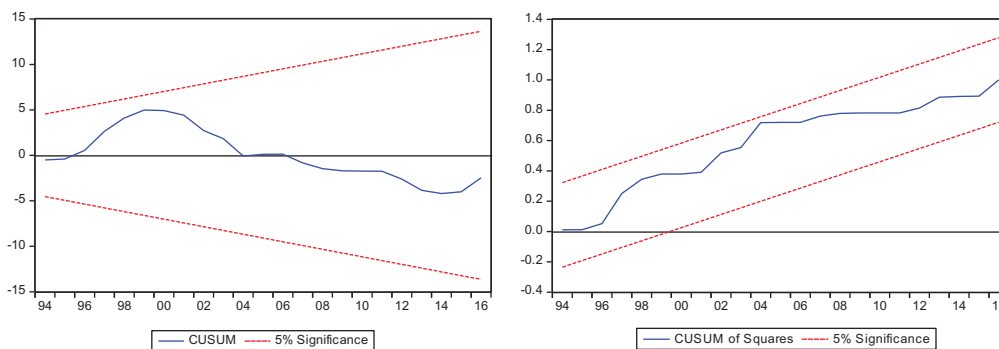


Figure 2. Stability test.



model stability and that there is no systematic change identified in the coefficients at 5% significance level over the study period.

Figure 3 explains the optimum lag-length selection criteria for the estimated model. The Akaike Information Criteria is used, and the results show that the selected lag-length selected (ARDL 1,2,2,2,2,2,1,2) is the best for the estimates of the ARDL model.

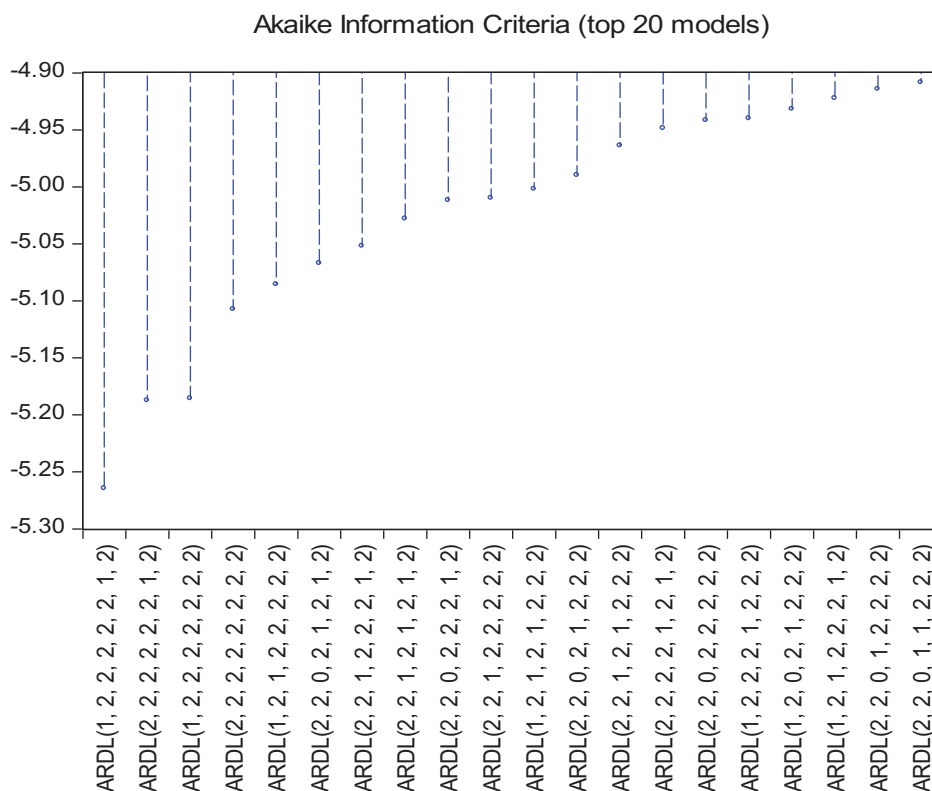
5. Conclusions and recommendations

Being a relatively new research area in economics, the green economy has enjoyed few patronages from researchers across the globe, especially in SSA where data on these variables are scarce. In this context, this study has contributed to the dearth of existing literature on a green economy by using South Africa, which is the second largest economy in the SSA. Findings from the empirical analysis of the relationship between a green economy and poverty have led to the following conclusions.

First, findings from the study have shown that a long-run relationship exists between a green economy and poverty in South Africa. The implication is that a green economy has a significant long-run impact on poverty. Consequently, it is an indication that green economy indicators such as clean energy, HDI, education, life expectancy at birth (health indicator), access to electricity and CO₂ emission per capita among others all have significant permanent effects on poverty in South Africa.

Second, from the tests of statistical significance of each of the indicators used to capture the green economy, it was found that clean energy is a key factor that influences poverty levels in South Africa. As clean energy relates to source of energy that does not pose environmental

Figure 3. Model lag selection criteria.



hazards, CO₂ emission, which is used as a variable in the green economy model, also exhibits a significant impact on poverty. These sets of results show consistency and thus highlight the prominence of green energy in reducing poverty levels in South Africa. Based on the foregoing, it can be concluded that clean energy generation, which is energy that is devoid of environmental hazards, is a reliable indicator of a green economy that can lower poverty levels in South Africa. This conclusion is similar to OECD (2013) that access to clean energy is the preferred course of way to go in order to ensure that green economy growth impacts significantly on poverty reduction in the majority of the developing countries.

Third, the HDI is another indicator of a green economy, and the research results show that it has a significant impact on poverty reduction. Findings from the study indicate that a high HDI in South Africa will lead to the reduction in the number of people living below the poverty line. This is in accordance with the conclusion of UNCSD (2016) that countries with a high HDI also have a low poverty rate. This valid universally, and, consequently, the result of the study is justifying this assertion based on South African case. This study has shown that a positive HDI, apart from being a key variable of a green economy, is also a fundamental factor that can help reduce poverty levels in South Africa.

Education and health are proxied by secondary school enrolment and life expectancy at birth, respectively, have been shown to have a significant impact on poverty reduction in South Africa. The implication of the results of this study is that the more the people are educated, the less the people will be living below the poverty line. This is also valid for the health indicator. This follows the results of HDI that are significant because HDI comprises education, health and income indicators. However, it can be concluded from the findings of the study that a dependable education and health status contribute greatly to reduce poverty levels substantially, labelling them as reliable indicators of a green economy.

Access to electricity is used as one of the variables of a green economy. According to OECD (2013) and Smit and Musango (2015), the percentage of the population of a country with access to electricity is essential for the growth of a green economy. Findings that emanated from this study supported this position. Results from the study showed that access to electricity is significant in the green economy model. In addition, part of the conclusions from this study is that an improvement in the percentage of the population with access to electricity will significantly reduce poverty levels in South Africa.

Further to the above, per capita income fails to show a significant impact on poverty-level reduction in South Africa. These results are indicative of the weakness in using the income to represent the green economy. Results from the analysis show that a high level of per capita income does not necessarily translate into a low poverty rate (see Anda et al., 2018). According to UNDP (2015), the failure of a high level of per capita income in reducing poverty levels in most countries is because of the high rate of income inequality in the economy. This situation is common in SSA to which South Africa belongs.

Imperative recommendations flowing from the conclusions derived from this study are that more effort should be focused on improving the indicators of a green economy in South Africa if the increasing poverty level in the country is to be arrested. The status of high per capita income in the SSA might be misleading since the poverty level in the country has been on the rise within the last two decades.

Finally, the Government of South Africa needs to focus on important variables of the green economy that have a germane influence on poverty reduction in its economy. Empirical studies such as Edward (2015) and Barbier (2010) have shown that institution and structure of economy determine which variables of green economy that will be effective in poverty reduction. Therefore, this study has shown that in South African context, some variables of green economy are more important than some others when it comes to poverty reduction. For instance, clean energy and HDI education among others have been pointed out from the study as variables to be prioritised if the Government of South Africa is serious about reducing the rising trend of poverty in its economy via green economy.

Author details

Omolade Adeleke¹

E-mail: adelekeomolade@yahoo.com

ORCID ID: <http://orcid.org/0000-0003-3306-3879>

Mbonigaba Josue¹

E-mail: mbonigaba@ukzn.ac.za

¹ School of Accounting, Economics and Finance, University of KwaZulu-Natal, Durban, South Africa..

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References

- Anda, D., Nathalie, G., Nobuaki, H., Yudai, H., Hiroyuki, H., Murray, L., & Muna, S. (2018) Spatial poverty and inequality in South Africa: A municipality level analysis. *Saldru Working Paper 221University of Cape Town January 2018*
- Barbier, E. B. (2010). Poverty, development and environment. *Environment and Development Economics*, 15(3), 635–660.
- Edward, B. (2015) *Is green growth relevant for poor economies?* (Development policies working paper No. 144).
- Harris, R., & Sollis, R. (2003). Applied time series modeling and forecasting. *International Journal of Forecasting*. Wiley.
- Jacqueline, M., Borel, S., & Ivan, N. (2013). The impact of the green economy on jobs in South Africa. *South Afr J Sci*, 109 (9/10).
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration. *Oxford Bulletin of Economics and Statistics*, 52, 2.
- Kaggwa, M., Savius, S., & Nhamo, G. (2013). South Africa's green economy transition: Implications for reorienting the economy towards a low-carbon growth trajectory. South African Institute of International Affairs Occasional Paper No. 168.
- Klaus, J., Rainer, Q., & Holger, B. (2015). Green Jobs: Impact of a green economy on employment. Federal Ministry of Economic Cooperation and Development. GIZ publications.
- Maltida, D. (2013). *Does economic growth reduce poverty?* Stolholm: Soderton University repository.
- Martin, K. (2016). *Trade ministers propose more intensive trade-climate engagement* (TWN Bali News Updates and Climate Briefings). Penang: TWN.
- Narayan, P. K. (2005). The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, 37(17), 1979–1990.
- Oosthuizen, J., Brent, A. C., Musango, J. K., & de Kock, I. H. (2016). Investigating a green economy transition of the electricity sector in the western cape province of South Africa: A system dynamics approach. *South African Journal of Industrial Engineering*, 27(4), 166–181.

- Organization for Economic Cooperation and Development (OECD). (2012). *Towards green growth*. Paris: OECD.
- Organization for Economic Cooperation and Development (OECD). (2013). *Putting green growth at the heart of development*. Paris: OECD.
- Pedroni, P. (2004). Fully modified OLS for heterogeneous cointegrated panels. *Advances in Econometrics*, 15 (5), 93–130.
- Philip, D., & Miguel, S. (2014) *A review of economic theory of poverty* (National Institute of Economic and Research Discussion Paper No. 435)
- Shin, Y., & Pesaran, M. (2014). Generalized impulse response analysis in linear multivariate models. *Economics Letters*, 58(4), 17–29.
- Smit, S., & Musango, J. K. (2015). Exploring the connections between green economy and informal economy in South Africa. *South African Journal of Science*, 111(11/12), 10. Art. #2014-0435.
- Statistics South Africa. (2016). *Annual report. United Nations environmental programme (UNEP)*. 2011.
- Towards a green economy: Pathways to sustainable development and poverty eradication – A synthesis for policymakers*. Nairobi: UNEP.
- U.N. Commission on Sustainable Development (UNCSD). (2016). *The future we want: Zero draft of the outcome document* (UNCSD). Retrieved from <http://www.uncsd2012.org/futurewewant.html>
- UNDP. (2015). *Human development report*. United Nations Development Programme.
- UNEP-WCMC. (2018). *United Nations List of Protected Areas. Supplement on protected area management effectiveness*. Cambridge: UNEP-WCMC.
- World Bank. (2014). *Inclusive green growth: The pathways to sustainable development*. Washington, DC: Author.
- Zeb, R., Salar, L., Awan, U., Zaman, K., & Shahbaz, M. (2014). Causal links between renewable energy, environmental degradation and economic growth in selected SAARC countries: Progress towards green economy. *Renewable Energy*, 71, 123–132.



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