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Author(s): Alola, Uju Violet; Bekun, Festus Victor; Alola, Andrew Adewale; Ahmed, Zafar U.

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Sustainable development amidst technological innovation, access to electricity, and tourism activities in sub-Saharan Africa

Uju Violet ALOLA[1, 2], Festus Victor BEKUN[3, 4], Andrew Adewale ALOLA[5, 6]
Zafar U Ahmed[7]

[1] Istanbul Gelisim University, Department of Touriam Guidance. uvalola@gelisim.edu.tr
[2] School of Economics and Management. South Ural State University, Chelyabinsk, 454080, Russian Federation
[3] Istanbul Gelisim University, Department of International Logistic and Transportation. fbekun@gelisim.edu.tr
[4] Department of Accounting, Analysis and Audit, School of Economics and Management, South Ural State University, 76, Lenin Aven., Chelyabinsk, Russia.
[5] Department of Economics, School of Accounting and Finance, University of Vaasa, 65101, Vaasa, Finland. aadewale@gelisim.edu.tr
[6] Department of Economics and Finance, South Ural State University, Chelyabinsk, Russia
[7] Istanbul Gelisim University, Istanbul, Turkey. Email: zafaruahmed@gmail.com

Abstract

Following global debate for clean and responsible access to energy (electricity), access to recreation (tourism), technological innovation, and economic growth for sustainable development as captured by Human development index (HDI). This present study is motivated by the inconclusive guidance on the tecnhology-tourism industry and energy literature. To this end, This study adopts the use of Pedroni residual cointegration test to investigate the cointegration properties of the variables under consideration while the mean group, dynamic fixed effect, and the pooled mean group estimators are employed for simultaneous short and long run analysis. The study is based on annual frequency data from 1995-2016 with the adoption of panel analysis to show that technological innovation, tourism development, and access to electrification affect HDI significantly in sub-Saharan Africa (SSA) over the investigated study period.. This is instructive to policymakers that the highlighted sectors are good predicators for sustainable development. Furthermore, consolidating the results that tourism development, electricity access and technological innovation improves economic development. On the other hand, the growth-induced HDI fitted model resonates the importance of examined variables in sustainable development agenda of the continent. For instance, a 1%increase in tourism increases economic growth by 0.0195%. Similarly, a 1% increase in access to electrification and technological development increases economic growth by 0.0019 % and 0.0009 % respectively. Conclusively, this study highlights the multifaceted merits that can be gleaned from access to electrification, tourism, technological innovation in SSA as they improve economic growth and HDI indicators that comprise of life expectancy, quality education, and per capita income level positively.

Keywords: Sustainable development, Technological innovation, Tourism, Energy, Sub-Saharan Africa.

1. Introduction

According to the International Institute for Sustainable Development, Sustainable Development (SD) is not less of a 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (International Institute for Sustainable Development2020). In reality, and with no exemption to the Sub-Sahara African states, the desired development that is predicated on meeting the present needs without jeopardising the potential and resources of the future generations has remained a herculean ride. This account for why relevant economic and development plans such as the National Development Strategy (NDS) 2022 of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Millennium Development Goals (MDGs) have remained inadequate to drive the essential sustainable development targets. Rather, in 2015, the United Nations through the 17 Sustainable Development Goals (SDGs) further provided the framework for attaining the essential 2030 Agenda for Sustainable Development (Sustainable Development Goals, 2020). Since the adoption of the SGDs 2030 framework, a number of the European Union countries and other development states have significantly advanced the course of attaining the SDGs 2030. In essence, the pathway to achieve sustainable development targets has consistently been linked to socioeconomic and environmental factors such as poverty reduction, access to quality work and public services, access to resources utilization, increasing integrations among societal groups, and many other factors. However, the case is largely different for most African states especially that a significant number of the African countries have fallen behind the estimated continental and country specific targets.

Considering the aforementioned motivation, the current study attempts to illustrate the potential of a panel of selected Sub-Sahara African countries (SSAC) in achieving the sustainable development targets. In this regard, a selection of 12 SSAC with their respective Sustainable Development Index (SDI) as illustrated in Table A of the appendix and based on data availability is employed for the experimental period of 1995 to 2016. In order to achieve the set objective of the investigation, the current study utilizes the human development index (HDI), economic growth as measured by the Gross Domestic Product per capita, access to electricity, access to mobile technology, and tourism receipts for tourism development in the examined SSAC. The present study adopts the use of Human Development Index (HDI) as a broader measure for sustainable development that highlights three (3) core components of the United Nations Sustainable Development Goals (UN-SDGs) namely life expectancy (SDG-3) quality of education (SDG-4) and per capita income level, i.e. GDP growth (SDG-8). These elements of HDI such as good quality of life and education will increase human productivity in terms of labour and help close the employment gap in the region. As highlighted in macroeconomic literature, SSA is known to be labour intensive. Some share of her quality labour can be converted to other productive sectors for national prosperity and by extension increase per capital income of the bloc (SDG) to increase present living standard and without compromise for the future-which resonates the ideology of sustainability. As such, the study examines the role of access to electricity, access to technology innovation, and tourism activities in the sustainable development (through the human development index) drive in the aforementioned panel countries. In closing this gap in the extant literature on the determinants of human development in Africa (such as Elu, 2000; Asongu & Nwachukwu, 2016; Asongu & Nwachukwu, 2017; Asongu & Odhiambo, 2019a, 2019b; Asongu, Uduji & Okolo-Obasi, 2019; Asongu & Nnanna, 2020), the current study examines the access to electricity, tourism activities and human development nexus in addition to access to mobile technology which have received less attention in the literature. In addition, economic development vis-à-vis the Gross Domestic Product per capita is employed in lieu of the Human Development index in the same framework in order to ascertain the robustness of the expected findings. Consequently, the current study is billed to make a novel contribution to the existing contribution.

The other parts of the sections are sorted such that the next part of the introduction section presents the country specific highlight of sustainable development. In sections 2, 3, 4, and 5, the literature review, data description and methodology, discussion of the findings, and conclusion respectively.

2. Literatre Review

2.1 Tourism and Sustainable Development

The United Nations (UN) member states sets up the global development goals of 2030 in 2015, creating the 17 distinct sustainable development goals (SDGs) and 169 targets. In this goals, tourism map up several strategies by the UNWTO (UNWTO, 2016) to attain this goals leading to the declaration in 2017 as the international year of sustainable tourism development. This sustainable goals of the United Nations 2030, to rethink the tourism growth in context of development and the quest to integrate tourism and sustainability is a long term plan aiming to improve the agenda of the tourism industry (Selin & Chavez, 1995). For the case of Coastline Mediterranean Countries tourism-led growth sustainable development is validated in the study of Alola and Alola (2018) and Alola et al.(2020) where the Autoregressive Distributed Lag methodology is used for estimation analysis. The guidelines can be applied in different sectors of tourism; from mass tourism to niche tourism and a balance between the segments for a long-term sustainability. To achieve the enactment of these segments, sustainable tourism according to UNWTO should comprise the following; (1) Making maximum use of the environmental resources as essentials to tourism development and conserving the natural heritage and biodiversity. (2). Maintaining and respecting the host communities socio-cultural values and traditions. (3). In line with above mentioned, the long term economic benefits of the host country and all the stakeholders should be inclusive in the policy (social services provided to the host communities, and contributing to programs to alleviate poverty employment opportunities). This should involve several stakeholders and political leaders and requires a wider and continues monitoring.

Due to the complexity of tourism development, were several stakeholders are playing significant role, and no player has the sole power to institute the required system that will bring out solution

(Parker, 1999; Kernel, 2005). In response to this, Kernel (2005), calls for the integration of the different stakeholders in the change processes towards achieving sustainable tourism development. In the study above, 26 small and medium sized tourism enterprises were selected in Denmark to monitor the changes that have occurred over a long period of time. In the findings, four step-models was step up for sustainable development. Basically, the collective action in tourism sustainable development goes beyond operators personalized responsibility to industrial growth, consumer behaviour and tourist actions among other negative externalities (Saarinen, 2018). These might be taken as a positive means if tourism is not seen as an end to means (McCool & Bosak, 2016). Although in order to take a critical look at the tourism industry, a call to re-think the approaches been implemented to a global phrase is intended (Boluk et al., 2017). This study took a different look that is devoid of a narrow view of the tourism industry and development.

2.2 Electricity and Sustainable Development

Energy has been seen as an essential element and a prerequisite for a sustainable development (Ahmad & Tahar, 2014). Examining the supply of electricity for sustainability, loakimidis et al (2018), pointed out that the energy supply of Uruena, the result found out that the cost of electricity is high and often involves huge capital investment. Also, the integration of wind power as a sustainable electric water heating, examined by Fitzgerald et al. (2012), the research focused on decreasing fossil fuel resources thereby decreasing the effect on greenhouse emission. The finding reviews that several control procedures were combined for the integration of wind power responding to the shortage of network. Ugulu et al., (2019), made an investigation on PV electricity production in Nigeria on sustainable development. The result confirmed that the household were found to be positive in spending and the overall result reveals that the interest in PV generated electricity was high.

In addition, Comsan (2010) and Swain and Karimu (2020) respectively examined the trend of renewable electricity policy for the European Union countries and the nuclear electricity prospects for Egypt. İn specific, the study of Comsan (2010) employed a panel data analysis in a two-step estimation approach to conclude that renewable electricity prices, affordable and clean energy and access to decent work and economic growth (sustainable development) are significantly linked togther. Moreover, in the case of Swain and Karimu (2020), the introduction of nuclear power from 2018 to compliment the huge gap in the electricity demand in Egypt is good enough toward achieveing a more balanced generation mix of 13% nuclear, 14.3% renewables, and a 72.7% fossil targeted by 2052. By so doing, the goal of meeting Egypt's electricity needs by 2052 posit a desirable energy sustainability, therefore suggesting a realistic sustainable develeopment agenda.

2.3 Technology Innovation and Sustainable Development

The World Commission on Environment and Development in 1987 defined the term sustainable development as trying to meet the demands of the present generation without a compromise to the future generations' demands. Technology development and innovation have great impact on the economy. Because of the impact of technology on the economy, the government of many countries give out subsides to research groups to stimulate research. The link between sustainability and technology innovation has been examined in several literatures (Graafland 2018; Rothe, 2020).

Additionally, the study of Bansal (2005), examined the relationship between environmental sustainability practices and innovation in line with corporate social responsibility. In specific, the studies of Asongu and Nwachukwu (2016), Asongu and Le Roux (2017) and Asongu and Odhiambo (2019) examined the role of information communication and technology (ICT) or information technology and the access to mobile phone technology in advancing an inclusive human development in Sub-sahara Africa. İn the aforemnetioned studies, technological advancanement through ICT and mobile phone penetration is observed to have impacted an inclusive development in the region. In other studies, the role of ICT in both development-environental sustainability and socioeconomic development has been examined (Qureshi, 2019; Roztocki, Soja & Weistroffer, 2019).

Given the literature trajectory outlined in section 2 with a good number of studies on the determinant for economic growth in the extant literature such as (Asongu & Nwachukwu,2016; Asongu & Le Roux, 2017; Asongu & Odhiambo,2019) through the channel of information and communication technology (Asongu & Nwachukwu,2016) among others. However, there is a limited number of studies that have investigated the theme with a broader measure like HDI for the case of SSA countries. Furthermore, this study considers the pivotal role of human development index (HDI), economic growth as measured by the Gross Domestic Product per capita, access to electricity, access to mobile technology, and tourism receipts for tourism development in both short and long run simultaneously. The variables in our models are apparently selected following the United Nations Sustainable Development Goals (SDGs) agenda to be achieved by 2030 which is very rare in most studies.

3. Data and Method

3.1 Description of dataset

This study is carried out for the panel of (12) selected Sub-sahara African countries namely (Benin, Botswana, Cameroon, Congo Republic, d'Ivoire Cote, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, South Africa, and Zimbabwe) countries over the period 1995-2016. The choice of the variables in the present study draws motivation from the United Nations Sustainable Development Goals (SDGs) agenda to be achieved by 2030 which is very rare in most studies. The data span is limited due to data availability for all the investigated variables to address the study hypothesized claims. In order to achieve the main focus of examining the drivers of sustainable development in the panel African countries, the follwoing variables are employed:

- The Gross Domestic Prodeuct (GDP) is employed as a proxy for economic development or growth (measured in constant 2010 United States Dollars (USD).
- Human development Index (HDI) as a proxy for sustainable development. The variable is measures as an index.

- Access to electricicy (denoted as EACCESS) is measured as the percentage of the total population with access to electrification.
- Access to mobile telecommunication (denoted as TACCESS) which is employed as a proxy for access to technological innovation (measured as the percentage of the total population with access to mobiile communcation.
- Tourism receipt (denoted as Tourism) is measured as the total receipts from to inbound visitors and tourism activities within the country (this is measured in thousands of peopple).

Both the sustainable development vis-a-vis HDI and GDP are implemented as the dependent variables while the other variab;es are the explanatory indicators. With the exception of the HDI, access to electricity and access to mobile telecommunication series, the GDP and tourism receipts were retrieved from the World Bank Development Indicator, WDI (World Bank Development Indicator, 2019). In specific, both the access to electricity and access to mobile telecommunication series were retrieved from the Sustainable Energy for all of the World Bank (World Bank, 2019) while the HDI series was retrieved from the United Nations Development Programme, UNDP (United Nations Development Programme, 2019).

Generally, a balanced dataset is employed such that both correlation matrix for the employed variables and the descriptive statistics for each country is illustrated in Table 1 and Table 2 respectively.

Table 1: Correlation matrix

SERIES	HDI	GDP	TOURISM	E-ACCESS	T-ACCESS
HDI	1.000				
GDP	0.181	1.000			
	(0.003)	-----			
TOURISM	0.424	0.678	1.000		
	(0.000)	(0.000)	-----		
E-ACCESS	0.736	0.338	0.450	1.000	
	(0.000)	(0.000)	(0.000)	-----	
T-ACCESS	0.646	0.238	0.384	0.520	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	-----

Note: Here, we presents the correlation among the Human Development Index (HDI), Gross Domestic Product (GDP), tourism receipt (TOURISM), population with access to electricity (EACCESS), and population with access to technology (TACCES).

Table 2: Statistical Properties of the variables

	Tourism	HDI	Economic Growth	Access To Electricity	Access To Technology
BENIN					
Mean	1.28E+08	0.442	8.35E+09	27.619	34.238
Maximum	2.36E+08	0.512	1.23E+10	41.403	96.230
Minimum	56200000	0.373	5.10E+09	14.142	0.018
Std. Dev.	49779585	0.046	2.21E+09	8.454	38.361
Skewness	0.563	-0.014	0.267	0.010	0.503
Kurtosis	2.373	1.710	1.981	1.822	1.455
Jarque-Bera	1.520	1.526	1.213	1.272	3.115
BOTSWANA					
Mean	4.08E+08	0.626	1.12E+10	38.527	67.121
Maximum	6.64E+08	0.719	1.68E+10	60.688	163.875
Minimum	1.05E+08	0.572	6.65E+09	16.827	0.000
Std. Dev.	1.69E+08	0.054	3.24E+09	13.795	63.457
Skewness	-0.492	0.55	0.362	0.034	0.454
Kurtosis	1.789	1.735	1.888	1.731	1.551
Jarque-Bera	2.232	2.574	1.614	1.481	2.681
CAMEROON					
Mean	2.64E+08	0.478	2.31E+10	48.079	27.521
Maximum	6.29E+08	0.556	3.52E+10	60.075	78.229
Minimum	75000000	0.428	1.44E+10	36.163	0.021
Std. Dev.	1.66E+08	0.041	6.14E+09	7.136	29.359
Skewness	0.962	0.482	0.380	-0.013	0.639
Kurtosis	2.734	2.022	2.116	1.920	1.867
Jarque-Bera	3.461	1.730	1.246	1.070	2.673
CONGO REPUBLIC					
Mean	35875559	0.536	1.02E+10	33.380	43.590
Maximum	85000000	0.614	1.46E+10	60.40000	108.894
Minimum	9000000	0.495	6.78E+09	8.662	0.000
Std. Dev.	19884028	0.040	2.65E+09	14.665	43.706
Skewness	0.620	0.789	0.374	0.085	0.406
Kurtosis	2.999	2.223	1.735	2.126	1.419

Jarque-Bera	1.347	2.706	1.888	0.693	2.763

	Tourism	**HDI**	**Economic Growth**	**Access To Electricity**	**Access To Technology**
COTE d'lvoire					
Mean	1.21E+08	0.429	2.34E+10	53.353	32.628
Maximum	2.13E+08	0.478	3.12E+10	61.90000	97.602
Minimum	53000000	0.397	1.91E+10	43.234	0.000
Std. Dev.	49000235	0.026	2.76E+09	6.045	36.338
Skewness	0.443	0.563	1.395	-0.167	0.626
Kurtosis	2.050	1.938	4.887	1.714	1.693
Jarque-Bera	1.405	1.996	9.453*	1.471	2.731
ETHIOPIA					
Mean	9.43E+08	0.347	2.39E+10	17.961	9.349
Maximum	2.28E+09	0.460	5.33E+10	42.90000	49.442
Minimum	1.52E+08	0.201	1.05E+10	1.119	0.000
Std. Dev.	8.22E+08	0.083	1.33E+10	10.732	15.119
Skewness	0.559	-0.256	0.870	0.364	1.508
Kurtosis	1.654	1.791	2.487	2.602	3.966
Jarque-Bera	2.807	1.580	3.017	0.630	9.191
GHANA					
Mean	6.33E+08	0.521	2.74E+10	55.905	42.134
Maximum	1.15E+09	0.587	4.68E+10	79.30000	134.489
Minimum	30000000	0.462	1.49E+10	34.258	47.905
Std. Dev.	3.62E+08	0.042	1.08E+10	13.641	1.923
Skewness	-0.343	0.271	0.599	0.165	0.681
Kurtosis	1.756	1.480	1.929	1.943	1.920
Jarque-Bera	1.851	2.388	2.366	1.125	2.770
KENYA					
Mean	1.20E+09	0.496	3.48E+10	23.208	30.059
Maximum	2.00E+09	0.568	5.54E+10	56.00000	79.472
Minimum	5.00E+08	0.446	2.36E+10	9.768	0.008

Std. Dev.	4.67E+08	0.045	9.89E+09	10.963	31.387
Skewness	0.024	0.235	0.671	1.358	0.427
Kurtosis	1.836	1.470	2.193	4.812	1.476
Jarque-Bera	1.244	2.350	2.249	9.768*	2.798
MAURITIUS					
Mean	1.24E+09	0.717	8.49E+09	98.983	63.087
Maximum	1.82E+09	0.790	1.24E+10	99.435	143.756
Minimum	6.16E+08	0.649	5.11E+09	98.601	1.040
Std. Dev.	4.61E+08	0.047	2.25E+09	0.334	49.290
Skewness	-0.040	0.097	0.198	0.314	0.215
Kurtosis	1.356	1.700	1.822	1.394	1.656
Jarque-Bera	2.484	1.585	1.415	2.727	1.824
NIGERIA					
Mean	3.80E+08	0.422	2.82E+11	48.223	30.211
Maximum	1.09E+09	0.528	4.64E+11	59.300	83.268
Minimum	47000000	0.213	1.46E+11	37.770	0.012
Std. Dev.	3.29E+08	0.103	1.12E+11	6.144	32.390
Skewness	0.661	-0.797	0.309	-0.036	0.482
Kurtosis	2.135	2.173	1.674	2.010	1.609
Jarque-Bera	2.286	2.958	1.961	0.903	2.625
SOUTH AFRICA					
Mean	7.16E+09	0.648	3.29E+11	77.574	70.243
Maximum	1.12E+10	0.702	4.20E+11	86.000	158.883
Minimum	2.65E+09	0.610	2.33E+11	57.6000	1.291
Std. Dev.	3.17E+09	0.028	6.50E+10	8.231	54.518
Skewness	-0.299	0.561	-0.012	-0.915	0.185
Kurtosis	1.380	2.214	1.508	2.672	1.601
Jarque-Bera	2.732	1.723	2.041	3.169	1.921
ZIMBABWE					
Mean	1.79E+08	0.470	1.47E+10	35.274	31.128
Maximum	3.65E+08	0.549	1.79E+10	43.369	102.118
Minimum	61000000	0.425	8.98E+09	32.130	0.000

Std. Dev.	77922053	0.040	2.87E+09	2.620	39.665
Skewness	0.791	0.797	-0.568	1.314	0.815
Kurtosis	3.368	2.346	1.863	5.097	1.868
Jarque-Bera	2.417	2.721	2.367	10.357*	3.613

Note: ‘A’ is the 1% statistical significance level. HDI and Std.Dev are respectively the Human Development Index and Standard Deviation.

3.2 Estimation Framework

In the extant literature, the drivers of inclusive human development have been widely modelled within diverse framework (see Asongu & Nwachukwu, 2016; Asongu & Le Roux, 2017; Asongu & Odhiambo, 2019a; Asongu & Odhiambo, 2019b). İn this frameowrk, the drivers of sustainable development is examined from the perspective of tourism, access to electricity, and access to technology such that

$$HDI = f(\text{TOURISM, EACCESS, TACCESS}) \quad (1)$$

and for the robustness estimation, we have

$$\text{ECONOMIC Development} = f(\text{TOURISM, EACCESS, TACCESS}) \quad (2)$$

3.2.1 Estimation procedure

This examination approach enrout three pathways for the empirical analysis. This first step is to verify the stationarity properties of the variables under consideration . In this case, the stationarity test by Levin et al (2002) and Im et al (2003) unit root tests are approprately employed such that result posit a stationary status of the variables largely at first difference (See Table 3). Consequently, the study proceed with the investigation of potential cointegration (long-run) equilibrium analysis as reported Pedroni (2004) as presented in Table 4. As implied in Table 4, there is a significant evidence of long-run relationship (cointegration) among GDP, HDI, TOURISM, EACCESS, and TACCESS. Lastly, the Granger causality investigation through the approach of Dumitrescu and Hurlin (2012) is employed to ascertain the inference of predictability among the concerned variables (see Table B of the appendix).

Table 3: The Unit Root and Cointegration Tests

Unit Root Test	**LLC**		**Im, Pesaran Shin**	
	Level	Δ	Level	Δ
GDP	5.460	-1.932[B]	8.863	-2.094[B]
HDI	-0.528	-0.465	4.552	-1.502[C]
TOURISM	-2.03[B]	-5.225[A]	0.288	-6.783[A]
EACCESS	-0.389	-5.564	3.186	-10.277[A]
TACCESS	1.055	-0.874	4.731	-1.524[C]

Note: Here, we presents the correlation among the Human Development Index (HDI), Gross Domestic Product (GDP), tourism receipt (TOURISM), population with access to electricity (EACCESS), and population with access to technology (TACCES).

Table 4: Pedroni Residual Cointegration Test

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Probability	Weighted Statistic	Probability
Panel v-Statistic	1.609	0.054*	-0.032	0.513
Panel rho-Statistic	0.293	0.615	1.315	0.906
Panel PP-Statistic	-2.342	0.010**	-1.474	0.070*
Panel ADF-Statistic	0.176	0.570	-1.237	0.108

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Probability
Group rho-Statistic	2.742	0.997*
Group PP-Statistic	-1.818	0.035**
Group ADF-Statistic	-0.206	0.418

Here ***,** and * represents 1%, 5% and 10% statistical significant level

Proceeding from the priori investigations of stationarity and cointegration, the two models comprising the main model and the robustness are employed respectively with the following presentations:

$$HDI_{it} = \beta_0 + \beta_1 TOURISM_{it} + \beta_2 EACCESS_{it} + \beta_3 TACCESS_{it} + \varepsilon_{it} \quad (3)$$

$$LGDP_{it} = \beta_0 + \beta_1 TOURISM_{it} + \beta_2 EACCESS_{it} + \beta_3 TACCESS_{it} + \varepsilon_{it} \quad (4)$$

where L denotes the logaritnmic expression, β_0 represents the constant term, while β_1, β_2, and β_3 are the slope coefficients, and ε_{it} represents the stochastic term.

Given that the standard Autoregressive Distributed Lag (ARDL) is not efficient for controlling the bias prompted by the link between the mean-differenced autonomous factors and the disturbance term especially for the panel data, a set of estimators (Mean Group (MG), the Pooled Mean Group (PMG), and the Dynamic Fixed-Effect (DFE)) are considered better options. When both *N* and *T* are large values, the MG estimator is a preffered consistent choice. Meaning that MG is sensitive to outliers, mostly a small time (*T*) dimension, and a signficantly large cross-section (*N*) (Blackburne III, & Frank, 2007). Whereas, while excluding the constant term (intercept), homogeneity is presumed by the DFE estimator for the short-run and long-run coefficients. Moreover, the suitability of the ARDL-PMG approach of Pesaran et al. (1999) is based on (i) it uniqueness to model series with a mixture level of integration order, (ii) it capability of providing both the long run and short run estimates at the same time, and that the approach is appropriate for a short sample analysis. Given that the PMG estimator suggests that the long-run coefficients are homogeneous but allows other slope coefficients to vary across cross-sections, the estimator is inconsistent for a heterogeneity assumption of the long-run slope coefficient. According to Pesaran and Smith (1995), the PMG exhibits complimentary properties. Similalry, for a homogeneity assumption, PMG is assumed to be more robust, consistent and efficient compared to the MG estimator. Thus, the aforementioned estimators are examined for equation 3 by using the following expression :

$$\Delta HDI_{it} = \emptyset_i ECT_{it} + \sum_{j=0}^{q-1} \beta_{ij} \Delta X_{1(t-j)} + \sum_{j=1}^{p-1} \psi_{ij} \, \Delta HDI_{i(t-j)} + \varepsilon_{it} \quad (5)$$

$$ECT_{it} = HDI_{i(t-1)} - X_{it}\theta \quad (6)$$

İn this case, HDI is seen as the dependent variable such that X is the set of explanatory varibales (TOURISM, EACCESS, and TACCESS). In addition, the same number of slacks q is employed across singular cross-sections *i* (12 selected countries) in time *t* (1995 to 2018). The Δ, ϕ, and θ

denotes the difference operator, the adjustment coefficient, and the long term coefficient that produces the respective coefficients β and ψ while ε is the error term. As earlier indicated, given the null hypothesis of homogeneity restrictions, the DFE and PMG estimators exhibits higher consistency and efficiency relative to the MG estimator. Thus, given the the Hausman specification test (as indicated in Table 5) with the MG vs PMG chi-square statistics of 1.57, the PMG estimator is selected for the investigation. Consequently, the ARDL-PMG approach for the equation 4 (the robustness estimate) is performed such that the results are presented in lower part of Table 5 and the short-run results for the examined countries are provided in Table 6.

Table 5: The long-and short-run impact with PMG, MG, and DFE estimators

Panel A (With HDI)	Short-run Coefficient			Long-run Coefficient			Hausman result
Variables	PMG	MG	DFE	PMG	MG	DFE	PMG is selected
TOURISM	-0.0050	-0.0004	-0.0013	0.014[a]	0.0144[c]	0.0035	Chi^2 = -1.57 (PMG vs MG)
EACCESS	-0.0017	-0.00002	0.0001	0.003[a]	0.8844[b]	0.0018[b]	
TACCESS	0.0022[b]	0.0002[b]	0.0002[a]	0.0040[a]	0.0001	0.0009[a]	
Adjustment Parameter	-0.1511[b]	-0.2123[a]	-0.1098[a]				
Panel B (Robustness test with GDP)							
TOURISM	-0.001			0.399[a]			
EACCESS	-0.002			0.003			
TACCESS	0.001			0.002[a]			
Adjustment Parameter	-0.085[a]						

Note: [a, b,] and [c] denote the statistical significance at 1%, 5%, and 10% respectively. Here, we have the Human Development Index (HDI), Gross Domestic Product (GDP), tourism receipt (TOURISM), population with access to electricity (EACCESS), and population with access to technology (TACCES).

Table 6: Cross-section (Short-run)

Countries	TOURISM	EACCESS	TACCESS	ECT(-1)
Benin	0.0023[A]	0.0003[A]	3.07E-05[A]	-0.030[A]
Botswana	-0.003[A]	-6.13E-05[A]	0.0002[A]	-
Cameroon	0.008[A]	0.0002[A]	0.0003[A]	-0.320[A]
Congo Rep	-0.001[A]	0.001[A]	0.001[A]	-0.020[A]
Cote d'lvoire	0.004[A]	4.38E-05[A]	-5.22E-05[A]	-0.064[A]
Ethiopia	0.010[A]	-0.0004[A]	-2.49E-05[A]	-0.124[A]
Ghana	0.001[A]	-7.78E-06[A]	0.001[A]	-
Kenya	0.003[A]	0.0002[A]	0.0002[A]	-
Mauritius	-0.004[A]	0.0002[A]	0.0001[A]	-
Nigeria	-0.014[A]	0.002[A]	0.0003[A]	-0.095[A]
South Africa	-0.005[A]	0.0001[A]	-0.0001[A]	-0.138[B]
Zimbabwe	0.0003[A]	-8.41E-06[A]	0.0004[A]	-0.098[A]

Note:[A], [B], and [C] denote the statistical significance at 1%, 5%, and 10% respectively. ARDL with Fixed (Dependent, dynamic regressors lag) = (2, 1). Here, we have the Human Development Index (HDI), Gross Domestic Product (GDP), tourism receipt (TOURISM), population with access to electricity (EACCESS), and population with access to technology (TACCES).

4. Result and Discussion

As earlier highlighted, the present study investigates the drivers of sustainable development in a balanced panel of SSA countries. To this end, we set off by examining the basic summary statistics of the outlined variables over the considered period. Table 2 presents the basic statistical properties that comprise of basic measures of central tendencies i.e. average, maximum, minimum. An additional measure of dispersion is also documented such as standard deviation, skewness that reports the symmetry status of the variables and also peakedness as outlined by Kurtosis. In Benin republic access to technology as measured by access to mobile telecommunication with an average of 27.619 followed by access to electrification and subsequently sustainable development as a proxy by GDP growth. Coincidentally, In Benin republic, both maximum and minimum value is attributed to access to mobile and sustainable development accordingly. For the cases of Benin all variables examined are positively skewed and light tail with none of its tails more than 3 that reflects heavy tail. This resonates with all series being normally distributed as illustrated by the Jarque-Bera (J-B) test statistics. The take-home from the basic summary statistics for Benin republic shows that both economic growth and sustainable development shows low value. This position gives credence to the current per capita income level of slightly above $1000USD as reported by the world bank. This revelation further translates into poor macro-economic indices evidence in the country. Growth drives like tourism do not show high magnitude somewhat. In Botswana located on the southern part of Africa illustrates somewhat same attributes like Benin republic with highest averages on access to technological innovation and access to electronification and tourism in that order with GDP growth and sustainable development ranking low. In the case of Botswana, all series shows huge dispersion from their averages which reflect negative skewness seen (tourism indicator), However, others variables are positively skewed and all indicators normally distrusted as outlined by the J-B test statistics. Botswana also shares the same if not worse indices of per capita GDP and HDI measures. The same story of weak indices of GDP growth and HDI index holds for all outlined panel under consideration. The basic summary statistics offers basic insight on the dataset and not sufficient for decisive conclusion just a glimpse.

Thus, we proceed to explore the pairwise correlation among these variable as illustrated in Table 1. We observe a positive and statistical relationship between HDI and GDP growth over the sampled. This indicates that positive growth indices in HDI that comprises of life expectancy, education and per capita income level leads to a corresponding increasing in sustainable development. Similarly, GDP growth is driven by tourism in SSA as revealed by the positive nexus between GDP growth and tourism. This gives credence to the tourism led growth hypothesis (TLGH), where tourism is seen as a stimulus for economic growth. Subsequently, the same fashion of statistically positive relationship is observed between access to electricity and technological innovation and growth for SSA countries. These revelations are insightful and worthy of further investigation given that Pearson pairwise linear correlation is not sufficient in itself to justify the causation. Thus, we proceed to conduct more econometrics analysis to reinforce the level of relationship among the outlined variables. Subsequently, we investigate the stationarity properties of the variables outlined earlier. The need for the stationarity status is to circumvent for modelling variables integrated of order 2 and as such misleading inference. This study highlights the stationarity test and shows all variables are integrated of mixed order with no I(2) variable (See Table 3). This stationarity status is prerequisite to conducting the equilibrium properties.

Furthermore, the long-run equilibrium (cointegration) relationship is explored with the Pedroni cointegration test among the variables under consideration as reported in Table 4. The results trace a long-run equilibrium sustainable development and other explanatory variables. Thus, implying a converge between the variables. Given the equilibrium status, we proceed to investigate the magnitude of the cointegration relationship among the outlined variables simultaneously by exploring both short- and long run-relationship simultaneaouly with the Panel Auto-regressive distributed lag methodology. To address this issue, we fitted a model with sustainable development is explained by access to electricity (energy), access to technological innovation and recreation (tourism).

As earlier opined in the illustration of the estimators (MG, DFE, and PMG) the choice of the PMG estimator is based on the evidence of the Hausman test as indicated in Table 5. Thus, we proceed to demostrate the applicability of the short and long-run evidence from the perspective of the PMG results. We observe that tourism is a significant driver for a desirable human development in SSA in both the long run and short run. Specifically, the result reveals that 1% increase in tourism development in the region is responsible for a statistically significant increase in sustainable development for about 0.014% in the long run. This is in line with the tourism led-growth hypothesis and coincides with the sustainable development goals (SDG 3,4,5 and 8). This is insightful as a focus in the recreation, leisure sector will trigger sustainable development that encompasses good health, access to education, gender balance and much more sustainable development. As mentioned in the study of Alola and Alola (2019) and Tecel et al (2020), tourism development has consistently been deployed toward the development of the human aspects such as housing and other socioeconomic aspects that specifically characterise the SSA region as implied by Bekun and Akadiri (2019). Moreover, this desirable effect can be achieved by government commitment to the reinforcement of tourism infrastructures by providing more recreational centres, amusement parks and regulations in tourism and the hospitality industry. In essence, this positive development in the tourism industry is expected to attracts more tourists as well increase the promotion of access to electrification sources, thus enhancing sustainable development.

Additionally, empirical results show that access to electricity is a stimulus for sustainable development especially in the long run. Specifically, a 1% increase in access to electricity spur a positive and statistically significant increase in human development to about 0.003% in the long run. This result resonates the position of the United State Energy Administration (EIA,2018) as they asserted that access to electrification (energy) is a catalyst for economic growth. This position is being amplified by the result of our study as we see a statistically significant relationship in both short and long-run over the sampled period. This study gives credence to the energy-induced sustainable development hypothesis. This assertation has been validated in the empirical literature by several studies for regions and country-specific cases e.g. Bekun *et al.,(*2019a) for the case of South Africa and Bekun *et al.*, (2019b) for selected European countries. On the contrary, consideirng that electrification from fossil-fuel sources is not sustainable for environmental sustainability target in the investigated bloc, there is a need for a paradigm shift to renewable energy sources for electrification generation from hydro, solar, thermal and potovoltaic among other non-fossil energy sources. Probably, the short run negative effect of acess to electricity on human development in the current investigation could be ascribed to the high consumption rate of fossil fuel energy sources.

Generally, energy-induce stainable growth expectedly stirs up other sectors of the economy such as technological advancement which is reflected by the current study as we observe a positive and statistically significant relationship between access to technology and sustainable human development in the African region. Specifically, the result reveals that a 1% increase in access to mobile telecommunication positively spur human development in the short run and long run by 0.002% and 0.004% respectively. This entails the ripple effect of efficiency glean from the use of new technology to ease bureaucracy in carrying out production activities in the region. Thus, the region will benefit more by reinforcing its information and the technology sector more increase efficiency and productivity in the blocs investigated. This outcome resonates the study of Asongu and Roux (2017).

Our estimated model is robust and effective for policy construction with an error-correction term i.e. adjustment parameters for case of disequilibrium over the sampled period by 1.5% at 1 per cent statistical level on an annual basis. Furthermore, for more country-specific analysis and inferences we estimate the country-specific results as reported in Table 6. The table shows that all countries investigated exhibited a strong relationship between the outlined variables. The results reinforced the outcomes from the short-long run results. For instance, in Benin Republic, we see that in Benin republic tourism, access to energy and access to technological innovation. The same trend is visible in other countries. This implies that the identified indicator (tourism, access to energy and access to technological innovation) are key drivers for sustainable development and worthy of action step of the specific countries.

5. Conclusion and Policy suggestions

This study presents a novel perspective to explain the drivers of sustainable development and economic growth argument within a balance panel environment for the case of selected Sub-Saharan African countries (SSA). The motivation for this study is driven by the United Nations Sustainable development Goals (UN-SDGs), these goals are known to address pertinent issues across the world. To this end, we seek to the question of what are the " main drivers of sustainable development in the panel of selected African countries under investigation.

Given the above highlights, based on economic intuition and hypothesis, this study constructed a model and identified tourism that is leisure, access to energy and access to technological innovation are a driver of both economic growth and sustainable development as measured by a broader indicator (HDI). These variables are in line with the SDGs (3,4,5,7 and 8). To ensure a robust and adequate coefficient for policy formulation two models were fitted as reported in section 3. This study traces statistics long-run equilibrium relationship among the variables, thus implying these variables converges with the contribution of the other explanatory

Further empirical investigation validated the TLGH where tourism sector in the sampled countries is a key catalyst for both sustainable development and economic growth in the short and long run period in SSA. This results also resonates the energy-led growth hypothesis where investment and access to energy supplies will help stimulate the economy of Africa and much more spillover to other sector and driver other small and medium enterprises (SME's) in the region. This explains why our study also found a statistical relationship between sustainable development and economic growth and access to technological innovation. The plausible logic is that technology will enhance efficiency, improve ease of doing business in the region and much more productivity and spillover to economic growth that is sustainable in the region. These are insightful results for the various countries in this study as we reveal alternative growth channel relative to the previous believe that agriculture was the panacea for sustainable growth in the region

From a policy perspective, the following policy prescriptions are suggested based on the empirical outcome of our study

(i) The positive relationship observed between tourism and economic growth and sustainable development is instructive to the respective government officials of SSA. This can be achieved by government officials commitment to reinforce tourism infrastructures like more recreational centres, amusement parks and regulations in tourism and the hospitality industry to warranty the tourism sector attracts more tourist arrival as well increase the promotion of access to electrification sources, which will engender sustainable development. This suggests the need to make tourism and her recreation more attractive destination as the sector hold potential to spur national and even regional prosperity. That is more than lip service by government administrators there is a need to construct more recreational parks and increase tourism infrastructure.

(ii) We also see that access to energy is a key contributor to sustainable development and economic growth. This revelation is not surprising as most countries in the region have little or no access to electrification which has plagued the region from the ripple effect of access to sustainable economic development. This is because energy is needed to power manufacturing plants and stimulate over SME. This is indication for policymaker to invest in energy access for all which in line with SDG-7. This fit can be achieved by government creating an enabling environment for foregin idrect imnvestment (FDI) in energy sector and public-private partnership in the enegy sector for sustainable development in the bloc. On the contrary, while electrification measured in KW/h from fossil-fuel sources which is not sustainable for environmental sustainability target in the investigated bloc as such, there is a need for a paradigm shift to renewable energy sources for electrification generation from hydro, solar , thermal and potovoltaic among other non-fossil energy sources and shift to renewables which are reputed to be cleaner and more ecosystem friendly.

(iii) Additionally, the wave of Information and communication technology (ICT), better still technological innovation also demonstrated to be a good growth driver over the sampled period and countries. Thus, government of these countries are encouraged to pattern with both private sectors to adopt the use of new technology to glean efficient and increase productivity in the region.

Conclusively, having these significant result SSA, we suggest that subsequent studies can be examined by considering other macro-economic drivers such as demographic indicators like population, market structure and economic architecture. The main limitation of this study lies on data availability for the selected SSA countries for all the investigated variables to address the study hypothesized claims.

References

Ahmad, S., & Tahar, R. M. (2014). Selection of renewable energy sources for sustainable development of electricity generation system using analytic hierarchy process: A case of Malaysia. Renewable energy, 63, 458-466.

Alola, A. A., & Alola, U. V. (2019). The dynamics of tourism—refugeeism on house prices in Cyprus and Malta. Journal of International Migration and Integration, 20(2), 521-536.

Alola, A. A., Eluwole, K. K., Alola, U. V., Lasisi, T. T., & Avci, T. (2019). Environmental quality and energy import dynamics: the tourism perspective of the coastline Mediterranean countries (CMCs). Management of Environmental Quality: An International Journal.

Alola, A. A., & Alola, U. V. (2018). Agricultural land usage and tourism impact on renewable energy consumption among Coastline Mediterranean Countries. Energy & Environment, 29(8), 1438-1454.

Asongu, S. A., & Le Roux, S. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa. Technological Forecasting and Social Change, 118, 44-54.

Asongu, S. A., & Nwachukwu, J. C. (2016). The role of governance in mobile phones for inclusive human development in Sub-Saharan Africa. Technovation, 55, 1-13.

Asongu, S. A., & Odhiambo, N. M. (2019a). Basic formal education quality, information technology, and inclusive human development in sub-Saharan Africa. Sustainable Development, 27(3), 419-428.

Asongu, S. A., & Odhiambo, N. M. (2019b). Income levels, governance and inclusive human development in Sub-Saharan Africa. Applied Research in Quality of Life, 1-33.

Asongu, S. A., Uduji, J. I., & Okolo-Obasi, E. N. (2019). Thresholds of external flows for inclusive human development in sub-Saharan Africa. International Journal of Community Well-Being, 2(3-4), 213-233.). Thresholds of external flows for inclusive human development in sub-Saharan Africa. International Journal of Community Well-Being, 2(3-4), 213-233.

Asongu, S., & Nnanna, J. (2020). Inclusive human development in sub-Saharan Africa. Journal of Enterprising Communities: People and Places in the Global Economy.

Asongu, S., & Nwachukwu, J. C. (2017). Mobile phones in the diffusion of knowledge and persistence in inclusive human development in Sub-Saharan Africa. Information Development, 33(3), 289-302.

Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. Strategic management journal, 26(3), 197-218.

Bekun, F. V., Alola, A. A., & Sarkodie, S. A. (2019a). Toward a sustainable environment: Nexus between CO2 emissions, resource rent, renewable and nonrenewable energy in 16-EU countries. Science of the Total Environment, 657, 1023-1029.

Bekun, F. V., Emir, F., & Sarkodie, S. A. (2019b). Another look at the relationship between energy consumption, carbon dioxide emissions, and economic growth in South Africa. Science of the Total Environment, 655, 759-765.

Bekun, F.V., & Akadiri, S. S. (2019). Poverty and agriculture in Southern Africa revisited: a panel causality perspective. SAGE Open, 9(1), 2158244019828853.

Blackburne III, E. F., & Frank, M. W. (2007). Estimation of nonstationary heterogeneous panels. The Stata Journal, 7(2), 197-208.

Comsan, M. N. H. (2010). Nuclear electricity for sustainable development: Egypt a case study. Energy Conversion and Management, 51(9), 1813-1817.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. Economic modelling, 29(4), 1450-1460.

Elu, J. (2000). Human development in sub-Saharan Africa: Analysis and prospects for the future. Journal of third world studies, 17(2), 53-71.

Energy Information Administration (2018). Available at https://www.eia.gov/conference/2018/(access 22 August 2020).

Fitzgerald, N., Foley, A. M., & McKeogh, E. (2012). Integrating wind power using intelligent electric water heating. Energy, 48(1), 135-143.

Graafland, J. (2018). Does corporate social responsibility put reputation at risk by inviting activist targeting? An empirical test among European SMEs. Corporate Social Responsibility and Environmental Management, 25(1), 1-13.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of econometrics, 115(1), 53-74.

International Institute for Sustainable Development (2020). https://www.iisd.org/about-iisd/sustainable-development. (Accessed 24 August 2020).

Ioakimidis, C. S., Koutra, S., Bagheri, A., & Genikomsakis, K. N. (2018). Solar thermal and wind energy applications: Case study of a small Spanish village. Thermal Science, 22(5), 2163-2176.

Swain, R. B., & Karimu, A. (2020). Renewable electricity and sustainable development goals in the EU. World Development, 125, 104693.

Kernel, P. (2005). Creating and implementing a model for sustainable development in tourism enterprises. Journal of Cleaner Production, 13(2), 151-164.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. Journal of econometrics, 108(1), 1-24.

McCool, S. F., & Bosak, K. (Eds.). (2016). Reframing sustainable tourism. Dordrecht: Springer.

Qureshi, S. (2019). Climate change adaptation for sustainable development: the information and communication technology (ICT) paradox.

Parker, S. (1999). Collaboration on tourism policy making: Environmental and commercial sustainability on Bonaire, NA. Journal of Sustainable Tourism, 7(3-4), 240-259.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econometric theory, 597-625.

Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. Journal of econometrics, 68(1), 79-113.

Rothe, F. F. (2020). Rethinking positive and negative impacts of 'ICT for development'through the holistic lens of the sustainable development goals. Information Technology for Development, 26(4), 653-669.

Roztocki, N., Soja, P., & Weistroffer, H. R. (2019). The role of information and communication technologies in socioeconomic development: towards a multi-dimensional framework.

Saarinen, J. (2018). Beyond growth thinking: the need to revisit sustainable development in tourism. Tourism Geographies, 20(2), 337-340.

Scheyvens, R., & Biddulph, R. (2018). Inclusive tourism development. Tourism Geographies, 20(4), 589– 609.

Scheyvens, R., & Hughes, E. (2019). Can tourism help to "end poverty in all its forms everywhere"? The challenge

Selin, S., & Chavez, D. (1995). Developing an evolutionary tourism partnership model. Annals of tourism research, 22(4), 844-856.

Sustainable Development Goals (2020). The 17 Goals. https://sdgs.un.org/goals. (Accessed 24 August 2020).

Tecel, A., Katircioğlu, S., Taheri, E., & Bekun, F. V. (2020). Causal interactions among tourism, foreign direct investment, domestic credits, and economic growth: evidence from selected Mediterranean countries. Portuguese Economic Journal, 19(3), 195-212.

Ugulu, A. I., & Aigbavboa, C. (2019). Assessing Urban Households' Willingness to Pay for Standalone Solar Photovoltaic Systems: A Case Study of Lagos, Nigeria. Journal of Sustainable Development of Energy, Water and Environment Systems, 7(3), 553-566.

United Nations (2020). Millennium Development Goals (MDGs). https://www.un.org/millenniumgoals/. (Accessed 24 August 2020).

United Nations and World Tourism Organization (UNWTO). (2008). International recommendations for tourism statistics 2008 (IRTS 2008). New York. Retrieved 29.8.2020 https://www.unwto.org/sustainable-development

United Nations Development Programme (2019). http://hdr.undp.org/en/data. (Access 22 August 2020).

United Nations Educational, Scientific and Cultural Organization (2020). https://en.unesco.org/creativity/policy-monitoring-platform/national-development-strategy-nds. (Accessed 24 August 2020).

World Bank (2019). https://datacatalog.worldbank.org/dataset/sustainable-energy-all. (Access 22 August 2020).

APPENDIX

Table A: The Sustainable Development Index (SDI) of selected African countries

Country	Sustainable Development Index (SDI)
Benin	0.547
Botswana	0.351
Cameroon	0.590
Congo Republic	0.479
d'Ivoire Cote	0.515
Ethiopia	0.486
Ghana	0.630
Kenya	0.623
Mauritius	0.615
Nigeria	0.568
South Africa	0.675
Zimbabwe	0.569

Table B: Dumitrescu Hurlin Panel Causality Tests

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
ECONOMIC_GROWTH does not homogeneously cause SUSTAINABLE_DEVELOPMENT	5.79348	4.48090	7.E-06
SUSTAINABLE_DEVELOPMENT does not homogeneously cause ECONOMIC_GROWTH	4.26174	2.51188	0.0120
TOURISM_RECEIPTS does not homogeneously cause SUSTAINABLE_DEVELOPMENT	4.19278	2.42324	0.0154
SUSTAINABLE_DEVELOPMENT does not homogeneously cause TOURISM_RECEIPTS	4.79805	3.20130	0.0014
ACCESS_TO_ELECTRICITY does not homogeneously cause SUSTAINABLE_DEVELOPMENT	4.63915	2.97727	0.0029
SUSTAINABLE_DEVELOPMENT does not homogeneously cause ACCESS_TO_ELECTRICITY	3.32510	1.29587	0.1950
ACCESS_TO_TECHNOLOGY_INN does not homogeneously cause SUSTAINABLE_DEVELOPMENT	4.24558	2.48323	0.0130
SUSTAINABLE_DEVELOPMENT does not homogeneously cause ACCESS_TO_TECHNOLOGY_INN	7.24272	6.32804	2.E-10
TOURISM_RECEIPTS does not homogeneously cause ECONOMIC_GROWTH	3.75739	1.86355	0.0624
ECONOMIC_GROWTH does not homogeneously cause TOURISM_RECEIPTS	3.84380	1.97463	0.0483

ACCESS_TO_ELECTRICITY does not homogeneously cause ECONOMIC_GROWTH	4.23515 2.460320.0139
ECONOMIC_GROWTH does not homogeneously cause ACCESS_TO_ELECTRICITY	5.40371 3.955578.E-05
ACCESS_TO_TECHNOLOGY_INN does not homogeneously cause ECONOMIC_GROWTH	2.87447 0.724330.4689
ECONOMIC_GROWTH does not homogeneously cause ACCESS_TO_TECHNOLOGY_INN	3.70474 1.789430.0735
ACCESS_TO_ELECTRICITY does not homogeneously cause TOURISM_RECEIPTS	3.15686 1.080590.2799
TOURISM_RECEIPTS does not homogeneously cause ACCESS_TO_ELECTRICITY	- 1.94629 0.46840 0.6395
ACCESS_TO_TECHNOLOGY_INN does not homogeneously cause TOURISM_RECEIPTS	3.23842 1.191220.2336
TOURISM_RECEIPTS does not homogeneously cause ACCESS_TO_TECHNOLOGY_INN	4.29536 2.547080.0109
ACCESS_TO_TECHNOLOGY_INN does not homogeneously cause ACCESS_TO_ELECTRICITY	- 2.19276 0.15545 0.8765
ACCESS_TO_ELECTRICITY does not homogeneously cause ACCESS_TO_TECHNOLOGY_INN	5.85715 4.523776.E-06