IMPACTS OF TOURISM DEVELOPMENT ON ECONOMIC GROWTH, POVERTY ALLEVIATION, AND ENVIRONMENT: EVIDENCE FROM TANZANIA

A Thesis submitted by

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ABSTRACT

Tourism development is increasingly accepted as a strategy to improve economic growth and to reduce poverty levels in developing countries. The prospects of poverty alleviation through tourism growth have lately attracted a lot of debate, interest in scholarly research, and policy formulations. For instance, despite the limited research findings on economic benefits of tourism in Tanzania, the country's policymakers have added the tourism sector to the list of important economic sectors to spearhead economic growth and poverty alleviation.

This thesis investigates the impact of tourism development on economic growth, poverty alleviation, and the environment in Tanzania. The thesis reviews both theoretical and empirical literature on pro-poor tourism, tourism-led growth hypothesis, growth-poverty nexus, and the impacts of tourism growth on the environment. While the thesis is based on paper format and each paper is self-contained and has independent stand, when put together the papers form one complete thesis addressing the broad research objectives. To determine whether there is a long-term relationship between the proceeds from the tourism sector and economic growth, the study used Granger Causality technique, Wald test, and Impulse Response Function in assessing time series data on international tourism revenue, real gross domestic product, and real effective exchange rate. Likewise, to investigate the impact of tourism growth on the quality of the natural environment, the study employed Autoregressive Distributed Lag (ARDL) Bounds Testing approach, Vector Error Correction Model and Granger Causality test in analyzing time series data on ecological footprint, tourism receipts, primary energy consumption, urban population, and trade openness. The vector autoregressive model (VAR) and Impulse Response Function were employed to assess the relationship between tourism growth and population wellbeing using annual data on tourism development, agricultural growth, and per capita

household final consumption expenditure. The nonlinear autoregressive distributed lag (NARDL) model and Wald test approach was employed to explore the causality and long-run asymmetry between consumption expenditure and economic growth using annual time-series data on per capita consumption expenditure, real gross domestic product, GINI index and unemployment. Subsidiary estimation techniques such as Augmented Dickey-Fuller test and Phillips-Perron test (for unit root tests), Johansen and Juselius test (for co-integration test), Wild Bootstrap (for checking the accuracy of computed statistics), etc., were applied at various stages of the estimation process.

The study confirms a unidirectional causality from tourism development to economic growth and from tourism development to population wellbeing. Thus, tourism development causes economic growth and alleviates consumption deprivation significantly. Further, international tourism revenue and trade openness compacts environmental damages, while urbanization and energy consumption aggravate environmental damages. As for the impact of economic growth on poverty, the study confirms the presence of long-run asymmetric behavior of economic growth, while the Granger causality supports a short-run feedback hypothesis between economic growth and consumption expenditure, and unidirectional causality from unemployment and income inequality to consumption expenditure. In the long run, unidirectional causality was observed from consumption expenditure to unemployment and income inequality. Overall, the growth-poverty nexus in Tanzania is such that although economic growth exhibits poverty reduction features, it is not sufficient to alleviate consumption poverty because the interaction of income inequality with economic growth dampens the poverty-reducing effects of economic growth. The study opens new policy perspectives with wide international relevancy as outlined in the thesis.

CERTIFICATION OF THESIS

I Valensi Corbinian Kyara declare that the PhD Thesis entitled *Impacts of Tourism Development on Economic Growth, Poverty Alleviation, and Environment: Evidence from Tanzania* is not more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes.

This Thesis is the work of Valensi Corbinian Kyara except where otherwise acknowledged, with the majority of the contribution to the papers presented as a Thesis by Publication undertaken by the Student. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: *Associate Prof. Mohammad Mafizur Rahman*

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Student and supervisors' signatures of endorsement are held at the University

STATEMENT OF CONTRIBUTION

The agreed share of contribution for candidate and co-authors in the presented publications in this thesis is as follows:

Article I:

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The overall contribution of ***Valensi Corbinian Kyara*** was 70% to the concept development, data collection, statistical analysis, writing the manuscript, and revising the final submission. ***Mohammad Mafizur Rahman*** contributed 20%: assisted in designing the study, supervised data analysis and the writing of the manuscript. ***Rasheda Khanam***contributed 10%: updated the research design, reviewed the article, and wrote the manuscript.

Article II:

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Article III:

Kyara, V. C., Rahman, M. M., & Khanam, R. (2021). Rethinking tourism policy and planning in Tanzania, *Tourism Recreation Research* (**Under review**).

The overall contribution of ***Valensi Corbinian Kyara*** was 70% to the concept development, data collection, review of the article, and the writing of the manuscript. ***Mohammad Mafizur Rahman*** contributed 20%: assisted in review of the article, updated the research design, and supervised the analysis. ***Rasheda Khanam*** contributed 10%: assisted in data analysis, writing the manuscript and reviewed the article.

Article IV:

Kyara, V. C., Rahman, M. M., & Khanam, R. (2021). Is Tanzania'seconomic growth leaving the poor behind? A nonlinear autoregressive distributed lag assessment, *PLOS ONE* (**accepted for publication**).

The overall contribution of ***Valensi Corbinian Kyara*** was 65% to the concept development, data collection, review of the article, and the writing of the manuscript. ***Mohammad Mafizur Rahman*** contributed 20%: assisted in designing the study, supervised data analysis and the writing of the manuscript. ***Rasheda Khanam*** contributed 15%: updated the research design, reviewed the article, and wrote the manuscript.

Article V:

Kyara, V. C., Rahman, M. M., & Khanam, R. (2021). Environmental Kuznets Curve Hypothesis: A systematic review, *Current Issues in Tourism* (**submitted for review**).

The overall contribution of ***Valensi Corbinian Kyara*** was 70% to the concept development, data collection, analysis, review of the article and writing the manuscript. ***Mohammad Mafizur Rahman*** contributed 20%: supervised the drafting of the manuscript, updated the research design, and reviewed the article. ***Rasheda Khanam*** contributed 10%: assisted indesigning the study and reviewed the article.

Article VI:

Kyara, V. C., Rahman, M. M., & Khanam, R. (2021). Investigating the environmental externalities of tourism development, *Heliyon* (**accepted for publication**).

The overall contribution of ***Valensi Corbinian Kyara*** was 70% to the concept development, data extraction and analysis, interpretation, and drafting the manuscript. ***Mohammad Mafizur Rahman*** contributed 15%: assisted in designing the study, supervised data analysis and the writing of the manuscript. ***Rasheda Khanam*** contributed 15%: updated the research design, reviewed the article, and wrote the manuscript.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AFREC	African Energy Commission
AIC	Akaike information criterion
AMG	Augmented Mean Group
ARDL	Autoregressive Distributed Lag
ASEAN	Association of Southeast Asian Nations
BRIC	Grouping acronym which refers to the countries of Brazil, Russia, India, and China
CCEMG	Common Correlated Effects Mean Group Estimator
COVID-19	Coronavirus Disease of 2019
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Squares
EAC	Eastern Africa Community
ECOWAS	economic community of West Africa
ECT	Error Correction Term
EF	Ecological Footprints
EKC	Ecological Kuznets Curve
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GINI	Gini coefficient or Gini ratio named after the statistician and sociologist Corrado Gini
GMM	Generalized Method of Moment
GNP	Gross National Product
HDI	Human Development Index
HLVD	High-Value Low-Density
IEA	International Energy Agency
ILO	International Labor Organization
IMF	International Monetary Fund
IRF	Impulse response function

MENA	Middle East and North Africa countries
NARDL	Nonlinear Autoregressive Distributed Lag
NBS	National Bureau of Statistics
NCAA	Ngorongoro Conservation Area Authority
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
OPEC	Organization of the Petroleum Exporting Countries
PPT	Pro-Poor Tourism
SADC	Southern African Development Community
SAP	Structural Adjustment Programs
SDG	United Nations Sustainable Development Goals
SSA	Sub Saharan Africa
STRIPAT	Stochastic Impacts by Regression on Population
TANAPA	Tanzania National Parks
TASOTA	Tanzania Association of Travel Agents
TATO	Tanzania Association of Tour Operators
TAWIRI	Tanzania Wildlife Research Institute
TLG	Tourism led growth
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
UK	United Kingdom
UNWTO	United Nations World Trade Organization
USA	United States of America
VAR	Vector autoregressive
VEC	Vector Error Correction
VECM	Vector Error Correction Model
WDI	World Development Indicators
WTO	World Trade Organization
WTTC	World Travel & Tourism Council

LIST OF PUBLISHED AND UNDER REVIEW ARTICLES INCLUDED IN THE THESIS

A: Published articles:

1. Kyara, V. C., Rahman, M. M., & Khanam, R. (2021). Tourism expansion and economic growth in Tanzania: A causality analysis. *Heliyon*, *7*(5), e06966.
   DOI: https://doi.org/10.1016/j.heliyon.2021.e06966
   The aim of this study was to investigate an empirical insight into the actual nature of tourism-economic growth in Tanzania.

2. Kyara, V. C., Rahman, M. M., & Khanam, R. (2021): Pro-Wellbeing Tourism: The Dynamic Relationship Between Household Consumption Expenditure and Tourism Growth in Tanzania, *Tourism Planning & Development*,
   DOI: https://doi.org/10.1080/21568316.2021.2012510.
   The aim of this study was to pioneer the measurement of material wellbeing in Tanzania, thereby capture population's sustainable wellbeing and complement poverty measures which focus on market activities.

B. Accepted articles awaiting publication:

1. Is Tanzania's economic growth leaving the poor behind? A nonlinear autoregressive distributed lag assessment, (**accepted for publication** in *PLOS ONE*).
   This study aimed to empirically examine the impact of economic growth on poverty in Tanzania and answer the question on whether there is a specific level of GDP growth beyond which poverty level will start falling significantly.
2. Investigating the environmental externalities of tourism development, (**accepted for publication** in *Heliyon*).

The aim of the study was to make an empirical assessment of the environmental impacts of tourism expansion in Tanzania to inform tourism and environmental policy formulation, thereby add a voice to Tanzania's tourism and environmental sustainability literature. It also pioneered investigation of the Environmental Kuznets Curve (EKC) hypothesis for Tanzania using environmental footprints as a comprehensive environmental damage indicator

C. Under review articles:

1. Rethinking tourism policy and planning in Tanzania, (**under review** in *Tourism Recreation Research*).

   To lend a framework for policy recommendations towards a more effective and sustainable pro-poor tourism program and advance the country's overall economic progress, the study had twofold objectives: first, to assess some key macroeconomic innovations and changes in the Tanzanian economy and how they shape the development and outcome of tourism policy and planning. Second, to identify some systemic critical issues which hinder sustainable tourism development in Tanzania, and by extension in sub-Saharan Africa.

2. Environmental Kuznets Curve Hypothesis: A systematic review, (**submitted for review** in *Current Issues in Tourism*).

   The aim of the review was to synthesize and present a comprehensive status of Environmental Kuznets Curve (EKC) hypothesis research, provides hands-on insights on some shortcomings in the traditional income-environment approaches, re-emphasize how economic policies influence the sustainability of the natural environment, identify some trends and gaps in the existing EKC literature, and specify the appropriate direction of future studies. The review affirmed that sustainable environmental quality is integrally involved in any socio-economic decision

CHAPTER ONE: INTRODUCTION

1.1: The study background

Over the last few decades, tourism has emerged as one of the leading sectors in the international economy. The *Travel & Tourism Economic Impact 2021* report confirms that while 334 million jobs (i.e., 10.6% of all jobs globally) were supported by the tourism sector in 2019, the sector accounted for 25% of all net new jobs during the period 2014–2019 (WTTC 2021). In 2020, despite the negative impacts of COVID 19 on the travel and tourism industry, the sector supported 274 million jobs, equivalent to 8.6% of all jobs globally (WTTC, 2021). Further, the report attests that direct and indirect activities of the tourism industry accounted for up to 10.4% and 5.5% of the global gross domestic product (GDP) in 2019 and 2020 respectively. It is projected that the negative impacts of the global pandemic (COVID 19) to the tourism industry are likely to be significantly defeated and regain the sector's contribution to global income and employment before the end of 2022 (WTTC, 2021). Globally, many countries are increasing their investment in the tourism sector, and they have come to view the sector as the engine of economic growth. In less developed and developing countries, tourism expansion is increasingly being considered as a tool for poverty alleviation. It is with this background that the tourism-led growth (TLG) hypothesis surfaced in the economic literature and is generating a lot of interest, especially among development practitioners, academicians, and policymakers.

The TLG hypothesis is a postulate which seeks to analyze the temporal relationship, if any, between tourism development and economic growth in the short and long run. In particular, the TLG hypothesis seeks to answer the question whether tourism development spurs a country's economic growth, or whether tourism development is spurred by a country's economic growth, or whether there is a bidirectional relationship between economic growth and tourism development.

The TLG hypothesis is thought to have been first coined by Balaguer & Cantavella-Jordá (2002). Centering on TLG, some scholars (Bayramoglu & Ari, 2015; Kyara et al., 2021b; Luvanga & Shitundu, 2003) state that job creation, the increase of government revenue, the improvement of cross-cultural experiences, the provision of foreign currency earnings for the government, the promotion of healthy competition among the local firms, attraction of new investment in physical infrastructures and human capital, the encouragement of economies of scale, stimulate market for local goods and services, market for artifacts and agricultural goods, expansion of hotel and entertainment industry, development of cultural interchange, etc. are some of the ways via which tourism positively impacts economic growth and livelihood. Besides, a critical analysis of the existing TLG hypothesis literature designates tourism as either a supply side variable that increases supply (neoclassical growth theories), or exogenous/demand side variable that increases demand (Bassil et al., 2015). Thus, the TLG hypothesis anchors itself on the fact that whether through demand or supply, tourism has the potential of unlocking the necessary opportunities for the poor and enable them to get out of the vicious circle of poverty. Tourism that leads to poverty alleviation has been repeatedly described in the literature as pro-poor tourism, i.e., tourism that raises the incomes and wellbeing of the poor households (Handaru, 2018; King & Dinkoksung, 2014; Tolkach et al., 2012).

Further analysis of the existing literature on the relationship between economic expansion and tourism growth on one hand, and of tourism growth and poverty alleviation on the other hand, is a contentious subject. This is because there is no unanimous agreement on the direction of causality between economic growth and tourism, nor absolute agreement on whether tourism expansion can always be an ideal tool for poverty alleviation. It is fascinating to notice that some studies affirm causality running from tourism to economic expansion, others from economic expansion to tourism, and

others affirming bidirectional causality, yet some dismiss the existence of any causality whatsoever (Bassil et al., 2015). Besides, it is observable that studies affirming causality between tourism and economic growth hardly assess the tourism growth impacts on the environment.

While the impact of tourism on poverty reduction cannot be underestimated, the state of tourism development in Africa varies across countries. Overall, the tourism industry is more established in North Africa as compared to Sub-Saharan Africa where the industry is still at its infant stage (Conrady & Buck, 2012). From a policy perspective, Tanzania has emphasized the importance of a consistent sectoral growth to contribute to the aggregate economic growth, anticipating that the good track of economic growth will be transformed into economic development for the betterment of all the people. The Tanzanian economy, which is the second largest economy in the Eastern Africa Community (EAC) and the 12th largest economy in Africa, is largely dependent on agriculture. About 34% of Tanzania's population currently live in extreme poverty of under US$ 1 per day (IMF, 2021). The country has entered its 4th decade since it transitioned from the command economy in 1985 to a market economy. Following the economic reforms, the overall GDP has maintained an upward trajectory since the beginning of the transition to the market economy. In 2001, the GDP increased to $ 12,700 million from US$ 8,600 million in 1985; and then up to $ 60,800 million in 2019 (IMF, 2021). The real GDP growth improved by 3.3% in 1985, to 7% in 2019, while the highest growth recorded was 8.5% in 2007 (IMF, 2021). However, the GDP per capita and the poverty ratio have not shown an impressive picture. For instance, the GDP per capita in the first two decades of reform plummeted significantly from US$ 596.87 in 1985, down to US$ 190.68 in 1993, only to rise to $ 683.14 above the figure at the transition in 2004, and then up to US$ 1080 in 2019 (IMF, 2021).

In recent years, tourism is gradually proving to be a significant driving force in the Tanzanian economy. The sector is consistently recording a rapid growth rate in terms of the numbers of tourist arrivals and financial receipts. Tourism has experienced an increasing number of local and foreign private investors, unlike the period before reforms. For instance, in 2014, the sector became Tanzania's leading economic sector, contributing to over US$ 1 billion.

The World Travel and Tourism Council report (WTTC, 2015) shows that the contribution of the tourism industry for the period to the national GDP was US$ 6.7 billion, which is about 14% of the total Tanzanian GDP in 2014. This is in comparison with 10.5% in Kenya, 9.9 % in Uganda, and 9.1% in Rwanda, and the world average of US$ 7,580.9bn (9.8% of GDP). What is more, in 2014, Tanzania's tourism sector generated 12.2% of total employment (1,337,000 jobs), as compared with 9.2% of total employment (543,500 jobs) in Kenya, 8.6% of total employment (592,500 jobs) in Uganda, 7.9% of total employment (176,000 jobs) in Rwanda, and the world average of 9.4% of total employment, i.e., 276,845,000 jobs (WTTC 2015).

Within a decade, the international tourist arrivals in Tanzania rose by 113.86%, i.e., from 714,000 visitors in 2009 to 1,527,000 visitors in 2019[1]. Tanzania is the 7th most visited country in Sub-Saharan Africa after South Africa (9.5m), Zimbabwe (1.9m), Mozambique (1.7m), Uganda (1.27m), Kenya (1.26m), and Namibia (1.2m). Around 81% of the total number of tourist arrivals in Tanzania visited the country for leisure and holiday with most of the visitors coming from Africa (46%) and Europe (32%). Average expenditure per tourist per night ranged between US$ 117 and US$ 277 in 2014.

[1] https://data.worldbank.org/indicator/ST.INT.ARVL?locations=TZ

1.2: Statement of the Problem

During the last three decades of economic reform, Tanzania has registered both high sectoral and overall national growth. For instance, Tanzania's annual GDP growth rate averaged 6.68% over the past 10 years, i.e., 2010 to 2019, making it one of the 20 fastest growing economies in the world (IMF, 2021). Some of the key sectors contributing to such growth include tourism, agriculture, and mining. For example, in 2014 tourism was reported as the country's number one foreign income earner (WTO Economic Impact Report for Tanzania, 2015). Contrary to the widespread expectations of many, such high growth rates have not been commensurate with poverty reduction; many of the Tanzania population remains poor as evidence shows that as of 2020, the World Bank estimated that 27.2% of Tanzanians live below the poverty line of $ 1.35 per person per day[2]. The rapid and consistent economic growth in Tanzania therefore has largely been growth without prosperity; it has neither reduced poverty significantly nor made significant strides in improving the quality of life especially of the population at the bottom of the pyramid (Nelson, 2012). Nevertheless, the government has consistently emphasized sectoral growth with anticipation that sectoral growth will lead to higher economic expansion, poverty alleviation, and quality of life for all.

After transitioning to the market economy, Tanzania has regarded the tourism industry as an effective tool for poverty alleviation due to its significant contribution to the total GDP and job creation every year. In particular, the rapid growth rate in the tourism sector has been recorded in terms of tourist arrivals, tourism activities, and earnings (Kyara et al., 2021b; Luvanga & Shitundu, 2003; Odhiambo, 2011; Wamboye et al., 2020). However, in economic literature, the relationship between tourism earnings and economic growth, and the impacts of tourism industry on poverty alleviation has been an area of debate often fraught with disagreements among contemporary

[2] https://www.worldbank.org/en/country/tanzania/overview

economists. This has had tremendous policy implications (Gautam 2011; Ahiawodzi 2013; Kim et al., 2016; Antonakakis et al., 2017). The issue at stake is whether growth in GDP contains useful information that could be used to predict growth in the tourism sector or whether growth in the tourism sector contains useful information that could be used to predict the GDP growth or whether the two spur each other. Such analysis leads to the econometric question of causality. This is a philosophical question and is fraught with all kinds of controversies.

This study therefore seeks to meaningfully contribute to this debate in three main ways. First, the study seeks to understand the direction of causality, if any, between tourism growth and GDP growth in Tanzania, i.e., whether the GDP growth spurs tourism earnings or whether tourism earning spurs the GDP growth or if they spur each other. Such information is of crucial importance for the government and policymakers in their effort to design and implement policies that are geared towards improved quality of life of the population and overall sustainable economic development.

Second, the study investigates the causal nexus between tourism growth and poverty alleviation. While the potential for growth of the tourism industry as a tool for poverty alleviation and expansion of the Tanzanian economy cannot be underestimated, the specific impact of tourism growth on poverty alleviation in Tanzania needs to be empirically investigated and documented. The report of the World Bank (WB 2016) attests that Tanzania has consistently recorded a high GDP growth rate and several sectors have maintained an upward growth trend, but the number of absolute poor in Tanzania has not changed significantly. As Tanzania continues becoming a significant tourist destination, it cannot be taken for granted that the poverty level will decline with the growth of GDP; some empirical evidence is needed if such a causality is to be presumed.

Third, the study seeks to understand environmental externalities of tourism growth, if any, and outline some remedial measures. The ongoing emphasis on tourism growth as a tool for poverty alleviation has not paid adequate attention to the impacts of tourism growth on the surrounding environment. The expansion of tourism activities (and their supporting mechanisms, such as air and land transport, housing construction, and manufacturing) is not accompanied by active measures to alleviate the potential of the industry generating unsustainable levels of carbon dioxide. Usually, carbon dioxide emissions are measured in Kiloton (Kt). The World Bank Report (2018) affirms that the rate of carbon dioxide emission in Tanzania has increased steadily from 2,538 Kt in 1999 to 11,562 Kt in 2014, and the emissions are increasing at an alarming rate. The main sources of emission are reported to be burning of fossil fuel and from the utilization of petroleum products such as diesel, petrol, and gas. The emphasis on rapid growth in tourism may cause serious environmental problems. At present, Tanzania's tourism policies are geared towards growth, and they hardly address the concomitant negative impacts on the environment.

1.3. The significance of the Study

Tourism has been projected on the front line as one among the most appropriate and cost-efficient tools for effective poverty alleviation in developing countries. This is largely because the sector has posted significant aggregate growth figures for consecutive years at an increasing rate. Despite the significant growth in the tourism sector, Tanzania has scant information that could provide empirical evidence on the relationship between growth in the tourism industry and poverty alleviation, and between tourism growth and the country's economic growth. This study is significant because it seeks to narrow the knowledge gap by empirically investigating the direction of causality, if any, between the growth in the tourism sector and GDP, tourism and poverty alleviation, GDP growth and poverty alleviation, and tourism and

environmental degradation. At present, empirical evidence is lacking to substantiate the impact of tourism on poverty alleviation, economic growth, and environment in Tanzania. The study will also document key developments which have taken place in Tanzania's tourism sector for the period 1980–2017, since this period marked the country's major economic reforms.

This study is different from the previous studies, some of which were mentioned above, in three main ways: First, it seeks to undertake an empirical analysis of the impacts of tourism development on economic growth, poverty alleviation, and environment, by examining new data that is drawn from the Tanzanian economy over a relatively long period of time, i.e., from 1980–2019. Most of the previous studies on tourism in Tanzania have taken narrative approaches and they lack empirical rigor. Empirical approach is an essential extension of the narrative studies because it generates more quantifiable findings with more reliable replication attributes, thereby availing policymakers with a firm and precise foundation for policy formulation.

Second, unlike the previous studies, this study is novel because it will incorporate efforts to determine the necessary environment for an economic growth that will enable most Tanzanians to exit abject poverty. The study therefore is an important extension of most of the previous studies on tourism and economic growth in Tanzania which are based on trickle-down economics (Jung & Thorbecke, 2003; Kweka et al., 2003; Luvanga & Shitundu, 2003; Odhiambo, 2011), i.e., studies which emphasize continued economic growth for an improved wellbeing of the population without deliberately assessing the necessary conditions for the realization of an improved wellbeing from the additional benefits of tourism and economic growth.

Third, the research analyses the impacts of tourism growth on the environment, as a tool for poverty alleviation. The negative impacts of tourism growth on the environment and how such impacts further exacerbate poverty

and the general quality of life of the population is an aspect that previous empirical studies on the Tanzanian economy have not addressed substantially. Therefore, this study will fill in the named gaps by assessing the relationship between tourism growth and environmental quality.

Furthermore, the growth in GDP, be it through the outcome of tourism development or other factors, has been fluctuating with poverty levels remaining high (Adam et al., 2017; Lewis, 2008; Nelson, 2012). From this background, the study will seek to show how economic growth affects poverty levels in Tanzania. Currently, there is a significant empirical gap between the studies that are done in Tanzania to determine the specific nature and necessary conditions of economic growth to facilitate mass exodus from the vicious circle of abject poverty.

1.4: Motivation for the Study:

I am motivated to conduct this study because while the GDP from the tourism sector in Tanzania looks impressive, there has not been a detailed empirical investigation of its impact on the livelihood of the poor, economic growth, and the environment. It is necessary, therefore, to investigate such impacts before declaring tourism growth as a positive development that should be consistently promoted. The existing tourism literature for the Tanzanian economy has a big gap in terms of empirical analysis. Thus, this study is interested in narrowing the existing information gap by providing empirical analysis that could enable policymakers to formulate appropriate policies whose implementation could help to align tourism growth with the improvement of livelihoods and environmental quality in Tanzania.

Besides, the study is centered on the tourism sector because tourism is being considered by the Tanzanian policymakers as an essential tool to alleviate poverty and for promoting economic growth. Some of the reasons advanced for considering tourism growth as a special tool for alleviating poverty and for

boosting economic growth include the following: First, in contrast with other sectors, tourism has proved to be an efficient income generating off-farm activity: the agriculture sector employs about 60% of the labor force in Tanzania and the sector is considered as the backbone of the economy. Nevertheless, agricultural activities are practiced on a very low scale, are peasantry in character, and are dependent on rains. As a result, many farmers are rendered unemployed after the harvest season until the next rainy season. With this background, tourism, especially cultural tourism, is thought to be a relevant sector for absorbing many unemployed farmers during the off-farm seasons, earning them additional income, and enabling them access to improved livelihood. However, such a tourism-wellbeing hypothesis needs to be empirically tested if it is to be advanced.

Second, the tourism sector in Tanzania is still labor intensive and thus it has a great potential of absorbing the readily available labor force and thereby play a significant role in reducing consumption deprivation poverty by increasing the population's disposable income. Many of the unemployed (and or under-employed) labor force in Tanzania are also poor people. Unlike other sectors, such as the mining and modern agriculture which require a relatively large amount of initial capital and high skills, the tourism sector requires a relatively low amount of initial capital and moderate basic skills. The skills of the tourism industry can be acquired more easily as compared with the skills of other sectors.

Third, Tanzania has several unexplored tourism potentials which, if developed, could contribute significantly to the livelihood of the poor households through increased employment and market for the local products. Such potentials include nature tourism (e.g., wildlife and ecotourism), cultural tourism, adventure tourism (e.g., rock and mountain climbing), wilderness tourism (including the introduction of the famous safari walks in new sites), and

recreation tourism (e.g., developing new camping sites and beach events). Development of such unexplored potentials are thought to lead to more job creation, boost the sales of goods (e.g., agricultural goods and handicrafts) and services (e.g., hospitality and transport), inlet for forex, alternative source of non-farm revenue for farmers, etc.

While the above reasons are logically sound, they are based on a weak ground: studies on the Tanzanian tourism sector (and some more comprehensive studies carried elsewhere) are largely based on narrative. The current study, therefore, is interested in providing some of the missing detailed empirical assessments of the Tanzanian tourism sector and thereby assess the strength of some of the assumptions surrounding the impacts of tourism growth in the Tanzanian economy. Ultimately, the study seeks to provide a more assured basis for the formulation of a sustainable development and policies that lead to the improvement of livelihood.

In addition to analyzing the impact of growth in tourism on poverty alleviation, this study looks at the consequences of tourism growth on the physical environment. The rationale for including the environmental aspect in this study is because, while tourism growth in Tanzania is a significant source of revenue, the growth is often accompanied by negative environmental externalities which tends to aggravate poverty and the quality of life. Such tourism-induced human disturbances on the physical environment include pollution (e.g., sound, air, and water pollution due to increased numbers of tourists and tourist activities such as transport), aesthetic damages, clearing of forests and vegetation cover (e.g., to give room for house and road construction to sustain tourism expansion). Therefore, efforts to promote tourism for poverty alleviation ought to go hand in hand with efforts to promote a sustainable environment, which is a pre-condition for sustainable poverty alleviation. This study is timely and necessary because it will provide the Tanzanian policymakers with the necessary data for formulating and

implementing preservation and regulatory measures against the environmental disturbances that arise from mass-tourism. This will eventually pave the way for a more sustainable pro-poor tourism.

1.5. Research objectives and questions

The main objective of this study is to investigate the relationship among tourism, economic growth, and poverty alleviation in Tanzania. Specifically, the study aims to:

I. carry out an empirical verification of the tourism-led growth hypothesis for Tanzania.
II. determine the threshold of economic growth that will lead to significant poverty reduction and improved population wellbeing in Tanzania; and
III. assess and document the impacts of tourism expansion on poverty alleviation and the environment in Tanzania.

To achieve these objectives, the research seeks to address the following three questions:

1) What is the causal direction, if any, between tourism expansion and economic growth in Tanzania?
2) What is the specific level of GDP growth beyond which the poverty level will start falling significantly?
3) What is the impact of tourism expansion on the environment and poverty alleviation, especially among the poor households?

The current research contributes to the existing body of knowledge in three broad ways:

i) The findings contribute empirical evidence and narrow the existing knowledge gap regarding the causal relationship, between tourism growth and economic growth, poverty and economic growth, and the impact of tourism on poverty alleviation in Tanzania. Hence, the findings form a strong basis for policy formulation.

ii) The findings bring to light, in a systematic way, some of the unexplored tourism potentials that can lead to income generation and significant poverty reduction in Tanzania. Besides, the findings of this study provide motivation and a basis for policy formulation to inspire active participation in the tourism industry by the Tanzanian nationals[3].

iii) To the best understanding of the researcher, no earlier study focusing on Tanzania has utilized VAR and the cointegration approach, using data on international tourism receipts, GDP, per capita consumption expenditure, and ecological footprints, to analyze the impact of tourism development on economic growth, poverty, and environment respectively.

1.6 Data, methodology and ethical standards:

The study makes an in-depth revision of the Tanzanian tourism industry and investigates the impact of tourism development on economic growth, poverty, and the environment. Alongside other variables, the study uses the following time series data: Gross domestic product (proxy for economic growth), tourism receipts (proxy for tourism development), ecological footprint (proxy for environmental degradation), and household consumption expenditure (proxy for consumption deprivation poverty), and GINI index (proxy for income inequality). With the aid of cointegration technique, the study endeavors to determine whether there is a long-term relationship between the proceeds from the tourism sector and economic growth, poverty, and environmental degradation.

So far, there is no study in Tanzania which has used time-series data, VAR, and cointegration method to examine the impacts of tourism growth on poverty alleviation, economic growth, and the environment. Previous studies on the Tanzanian economy employed a meta-analysis and narratology

[3] It has been observed that the tourism industry in Tanzania is largely left in the hands of foreign investors and at the same time most natives do not take a significant active part in planning and implementing tourist activities.

approach. The cointegration empirical method is chosen to bring a new perspective, i.e., empirical evidence in the existing Tanzanian literature on tourism growth and environment, pro-poor tourism, and tourism led growth hypotheses. In particular, the co-integration empirical method and the Environmental Kuznets Curve approach, which in this study makes use of the Tanzanian Ecological footprint statistics, have been chosen based on their steadfastness in generating robust and dependable results.

For efficient and economically manageable research, the researcher largely makes use of secondary data, drawn from published reliable statistical sources, including the Tanzania Economic Survey data, Tanzania Bureau of Statistics, World Development Indicators, and World Travel and Tourism Council data. Additionally, published information from various academic journals and research works were reviewed and used to enrich the study outcomes.

The research experiments neither on animals nor humans. Besides, necessary measures were taken throughout the study to adhere to acceptable ethical standards.

1.7. The scope and structure of the current research

This study focuses on the impact of tourism on economic growth, poverty alleviation, and the environment in Tanzania, where tourism growth has been earmarked as one of the emerging approaches to poverty alleviation and economic prosperity. The current study pioneer empirical assessment of tourism-growth-poverty-environment nexus in Tanzania and takes a step further to assess the necessary conditions for economic growth whose benefits translate into the improved wellbeing of the population. While the thesis is based on paper format and each paper is self-contained and has independent stand, when put together the papers form one complete thesis that addresses the broad research objectives.

CHAPTER ONE: INTRODUCTION

1.1: The study background

Over the last few decades, tourism has emerged as one of the leading sectors in the international economy. The *Travel & Tourism Economic Impact 2021* report confirms that while 334 million jobs (i.e., 10.6% of all jobs globally) were supported by the tourism sector in 2019, the sector accounted for 25% of all net new jobs during the period 2014–2019 (WTTC 2021). In 2020, despite the negative impacts of COVID 19 on the travel and tourism industry, the sector supported 274 million jobs, equivalent to 8.6% of all jobs globally (WTTC, 2021). Further, the report attests that direct and indirect activities of the tourism industry accounted for up to 10.4% and 5.5% of the global gross domestic product (GDP) in 2019 and 2020 respectively. It is projected that the negative impacts of the global pandemic (COVID 19) to the tourism industry are likely to be significantly defeated and regain the sector's contribution to global income and employment before the end of 2022 (WTTC, 2021). Globally, many countries are increasing their investment in the tourism sector, and they have come to view the sector as the engine of economic growth. In less developed and developing countries, tourism expansion is increasingly being considered as a tool for poverty alleviation. It is with this background that the tourism-led growth (TLG) hypothesis surfaced in the economic literature and is generating a lot of interest, especially among development practitioners, academicians, and policymakers.

The TLG hypothesis is a postulate which seeks to analyze the temporal relationship, if any, between tourism development and economic growth in the short run and long run. In particular, the TLG hypothesis seeks to answer the question whether tourism development spurs a country's economic growth, or whether tourism development is spurred by a country's economic growth, or whether there is a bidirectional relationship between economic growth and tourism development.

CHAPTER 2: TOURISM AND ECONOMIC GROWTH IN TANZANIA

PAPER I:

RETHINKING TOURISM POLICY AND PLANNING IN TANZANIA

Abstract

There is a growing emphasis in the tourism literature commending tourism industry stakeholders to pay adequate attention to inclusive and sustainable tourism. Motivated by this emphasis, the current study takes a historical critical approach to assess the sustainability of the tourism industry in Tanzania. As a point of departure, the study considers the evolution of tourism policy and planning in Tanzania and then identifies some key macroeconomic and political changes in the country that influence and shape the tourism policy and planning. Subsequently, the study specifies some systemic challenges which affect sustainable tourism development in Tanzania, and by extension in sub-Saharan Africa. The findings show that for tourism to foster sustainable development and alleviate poverty in Tanzania, there must be a fundamental shift of policy emphasis from the current traditional framework of trickle-down approach to deliberately empower and seek greater involvement of the host communities from the point of making strategic tourism policy to actual economic participation and sharing the tourism development proceeds. The study recommends empowerment of the host communities in terms of training in tourism related skills, enhancing access to credit facilities, safeguarding, and fostering their rights to tourism resources, alongside promoting effective participation in the governance of the tourism industry. Besides, the strategic bridging model of collaboration is proposed as a reliable approach for promoting sustainability in the tourism sector because it will stir up necessary linkages among the industry, and with other sectors.

Keywords:
Strategic bridging; Sustainable tourism; Structural Adjustment Programs; Tanzania; Tourism policy; Tourism Planning; *Ujamaa.*

1. Introduction

Tourism policy has been described as a set of discourses, decisions, and practices driven by governments, sometimes in collaboration with private

or social actors, to achieve diverse objectives related to tourism (Velasco, 2016). Associated with tourism policy is tourism planning, which sketches a roadmap to be followed by the tourism stakeholders to attain better spatial distribution of tourism resources, enhance local participation in the decision-making process, and encourage the use of untapped resources (Velasco, 2016). Therefore, tourism policy and planning are important because together they aim at providing a framework for tourism development by setting goals and specifying strategies to attain those goals, providing directives and guidelines to be followed by practitioners, and lending a mechanism to evaluate the performance of the tourism industry. Tourism policy and planning, therefore, govern the tourism industry. For instance, tourism policy governs wildlife activities and helps to avoid conflicts among various stakeholders in the industry. A good tourism policy is normally anchored in the current and future economic, social, and environmental benefits (*UNWTO*, 2021).

Most developing nations, such as Tanzania, have taken tourism as a significant tool for poverty alleviation because it is a major source of foreign exchange, job creation, and off-farm income generation for peasant farmers (Kibara et al., 2012; Kyara et al., 2021b; Luvanga & Shitundu, 2003; Odhiambo, 2011). For instance, in Tanzania, the travel and tourism sector in 2019 contributed 10.7% of GDP (equivalent to US$ 6,577.3 million) and created 1,550,100 jobs, which is equivalent to 11.1% of the total employment in the country (WTTC, 2020). Thus, the sector is instrumental in the alleviation of general poverty level through job creation, generation of a market for traditional products, a stimulant for the development of hospitality industry and transport infrastructures, etc., (Gisore & Ogutu, 2015; Luvanga & Shitundu, 2003; Mutana & Mukwada, 2020; Odhiambo, 2011; Sokhanvar et al., 2018; Wamboye et al., 2020).

Despite the significant contribution of the tourism sector to developing economies, in the context of Tanzania, some of the challenges being experienced in the tourism sector, e.g., conflict over land use and

ownership, wildlife poaching, poorly developed tourism service standards, limited diversification of tourism products, are manifestations of deeper systemic issues with regard to the context and nature of the tourism policy and planning (Nelson, 2012). Such challenges, among others, compromise the sustainability of the tourism industry. Sustainable pro-poor tourism in Tanzania, and by extension in sub-Saharan Africa, is therefore partly dependent on the degree of understanding among the tourism stakeholders on how sociopolitical and economic policies and changes shape and dictate parameters for tourism sector development.

Unlike previous studies which largely focused on the ways tourism impacts the destination of shareholders concerning land rights, mode of investment, interaction with local culture, and generation of income, the current study is unique because it brings a new voice as it examines how changes in economic and political dynamics which have a significant bearing on the extent and the direction of a tourism industry inevitably shape tourism outcome and its impact on poverty alleviation. This is an area that is less researched and therefore not well known.

In particular, the study has two major objectives. First, to assess some key macroeconomic innovations and changes in the Tanzanian economy and how they shape the development and outcome of tourism policy and planning. Second, to identify some systemic critical issues which hinder sustainable tourism development in Tanzania, and by extension in sub-Saharan Africa. With these two objectives, the study lends a framework for concrete policy recommendations on how to address some of the existing challenges in the tourism industry, paving the way to building a more effective and sustainable pro-poor tourism program, and in turn advance the country's overall economic progress.

The rest of this paper is organized as follows: After the introduction, we focus on the historical macroeconomic innovations and changes in the Tanzanian economy and their impact on the outcome and development of

tourism policy and planning. The assessment of the structure and composition of tourism policy in Tanzania is subsequently evaluated and lends a framework for identifying and discussing some crucial systemic issues that compromise sustainable tourism development. The last section of the paper outlines some policy recommendations to further encourage sustainable pro-poor tourism development in Tanzania and by extension in sub-Saharan African economies which share common socio-economic and political features with Tanzania.

2. Historical development of tourism policy and planning

The organized tourism sector in Tanzania finds its roots in the development of national parks. In 1922 Selous was gazetted as a game reserve. Later in 1928, the country, by then called Tanganyika [4] saw the gazettal of Ngorongoro Highlands as a game reserve; followed by the gazettal of Serengeti in 1930. Later, in 1940 the Ngorongoro and Serengeti reserves were merged into the current Serengeti National Park. Since then, tourism development in Tanzania has been highly influenced by macroeconomic policies pursued in the country. Some of the key policies include the following:

a. Communal Self-reliance Policy

After gaining political independence in 1961, Tanzania pursued a Communal Self-reliance Policy, commonly called '*Ujamaa na kujitegemea*' as a key strategy for socio-economic development during the period 1965 to 1985. *Ujamaa* policy had five key features. First, it focused on the provision of free education, health services, and water. These services were earmarked as essential services for mass poverty reduction and improved welfare. Second, the policy encouraged provision of subsidies to the agricultural sector and parastatal organizations to ensure food security, making value additions especially to agricultural products, and job creation.

[4] The name Tanzania come to be in 1964 and replaced the name Tanganyika following the union between Tanganyika (the mainland) and Zanzibar (the islands).

Third, the policy was characterized by state control of major businesses, including tourism business enterprises. For instance, the Tanzania Tourist Board was established in 1962 and charged to promote and oversee the development of all aspects of tourism in Tanzania, e.g., running and managing the hospitality industry, marketing tourism products, transportation of people and goods. Fourth, during the *Ujamaa Policy* implementation period, the country witnessed the nationalization of commercial banks and controlled foreign currency exchange rate, a decision that produced an acrimonious impact on international tourism development. Fifth, the ruling government exercised stiff control on media houses, decreed not to establish a national television station for it was considered as a luxury, and discouraged private media such as radio, television, and newspapers, which are crucial for tourism marketing and development.

b. Structural Adjustment Programs (SAPs)

In the early 1980s, the performance of the economy worsened significantly for global and internal reasons. Some of the global scenarios which impacted negatively on the Tanzanian economy include the rising fuel prices due to the mid-1970s OPEC crisis and the fall of the price of cash crops - coffee, sisal, cotton, cashew nuts, tobacco, and tea - which were Tanzania's major exports. Some of the internal factors for the then defunct economy included poorly managed state enterprises which registered huge losses annually despite the heavy subsidies from the government, Tanzania's armed conflict with Uganda during 1978–1979, and overall lack of adequate expertise in management and production and distribution processes in most of the sectors. The rapidly declining economy affected the efficiency and quality of services and products, including the overall tourism standards.

Following the deterioration in the economy, Tanzania had to initiate economic recovery strategies. These mainly came in the form of a gradual

opening of the economy to the global market forces. In 1986, after a decade of serious economic decline, Tanzania adopted the Structural Adjustment Programs (SAPs) sponsored by the International Monetary Fund (IMF) and World Bank (WB). The SAPs consisted of conditional loans to developing economies facing economic hardships, supposedly intended to adjust the recipient economy's structure, enhance its international competitiveness and resilience, and restore its international balance of payments. To qualify for new loans and or lower the interest rates on the existing loans, the IMF and WB compelled Tanzania to implement certain policies, which were primarily centered around balancing government deficits, liberalizing trade and foreign investment, and striving towards greater privatization (Bello, 2008; Lensink, 1996). With these conditional structural political and socio-economic reforms, it could no longer be business as usual in the tourism sector and the entire economy. For instance, the privatization program led to a shift in ownership and management of some tourism and hospitality investments from state to private investors. While there was an overall improvement of tourism outcome as depicted by Figure 2 and Table 2, the programs estranged the poor from the benefits of the increased tourism revenue due to profit repatriation, increased corruption, the demise of social unity, and rising income inequality (Kaiser, 1996; Lensink, 1996; Vedasto, 2009). When such estrangements are coupled with rising income inequality, if not intervened timely, can overturn the hard-earned economic achievements and ruins tourism potential for further economic growth and poverty alleviation (Cuesta et al., 2020; Fosu, 2015).

c. The 1991 Tourism Policy

The Ministry of Natural Resources and Tourism (MNRT) is the highest institution in Tanzania responsible for tourism matters. The threefold primary mission of the MNRT is to formulate sustainable policies for resources management and tourism development, promote and diversify

tourism and tourism products, and ensure the consistently increased contribution of the tourism sector to national income.

It was until 1991 when MNRT came up with a comprehensive tourism policy for the country. Before then, all tourism activities were largely managed by the government. The 1991 policy aimed at guiding and managing tourism activities in the country to minimize the negative impacts of tourism in the destination environment (Gateway, 2021). The policy lasted for 8 years before its review in 1999. Its key impact on the sector's development includes the development of various tourism initiatives across the country and the preparation of a draft of the *Integrated Tourism Master Plan*. These achievements shaped the tourism sector as detailed in the subsequent subsections below.

d. The 1992 Constitutional Reform

The 1991 Tourism Policy and the implementation of SAPs prepared the way for further reforms in the county because they emphasized economic and democratic reforms which entail freedom of expression, tolerance, and co-existence of variant political ideologies, the introduction of and enforcement of Public-Private Partnership approach to development, and enhanced media freedom. These changes led to constitutional reform in 1992. Among others, the reformed constitution allowed multiparty politics in Tanzania for the first time, sanctioned private radio and television stations, allowed private daily newspaper publications, and encouraged private investment (by local and international investors) in key sectors such as tourism and agriculture. All these changes brought a significant revolution in the tourism industry in the form of marketing, product diversification, improved tourism service standards, and increased access to capital investment. Consequently, the sector registered a remarkable increase in both international tourist arrivals and tourism revenue. For instance, as detailed in Table 2, the tourism sector's contribution to GDP increased from US$ 502 million in 1995 to US$ 1,924 million in 2015. During the same period,

international tourist arrivals increased from 295,000 to 1,137,000 tourists: representing an increment of over 42,000 arrivals annually.

e. The Revised 1999 Integrated Tourism Policy

The key development brought by the revision was the acknowledgment and introduction of the role of the private sector in tourism development. The revised policy affirmed the place of the private sector as the most appropriate enterprise in responding to the problems of poverty and environmental conditions facing the country. The private sector was recognized for its potential to kindle transfer of appropriate technology and resource management.

The revised tourism policy also put some impetus into resolving the preexisting problems where the host communities were marginally involved in decision making and sharing the proceeds of tourism. The involvement of the private sector was also geared to empower the local communities through training and provision of loans for small and medium enterprises. The policy also provided a framework to help alleviate possible conflicts between the destination communities and private investors. Other strategies enshrined in the policy include improving infrastructure for improved accessibility to tourism sites, promoting cultural tourism by financing and merchandising indigenous products for the betterment of the local community, and developing the overall marketing and tourism standards.

f. Integrated Tourism Master Plan, 2002

To ensure that the revised tourism policy was time and resource-sensitive, the MNRT initiated the Integrated Tourism Master Plan in 2002. At the core of the plan was a strategy to enable Tanzania to attain a high-value, low-density (HVLD) tourist destination status. The HVLD strategy was thought to help, protect, and balance the interests of the current tourists and destinations while at the same time protecting and bolstering future tourism needs. Other areas illuminated by the Master Plan included

improving service standards, access, and knowledge; strengthening the market; buttressing economic and institutional linkages; and enhancing product diversification (MNRT, 2002). For instance, as a way to diversify the dominant wildlife-based tourism, the Master Plan stipulated explicit strategies to promote other areas outside the national parks such as the coastline area which extends from Tanga to Mtwara, inland areas surrounding the game reserve of Selous, and the Ruaha National Park and the unexplored Southern regions, e.g., Kilwa Kisiwani historical ruins, which hosts great tourism wealth (MNRT, 2002)

After the launch of the reviewed policy, the private sector assumed the role of developing and promoting tourism attractions in the country, while the state relinquished its direct involvement in tourism activities and assumed its primary role of creating a favorable investment climate for potential investors. The revised policy, alongside the SAPs conditionalities, led to the privatization of state-owned tourism facilities as well as the advent of local and foreign-owned entities entry into the tourism market in Tanzania. Some of the outstanding achievements of the revised policy included enactment of the Tourism Act 2008, increased international tourist arrivals from 295,000 in 1995 to 1,137,000 in 2015, increased domestic tourism, diversification of tourism products, increased tourism, and tourism-related infrastructure development, and an increase in the total contribution to employment from 5.96% in 1998 to 9.03% in 2008 and then up to 11.1% in 2019 (UNECA, 2021; WTTC, 2020).

g. Tourism Act 2008

The Tourism Act of 2008 aimed at providing an institutional framework, administration, regulation, registration and licensing of tourism facilities, activities, and related matters (Tourism Act, 2008). This act is the highest current legislative frame in the country, and it gives provision to all legal preoccupations to tourism endeavors and all tourism sub-sectors, e.g., the Tanzania National Parks (TANAPA), Ngorongoro Conservation Area

Authority (NCAA), Tanzania Wildlife Research Institute (TAWIRI), etc., and trade associations, e.g., Tanzania Association of Travel Agents (TASOTA), Tanzania Association of Tour Operators (TATO), Tourism and Hotel Professionals Association of Tanzania (THPAT), which are all constituent members of the Tourism Confederation of Tanzania (TCT). The act gave a mandate to the MNRT to formulate and implement tourism development policy and plans and to stimulate and promote tourism investment activities. The ministry is also charged with a duty to regulate, promote, and facilitate provision of tourism services in the country. Thus, the Act equipped the Director of Tourism with a mandate to facilitate the efficient development and marketing of tourism as well as to promote and encourage the establishment and development of appropriate tourism facilities, activities, and amenities. Table1 summarizes the key historical development and events which shaped the Tanzanian tourism sector.

3. Performance of tourism sector in Tanzania after the 1990s Reforms

From the preceding analysis, we can observe that the economic and political reforms which started in 1986 and intensified in the 1990s have enabled Tanzania to register steady growth in national income at an average of 5.8% annually during 1995–2019 as depicted in Figure 1. The reforms ushered a greater flow of investment and intensified economic activities in many sectors including tourism. For instance, following the reforms, the tourism sector started to register remarkable outcomes in terms of the annual number of tourist arrivals, the proportion of tourism sector revenue to the national income and increasing tourists experience as witnessed by tourists repeat visits. Table 2 sheds light on the gradual yet consistent improvement of the tourism industry in terms of international tourist arrivals and tourism revenue.

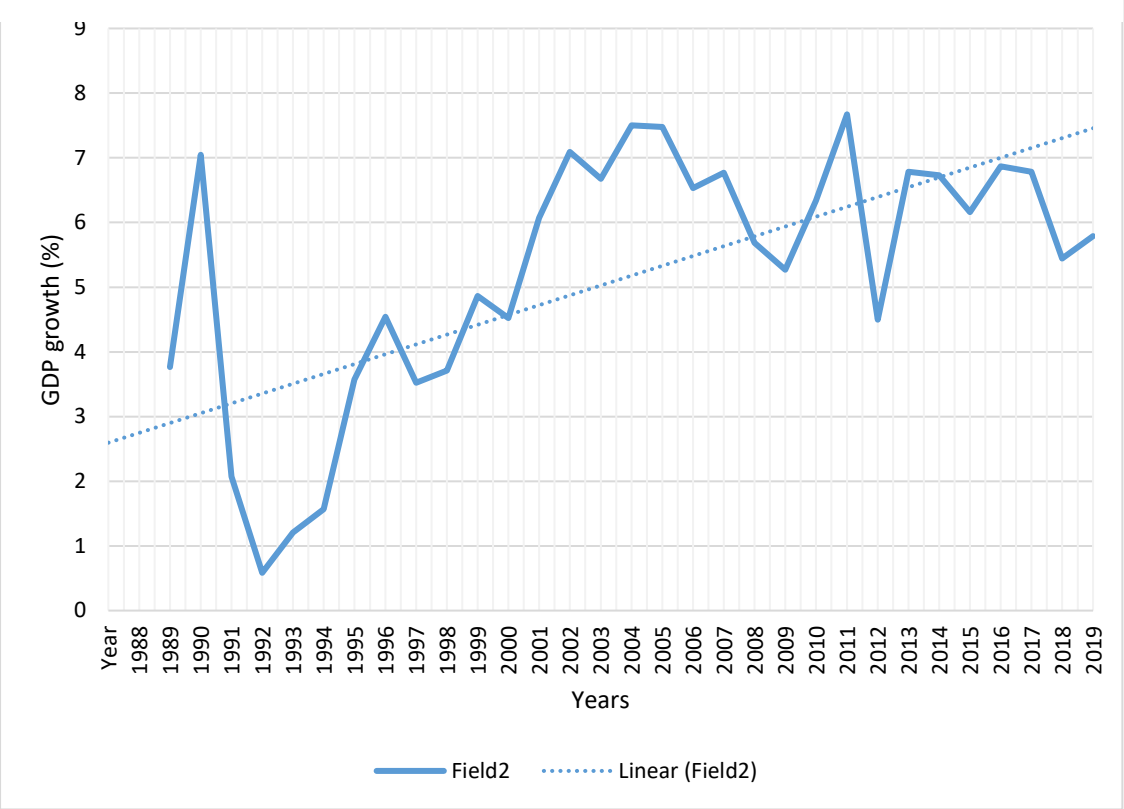
Notwithstanding the achievements, the parallel upward growth in national income and tourism revenue has been a growth without prosperity because it has not made significant headways in poverty alleviation (Nelson, 2012).

The growth without prosperity scenario is largely associated with increasing corruption, lack of a political system with appropriate ideology capable of commanding adequate legitimacy, and lack of adequate political will to strategically empower and include the poor in sharing the benefits accruing from the tourism industry and other sectors. Figure 3 depicts the national income and poverty trends after the economic reforms.

TABLE 1: HISTORICAL DEVELOPMENT OF TOURISM SECTOR IN TANZANIA

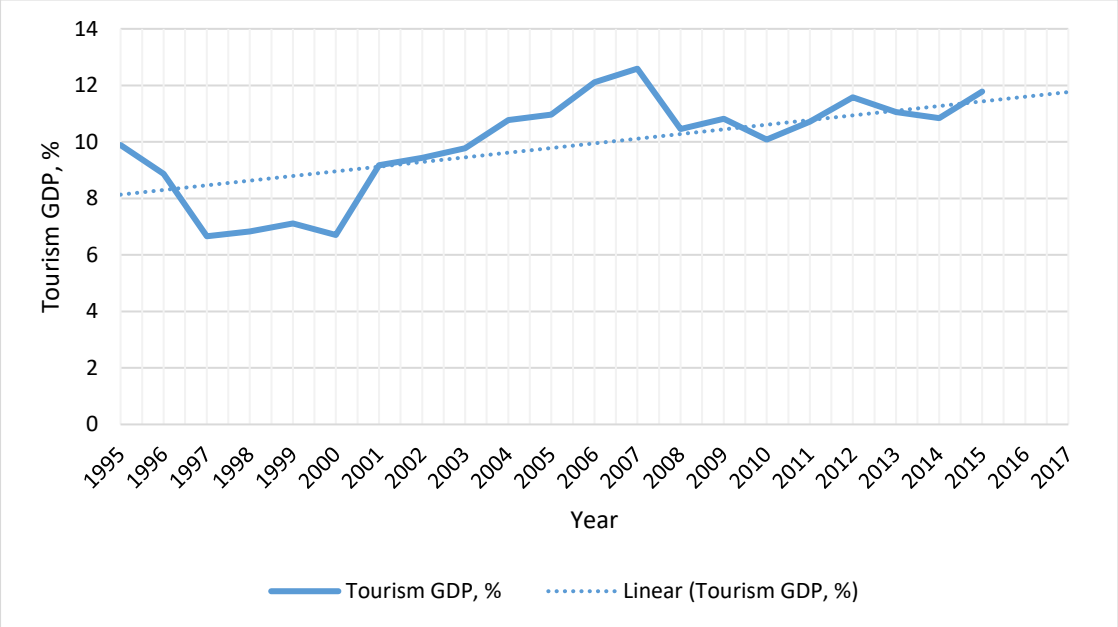
Year	Event
1922	Gazettal of Selous Game Reserve
1928	Ngorongoro Highlands gazetted as a game reserve
1930	Serengeti gazetted as a game reserve
1940	Ngorongoro and Serengeti merged to form Serengeti National Park
1962	Establishment of the Tanzania Tourist Board by Tanzania Tourist Board act, CAP 364 of 1962; mandated with promotion and overall development of the tourism industry in Tanzania.
1965 – 1985	Communal Self-reliance policy (Ujamaa na Kujitegemea) with significant bearing on the performance of the tourism sector
1978 – 1979	Armed conflict with Ugandan dictator, Idi Amin
1980's	Worsening economic condition of the country & massive poverty
1986	About-turn in economic strategies: Implementation of IMF/WB Structural Adjustment Programs (SAPs), the advent of multiparty politics, the introduction of free-market economy.
1991	Creation of first comprehensive tourism policy
1992	The disbandment of the Tanzania Tourist Cooperation (TTC), beginning of the privatization of most state-owned business investments and formation of the Tanzania Tourist Board (TTB) to market and promote domestic and international tourism
	Constitutional reform allowing multiparty politics
1999	Revision of the tourism policy
2000	Creation of the National Tourism Facilitation Committee
2002	Publication of *Integrated Tourism Master Plan*. At the core of the plan was a strategy to enable Tanzania to attain a high value, low-density (HVLD) tourist destination status; a one-stop tourism destination.
2008	Enactment of Tourism Act, 2008

FIGURE 1: THE TREND OF GDP GROWTH IN TANZANIA AFTER THE 1990S REFORMS



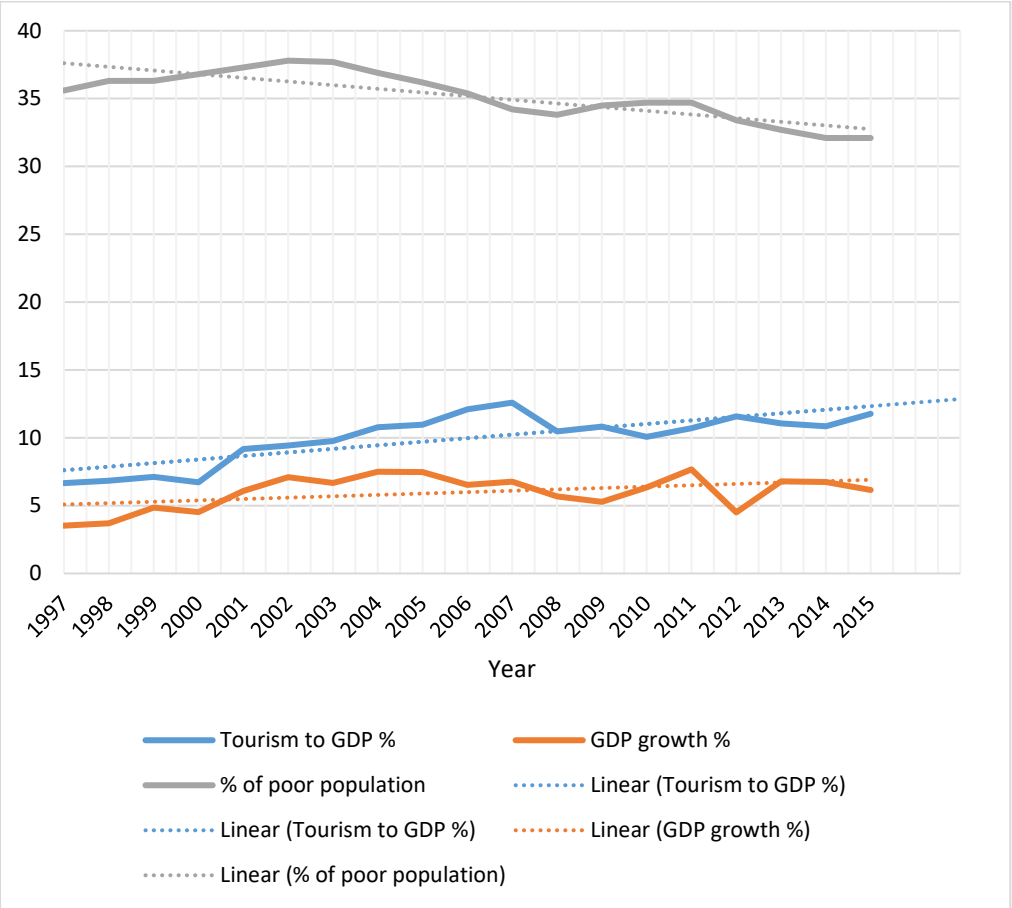
Source: World Bank Development Indicators (WDI, 2021)

FIGURE 2: CONTRIBUTION OF TOURISM REVENUE TO GDP (%)



Source: UN Economic Commission for Africa (UNECA, 2021)

FIGURE 3: NATIONAL INCOME AND POVERTY TRENDS AFTER THE 1990S ECONOMIC REFORMS



Source: UNECA, 2021 and WDI 2021 for GDP statistics

TABLE 2: THE TREND OF TOURISM SECTOR DEVELOPMENT IN TANZANIA

Year	International tourists' arrivals	Tourism revenue	Contribution of tourism to	Year	International tourists' arrivals	Tourism revenue	Contribution of tourism to
1995	295	502	9.89	2007	719	1215	12.59
1996	326	473	8.87	2008	770	1293	10.46
1997	360	343	6.66	2009	714	1192	10.82
1998	482	404	6.83	2010	783	1279	10.08
1999	627	467	7.11	2011	868	1383	10.71
2000	501	381	6.71	2012	1077	1754	11.58
2001	525	626	9.17	2013	1096	1939	11.06
2002	575	639	9.43	2014	1140	2047	10.84
2003	576	654	9.77	2015	1137	1924	11.78
2004	583	762	10.77	2016	1284	2149	
2005	613	835	10.96	2017	1327	2265	9
2006	644	986	12.11	2018	1506	2465	

Source: World Bank Development Indicators (UNECA, 2021)

4. Discussion

In the preceding part of this paper, we have assessed the historical development of tourism policy and planning in Tanzania in the context of major macroeconomic changes. We observed that the macroeconomic and political reforms have significantly inspired the growth of the tourism industry. However, such growth has been without prosperity; it has not produced a proportionate impact on poverty alleviation. The assessment, therefore, lends us a framework to identify and critically discuss two major aspects: first, the philosophy and vision of tourism policy and planning in Tanzania, and second, some critical systemic issues affecting sustainable tourism development in Tanzania, and by extension in sub-Saharan Africa.

i) Critical appraisal of the philosophy and vision of tourism policy

A typical comprehensive tourism policy consists of tourism philosophy, tourism vision, destination audit, tourism objective and constraints, supply, and demand development strategies, micromanagement organizational structure, and tactical supply and demand development programs (Goeldner & Ritchie, 2007). Goeldner further suggests that these components are to be understood and pursued in the context of the destination of socioeconomic macro-level policies. In this case, while the structure and context define the 'what' of tourism policy, the 'how' is defined by the process of policy formulation. Using the components suggested by Goeldner and Ritchie and focusing on Tanzania, we have limited our subsequent discussion on the evaluation of tourism philosophy and strategic tourism destination vision.

a) Tourism philosophy

The philosophy of tourism policy is based upon the socio-economic system of the nation or region in which the tourism subsystem is located. It sets the overall nature of tourism in the destination environment by providing an essential foundation, guidelines, and principles for considering and developing tourism policy. Goeldner and Ritchie (2007) described tourism philosophy as a set of general principles that indicate the beliefs and values of members of society concerning how tourism shall serve the population of a country or region, and that acts as a guide for evaluating the utility of tourism-related activities. Tourism philosophy, therefore, plays a significant role in shaping the attitude with which the host community approaches and appropriate tourism activities. Poorly articulated and under-emphasized philosophy fails to reflect the beliefs and values of destination stakeholders, and ultimately fails to deliver the desired benefits.

In the case of Tanzania, tourism policy is devoid of an ideal tourism philosophy. This is evidenced by the attitude of most middle- and lower-

class people towards tourism activities: they consider tourism and tourism activities as a prerogative for the government, wealthy foreigners, and upper-class citizens. This is largely so because the philosophy of tourism policy in Tanzania has not sufficiently reflected the fundamental values and beliefs of the destination stakeholders. As a result, the middle- and lower-class citizens are largely dormant spectators of tourism activities, the government still has an upper hand in designing tourism activities and directing tourism investment, and most of the senior technical and professional managerial positions in tourism subsystems such as hotels, wildlife and air transport are dominated by foreigners whose interests may not necessarily reflect those of the host community. The multiple conflicts surrounding various tourism subsystems, e.g., conflicts between host communities and wildlife authority over the use and ownership of land is another clear manifestation of the fact that the prevailing tourism philosophy has not taken into consideration the values of the destination stakeholders. Thus, due to the poorly developed philosophy of tourism policy, tourism in Tanzania has not adequately served the poor population who constitute most destination stakeholders. Tourism activities cannot be sustainable unless tourism policy upholds the tourism destination values and beliefs and seeks a balance between value-driven and market-driven benefits.

b) Tourism destination vision

The vision of a tourism policy seeks to paint a vivid portrait of where tourism stakeholders want the sector to be in the future, usually five, ten, or twenty years, based on defined aspirations and goals. Thus, a tourism policy vision statement captures in writing the essence of where the sector is to be and serves as an inspiration to reach the desired goals. In addition to the preamble and core vision, other key components of tourism destination vision framework include elements of the vision (i.e., ecology, awareness, visitors' experience, economy, community, and governance), values which form the basis of the vision, and principals guiding the

implementation of vision (Goeldner & Ritchie, 2007). The preparation of a realistic destination vision therefore must necessarily involve appropriate destination stakeholders. Mintzberg (1987) had previously drawn attention to 'crafting' a vision as differentiated from 'formulating' a vision. Formulating a tourism destination vision underscores a conceptual design, formal planning, and analytical positioning. Thus, strategic vision formulation produces a structured, logical, and largely mechanical model (Goeldner & Ritchie, 2007). Such a model places much responsibility on the chief executive who plays the role of consciously controlling the formulation process. On the other hand, strategic vision crafting is a dynamic, interactive, and evolving process in which strategies take their form as a result of learning over a while, as opposed to being formulated at a fixed point in time (Goeldner & Ritchie, 2007; Mintzberg, 1987). The crafting process, unlike the formulation, involves dynamic interphase of thinking, judging, and acting. The crafting process has the added advantage of integrating and responding in a timelier fashion to an evolving situation.

The tourism policy strategic vision in Tanzania largely exhibits the 'strategic formulation' features; the policymakers have not brought to speed the much-needed crafting approach, which is a major drawback in making tourism a pro-poor experience. The overly domineering rigid formulation effects are demonstrated by the time it takes to review the tourism operating strategies and guidelines. For instance, the prevailing comprehensive *Tourism Policy* was passed in 1999 and followed by the *Tourism Master Plan* in 2002. Since then, the country has experienced several socioeconomic and political changes such as the restoration of the Eastern Africa Community, climate change, the stronger division between party and state, the rapid development of information and communication technology, population growth, and increased income inequality. Nevertheless, the policy has remained as it was; it has not taken the opportunity to learn and adapt to the new realities being experienced by the tourism sector. The inability of the sectors' architects to have a realistic

balance between crafting and formulating a strategic vision with corresponding goals and aspiration has turned the country's dream of building pro-poor tourism into wealth without prosperity because the benefits accruing from the expanding tourism industry have not enabled a mass exit from vicious cycles of poverty and marginalization.

ii) Systemic Challenges affecting sustainable tourism development

Over the last two decades, the tourism industry has played a pivotal role in spearheading economic growth in Tanzania. Despite the achievements, the sector is not without some major challenges. These challenges are of two broad categories: explicit challenges and systemic challenges. The explicit challenges are due to specific individual isolated factors such as political instability, poorly developed physical infrastructures, climate change, corruption, and excessive rent-seeking practices. Most of the explicit challenges including those in developing economies have been explored in detail by various researchers (Chok et al., 2007; Honey, 2009; Jenkins, 2015; Melubo, 2017; Nelson, 2012; Njoroge et al., 2020; Richter, 1994, 2001; Sinha, 2002). Nonetheless, the systemic challenges, which are the consequence of issues inherent in the overall system, and equally limit sustainable tourism development in developing economies, have not received adequate research attention. In the current subsection, we identify and discuss some leading systemic challenges affecting sustainable tourism in Tanzania; challenges which are also applicable in sub-Saharan Africa.

a) The ambiguity of the term sustainability in tourism

The term sustainability involves some subjective value judgment by destination stakeholders and organizations. Such judgments generate some ambiguity and lack of clear-cut agreement on what is or what is not sustainable. Economists and ecologists differ in their view of sustainability largely in terms of how they perceive intergenerational fairness, the

ecosystem's carrying capacity, and the substitutability of natural and other resources (Amsler, 2009; Toman, 1992). In this case, Higgins-Desbiolles (2010) observes that while sustainable tourism is among the leading themes in tourism discourses, ironically its achievement has remained quite elusive. For instance, the United Nations World Tourism Organization (UNWTO) describes sustainability in tourism as a continuous process of meeting the needs of the current tourists and those of the host communities while safeguarding and enhancing the needs of the future tourists and destinations (WTO, 1997). This definition suggests that it is possible to use tourism resources to fulfill economic and social needs while maintaining environmental and cultural integrity (Day, 2014). Nevertheless, the UNWTO definition does not make a decisive distinction between what is objectively sustainable and what is not; it leaves each destination community with the prerogative to determine and judge ideal economic, social, and environmental costs and the benefits of tourism endeavors in meeting the current needs and those of the future. Since different destination communities will weigh the current and long-run costs and benefits of tourism differently, then it is difficult to have an absolute way of conducting sustainable tourism. As a result, various tourism subsystems resort to a set of 'best practices' which may neither be objectively sustainable in the longrun nor universally sustainable.

In the light of sustainability ambiguity, researchers and scholars have made some efforts to guide practitioners on how to approach sustainability. For instance, Robbins and Coulter (2012) recommended that instead of focusing on the absolute vision of sustainability, it could be more realistic to take an approach that recognizes that destinations and organizations implement socially and environmentally responsible programs depending on leadership, availability of resources, and corporate culture which in turn determine their level of commitment; ranging from mere legal compliance to social and environmental activism. However, Tanzania's efforts to build pro-poor tourism are likely to experience stagnation soon because

destinations and organizations seem to neither be aware of the complexity of the sustainability practices nor open to embrace a robust and enduring path to durable tourism practices which are at the core of sustainability.

b) Accessibility to knowledge and information

In the case of Tanzania, there is already a lot of information on sustainable tourism on the internet and other platforms, but very few people can access that knowledge. For instance, some excellent publications on approaches to sustainable tourism in developing economies can be retrieved online or accessed in a print version in some local university libraries and resource centers. However, the masses, including those directly involved in the tourism industry, have no access to the existing wealth of information due to some limiting factors such as inability to pay a subscription fee, unreliable access to the internet and computers, limited funding to facilitate training, poorly developed reading habits and research culture, and language barriers[5]. It is important to emphasize here that in sub-Saharan Africa tourism is largely a rural phenomenon; most tourism sites are in the rural areas, which are still experiencing limited access to necessities such as electricity and internet. Therefore, a vast body of knowledge on sustainable tourism has not been effectively diffused to the destination levels where it is most needed by those who plan and manage activity (Ruhanen, 2008). Since masses of people have no access to the platforms where most of the relevant information and knowledge on sustainable tourism sits, they consequently lack awareness of how they can partake in tourism activities to harness the benefits of tourism in a sustainable manner (Shimekit et al., 2019).

[5] Most people in Tanzania are conversant with the Kiswahili language. However, the online and print medias' sustainable tourism literature is largely in English. Quality information in the Kiswahili language is limited and difficult to access in rural settings.

c) Collaboration among the industry's stakeholders

The tourism industry is complex and diverse due to interdependence among its tourism subsystems and linkages with other sectors. For sustainable tourism development, national and regional tourism subsystems, and trade associations[6] need to form a strong working alliance to produce products and services to deliver the best tourism experiences sustainably. They need to build mutual partnerships in their operations to realize the industry's sustainability. Nevertheless, like other sub-Saharan African countries, Tanzania is facing a challenge in ensuring collaboration among the tourism sector subsystems. This is largely so because by nature tourism governance does not have a top-down structure, i.e., tourism sub-sectors are self-directed and each makes a subjective judgement on the way to attain sustainability (Day, 2014). Rather than receiving orders and thereafter implementing them, tourism subsystems are semi-autonomous and are assembled by product specialization and experiences. Tourism governance, therefore, is always faced by a structure where all subsystems participate in the process of leading the industry. Such a collaborative method places much weight on each subsystem on how to accomplish the overall goals and objectives of tourism development. The challenge for the government is thus how to enforce adequate collaboration among the key players within the industry and between the industry and other sectors. Inability to enforce adequate partnership among the industry's subsystems and the related sectors undermine government efforts to build effective pro-poor sustainable tourism.

5. Recommendations: Areas of policy review

The current tourism policy and planning in Tanzania needs re-orientation to propel the agenda of responsible tourism which is a basis for pro-poor tourism. Since the formulation of tourism policy in 1991 and the subsequent review in 1999, many changes have taken place in the Tanzanian economy

[6] A sample of tourism subsystems and trade associations in Tanzania is provided under section 2, part g.

and have shaped and redefined Tanzania's business environment significantly. These changes necessitate a review of the tourism policy for it to be abreast and responsive to the prevailing political and economic realities. Some of the key social political and economic changes include re-establishment of the East African Community in late 1999, enactment of the Tourism Act 2008, increasing access and use of the internet and social media (for business communication, marketing, and advertising), rising ethical consumerism, increased awareness of the consequences of socioeconomic impacts of climate change, and annually increasing foreign direct investment, e.g., from US$ 282 million in 2000 up to US$ 1180.4 million in 2017, with a highest annual inflow of US$ 2,087.3 million in 2013 (UNECA, 2021).

The reviewed policy should be based on the context of responsible tourism. So, we recommend here three areas of a policy review to realign the sector with the responsible tourism agenda.

First, the revised policy should seek to empower the destination stakeholders to participate in the tourism sector more proactively. It has been established that empowering local communities is a reliable strategy to eradicate poverty effectively (Heyer, 1996). Therefore, greater involvement of the local population is needed in terms of management, investment, and actual participation as domestic tourists. The investment by the local population ought to focus on developing the unexplored vast tourism potential. At present, key tourism investments are owned and managed by foreign investors and expatriates; most local people involved in the industry are largely serving as less-specialized support staff and casual laborers. Improved participation in management and investment by the local population will ensure less profit repatriation and more benefits to the impoverished destinations.

For instance, the policy should seek to empower the local communities, which are largely made up of poor households, to regulate and manage

tourism activities, by granting them adequate authority and property right over resources governance (Kyara et al., 2021a). In most sub-Saharan states, local customary property rights are weak and scarcely documented and or known. As a result, unscrupulous public officials easily sabotage host communities' efforts to safeguard their rights. To develop an effective sustainable pro-poor tourism especially for the rural destinations, Tanzania must consider the prevailing power imbalances and the need to empower the local community in the framework of rights and governance.

Second, the revised policy must lay out strategies for enhancing collaboration within the tourism sector and with other sectors. Collaboration is of critical importance because tourism is a multifaceted industry; the tourism subsystems are interdependent and as an industry tourism necessarily interacts with other sectors such as the transport sector, agriculture, and energy for it cannot operate in isolation (Graci, 2013). The strategic collaboration will enable the sector to experience economies of scale in product development, marketing, and overall maintenance of high tourism standards. For instance, various subsystems such as transport, hospitality, and immigration, are directly or indirectly involved at various stages of a tourist's experience (S.-Y. Park & Vargo, 2012).

While the current tourism policy underscores the importance of collaboration for responsible tourism, there is limited understanding of alternative models of collaboration and how they function. One of the alternative collaborative models that can be emphasized by the revised policy is strategic bridging. This model is superior to the commonly used models, e.g., public policy and planning, because it gives a provision for the bridging partner (the third-party) to link industrial players who are either unable or unwilling to collaborate directly simply because they are not adequately organized or they consider themselves to be too diverse to collaborate in solving a common challenge (S.-Y. Park & Kohler, 2019). In the case of Tanzania, the strategic bridging model, alongside ongoing training to acquire tourism related skills, will promote sustainability in the

tourism sector because it will usher adequate cooperation among the tourism subsystems and between the tourism sector and other sectors (Edgell, 2019; Gössling et al., 2009; S.-Y. Park & Kohler, 2019). The model has a potential to spearhead intraregional tourism and industrial trade within East Africa Community, thereby diversify the current trend of industrial and tourism revenue which is significantly dependent on extra-regional returns (Na, 2019). Despite the fast-growing online platform, not much is known nor done regarding strategic bridging in tourism in sub-Saharan Africa.

Third, for a robust policy review, the revised policy must give preferential attention to tourism product diversification to broaden the income base of the tourism sector in Tanzania. Over the years, Tanzania has heavily relied on safari products (i.e., wildlife-based tourism) and traditional beaches to woo visitors. A revision in the policy is needed to provide a framework to diversify the traditional products to other tourism packages to attract holidaymakers. For instance, the policy needs to provide a framework on how to identify tourism experiences to form part of the must-visit experiences in Tanzania. Likewise, the revised policy ought to contain adequate incentives to propel tourism stakeholders, especially local private investors, to look beyond the conventional approaches and explore hidden gems across the country. For example, in addition to the traditional safari products, Tanzania could explore adventures such as nature walks, Forest Rovers, mountain biking, and Footgolf, which are largely unexplored. Thus, the revised policy must give pride of place and adequate support to private investors because they possess appropriate entrepreneurial expertise and technological skills needed for successful and sustainable diversification of tourism products; they are essential partners with the government (Kyara et al., 2021b). The need for product diversification is of utmost importance to help the industry come up with attractive and affordable products (Conway & Timms, 2010), and to revive the sector, having borne the debilitating effects of COVID-19.

6. Conclusion

This study has assessed some key macroeconomic and political changes which shape and determine the outcome of tourism policy and planning in Tanzania. In so doing, we assessed the historical development and innovation in the tourism industry, evaluated the philosophy and vision of the tourism policy, identified, and discussed tourism sector systemic challenges, and recommended a crucial basis for tourism policy review. The paper established that Tanzania needs some more proactive policies which ensure participation of the host community from decision making to economic participation, unlike the current policy which is hinged largely on spillover effects, i.e., the consistent growth in the tourism sector will lead to creating more jobs, more output, more income, and less poverty because the growth in the sector which is associated with increased income will instantaneously trickle down to the poor at the bottom of the pyramid. The benefits of tourism growth will not move instantaneously to the poor; there are limiting systemic issues, which call for policy realignment if Tanzania is to realize sustainable pro-poor tourism.

Likewise, empowering destination stakeholders in terms of rights and governance, promoting collaboration among tourism subsystems and with other sectors, and investing in realistic strategies for tourism product diversification are three critical areas in need of review in the tourism policy. For instance, while product diversification will help to move away from over-dependence on national parks and wildlife and embrace other forms of 'alternative tourism' e.g., ecotourism and nature tourism, and consequently broaden the tourism income revenue base, the effective collaboration will help the constituents to mobilize, synchronize, and synthesize their resources and efforts toward sustainable tourism.

The authors recognize that COVID-19 has generated negative effects on the overall global tourism industry. Restrictions to travel and social gatherings are likely to stay until the pandemic is under control. Therefore, the question is how to build resilience to revive and sustain the industry

during and after the COVID-19 pandemic. This is an area open for further research. Nevertheless, as pointed out above regarding empowering the destination stakeholders, we further emphasize that involvement of destination stakeholders is critical because that will invigorate domestic demand which in turn will fuel the process of reviving the tourism industry post COVID-19 and will at the same time facilitate responsible tourism.

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PAPER II:

TOURISM EXPANSION AND ECONOMIC GROWTH IN TANZANIA: A CAUSALITY ANALYSIS

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Research article

Tourism expansion and economic growth in Tanzania: A causality analysis

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ABSTRACT

After the economic liberalization in mid-2000, Tanzania has assumed that tourism growth spars economic growth due to the consistent significant contribution of tourism sector to the country's annual income. However, there are limited empirical studies that investigated tourism-economic growth relationship in Tanzania. This study aims to investigate an empirical insight into the actual nature of tourism-economic growth in Tanzania by applying the Granger causality and Wald test methods where annual time series data on international tourism receipt, real Gross Domestic Product, and real effective exchange rate over the period 1989–2018 are used. Further, the Impulse Response Function approach is utilized to provide insight into the qualitative nature of the relationships and the length of time necessary for the causal effect to take place. The findings confirm a unidirectional causality from tourism development to economic growth. The study concludes that Tanzania ought to focus on economic strategies that encourage sustainable tourism development as a feasible source of economic growth.

1. Introduction

The tourism sector is among the fastest-growing sectors in the global economy. The World Travel and Tourism Council 2020 report shows that globally, in 2019 tourism sector contributed 10.3% (US$ 8.9 trillion) of global Gross Domestic Product (GDP) and 330 million jobs, which is about 10% of all global employment (WTTC, 2020). The report further affirms that the growth rate of the global tourism sector in 2019 outpaced the overall global economic growth rate: the sector grew at 3.5% as compared to the global economic growth rate of 2.5%. Besides, the sector's role in the overall improvement of human development through income and job creation, tourism is making a significant contribution in many countries towards the balance of payment, poverty alleviation, foreign exchange generation, creation of a market for indigenous commodities, promotion of the hospitality industry, and stimulation of transport sector development (Gisore and Ogutu, 2015; Sarpong et al., 2020).

The tourism sector's contribution to the economies of developing nations is incredibly significant. For instance, in Tanzania, the tourism sector is second after the manufacturing sector in contributing to the national income. In particular, the travel and tourism sector's contribution to GDP in 2019 was US$ 6,577.3 million, equivalent to 10.7% of the country's GDP (WTTC, 2020). The sector created 1,550,100 jobs in 2019, which is equivalent to 11.1% of the country's total employment. The tourism sector in Tanzania is also instrumental in the fight against abject poverty through job creation and the development of a market for traditional products (Luvanga and Shitundu, 2003; Odhiambo, 2011; Wamboye et al., 2020). The development of the tourism sector in Tanzania, and the developing countries at large, is also a stimulant for the development of transport and hospitality industries (Gisore and Ogutu, 2015; Sokhanvar et al., 2018). The consistent increase of international tourism receipts, as a special form of export, contributes to increasing forex and a better balance of payment (Gisore and Ogutu, 2015; Luvanga and Shitundu, 2003). In total, Tanzania has 44 game-controlled areas; 16 national and 2 marine parks, 28 game reserves, several forest reserves, and 1 conservation area hosting the world's renowned biodiversity, wildlife, and unique ecosystems (Wamboye et al., 2020).

In terms of international tourism receipts, Tanzania exhibits a unique trend as compared to other emerging economies in Africa. For instance, over the period 2010–2019, the average international tourism receipt (% of total exports) for Tanzania was 23.95%, Uganda 21.17%, Kenya 16.22%, South Africa 9.24%, Ghana 5.85% and Mozambique 4.68% (World Bank, 2021). These figures suggest that Tanzania has a comparative advantaged of building up her economy by investing on tourism sector. Besides, Tanzania is endowed with massive storehouse of nature-tourism, which in turn has made the tourism industry in the recent years a robust source of growth. A World Bank source discloses that Tanzania has attained a high-value low-density (HVLD) tourist destination because the sector has a strategy of targeting high ended segment of the market which is normally unaffected by seasonal

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economic fluctuations (World Bank, 2015). As a result, in contrast with other emerging economies such as Kenya which attracts more tourists, HLVD enables Tanzania to make more revenue for it attract visitors from more price inelastic market segment.

The growth in tourism sector is expected to continue and thus lead to increased government revenue (through taxation and foreign exchange) and improved household revenue (through increased employment income: salaries, wages, interest, etc.). The WTTC 2020 report attests that globally, the travel and tourism sector will significantly drive the global economic recovery after COVID-19 through job creation and its economic effect on suppliers across the whole supply chain.

Tugcu (2014) affirms that growth in the tourism sector can at least be used in three major ways: first, increase regional and seasonal employment and, as a special type of export, tourism growth generates foreign currency. Second, tourism development promotes the growth of transport sector, hospitality industry, and construction in the host country. Third, tourism growth can be used by policymakers to contract income inequalities in the host country. Further, Sokhanvar et al. (2018) attest that tourism development has the potential to increase the price of non-traded local goods and services, thereby increasing the employment of people and use of resources, which culminate in improved people's wellbeing.

The importance of the tourism sector in economic growth has inspired many researchers to assess the actual nature of the tourism-income relationship. To this end, some have employed various econometric models and variables to assess the relationship in a particular country (Mérida and Golpe, 2016; Ribeiro and Wang, 2019; Suryandaru, 2020; etc.) or group of countries (Bilen et al., 2017; Kareem, 2013; Shahzad et al., 2017; etc.). While some researchers have specified a bivariate model to assess the tourism-income relationships (Bilen et al., 2017; Sak and Karymshakov, 2012; Suryandaru, 2020; etc.), others have specified multivariate models (Georgantopoulos, 2013; Lawal et al., 2018; Tang and Tan, 2015; etc.). The results are frequently mixed: some confirm one-way causal relationship (Kibara et al., 2012; Lin et al., 2019; Surugiu and Surugiu, 2013; Suryandaru, 2020; etc.) others bi-causality (Bilen et al., 2017; Lawal et al., 2018; Wu and Wu, 2018; etc.) yet others produce evidence of no causality between tourism expansion and economic growth (Ekanayake and Long, 2012; Jin, 2011; Tugcu, 2014), etc.

Most of the developing nations have identified tourism growth as a tool for economic development and poverty alleviation. This is due to the sector's continued significant annual contribution to the national income. For instance, Tanzania is committed to promoting the tourism sector, alongside mining, manufacturing, and agriculture sectors, as a way to realize greater economic growth and poverty alleviation and improved welfare for all; the sector is ranked 4th among the 140 countries because of the country's tourism-related endowments (Tanzania. Wizara ya Fedha na Mipango, 2016). Nevertheless, there are limited empirical studies carried out to investigate the tourism-income relationship among the developing nations (Wamboye et al., 2020); most of the studies focus on Europe, Latin America, Asia, and the Middle East; scanty studies focus on Africa.

For instance, we found only one study by Odhiambo (2011) that empirically assesses the tourism-economic growth relationship in Tanzania. Odhiambo's study employed the Granger causality ARDL approach to assess the annual time series data on real GDP, international tourism receipts, and real exchange rate for the period 1980–2008. Nevertheless, the real GDP and tourism receipts entered the model erroneously as actual values (US$). The actual tourism receipt (US$) and real GDP (US$) values is likely to produce spurious causal relationship because the GDP from tourism may increase but other sectors may also increase in such a way that the proportionate share of tourism to the GDP decreases over time, such that the tourism contribution to the GDP may not be as significant.

The current study takes a different approach: first, the tourism receipts and the real GDP enter the model as a percentage of the real GDP (T_t) and the real GDP growth rate (Y_t) respectively. Then, the real effective exchange rate enters the model as an annual percentage change in the real effective exchange rate (R_t). When the real effective exchange rate index increases, it signifies the appreciation of the local currency against the basket of currencies of trading partners from the rest of the world. Second, in addition to the Granger causality and Wald test, we employ, for analysis, the Impulse Response Function (IRF) to assess the impact on one variable following a shock to another variable, using the most recent annual data on tourism, economic growth, and real effective exchange rate.

Therefore, the objective of this study is to investigate a reliable empirical insight into the actual nature of tourism-economic growth relationship in Tanzania. The research is motivated by the fact that the assumed tourism-led growth hypothesis in Tanzania lacks adequate, correct, and up-to-date robust empirical evidence. The findings from this research will therefore make a significant contribution towards narrowing the gap in tourism-income relationship literature in Tanzania, and thereby provide a solid foundation as a basis for formulation of tourism-economic growth related policies not only in Tanzania, but also in other similar countries. Besides, to the best of authors' understanding, the IRF approach has not been used earlier to assess the tourism-income relationship in Tanzania. Hence our current study provides a unique contribution to the existing literature.

The rest of this paper is organized as follows: Part Two makes a review of the four traditional income-tourism hypotheses: the growth hypothesis, the reverse hypothesis, the neutral hypothesis, and the feedback hypothesis (Oh, 2005; Tugcu, 2014). Under each hypothesis, the review is subdivided into 2 categories: studies focusing on a single country and those focusing on a group of countries. Due to the fast-growing number of researches on this area, except for some seminal works, our review is limited to a sample of studies published over the last 10 years i.e., from 2010 onward. Part Three focuses on data and methodology, while Part Four makes a presentation and discussion of the findings. Part Five consists of concluding remarks, policy recommendations, and delineates some aspects for further research.

2. Review of literature

To examine the dynamic relationship between tourism growth and economic growth, various approaches have been used in terms of the type of data and the methodology employed. Some studies have used time series data to assess the relationship for one country, while others have attempted a comparative study and so employed panel data across countries. Likewise, various methodological approaches are being used: some studies employ a qualitative approach coupled with descriptive statistics to estimate the influence of tourism on growth. Gradually, researchers are adopting the quantitative econometric tools to empirically assess the economic growth-tourism relationship. Many quantitative studies rally behind Granger causality, ARDL bounds test, and Johansen cointegration test to validate the hypothesis and determine the direction of causality. The outcomes are quite diverse and can be classified into 4 categorical hypotheses as follows.

2.1. Tourism led-growth hypothesis

Studies on the tourism-led growth hypothesis (TLGH), also commonly referred to as the growth hypothesis, attests that tourism development causes economic growth. This implies that greater economic growth can be experienced if the government encourages economic policies that promote tourism development (Sokhanvar et al., 2018). Thus, TLGH studies validate a unidirectional causality from tourism to economic growth. Some of these studies use time series data and focus on a single country. For instance, in Uruguay, Payne & Mervar (2010), employed quarterly data from 1987 q1 to 2006 q4 on real per capita GDP, Argentinean tourism expenditure (the main source of tourism in Uruguay), and real exchange rate, i.e., Argentina vs. Uruguay, to examine the effect of tourism on the long-run economic development. The Granger causality

and Johansen cointegration tests confirmed tourism led economic growth for Uruguay. Still, in Asia, similar results were obtained by Katircioğlu (2010) for Singapore, Mishra et al. (2011) for India, and Lin et al. (2019) for China.

Motivated by the question of whether tourism is pro-growth in the case of Kenya, Kibara et al. (2012), carried out a study to examine the dynamic relationship between tourism and economic growth using annual time series data on real GDP, number of tourist arrivals, and the volume of trade over the period 1983–2010. The ARDL bounds testing and causality test based on ECM confirmed unidirectional causality from tourism to economic growth.

The recursive Granger causality test and the combined cointegration test, have also been used to assess TLGH. For instance, Tang and Tan (2013), examined the stability of tourism – economic growth relationship for 12 tourism destination markets in Malaysia, utilizing monthly data over the period from January 1995 to February 2009. The study generated evidence in support of TLGH in 8 out of 12 tourism markets. Using different methodologies but still in Asia, Hye & Khan (2013) examined the cointegration between tourism income and economic growth in Pakistan by employing time series annual data for the 1971–2008 period. The ARDL and Johansen cointegration methods generate evidence in support of TLGH except for the period 2006–2008.

To analyze the relationship between economic growth and tourism receipts in the case of Sao Tome, Ribeiro & Wang (2019) employed annual time series data on GDP, tourism receipts, foreign direct investment, and real exchange rate for the period 1997–2018. The Johansen cointegration test confirmed cointegration among the variables, while the Granger causality test generated evidence in support of unidirectional causality from tourism receipts to economic growth.

Besides TLGH studies focusing on a single country, some researchers have attempted to validate the hypothesis by bringing together several countries. Such studies include Bouzahzah and El Menyari (2013); Brida et al. (2016); Dritsakis (2012); Nene and Taivan (2017); and Shahzad et al. (2017). For instance, Dritsakis (2012) carried out a study to examine the dynamic relationship between tourism income and economic growth in 7 Mediterranean countries using the Panel Cointegration and Fully Modified Ordinary Least Square (FMOLS) approaches on panel data, real per capita tourism receipts, number of international tourist arrivals, real effective exchange rate, and real GDP over 1980–2007 period. The study confirmed the validity of TLGH in all the seven Mediterranean countries.

Other TLGH studies include Shahzad et al. (2017) for top 10 tourism destination in the world, Surugiu and Surugiu (2013) in the case of Romania, Bouzahzah & El Menyari (2013) for North Africa, Tang & Abosedra (2014) for Lebanon, Brida et al. (2016) on systematic literature review for over 100 countries, Tang and Tan (2015) who decided to revisit their 2013 case for Malaysia, Hampton & Jeyacheya (2020) on 58 Small Island Developing States, and Nene and Taivan (2017) who investigated the validity of TLGH in 10 sub-Saharan African countries. The details of these studies are summarized in Appendix A.

2.2. Reverse hypothesis

The reverse hypothesis rejects the view that tourism causes economic growth but affirm that economic growth is the cause of tourism development, i.e., growth-led tourism hypothesis (GLTH). This means that the government can conveniently direct subsidies away from tourism to other sectors without generating an adverse effect on economic growth (Sokhanvar et al., 2018). For instance, Payne & Mervar (2010) examine the tourism – economic growth relationship for Croatia using quarterly time series data on real GDP, real effective exchange rate, and real international tourism receipts over 2000–2008 period. The Toda-Yamamoto test result lends support for growth-led tourism in Croatia. Likewise in Singapore, Lee (2012) used annual data on international tourism receipts, real GDP, exports, and imports over the period 1980–2007. Employing ARDL bounds testing and the Granger causality approach, the study revealed a short-run causality from economic growth to tourism.

Ahiawodzi (2013) utilized annual time series data on real GDP and real tourism earnings for Ghana over 1985–2010 to examine the tourism – economic growth long-run relationship. The Johansen-Juselius test was employed to examine cointegration among the variables. The Granger causality test results supported the economic growth-led tourism hypothesis.

The reverse hypothesis has also been tested using panel data focusing on a group of countries. For example, Kadir et al. (2011) investigated the influence of tourism on economic growth in the case of 9 ASEAN and non-ASEAN countries using quarterly time series data on real GDP, international tourism receipts, consumer price index, and real effective exchange rates over 1994Q1 – 2004Q4. The Johansen test and Granger causality generated evidence in support of the growth-led tourism hypothesis. Other reverse hypothesis studies, with details summarized in Appendix A, include Aslan (2014); Lin et al. (2019); Suryandaru (2020); Trang, Duc, & Dung, (2014b).

2.3. Feedback hypothesis

The feedback hypothesis represents a category of studies that provides evidence for a bidirectional causality between tourism growth and economic growth. This hypothesis is also commonly referred to as a reciprocal hypothesis because policies to expand tourism also lead to economic growth, and economic expansion tends to promote tourism development (Sokhanvar et al., 2018; Tugcu, 2014). Some of the studies in this category use time series data and focus on a single country. For instance, Odhiambo (2011) examined the tourism-economic growth relationship in the case of Tanzania using annual time series data on the real GDP, international tourism receipts, and real exchange rate for the period 1980–2008. The ARDL bounds test confirms cointegration among the variables, while the Granger causality confirms bidirectional causality between tourism and GDP in the short run and unidirectional causality from GDP to tourism in the long run.

In Spain, Mérida & Golpe (2016) tested causality between cycles of tourism growth and the GDP by utilizing Spanish quarterly time series data on the real exchange rate, the number of nights spent by tourists in accommodation places, and GDP for the period 1980–2013. The Granger causality based on the VAR system confirmed a unidirectional causality from tourism to economic growth during 1980–1985, and bidirectional causality between economic growth and tourism during 2000–2013. Other single country studies on the feedback hypothesis include Perles-Ribes et al. (2017), Lawal et al. (2018); Tang (2013); Wu and Wu (2018).

Some feedback hypothesis studies are centered on a group of countries. For instance, Samimi et al. (2011) evaluated causality between tourism growth and economic growth in 20 developing countries by employing a panel autoregressive (P-VAR) approach and annual data on real GDP and the number of international tourists' arrival over 1995–2009. The test results revealed a bidirectional causality between tourism and economic growth.

Kareem (2013) carried out a study on 30 African countries to assess the contribution of tourism to economic growth. The research utilized the GMM approach to analyze annual data on real GDP, gross capital formation, labor, final consumption expenditure of tourists, number of tourist arrival, and energy consumption during 1990–2011. The study affirmed a bidirectional causality between tourism development and economic growth. Another recent study by Bilen et al. (2017) examined the long-run relationship of tourism and economic growth in 12 Mediterranean countries, using annual data on real GDP and international tourism receipts for the period 1995–2012. The panel Granger causality test result revealed a bidirectional causality between tourism receipts and real GDP. Other studies confirming the feedback hypothesis, with detailed findings summarized in Appendix A, include Apergis and Payne (2012); Ridderstaat et al. (2014); and Sak and Karymshakov (2012).

2.4. Neutral hypothesis

The neutrality hypothesis studies attest no causation between economic growth and tourism development, and so economic growth cannot be realized by promoting tourism growth nor is tourism impacted by changes in economic growth (Oh, 2005; Sokhanvar et al., 2018). For instance, Ekanayake and Long (2012) assessed the causal relationship between tourism receipts and real GDP for 140 developing countries during 1995–2009. The Granger causality test confirmed the neutral hypothesis among the variables. The neutral relationship was also confirmed by (Sak and Karymshakov, 2012) using panel data over 1995–2008 period on tourism receipts and the GDP in 135 countries that were divided into 11 groups. The study revealed no causal relationship in sub-Saharan Africa (24), Central Asia (5), Middle East, North & Central Africa (45).

Antonakakis et al. (2015) used a spillover index approach to examine monthly data on industrial production and the number of international tourists' arrival for 10 European countries[1] over the period 1995–2012. The examination revealed that the relationship between tourism and economic growth is unstable; it is time dependent.

Can and Gozgor (2018) used new index for the market diversification of tourist arrivals and re-assessed the tourism-growth for 8 countries in the Mediterranean region. The study employed individual Granger and panel data non-Granger causality to assess data on annual tourist arrivals, GDP per capita, and tourism market diversification index for the period 1995–2014. The study confirmed tourism led growth in Egypt and Greece, growth lead tourism in France, Morocco and Turkey, and feedback hypothesis in Italy, Spain, and Tunisia.

In China, Wu & Wu (2018) carried out research focusing on China's 12 Western regions using data on real GDP and international tourism receipts over the period 1995–2015. Utilizing the bootstrap Granger causality approach, a neutrality hypothesis was verified in 5 out of the 12 regions; and the reverse hypothesis in 4 regions; growth in 3 and feedback in 2 regions. Other studies on the neutrality hypothesis, with details summarized in Appendix A, include Georgantopoulos (2013) for India, Jin (2011) for Hong Kong, Tugcu (2014) for the Mediterranean Region, and Tang (2013) in the case of Malaysia.

In addition to the above four hypothesis, some scholars have spearheaded studies to assess the impacts of uncertainties such as economic policies, inflation, socioeconomic and metrological variables on domestic tourism spending (Gozgor and Ongan, 2017; Massidda and Etzo, 2012) (Otero-Giráldez et al., 2012). Such studies complement the tourism-growth studies by assessing the determinants of tourism demand itself.

Appendix A summarizes the literature reviewed. Two key conclusions can be drawn from the current review. First, while there is overwhelming evidence of the rapidly increasing significance of tourism in African economies, empirical investigation on tourism-economic growth relationship has not received adequate attention as compared to extensive studies in other parts of the world. For instance, out of the 40 works reviewed, only 3 works (7.5%) were single-country studies focusing on Africa. For African countries to count on tourism development confidently and reliably for sustained economic growth and livelihood improvement, a systematic empirical study on tourism – economic growth nexus at the county level and regional levels is indispensable. Second, to assess the tourism-economic growth relationship, some studies used the actual tourism receipts (constant US$) and the actual real GDP (US$). Nevertheless, the actual values are likely to generate spurious regression results because over time, the actual tourism receipts might be increasing but its proportionate contribution to GDP may not be statistically significant if other sectors are growing in such a way that the share of tourism to GDP decreases overtime. For reliable results, tourism receipts should enter the specified model as a proportionate contribution of tourism receipt to the GDP and the real GDP should be represented by its growth rate. The current study takes Tanzania as a case in point and endeavors to contribute to narrowing the above gaps.

3. Data, conceptual approach and methodology

3.1. Data and conceptual approach

To investigate the relationship between tourism development and economic growth, the annual contribution of tourism revenue to the country's gross domestic product is considered. However, as mentioned in the subsequent section, to avoid generating spurious causality, this study will use the annual percentage contribution of tourism revenue to the GDP as a proxy for tourism growth. Likewise, the annual GDP growth rate will be employed as a proxy for economic growth. This study uses time series annual data on tourism revenue (as % of real GDP), real GDP growth (% annual), and annual percentage change of the real effective exchange rate for Tanzania over the period 1983–2018. The data for the percentage contribution of tourism to GDP are collected from the United Nation Economic Commission for Africa database and the Ministry of Tourism - United Republic of Tanzania (URT). The data for the annual GDP growth rate and the real effective exchange rate is extracted from the World Bank and Bruegel publications database[2]. These databases are well cited in the literature as a source of published up-to-date, robust and comprehensively reliable annual data (Ozturk et al., 2016; Rahman et al., 2020). Our analysis of data is based on empirical estimated results obtained by using econometric/statistical techniques where we employ EView statistical package.

In this study, tourism is singled out as a growth-generating sector for two major reasons. First, the tourism sector in Tanzania has recorded a consistent significant contribution to the real GDP and employment. For example, during the period 2004–2017, the average GDP from tourism was 10.91%, the highest contribution being 12.59% in 2015 and lowest being 9% in 2017 ("ECAStats: The ECA Statistical Data Portal," n.d.). On average, the tourism sector is second after manufacturing for its share of GDP. Following this trend, policymakers in Tanzania have singled out tourism as a key growth generating sector. However, empirical evidence is needed to understand the actual relationship between tourism and GDP in the long and short run. Second, as noted in the literature review and the summary on Appendix A, elsewhere TLG and feedback hypotheses have been tested and generated evidence that tourism is often a growth-generating factor (Lawal et al., 2018; Tang 2013; Wu and Wu 2018; Shahzad et al., 2017; Ribeiro and Wang 2019; etc.)

The real effective exchange rates (R_t) are a significant indicator of the GDP growth because it is a measure of the external competitiveness of an economy (Bouzahzah and El Menyari, 2013). For instance, when exchange rates are overvalued, they negatively affect the export sector and exposes competing import industries to intensive competition from foreign firms. Likewise, overvaluation may end to a tight fiscal and monetary policy (if local authorities attempt to defend the currency), capital flight (when devaluation is anticipated), as well as economic recession, accompanied by a decline in international technology transfer and foreign direct investment (Tarawalie, 2010). All these have a serious bearing on GDP growth. Therefore, R_t has been regularly employed to assess economic growth trends (Apergis and Payne, 2012; Ribeiro and Wang, 2019; Tang, 2013; Trang et al., 2014b).

3.2. Methodology

Before carrying out a causality test on time series data, it is necessary to ensure that the series is stationary. Regression on non-stationary series

[1] Cyprus, Greece, Italy, Portugal, Spain, Austria, Germany, the Netherlands, Sweden, and the United Kingdom.

[2] World Bank database: https://data.worldbank.org; Bruegel publications: www.bruegel.org.

generates spurious results that neither be used for forecasting nor hypothesis testing. Therefore, the Augmented Dickey-Fuller (ADF) test for a unit root will be utilized to check if the series is stationary (Dickey and Fuller, 1979; Pinzón, 2018).

The pairwise Granger causality will show the existence and direction of causality, if any, among the variables. However, it will neither give us insight on the length of time necessary for the causal effect to take place nor the authentic qualitative nature of the relationships. It is from this context that the Impulse Response Function (IRF) is employed to complement the Granger causality method in this research. The IRF is also ideal for tracing the nature of transmission of a single shock within a noisy system of equations and, thus, makes them quite valuable tools in the assessment of economic policies (Blotevogel, 2014; Gershon et al., 2019; Koop et al., 1996; Obadiaru et al., 2020).

To determine causality and its direction, if any, between tourism sector growth (T_t) and economic growth (Y_t), the study will employ the Wiener-Granger causality technique, popularly known as the Granger causality test (Granger, 1988). Granger causality has a strength of assessing the effect of lag values of one variable on the current value of another variable (Bates et al., 2013; Hamdan et al., 2020; Obadiaru et al., 2020; Sethi et al., 2019). The annual percentage change of the real effective exchange rate (R_t) is also introduced into the model to address the problem of omitted variable bias. Thus, the study will be preoccupied with estimating the following fundamental regression equations (Bahmani-Oskooee and Wu, 2018; Granger, 1988; Karabulut et al., 2020; Rahman et al., 2020; Sokhanvar et al., 2018):

$$Y_t = ß + \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{j=1}^{k} \phi_i T_{t-j} + \sum_{m=1}^{k} \Omega_i R_{t-m} + \mu_{1t} \quad (1)$$

$$T_t = \partial + \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{j=1}^{k} \phi_i T_{t-j} + \sum_{m=1}^{k} \Omega_i R_{t-m} + \mu_{2t} \quad (2)$$

$$R_t = Ø + \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{j=1}^{k} \phi_i T_{t-j} + \sum_{m=1}^{k} \Omega_i R_{t-m} + \mu_{3t} \quad (3)$$

Where: k = optimal lag; ß, ∂, Ø = intercepts; α_i, ϕ_i, Ω_i = short-run dynamic coefficients; μ_{it} = residuals in the equations. Most scholars rally behind this method because it provides additional insight over and above that provided by a typical lagged linear regression model. Also, the Granger causality approach is considered to be superior to the traditionally lagged regression because in the event that one or more of the employed dataset is suffering from autocorrelation, lagged regression is susceptible to over-reporting the relationship (McGraw and Barnes, 2018).

Accessibility of Tanzania's international tourism revenue data for the period before 1989 has been the main limitation of this study. To manage the challenge, the authors obtained and utilized the latest available annual data from 1989-2018 to generate the most representative and reliable sample.

4. Findings

4.1. Unit root test

Before subjecting the series to the scientific ADF test, 2 preliminary tests for unit root are carried out: plotting the 3 series and observing their trend, and performing regression for the 3 variables, and observing the value of R-squared and the Durbin-Watson statistic. Figure 1 shows a line graph for Y_t, T_t, and R_t. The three graphs maintain a gradual upward trend; an indication of non-stationarity.

The regression of Y_t on T_t and R_t revealed that R-squared = 0.6379 and Durbin-Watson statistic = 1.7603. This outcome suggests that the series is stationary because the R-squared is less than the D-W statistic. Nevertheless, the ADF test must be performed because the preliminary tests are neither robust nor conclusive.

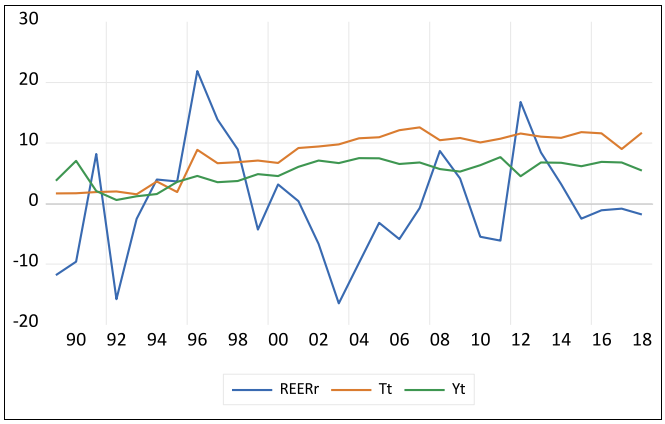

Figure 1. Line graph - GDP growth rate (Y_t), tourism as % of GDP (T_t), and annual percentage change of real effective exchange rate (R_r) over the period 1989 to 2018. Source: Authors' estimation.

4.2. Augmented Dickey-Fuller (ADF) test

Y_t series at the level: When Y_t is tested at level with intercept, the ADF absolute value (2.05) is lower than the critical value at 5% (i.e., 2.998). So, we fail to reject the null hypothesis that Y_t has a unit root. When tested with trend and intercept, the ADF absolute value (1.65) is lower than the critical value at 5% (i.e., 3.62). So, overall, at the level, we fail to reject the null hypothesis that Y_t has a unit root.

When the Y_t series is tested at the first difference with intercept, the ADF absolute value (5.3142) is higher than the critical value at 5% (i.e., 2.9). So, we reject the null hypothesis that Y_t has a unit root at the first difference with intercept. Again, when tested at the first difference with trend and intercept, the ADF absolute value (5.1180) is higher than the critical value at 5% (i.e., 3.58). So, we reject the null hypothesis at the first difference with the trend and intercept. Thus, overall, we confirm that the Y_t series is stationary at first difference. A similar approach was used to perform the ADF test on the T_t and R_t series. Both series were found to be stationary at first difference. Overall, we affirm that the three series, i.e., Y_t, T_t, and R_r have unit roots, but they all become stationary on the first difference. The ADF results are summarized in Table 1.

4.3. Causality test: Wald coefficients test & pairwise Granger causality test

To carry out the causality test meaningfully, it is important to determine the optimal lag length. First, we identify the appropriate criteria. Akaike information criterion (AIC) and Schwarz criterion (SC) are the most used and recommended criteria in the literature. The VAR estimates extract in Table 2.1 identify the AIC as the most appropriate criteria because it gives us the lowest value. Applying AIC to determine the optimal lag generates the evidence, as depicted in Table 2.2, that 2 is the optimal lag length.

The identified optimal lag length, 2, was used to run the unrestricted VAR and the outcome is presented in Appendix B. These are important results in the study and they will be subjected to the Wald coefficient test and pairwise Granger causality test to establish if the causal relationship among the variables can be inferred and if any, to establish its direction.

The Wald coefficient test will essentially confirm if a coefficient in the model is statistically significant or not (Behar, 2010; Smale et al., 2016). Based on the *Unrestricted VAR Estimate* (Appendix B), we estimated Wald Coefficients and the results are presented in Appendix C.

4.3.1. Specification of parsimonious VAR model

Since not all coefficients on appendix C are significant, it is necessary to run hypothesis testing to establish which variables have affected the dependent variable of each model. The non-significance of some

Table 1. ADF Unit root test results.

Null Hypothesis: $D(Y_t)$ has a unit root				Null Hypothesis: $D(T_t)$ has a unit root		Null Hypothesis: $D(R_t)$ has a unit root	
		t-Statistic	Prob.*	t-Statistic	Prob.*	t-Statistic	Prob.*
ADF test statistic		-5.314201	0.0002	-8.741065	0.0000	-3.046699	0.0441
Test critical values:	1% level	-3.699871		-3.689194		-3.724070	
	5% level	-2.976263		-2.971853		-2.986225	
	10% level	-2.627420		-2.625121		-2.632604	

* MacKinnon (1996) one-sided p-values.

coefficients may be due to having excess lags or due to specifications error. So, we specify a parsimonious VAR model with the aid of the Wald test and re-estimate it.

Eliminating the non-significant coefficients on the results in Appendix C and carry out a Wald test with null hypothesis (H_o): C(3) = C(7) = C(11) = C(14) = C(16) = C(19) = C(21) = 0, we obtain the results in Appendix D.

Since the results in appendix D affirm that C(16), C(19), and C(21) are not significant, we eliminate them and remain with a Parsimonious VAR Model as presented by Eqs. (4) and (5).

$$Y_t = C(3)*T_t(-1) + C(7) \quad (4)$$

$$T_t = C(11)*T_t(-2) + C(14) \quad (5)$$

Running a Wald test on the above Parsimonious model, with H_o: C(3) = C(7) = C(11) = C(14), we find that all coefficients are statistically significant as shown in Table 3 i.e. Parsimonious VAR Results.

The Parsimonious VAR model results, Table 3, can now be interpreted as follows: C(3) is the coefficient of $T_t(-1)$, with a value of 0.383051 and p-value of 0.0000. It has a significant effect on Y_t. This means that a past period unit change independent variable (T_t) will on average lead to a 0.38 unit increase in the current annual value of the dependent variable (Y_t). In this case, due to the positive sign of C(3), changes in the tourism sector have expanding effects on the GDP. Likewise, C(11) is the coefficient of $T_t(-2)$ with a value of 0.800431 and a p-value of 0.0000; and so, it has a significant effect on the dependent variable T_t. Thus, a unit increase in the second lag value of tourism revenue, T_t (-2), will lead to a 0.8 increase in T_t. C(7) and C(14) are constant terms and they are both significant.

4.3.2. *Wald coefficients diagnostic test and pairwise Granger causality test*

To infer causality at a 5% level, the coefficients of interest are C(3) and C(11). To establish if these coefficients have a causal effect, we performed the Wald coefficient diagnostic test and the results are summarized on the left side column of Table 4. In line with Wald test results, we reject the null hypothesis that the coefficients are not statistically different from zero because the p-values of the Chi^2-statistics (i.e., 0.0000) is less than the critical value 0.05. Thus, C(3) and C(11) have a significant causal effect with the respective dependent variables. Overall, therefore, for estimated coefficient of C(3), we conclude that tourism growth causes economic growth. This findings are in line with the findings of Dritsakis (2012); Hye and Khan (2013); Katircioğlu (2010); Mérida and Golpe (2016); Payne and Mervar (2010); Ribeiro and Wang (2019); Shahzad et al. (2017); Tang and Abosedra (2014); Tang and Tan (2015). Likewise, for C(11) we conclude that the lag values of tourism revenue have a significant impact on the current value of tourism revenue. As a way of validating the Wald coefficient test results, confirm its robustness and define the direction of causality between T_t and Y_t, we performed the Pairwise Granger causality test, and the results are summarized in the right-side column of Table 4.

Since the p-value (0.0007) is less than 0.05, we can reject the null hypothesis that T_t does not Granger Cause Y_t, and thus conclude that T_t Granger Cause Y_t. Nevertheless, we fail to reject the hypothesis that Y_t does not Granger Cause T_t for its corresponding p-value is not significant at 0.05 significant level. And so, Y_t does not cause T_t. Overall, therefore, there is a unidirectional causality from T_t to Y_t. This finding is consistent with the findings of Dritsakis (2012); Hye and Khan (2013); Katircioğlu (2010); Mérida and Golpe (2016); Payne and Mervar (2010); Ribeiro and Wang (2019); Shahzad et al. (2017); Tang and Abosedra (2014); Tang and Tan (2015) but opposed to the findings of Ahiawodzi (2013); Kadir et al. (2011); Nene and Taivan (2017); Suryandaru (2020) which confirm reverse hypothesis. Further, some diagnostic tests, i.e., autocorrelation and normality tests were carried out to check the reliability of the causality tests. The results are summarized in Appendix E; they are consistent with the causality test results in Table 4.

To further assess the tendencies of the significant Granger causality results, we estimate the Impulse Response Function (IRF). The IRF is applied to generate some information which the Granger causality could not provide: it will give us an insight into the length of time that is necessary for the causal effect to take place and also the qualitative nature of the relationship; it traces the impact of shocks for several periods in the future on the dependent variable (Sethi et al., 2019). The IRF results are depicted in Figure 2.

Figure 2 shows the response of Y_t to a one standard deviation shock to T_t. The middle line represents IRF while the upper and lower lines are

Table 2.1. VAR estimate.

Determinant resid covariance (dof adj.)	103.4687
Determinant resid covariance	43.65087
Log likelihood	-172.0580
Akaike information criterion (AIC)	13.78985
Schwarz criterion (SC)	14.78901

Table 2.2. VAR lag order selection criteria.

Endogenous variables: Y_t, T_t, and R_t

Included observations: 28

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-211.1423	NA	882.1300	15.29588	15.43862	15.33952
1	-185.4421	44.05752	269.1527	14.10301	14.67395*	14.27755
2	-172.0580	20.07620*	202.0874*	13.78985*	14.78901	14.09531*

* Indicates lag order selected by the criterion.

Table 3. Parsimonious VAR model results.

	Coefficient	Std. Error	t-Statistic	Prob.
C(3)	0.383051	0.069998	5.472328	0.0000
C(7)	2.215522	0.620390	3.571177	0.0008
C(11)	0.800431	0.080815	9.904456	0.0000
C(14)	2.217329	0.715865	3.097412	0.0031
Determinant residual covariance: 4.051580		80		
Equation: $Y_t = C(3)*T_t(-1) + C(7)$				
Observations: 29				
R-squared	0.525870	Mean dependent var		5.295243
Adjusted R-squared	0.508309	S.D. dependent var		2.005038
S.E. of regression	1.405945	Sum squared resid		53.37043
Durbin-Watson stat	1.390974			
Equation: $T_t = C(11)*T_t(-2) + C(14)$				
Observations: 28				
R-squared	0.790489	Mean dependent var		8.625321
Adjusted R-squared	0.782430	S.D. dependent var		3.475868
S.E. of regression	1.621296	Sum squared resid		68.34361
Durbin-Watson stat	1.657705			

Source: Authors' estimations

95% confidence interval. The estimated IRF lies within the 95% critical bounds as expected. The response on Y_t, captured by the IRF, can be interpreted as follows: a one standard deviation shock (innovation) to T_t initially leads to an increase in Y_t in period 1 and part of period 2. Then, about the middle of the 2nd period to slightly over the middle of the 3rd period, the shock to T_t leads to no significant increase in Y_t. From the mid of the 3rd period onward, the shock to T_t leads to a gradual decline in Y_t and remains in the positive region. In sum, the IRF shows that shocks to T_t will have a positive impact on Y_t both in the short run and in the long run.

The IRF outcome is consistent with economic theory and intuitions: increasing tourism activities have a positive impact on economic growth, of which the impact of the shock tends to disappear gradually beyond the 3rd period. This means that as income increases, people tend to spend more though the proportion of income spent on a particular commodity or service tends to decline with increasing income. For instance, the absolute amount of income spent on leisure tourism may increase as income increases but its proportion tends to decline as income increases.

5. Conclusion and policy implications

This research focused on assessing the causal relationship between tourism expansion and economic growth in Tanzania over the period 1983–2018. Unlike the study by Odhiambo (2011) which confirmed the feedback hypothesis in the short run and reverse hypothesis, in the long run, our empirical findings confirm tourism led-growth i.e., growth hypothesis. The apparent difference in the findings of these two studies is largely because Odhiambo's study used dollar value for real GDP and international tourism receipts, thereby rendering them inappropriate proxies and therefore led to an erroneous conclusion. The appropriate approach is to use the proportion (percentage) of tourism receipts to GDP and the growth rate of GDP. As discussed above, selecting inappropriate proxies can lead to a spurious regression result. Therefore, it is always crucial to carefully select appropriate variables and in a suitable form before embarking on a study and use the findings as a basis for policy formulation.

The existence of unidirectional causality from tourism expansion to economic growth implies that Tanzania can effectively boost her economic growth by enacting and implementing economic policies that promote tourism expansion. In this case, tourism is of crucial importance for economic development and livelihood improvement in Tanzania. It follows, therefore, that strategies to subsidize the tourism sector will in turn empower the overall country's economy. Tanzania may increase its tourism income by making concerted efforts to improve its infrastructures (especially transport and hospitality); set strategies to improve the quality of Tanzanian tourism products to meet international standards and aggressively endeavor to market such products in the target markets; and embrace domestic policies which lower the cost of living, improve the exchange rate, sustain political stability and discourage unnecessary bureaucratic travel and tourism procedures.

The findings also imply that to ensure increased and sustainable tourism revenue, Tanzania need to promote private investments especially in hotels and resorts alongside the on-going government infrastructure development geared to open new tourism destinations in the country. Besides, the unique marketing approach of targeting tourism market segment, which is less affected by financial and economic shocks, which has enabled the country to attain a high-value, low-density (HVLD) tourist destination status must be sustained and enhanced. The HVLD policy exhibit great potential of meeting the needs of the current tourists and destination while at the same time protecting and enhancing the future tourism needs thereby making tourism growth sustainable. The HVLD approach is consistent with the International Labour Organization's pillars of sustainable tourism i.e., social justice, economic development, and environmental integrity.

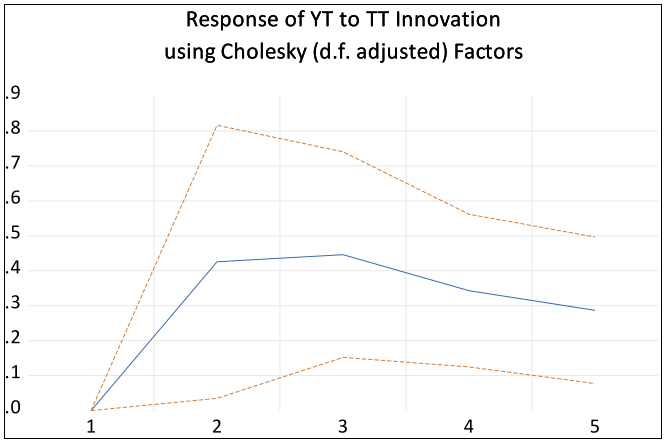

Figure 2. Impulse Response Function. Source: Authors' estimation.

Table 4. Wald Coefficients diagnostic and Pairwise Granger Causality tests results.

Wald test coefficients diagnostic results				Pairwise Granger Causality Tests			
Test Statistic	Value	Df	Probability	Lags: 2			
Chi-square	94.54659	3	0.0000	Null Hypothesis:	Obs	F-Statistic	Prob.
Null Hypothesis: C(3) = C(7) = C(11) = C(14) Null Hypothesis Summary:				T_t does not Granger Cause Y_t	28	10.2651	0.0007
Normalized Restriction (= 0)		Value	Std. Err.				
C(3)–C(14)		-1.834277	0.719279	YT does not Granger Cause T_t		0.96535	0.3958
C(7)–C(14)		-0.001807	0.947284				
C(11)–C(14)		-1.416898	0.789662				

Source: Authors' estimation

The current study is based on countrywide tourism aggregate data on tourism international receipts. Thus, the findings are limited because they do not specifically tell us the contribution of each region (e.g., Coastal region, Zanzibar Iceland, etc.) and the contribution of each tourism sub-sector (e.g., wildlife, hotels and hospitality, cultural tourism, etc.) to the economy. Disaggregate data are difficult to access due to the poorly developed data collection in the country. Nevertheless, our findings which are based on aggregate data are quite robust and reliable for countrywide tourism-growth related policy formulation.

In the future, researchers on this area may consider the use of panel data to bring together e.g., the Southern African Development Community (SADC) and compare the sectoral income-tourism relationship at the regional level, taking into consideration the most recent economic reforms in the region and how they affect sectoral performance for each country.

Declarations

Author contribution statement

V.C. Kyara: Conceived and designed the analysis; Analyzed and interpreted the data and tools; Wrote the paper.

M.M. Rahman: Analyzed and interpreted the data; Wrote the paper. R. Khanam: Analyzed and interpreted the data; Wrote the paper.

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Data availability statement

Data associated with this study has been deposited online at: (1) The percentage contribution of tourism to GDP were obtained from the United Nations Economic Commission for Africa database (The ECA statistical data portal (n.d.). Retrieved 11 January 2021, from https://ecastats.uneca.org/data/browsebyIndicator.aspx). (2) The data for the annual GDP growth rate and the real effective exchange rate were extracted from the World Bank Open data (World Bank Open Data | Data. (n.d.). Retrieved 12 January 2021, from <https://data.worldbank.org/>), and the Bruegel publications database (Real effective exchange rates; Retrieved 12 January 2021, from <https://www.bruegel.org/2012/03/real-effective-exchange-rates-for-178-countries-a-new-database/>)

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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APPENDICES

Appendix A: Summary of Literature Review

Variables:

AGR = agricultural output; ATE = Argentinean tourism expenditure; C = real capital; CAP_d = capital stock depreciation rate; CPI = consumer price indices; DTTS = domestic travel and tourism spending; EC = energy consumption; EG = economic growth; EXP = Exports; FDI = foreign direct investment; FTE = final consumption expenditure of tourists; GCF = gross capital formation; GDP = Gross domestic product; GDP_{gr} = GDP growth rate; GNP_{pc} = per capita gross national product; GDP_{pc} = per capita gross domestic product; GDP_r = Real gross domestic product; GNS = per capital gross national servings; INDP = Industrial production; IMP = imports; ITR = international tourism receipts; ITOR = inbound tourism receipts; ITTC = international travel and tourism consumption; JOC = job creation; L = labor; POGr = population growth rate; POS = political stability; PRC = price competitiveness; RCG = ration of capital to GDP; REER = real exchange rate; REER = real effective exchange rate; REXAU = real exchange rate Argentina vs, Uruguay; RTG = ratio of total trade to GDP; T = tourism; TAR_{pc} = international tourist arrival per capita; TAR = international tourists' arrival; TE = tourism expenditure; TNS = tourist' number of stay-over; TO = trade openness; TPRr = technical progress rate; TP = total population; TR = tourism receipt; $TR_{pc, =}$ real per capita tourism receipts; TR_{pc}, = per capita tourism receipts; TD = Tourism demand; VOT = volume of trade.

Methodology:

ARDL = Autoregressive distributed lagged model; BPGC = Bootstrap panel Granger causality; BPM = Bayesian probit models; CCT = combined cointegration tests; CGC = conditional Granger causality; ECM = Error correction model; FMOLS = Fully modified ordinary least square; GDM = growth decomposition method; GMM = generalized method of moments; GC = Granger causality; J-J = Johansen and Juselius cointegration test; MBT = Modified bounds testing; NITA = new index of tourism activity; P-VAR = Panel autoregressive; PC = Panel cointegration; PPC = Pedroni Panel cointegration; Q-Q = quantile-on-quantile; RWBT = rolling windows bounds testing; RGC = Recursive Granger causality; SIP = spillover index approach; SRL = Systematic Review of Literature; T-Y = Toda-Yamamoto; T-Y = Toda and Yamamoto; VECM = vector error correction model; VAR = vector autoregressive model.

Author(s)	***Countries of Study***	***Data Period***	***Periodicity***	***Methodology***	***Variables***	***Results: Causal direction***
(Ahiawodzi, 2013)	Ghana	1985-2010	Annual	J-J, GC	GDP_r, TR	EG→T
(Antonakakis et al., 2015)	10 European countries	1995-2012	Monthly	SIP	INDP, TAR.	Inconclusive
(Apergis & Payne, 2012)	9 Caribbean countries	1995-2007	Annual	PPC, ECM	REER, TAR_{pc}, GDP_{pc}	T←→EG
(Aslan, 2014)	10 Mediterranean countries.	1995-2010	Annual	GC	GDP_r, TR	T←→EG in Portugal;[1]
(Bilen et al., 2017)	12 Mediterranean countries[2]	1995-2012	Annual	GC	GDP_r, TR	T←→EG
(Bouzahzah & El Menyari, 2013)	Morocco and Tunisia	1980-2010	Annual	ECM, GC	GDP_r, REER, TR.	T→EG in the SR; EG→T in LR.
(Brida et al., 2016)	N/A	2002-2016	N/A	SRL	N/A	T→EG

[1] T→GDP in Spain Italy, Tunisia, Cyprus, Bulgaria, and Greece; no causality in Malta and Egypt.

[2] Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Malta, Portugal, Spain, Turkey, and Tunisia

(Dritsakis, 2012)	7 Mediterranean countries	1980-2012	Annual	PC, FMOLS	$TR_{pc,}$ TAR, REER, GDP_r	T→EG
(Ekanayake & Long, 2012)	140 developing nations	1995-2009	Annual	GC	TR, GDP_r	No causality
(Georgantopoulos, 2013)	India	1988-2011	Annual	VAR/ECM	GDP_r, TE, REER	Neutral causality
(Hye & Khan, 2013)	Pakistan	1971-2008	Annual	J-J, ARDL, RWBT.	TR, GDP	T→EG; Except for year 2006-08.
(Jin, 2011)	Hong Kong	1974M1-2004M1	Quarterly	VAR	GDP_r, L, C, TO, TR.	T→EG in SR; no causality in LR.
(Kadir et al., 2011)	9 ASEAN and non-ASEAN countries[3]	1994-2004	Quarterly	GC, J-J	TR, GDP_r REER, CPI.	EG→T
(Kareem, 2013)	30 African countries	1990-2011	Annual	GMM	GDP, GCF, L, FTE, TAR, EC.	T←→EG

[3] Thailand, Singapore, Indonesia, the Philippines, the U.S, the U.K, Germany, Japan and Australia

(Katircioğlu, 2010)	Singapore	1960-2010	Annual	ARDL, ECM, CGC	GDP_r, REER, TAR.	T→EG
(Kibara et al., 2012)	Kenya	1983-2010	Annual	ARDL bounds testing	GDPr, TAR, VOT.	T→EG
(Lawal et al., 2018)	Nigeria	2000-2016	Annual	ARDL	GDP_r, TR, AGR	T←→EG
(Lee, 2012)	Singapore	1980-2007	Annual	ARDL Bounds testing, GC	EXP, IMP, GDPr, TR.	EG→T in the short run.(SR)
(Lin et al., 2019)	China	1978-2013	Annual	BPM, T-Y	GDP_r ITR	T→ GDP in 9 out of 29 regions; EG→T in 10 out 29 regions.
(Mérida & Golpe, 2016)	Spain	1980-2013	Quarterly	GC	REER, TNS, GDP	T→EG during 1980-85; T←→EG during 2000-2013
(Mishra et al., 2011)	India	1978-2009	Annual	J-J, GC	GDP_r, TR, TAR	T→EG in long run (LR)

(Nene & Taivan, 2017)	10 SSA[4]	1994-2014	Annual	VECM, GC	GDP_r, TAR, RTG, RCG	EG→T in 4 countries; T→EG in 6 countries
(Odhiambo, 2011)	Tanzania	1980-2008	Annual	ARDL Bounds test	TR, REER, GDP_r.	T←→EG in the short run; EG→T in the long run
(Payne & Mervar, 2010)	Croatia	2000-2008	Quarterly	T-Y	GDP_r, REER, TR.	EG→T
(Payne & Mervar, 2010)	Uruguay	1987-2006	Quarterly	GC, J-J	GDPpc, ATE, REXAU	T→EG
(Perles-Ribes et al., 2017)	Spain	1957-2014	Annual	ARDL, T-Y	TD, GDPr, JOC, PRC.	T←→EG
(Ribeiro & Wang, 2019)	Sao Tome and Principe	1997-2018	Annual	J-J, GC	GDP, TR, FDI, REER.	T→EG
(Ridderstaat et al., 2014)	Aruba	1972-2011	Annual	ECM, GC	TNS, TR, GDP_r.	T←→EG
(Sak & Karymshakov, 2012)	139 countries	1995-2008	annual	GC, Panel ECM	TR, GDP_r	T←→EG in 37 European

[4] Botswana, Democratic Republic of Congo (DRC), Kenya, Malawi, Mauritius, Mali, Namibia, South Africa, Tanzania, Uganda and Zimbabwe

						countries; and[5]
(Samimi et al., 2011)	20 developing countries	1995-2009	Annual	P-VAR	GDP_r, TAR.	T←→EG
(Shahzad et al., 2017)	Top 10 tourism destinations in the world[6]	1990-2015	Quarterly	Q-Q, NITA	TR, GDP_r	T→EG
(Surugiu & Surugiu, 2013)	Romania	1988-2009	Annual	VECM, GC	GDP_{gr} , ITTC, DTTS, REER.	T→EG
(Suryandaru, 2020)	Indonesia	1974-2017	Annual	MBT	GDP, ITOR	EG→ T
(Tang, 2013)	Malaysia	1974-2009	Annual	ARDL bounds testing, ECM	TR, GDPr, REER	No causality in the short run; T←→EG in LR
(Tang & Abosedra, 2014)	Lebanon	1995-2010	Annual	ARDL, GC	TR, GDP	T→EG

[5] T→EG in Caribbean, America and Latin America; EG→T in East Asia, Oceania and South Asia; No causality in sub-Saharan Africa, Asia, Middle East, North Africa and Central Asia.
[6] China, France, Germany, Italy, Mexico, Russia, Spain, Turkey, the UK and the US.

(Tang & Tan, 2013)	Malaysia	1995-2009	Annual	RGC, CCT	TR, GDP	T→EG in 8 out of 12 markets.
(Tang & Tan, 2015)	Malaysia	1975-2011	Annual	GC, J-J	GNP, GNS, TR_{pc}, POS, POGr, TPRr, CAPd	T→EG
(Trang et al., 2014b)	Vietnam	1992-2011	Annual	GC, J-J, GDM	REER, TR, GDP_r, TP.	EG→T
(Tugcu, 2014)	Mediterranean Region	1998-2011	Annual	GC	GDPpc, TR, TE	No causality
(Wu & Wu, 2018)	China's 12 Western regions	1995-2015	Annual	BPGC	TR, GDP_r	T←→ EG (2 regions); T→EG (3 regions); EG→T (4 regions); no causality (5 regions).

Appendix B: Unrestricted VAR Estimate: Y_t, T_t and R_r

	Y_t	T_t	R_t
$Y_t(-1)$	0.177916	0.352894	1.852175
	(0.18620)	(0.26222)	(1.30259)
	[0.95551]	[1.34581]	[1.42192]
$Y_t(-2)$	-0.254300	-0.158304	-3.720623
	(0.19078)	(0.26867)	(1.33463)
	[-1.33294]	[-0.58921]	[-2.78775]
$T_t(-1)$	0.351244	0.260221	-0.374068
	(0.15025)	(0.21160)	(1.05113)
	[2.33766]	[1.22980]	[-0.35587]
$T_t(-2)$	0.152091	0.517878	0.883187
	(0.14181)	(0.19971)	(0.99207)
	[1.07247]	[2.59316]	[0.89025]
$R_t(-1)$	-0.019668	0.025991	0.503393
	(0.02871)	(0.04043)	(0.20085)
	[-0.68503]	[0.64284]	[2.50632]
$R_t(-2)$	-0.003655	-0.023602	-0.250914
	(0.02916)	(0.04106)	(0.20396)
	[-0.12536]	[-0.57483]	[-1.23021]
C	1.497963	1.270995	6.058023
	(0.67003)	(0.94358)	(4.68730)
	[2.23566]	[1.34700]	[1.29243]
R-squared	0.757969	0.839033	0.385678
Adj. R-squared	0.688817	0.793043	0.210158
Sum sq. resids	26.47666	52.50807	1295.734
S.E. equation	1.122851	1.581260	7.855039
F-statistic	10.96096	18.24364	2.197342
Log likelihood	-38.94711	-48.53295	-93.41508
Akaike AIC	3.281936	3.966639	7.172505
Schwarz SC	3.614987	4.299690	7.505557
Mean dependent	5.232749	8.625321	0.777810
S.D. dependent	2.012863	3.475867	8.838493
Determinant resid covariance (dof adj.)		103.4687	
Determinant resid covariance		43.65087	
Log likelihood		-172.0580	
Akaike information criterion		13.78985	
Schwarz criterion		14.78901	
Number of coefficients		21	

Appendix C: Wald Coefficient test results

Estimation Method: Least Squares	

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.177916	0.186200	0.955509	0.3430
C(2)	-0.254300	0.190781	-1.332941	0.1874
C(3)	0.351244	0.150255	2.337656	0.0226
C(4)	0.152091	0.141813	1.072473	0.2876
C(5)	-0.019668	0.028711	-0.685027	0.4958
C(6)	-0.003655	0.029155	-0.125356	0.9006
C(7)	1.497963	0.670033	2.235656	0.0289
C(8)	0.352894	0.262217	1.345806	0.1832
C(9)	-0.158304	0.268669	-0.589214	0.5578
C(10)	0.260221	0.211597	1.229797	0.2233
C(11)	0.517878	0.199709	2.593164	0.0118
C(12)	0.025991	0.040432	0.642838	0.5227
C(13)	-0.023602	0.041058	-0.574834	0.5675
C(14)	1.270995	0.943577	1.346996	0.1828
C(15)	1.852175	1.302586	1.421921	0.1600
C(16)	-3.720623	1.334635	-2.787746	0.0070
C(17)	-0.374068	1.051125	-0.355873	0.7231
C(18)	0.883187	0.992070	0.890247	0.3767
C(19)	0.503393	0.200849	2.506324	0.0148
C(20)	-0.250914	0.203961	-1.230208	0.2232
C(21)	6.058023	4.687296	1.292435	0.2009
Determinant residual covariance		43.65087		

Equation: YT = C(1)*YT(-1) + C(2)*YT(-2) + C(3)*TT(-1) + C(4)*TT(-2) + C(5) *REERR(-1) + C(6)*REERR(-2) + C(7)

Observations: 28			
R-squared	0.757969	Mean dependent var	5.232749
Adjusted R-squared	0.688817	S.D. dependent var	2.012863
S.E. of regression	1.122851	Sum squared resid	26.47666
Durbin-Watson stat	1.816800		

Equation: TT = C(8)*YT(-1) + C(9)*YT(-2) + C(10)*TT(-1) + C(11)*TT(-2) + C(12)*REERR(-1) + C(13)*REERR(-2) + C(14)

Observations: 28			
R-squared	0.839033	Mean dependent var	8.625321
Adjusted R-squared	0.793043	S.D. dependent var	3.475868
S.E. of regression	1.581260	Sum squared resid	52.50807
Durbin-Watson stat	2.129144		

Equation: REERR = C(15)*YT(-1) + C(16)*YT(-2) + C(17)*TT(-1) + C(18)*TT(-2) + C(19)*REERR(-1) + C(20)*REERR(-2) + C(21)

Observations: 28			
R-squared	0.385678	Mean dependent var	0.777810

Adjusted R-squared	0.210158	S.D. dependent var	8.838493
S.E. of regression	7.855039	Sum squared resid	1295.734
Durbin-Watson stat	1.919790		

Appendix D: Re-estimated Wald Coefficient test results

Estimation Method: Least Squares				
	Coefficient	Std. Error	t-Statistic	Prob.
C(3)	0.383051	0.069998	5.472328	0.0000
C(7)	2.215522	0.620390	3.571177	0.0006
C(11)	0.800431	0.080815	9.904456	0.0000
C(14)	2.217329	0.715865	3.097412	0.0027
C(16)	-1.505019	0.762399	-1.974058	0.0519
C(19)	0.304431	0.171920	1.770772	0.0805
C(21)	8.424972	4.239613	1.987203	0.0504
Determinant residual covariance		211.5097		
Equation: Y_t = C(3)*T_t(-1) + C(7)				
Observations: 29				
R-squared	0.525870	Mean dependent var		5.295243
Adjusted R-squared	0.508309	S.D. dependent var		2.005038
S.E. of regression	1.405945	Sum squared resid		53.37043
Durbin-Watson stat	1.390974			
Equation: TT = C(11)*T_t(-2) + C(14)				
Observations: 28				
R-squared	0.790489	Mean dependent var		8.625321
Adjusted R-squared	0.782430	S.D. dependent var		3.475868
S.E. of regression	1.621296	Sum squared resid		68.34361
Durbin-Watson stat	1.657705			
Equation: RT = C(16)*Y_t(-2) + C(19)*R_t(-1) + C(21)				
Observations: 28				
R-squared	0.228076	Mean dependent var		0.777810
Adjusted R-squared	0.166322	S.D. dependent var		8.838493
S.E. of regression	8.070071	Sum squared resid		1628.151
Durbin-Watson stat	1.768178			

Appendix E: Diagnostic Tests

[A] VAR Residual Normality Tests				
Null Hypothesis: residuals are multivariate normal				
Component	Skewness	Chi-sq	df	Prob.
1	-0.049195	0.011294	1	0.9154

2	0.152911	0.109115	1	0.7412
3	-0.125123	0.073061	1	0.7869
Joint		0.193470	3	0.9786
Component	Kurtosis	Chi-sq	df	Prob.
1	2.445929	0.358161	1	0.5495
2	3.581770	0.394865	1	0.5298
3	2.371155	0.461354	1	0.4970
Joint		1.214380	3	0.7496
Component	Jarque-Bera	df	Prob.	
1	0.369455	2	0.8313	
2	0.503980	2	0.7773	
3	0.534414	2	0.7655	
Joint	1.407850	6	0.9654	

[B] VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	13.36107	0.1469
2	13.43117	0.1440

Probs from chi-square with 9 df.

IS TANZANIA'S ECONOMIC GROWTH LEAVING THE POOR BEHIND? A NONLINEAR AUTOREGRESSIVE DISTRIBUTED LAG ASSESSMENT

Abstract

Most developing economies have recently experienced significant economic growth without corresponding substantial poverty reduction and improved population wellbeing. This paper uses a nonlinear autoregressive distributed lag model to explore the growth-poverty relationship in Tanzania using annual time series data on per capita consumption expenditure, real GDP, GINI index, and unemployment from 1991–2020. To explore the causality among the variables and long-run asymmetry between per capita consumption expenditure and economic growth, the study employs Granger causality and Wild test respectively. The results confirm the presence of long asymmetric behavior of economic growth. Besides, in the short-run, the Granger causality test supported the feedback hypothesis between economic growth and consumption expenditure, and the unidirectional hypothesis from income inequality and unemployment to consumption expenditure. In the long-run, unidirectional causality was observed from consumption expenditure to both the economic growth and unemployment. The study submits that while economic growth exhibits poverty reduction features, growth alone is not sufficient to alleviate poverty because the interaction of income inequality with economic growth dampens the poverty-reducing effects of economic growth. Therefore, economic growth has a significant explanation about poverty but not all about the evolution of poverty. The study opens policy perspectives with wide international relevancy as outlined in the policy implication section.

Keywords:

Consumption expenditure, Economic growth; Income inequality; Nonlinear autoregressive distributed lag; Poverty; Tanzania

1.0 Introduction

Increasing economic growth has received extensive discourse in research and government following its perceived inherent potential to alleviate poverty and deliver improved populations' wellbeing. An increase in economic growth is normally considered good news, especially for the country's poor, while vice versa is true. Nevertheless, in recent years, it has been observed that economic growth, especially in developing countries does not elicit a corresponding poverty reduction (Adam et al., 2017; Lewis, 2008; Rodrik, 2012). Such a mismatch between growth and poverty is generally referred to as a growth-poverty dilemma.

This research queries the dilemma of growth-poverty mismatch in developing nations by investigating and presenting empirical evidence as a contribution to narrowing the gap in growth-poverty literature. The study is unique because it brings a new perspective that extends and enriches previous growth-poverty empirical studies by investigating whether economic growth is sufficient for alleviating consumption deprivation poverty and delivering improved quality of population's wellbeing in developing economies. Most of the previous studies such as Adeleye et al., (2020), Škare & Družeta (2016), Suryahadi et al. (2012), etc., dwelt on the question of whether economic growth ameliorates the incidence of poverty. Furthermore, most of the previous studies used cross-sectional data and linear autoregressive methods to assess the growth-poverty nexus; very few studies have employed time-series data. The current study, therefore, employs time series data and a nonlinear autoregressive distributed lag approach to add a new methodological perspective to the literature. The findings of the study affirm that while economic growth carries feasible kernels for poverty alleviation, growth alone is not sufficient for poverty alleviation and improved population wellbeing. Factors such as income inequality and unemployment tend to dampen the poverty-alleviating impact of economic growth, thereby aggravating the population's quality of life.

While the scenario of growth-poverty mismatch is not limited to developing economies, its manifestations are more pronounced in developing countries. It is from this background, therefore, that the authors are motivated to investigate empirical evidence on the growth-poverty dilemma, using Tanzania as a case in point and focusing on consumption deprivation poverty; an area which is still under-researched.

Economies of most developing nations, such as Tanzania, contain inherent characteristics such as lack of access to meaningful employment, social and income inequalities, low capital formation, the rapid increase of population, high levels of inflation, the vicious circle of poverty, struggle over the rights and market of resources, and severe vulnerability to climate change. Such characteristics pose a serious stumbling block on the path toward realization of the United Nations' Sustainable Development Goals 2030. For instance, poverty alleviation is one of the key development challenges facing Tanzania since its political independence in 1961. The history of the country's development strategies gives evidence of many, and rich policies formulated to spearhead growth for poverty reduction. Consequently, the Tanzanian economy has enjoyed an upward growth trajectory, especially over the last three decades, after the 1990s economic reforms which came at a near economic collapse in the 1980s. For instance, GDP improved from US$ 5.25 billion in 1995 to US$ 18.39 billion in 2005 and then up to US$ 61.14 billion in 2019 (WDI, 2021). During the period 2009-2019, the economy has been growing at an average rate of 6.2% annually; where the highest growth was 7.67% in 2011and the lowest rate of 4.5% was registered in 2012, (WDI, 2021).

Despite the high and consistent economic growth in Tanzania, the fruits of increased economic growth have not reached rural and peri-urban areas where the majority of the real poor are hosted(Diamond & Plattner, 2010; Lewis, 2008; Mashindano & Maro, 2011; Nelson, 2012). For instance, the rapid growth has not succeeded in generating decent and adequate jobs;

the average annual unemployment rate during 2010-2020 is 2.45% (WDI, 2021). Rural poverty in Tanzania is much more pronounced, as compared with its urban counterpart. Most of the poor are in the rural areas where poverty-combating facilities such as access to quality medical care, basic education, reliable transportation, and clean water are noticeably missing in most rural settings. The ill-developed infrastructures especially in rural areas further complicate the poverty scenario in Tanzania and are not able to support the needed economic transformation. As a result, economic growth in Tanzania has marginally combated poverty among rural and agrarian households. Thus, the Tanzanian economy presents a unique situation because it has achieved high strides in terms of growth over the last three decades, but such rapid growth has not elicited a commensurate level of poverty reduction and improved wellbeing (Adam et al., 2017). This scenario, therefore, calls for a systematic investigation into the nature and relationship between growth and wellbeing in Tanzania. Hence, the current study queries the uniqueness of the prevailing poverty-growth dilemma in Tanzania from the perspective of the population's wellbeing.

It is widely considered that increasing economic growth comes with poverty alleviating effects (Adeleye et al., 2020; Garza-Rodriguez, 2018; Škare & Družeta, 2016b). Thus, a high real GDP is theoretically associated with reduced incidence of poverty and an improvement in quality of life. Nevertheless, conditions such as unemployment and income inequality dampen the poverty-reducing impact of economic growth (Adeleye et al., 2020; Garza-Rodriguez, 2018). As a result, the rising mean income is not benefiting everybody (Shao & Krause, 2020). Moreover, poverty is most manifested in developing economies, and it is affirmed that managing income inequality is one of the important approaches for combating poverty.

This study has two primary objectives. First, to investigate empirical evidence and the importance of economic growth for alleviation of consumption deprivation poverty and improved population's wellbeing in

Tanzania. Second, to investigate the nature and impact of interaction of economic growth with income inequality on the quality of population's wellbeing. While such investigations could take a comparative approach, e.g., a cluster of East African or sub-Saharan countries, scrutinizing the impact of growth on consumption deprivation in Tanzania is germane due to the country's unique political and economic history.[1]

To probe the discourse, a time series data on the rate of growth of real economic growth, GINI index, and unemployment for the period 1991 – 2020 are analyzed using a nonlinear autoregressive distributed lag approach and Wald test to explore symmetry among the variables. The choice of the period i.e., 1991-2020 is based on first, the economic progress registered by the Tanzanian economy following the 1990s economic reforms. Second, the period is determined by the availability of reliable data for the chosen variables.

The current study makes a distinctive contribution to the growth-poverty literature because it is one of only a handful of studies that explore empirically the relationship between growth and consumption expenditure in the presence of income inequality and unemployment in developing countries. Besides, to the best understanding of the authors, the study pioneers such investigation for the first time using Tanzanian data and methodologically it is first of its kind in sub-Saharan Africa where consumption deprivation poverty is rife. While the empirical assessment is based on Tanzanian data, the findings are of great significance for developing economies because the knowledge of the growth-poverty nexus and the impact of economic growth interaction with income inequality and unemployment can assist planners in conducting policy instruments to

[1] Unlike other sub-Saharan African economies, the Tanzanian economy is shaped by unique macroeconomic and political reforms that shape the current alignment, nature, and magnitude of doing business in Tanzania. These includes Ujamaa development policy - communal self-reliance policy, Kiswahili language which unified all the ethnic groups in the country, existence of reasonable democratic rule of law and smooth transition of power, etc.

enhance household consumption expenditure and improve overall population's wellbeing.

To attain the objective of the study, the remaining part of this study is organized as follows. After a brief literature review in section two, section three presents the study methodology, followed by presentation of empirical estimation findings and discussions in section four. Section five outlines key policy implications based on the findings and concluding remarks.

2. Brief literature review

The 2030 Sustainable Development Goals 1 and 10 seek to alleviate all forms of poverty and make significant strides in reducing inequality (*Sustainable Development Goals (SDGs) and Disability | United Nations Enable*, 2015). Various approaches are being taken to realize poverty reduction and improved livelihood. The growth-poverty-inequality literature suggests some aspects which researchers and practitioners must pay attention to when assessing and addressing poverty and poverty related issues. Considering the scope of this study and without trying to be exhaustive, we draw our attention on three of such aspects: inequality aggravates poverty, economic growth alleviates poverty, and growth-inequality-poverty exhibits inseparable triangular relationships.

First, most studies have observed that inequality aggravates poverty because it reduces the level of disposable income, thereby limits individuals purchasing power, and ultimately leading to consumption deprivation. Proponents of this school attest that inequality and poverty are closely netted together in such a way that strategies to end income inequality will also lead to poverty reduction (Garza-Rodriguez, 2018; Heshmati, 2007; Ho & Iyke, 2018; Mundial, 2006; Sehrawat & Giri, 2018). For instance, Sehrawat & Giri (2018) assessed the impact of financial development, income inequality, and economic growth on poverty in India using time

series data for the period 1970 – 2015. The linear autoregressive distributed lag model bound testing procedure delivered evidence that while economic growth and financial development help to alleviate poverty, income inequality and inflation aggravated poverty significantly. Therefore, different countries may experience rapid economic progress over a prolonged period but the rate at which such growth translates into poverty reduction and improved livelihood is among other factors dependent on the parallel efforts in place to curb income inequality (Adeleye et al., 2020; Ehigiamusoe et al., 2022; Sehrawat & Giri, 2018).

Second, there are cluster of studies propagating higher levels of economic growth as a tool for poverty alleviation: Sustained economic progress approach, commonly rerefer to as trickle-down economics approach, is frequently cited in the literature as among the traditional approaches to address poverty (Ahmad et al., 2019; Basu & Mallick, 2008; Burnside & Dollar, 2000; Hassan et al., 2015; Sehrawat & Giri, 2018; Škare & Družeta, 2016a). However, the results from these studies exhibit variation across regions, countries, and even disparity across various parts of the same country – e.g., rural vs. urban. This suggests that different regions have different underlying conditions in such a way that the same rate of economic growth produces a varied impact on poverty and people's wellbeing. For instance, to this end, Diamond & Plattner (2010), Jerome (2011), Kyara et al., (2021), Nelson (2012), Read & Parton (2009), etc., attest that in the recent years most of the sub-Sahara African countries have experienced wealth without prosperity; the rapid economic progress is not accompanied with household poverty reduction and improved quality of life.

Third, there are studies which attest that income inequality, growth, and poverty exhibit inseparable triangular relationship, i.e., subject to poverty income inequality and growth can be either positive or negative depending on the empirical approach employed, while subject to income inequality poverty and economic growth are negatively correlated irrespective of the

method employed (Hassan et al., 2015; Marrero & Servén, 2018). In this case, policies to address e.g., poverty must consider the inbuilt connection between poverty, inequality, and growth (Adeleye et al., 2020; Alkire et al., 2015; Alkire & Santos, 2013). Therefore, these findings confirm that poverty is a multi-pronged approach issue, and its alleviation calls for a multi-dimensional strategy. A single approach to poverty alleviation will fail to yield the desired results.

The current study contributes to the debate on the growth-poverty-inequality debate by presenting empirical assessment on economic growth, income inequality and consumption deprivation in Tanzania. While empirical studies on consumption deprivation poverty are still limited in sub-Saharan Africa, to the best of the authors' understanding, this is the first study of its kind focusing on Tanzania and using the NARDL approach for analysis.

3.0 Methodology

Taking into consideration the goal of this study, a linear model is not an ideal model because of the possibility that our data may comprise some inherent nonlinearities. It has been affirmed that nonlinear autoregressive models provide a better fit to volatility as compared to the traditional linear autoregressive models which tends to impose unrealistic restrictions, culminating to biased inferences (Curto & Pinto, 2012; Dakhlaoui & Aloui, 2016; Katrakilidis & Trachanas, 2012).

Therefore, nonlinear autoregressive distributed lag (NARDL) mode is the most suited for our analysis because, first it allows for testing of the responses of the explained variable to changes in each of the explanatory variable, and so makes it possible to build asymmetry line (Lahiani et al., 2016). Second, NARDL lends hand in differentiating the long-run and short-run effects of changes in independent variables in the dependent variable. In this case, the model allows for ascertaining key features in the immediate reaction of dependent variable following the shocks in independent variable (Lacheheb & Sirag, 2019; Lahiani et al., 2016). Third,

NARDL is prominent for its ability to handle both linear and nonlinear cointegration as well as accommodate multiple data series with different order of integration (Liang et al., 2020).

3.1 Data and variables

This study employs annual time series data on per capita consumption expenditure (CE) as a proxy for consumption deprivation poverty, GDP growth rate (EG) as a proxy for economic growth, GIN index growth rate (IQ) as a proxy for income inequality, and total unemployment rate (UE) - a % of labor force - to depict the proportion of total labor force willing and able to work but without work, all for the period 1991 - 2019.

a. Per capita consumption expenditure

The CE is employed here as a proxy for measuring consumption deprivation poverty. It is a best proxy for consumption deprivation poverty, and so measure of population's wellbeing, because consumption expenditure among the poor is more reliably reported and more stable as compared to income (Datt & Ravallion, 1992; Sehrawat & Giri, 2018; Stoyanova & Tonkin, 2018). Besides, CE as a measure of consumption deprivation poverty is analogous with the World Bank's standard description of poverty as inability to attain a minimum acceptable standard of living as quantified in terms of basic consumption needs (Spicker, 2007). Further, due to inaccessibility to poverty headcount data for many countries, consumption expenditure has been widely used to measures consumption deprivation poverty as an alternative approach to cast insight on the overall scenario of poverty (Adeleye et al., 2020; Gore et al., 1994; Johnson, 2004; Pape & Mistiaen, 2018; Stoyanova & Tonkin, 2018).

b. GDP growth rate

GDP growth rate is widely used in the literature as standard proxies for economic growth (Adelakun, 2011; Adu et al., 2013; Odhiambo, 2009; Saqib et al., 2013). GDP is frequently considered an effective indicator of economic growth because it gives quantifiable information about the size

and the performance of the economy. Thus, real GDP growth rate gauges the health of the economy because an increase in real GDP is an indication that in overall the economy is performing well. If the real GDP is falling, that is an indication of economic stagnation and or decline and the nation is not making economic progress. An increase in real GDP is expected to have a positive impact on per capita final consumption expenditure, and thus compact consumption deprivation.

c. GINI index

GIN index, a well-celebrated measure of income inequality, is a statistical measure of income or wealth distribution among individuals relative to the entire country's population (Adeleye et al., 2020; De Haan & Sturm, 2017; Munir & Sultan, 2017; Wan, 2004). It is also referred to as the GINI index and it ranges from 0 (0%) to 1 (1%) such that 0 represent perfect equality and 1 perfect inequality. It is noted here that while the GINI index shows the income distribution among the population in a country, it however does not show its overall income (Park & Kim, 2021). Thus, a low-income and high-income country can exhibit the same GINI index for the index is only an indication of wealth distribution, not income level.

d. Unemployment

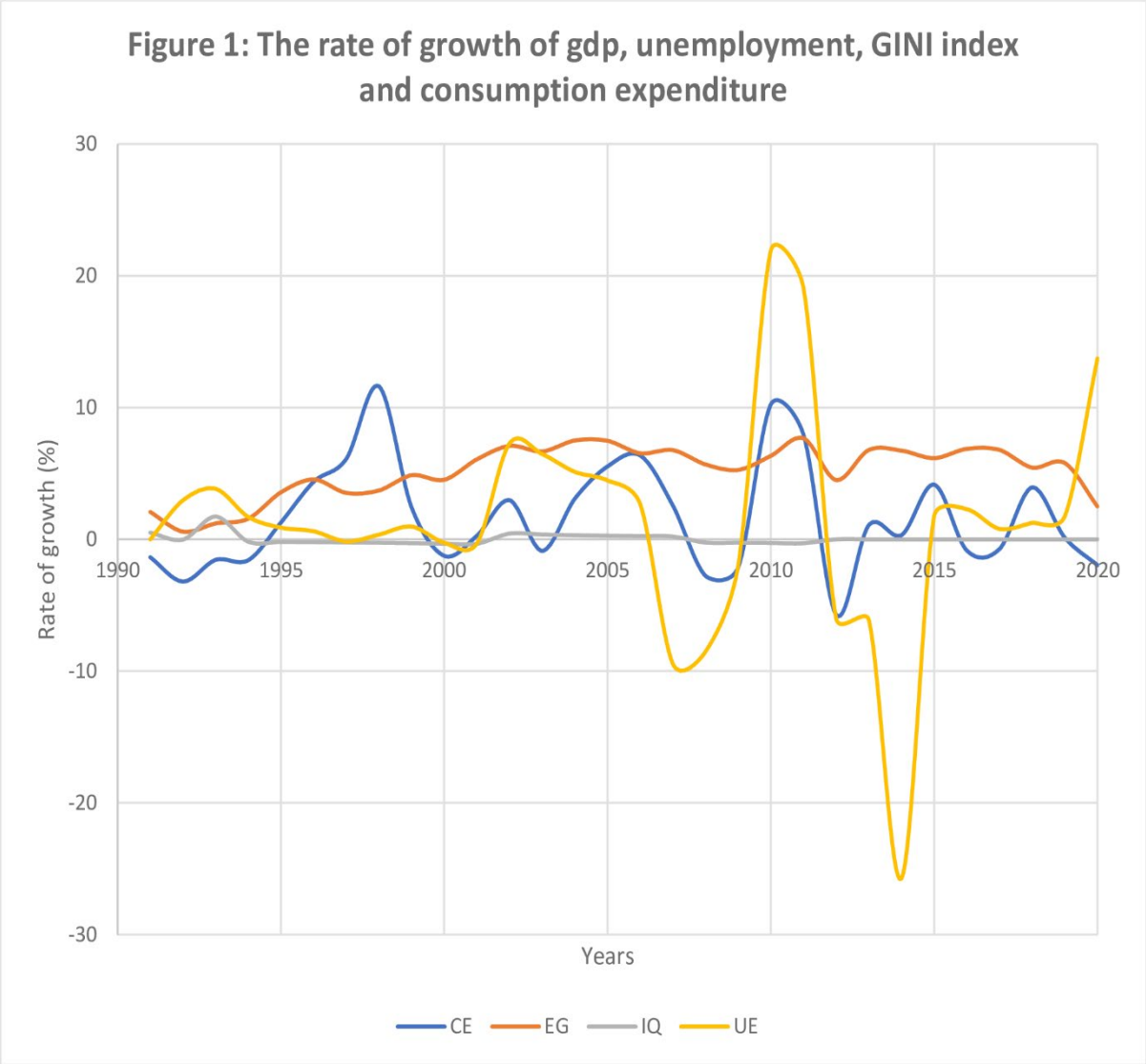
Unemployment, measured as % of the labor force in a country willing and able to work but without work, indicates the extent at which active population is inhibited from obtaining reliable capability to access necessary income for improved livelihood (Adeleye et al., 2020; Sen, 2006). The description of each variable and data source is summarized in Table 1. *Figure 1: The rate of growth of GDP, unemployment, GINI index, and consumption expenditure*, is a graphical representation showing the trend of the variables. The horizontal straight line at the middle of the figure represents time in years. The blue trend line represents the consumption expenditure, which is the dependent variable. The other 3 trend lines depict independent variables, i.e., the dark-yellow line depict economic growth

(EG) trend, the grey line depicts income inequality (IQ) trend, and the light-yellow line depicts unemployment (UE) trend. Overall, all independent variables exhibit upward trend, and they seem to be associated with the variation in the dependent variable.

Table 1 Description of variables and corresponding statistical data sources

Variable	**Description**	**Data source**
Per capita consumption expenditure	Proxy for consumption deprivation poverty	(WDI, 2021)
Growth rate of consumption expenditure (% annual)	Annual growth rate of per capital consumption expenditure	Computed by the Authors
GDP growth rate (% annual)	Annual growth rate of the economy	(WDI, 2021)
GINI index	Measure of income inequality	(Lahoti et al., 2015)
GINI index growth rate (% annual)	Annual growth rate of income inequality	Computed by the Authors
Total unemployment	total labor force willing and able to work but without work*.	(WDI, 2021)
Unemployment growth rate (% annual)	Annual growth rate of unemployment	Authors' calculations

* Derived by multiplying the provided annual unemployment rate (%) by the WID provided total labor force data.



3.2 Empirical model specification

The study applies a nonlinear autoregressive distributed lag (NARDL) model to assess the relationship between consumption expenditure, GDP growth, income inequality, and unemployment in Tanzania during 1991 – 2020. In addition to the advantages of using NARDL model outlined in section 3.0 above, we also observe that some previous studies have used NARDL approach to assess asymmetry in financial markets (CHIKRI et al., 2020; Mahmood & Alkhateeb, 2018), energy policy (Ndoricimpa, 2017), uncertainty impacts (Gupta et al., 2019), commodity pricing (Atil et al., 2014; Kumar, 2017), etc. Nevertheless, to our best knowledge, our study

is the first one to apply the NARDL model for exploring the relationship between economic growth and consumption expenditure, to measure consumption deprivation poverty.

The relationship among the variables is construed following the empirical studies of Ibrahim (2015), Khan et al. (2019) and Lacheheb & Sirag, (2019):

$$CE_t = \beta_0 + \beta_1 EG_t + \beta_2 IQ_t + \beta_3 UE_t + e_t \quad (1)$$

Where CE is per capita consumption expenditure growth rate, measuring consumption deprivation poverty; EG is GDP (economic) growth rate, IQ is the growth rate of income inequality, UE is annual growth rate of unemployment, and β_i is a vector of long-run coefficients to be estimated.

In view of the works of Khan et al. (2019), Lacheheb & Sirag (2019) and Liang et al. (2020), to account for the asymmetries among the variables, equation 1 can be expressed as:

$$CE_t = \theta_0 + \theta_1 EG_t^+ + \theta_2 EG_t^- + \beta_3 IQ_t + \beta_4 UE_t + \varepsilon_t \quad (2)$$

Where θ_i is a vector for long-run coefficients. It is here expected that $\theta_1 > 0$ and $\theta_1 > \theta_2$ because an increase in economic growth will have a higher effect on consumption expenditure than a decline in economic growth. To account for the asymmetry impacts of income growth on consumption expenditure, we have included EG_t^+ and EG_t^- in equation 2 to represent the positive changes and negative changes in economic growth respectively. In this case, EG_t^+ and EG_t^- depict the partial sum of the changes in EG_t such that

$$EG_t^+ = POS(EG)_t = \sum_{i=1}^{t} \Delta EG_t^+ = \sum_{i=1}^{t} max(EG_{i,0}) \text{ and}$$

$$EG_t^- = NEG(EG)_t = \sum_{i=1}^{t} \Delta EG_t^- = \sum_{i=1}^{t} min(EG_{i,0})$$

From equation 3, the long-run relationship between positive shocks in economic growth and consumption expenditure is depicted by θ_1, while θ_2

shows the long-run relationship between the negative shocks in economic growth and consumption expenditure. Besides, we anticipate that $\theta_1 > \theta_2$.

The unrestricted error correction form of equation 2 can be modeled as follows (Ibrahim, 2015; Lacheheb & Sirag, 2019; Liang et al., 2020):

$$\Delta CE_t = \alpha_0 + \alpha_1 CE_{t-1} + \alpha_2 POS(EG)_{t-1} + \alpha_3 NEG(EG)_{t-1} + \alpha_4 IQ_{t-1} + \alpha_5 UE_{t-1} + \sum_{i=1}^{n} \beta_1 \Delta CE_{t-i} + \sum_{i=0}^{n} \beta_2 \Delta POS(EG)_{t-i} + \sum_{i=0}^{n} \beta_3 \Delta NEG(EG)_{t-i} + \sum_{i=0}^{n} \beta_4 \Delta IQ_{t-i} + \sum_{i=0}^{n} \beta_5 \Delta UE_{t-i} + \mu_t \quad (3)$$

3.3 Estimation process

To estimate the NARDL model as depicted by equation 3, we first employed the Augmented Dickey-Fuller unit root test to determine the order of cointegration of the variables. While ARDL is appropriate for variables with different orders of integration i.e., I(0) and I(1), it is limited when it comes to the I(2) series. Thus, testing for unit root is necessary to avoid estimating spurious regression. Second, to correctly estimate equation 3, we determined the lag length with the help of Akaike Information Criterion (AIC). Third, we employed bound testing cointegration method of Pesaran et al. (2001) to test for existence of long-run nexus among the variables for both linear and nonlinear specification of equations 1 and 2 respectively and Shin et al. (2011) in unrestricted error correction model i.e., equation 3. Fourth, we derived the cumulative dynamic multiplier of 1% positive and negative changes in economic growth, to estimate the long-run asymmetric impact of changes of economic growth on consumption expenditure. Finally, we apply Granger causality approach (Granger, 1988) to examine the causal nexus among the variables.

4. Findings and discussions

4.1 Unit root test

To determine whether the series is stationary or not, this study employed augmented Dickey-Fuller test, i.e., ADF test (Dickey & Fuller, 1981) and compared the results with the Phillips and Perron test, i.e., PP test (Phillips

& Perron, 1988). Stationarity test is an important step in regression analysis to avoid generating spurious regression results. The ADF test findings shown in Table 2 confirm that CE, IQ, and UE are stationary at level. However, EG contains unit root at level, but it is stationary at first difference. Thus, the series CE, IQ, and UE are integrated of order 0, i.e., I(0), while the series EG is integrated of order 1, i.e., I(1). To substantiate the ADF test results, we carried out PP stationarity test which is said to be more powerful than ADF test (Lacheheb & Sirag, 2019). The PP results in Table 2, are consistent with the ADF test results. These results allow us to apply the NARDL model for no series that is integrated of order I(2).

Table 2: Series stationarity tests

Variable	ADF test statistic		PP test statistic	
	Level	1st Difference	Level	1st Difference
CE	-4.7292***	-5.0108***	-4.3640***	-9.2201***
EG	-1.9427	-6.3082***	-1.7593	-6.2903***
IQ	-5.0613***	-5.6512***	-4.6879***	-13.3109***
UE	-3.5171*	-3.7567***	-3.8709***	-9.1035***

Note: ** and *** indicate statistically significant at 5% and 1% respectively.

4.1 Lag length determination

Time series estimation is sensitive to lag length. Therefore, it is necessary to determine the optimal lag before running regression. Table 3 shows the results of lag order selection criteria. Following Akaike information criterion (AIC), when CE is the dependent variable, the optimal lag is two.

Table 3: VAR Lag Order Selection Criteria

Endogenous variables: CE						
Exogenous variables: C EG IQ UE						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-74.59199	NA*	16.08367	5.613714	5.804029*	5.671895*

1	-74.24025	0.577871	16.87800	5.660018	5.897911	5.732744
2	-72.40492	2.884083	15.9462 1*	5.60035 2*	5.885824	5.687623
* Indicates lag order selected by the criterion						

4.2 NARDL Long-run form and Bounds test

Table 4 shows the estimation of long-run form and bounds test results. We observe that the calculated F-statistic, which is 7.33, is greater than upper bound limit I(1), at 1% level i.e., 4.37. This result is evidence that there is cointegration (long-run relationship) among the variables.

Table 4: ARDL Long-run Form and Bounds Test

Dependent Variable: D(CE)				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.392531	6.584752	0.970808	0.4032
CE(-1)*	-1.932861	0.543603	-3.555648	0.0379
EG_POS(-1)	-0.019496	1.108228	-0.017592	0.9871
EG_NEG(-1)	0.259880	1.051838	0.247072	0.8208
IQ(-1)	-4.184931	6.099286	-0.686135	0.5419
UE(-1)	1.164577	0.281881	4.131453	0.0257
D(CE(-1))	0.247849	0.365234	0.678603	0.5460
D(EG_POS)	-4.209486	1.454808	-2.893499	0.0628
D(EG_POS(-1))	-8.525093	2.386922	-3.571585	0.0375
D(EG_POS(-2))	-1.340253	2.770936	-0.483683	0.6617
D(EG_POS(-3))	7.055739	1.944731	3.628131	0.0360
D(EG_NEG)	3.645085	1.813456	2.010022	0.1380
D(EG_NEG(-1))	3.923847	2.042104	1.921473	0.1504
D(EG_NEG(-2))	-4.980706	1.754679	-2.838528	0.0657
D(EG_NEG(-3))	-7.198717	3.022139	-2.381994	0.0974

D(IQ)	2.052638	4.962288	0.413648	0.7069
D(IQ(-1))	5.109531	5.640301	0.905897	0.4318
D(IQ(-2))	-14.03333	3.596815	-3.901600	0.0299
D(IQ(-3))	-7.471865	2.363949	-3.160755	0.0508
D(UE)	0.116548	0.168035	0.693597	0.5378
D(UE(-1))	-0.636641	0.171041	-3.722161	0.0338
D(UE(-2))	-0.139274	0.141980	-0.980942	0.3990
* p-value incompatible with t-Bounds distribution.				
Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EG_POS	-0.010087	0.571950	-0.017636	0.9870
EG_NEG	0.134454	0.553401	0.242959	0.8237
IQ	-2.165148	3.291425	-0.657815	0.5576
UE	0.602515	0.245516	2.454076	0.0913
C	3.307290	2.738357	1.207764	0.3137
EC = CE - (-0.0101*EG_POS + 0.1345*EG_NEG -2.1651*IQ + 0.6025*UE + 3.3073)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.339637	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	25		Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Note:
The variables EG_POS(-1), EG_NEG(-1), IQ(-1), UE(-1), D(CE(-1)), D(EG_POS), D(EG_POS(-1)), D(EG_POS(-2)), D(EG_POS(-3)), D(EG_NEG), D(EG_NEG(-1)), D(IQ), D(IQ(-1)), D(IQ(-2)), D(IQ(-3)), D(UE), D(UE(-1)), and D(UE(-2)), are system generated and they refer to the short-run changes (increase or decrease) of the primary variables defined under equation one above.

In view of equation 2, Table 4 results show that in the short-run the coefficients of D(EG_POS(-1)), D(EG_NEG(-2)), D(IQ(-2)) and D(UE(-1)) are all statistically significant at 5% level, while the rest of the coefficients are not statistically significant. In the long-run, the coefficients of UE(-1) and CE(-1) are both statistically significant at 5% level. Since some of the variable in the NARDL estimation are not significant, for forecasting and exploring the long-run asymmetric relationship, a parsimonious model based on NARDL findings need to be estimated. Hence, we estimate a stepwise regression based on Table 4 results.

Stepwise estimation

The upper part of Table 4 shows a form of parsimonious model which has been depicted by the AIC criteria. Table 5 shows the results of Stepwise Regression when CE is dependent variable. The parsimonious estimation results shows that in the long-run changes in CE are explained by CE(-1) and IQ(-1). In the short-run, changes in CE are significantly accounted for by D(CE(-1)) and D(EG_POS(-1)). Besides, our parsimonious results fulfill the anticipation that θ_1, $\theta_2 > 0$. The non-significance of EG_POS(-1) and EG_NEG(-1) in the long-run, while IQ(-1) is significant in the long-run is very revealing. This suggests that in the case of Tanzania, unlike the traditional expectation that higher levels of economic growth will deliver increased consumption expenditure and so alleviate consumption deprivation both in the long and short-run, on the contrary, in the long-run increased economic growth alone cannot significantly lower consumption

deprivation poverty. Instead, in the long-run, unless income inequality is fundamentally managed, increased economic growth will not lead to poverty alleviation because increased benefits of economic growth will be eroded by growing income inequality as well as unemployment.

Besides, unlike the short-run coefficients of economic growth in Tables 4 and 5 which are positive, the long-run coefficients are negative, implying a long-run negative relationship between economic growth and consumption expenditure. Such a counterintuitive sign is because of the long-run systemic effect of inequality in the redistribution of income, as evidenced by the positive long-run statistically significant coefficients of income inequality i.e., IQ(-1) in Table 5.

Table 5: Stepwise Regression

Dependent Variable: D(CE)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	6.058014	1.926842	3.144012	0.0053
CE(-1)	-1.361729	0.263318	-5.171417	0.0001
EG_POS(-1)	0.194350	0.486186	0.399743	0.6938
EG_NEG(-1)	0.681684	0.658160	1.035742	0.3133
IQ(-1)	-3.625603	1.829499	-1.981746	0.0622
UE(-1)	-0.024399	0.096638	-0.252483	0.8034
D(CE(-1))	0.579567	0.184611	3.139390	0.0054
D(EG_POS(-1))	-2.445476	1.160555	-2.107160	0.0486
R-squared	0.664271	Mean dependent var		-0.014847
Adjusted R-squared	0.540581	S.D. dependent var		5.228283
S.E. of regression	3.543752	Akaike info criterion		5.609444
Sum squared resid	238.6054	Schwarz criterion		5.993396
Log likelihood	-67.72749	Hannan-Quinn criter.		5.723613
F-statistic	5.370468	Durbin-Watson stat		2.303003
Prob(F-statistic)	0.001621			
	Selection Summary			

Added D(CE(-1))		
Added D(EG_POS(-1))		
*Note: p-values and subsequent tests do not account for stepwise selection.		

Wald coefficient diagnostic test:

Wald test is necessary to enable us to determine long-run symmetry. The stepwise regression results help us to develop estimation commands as shown on upper part of Table 6, which is a representation of stepwise regression results in table 5. The estimation command identifies the long-run coeffects of the independent variables i.e., C(3) to C(8). The Wald test for the long-run asymmetry will therefore seek to identify if C(3) = C(4). Table 7 summarizes the Wald test results.

Table 6 Estimation command, equation, and substituted coefficients

Estimation Command:

STEPLS(METHOD=UNI, FTOL=0.05) D(CE) C CE(-1) EG_POS(-1) EG_NEG(-1) IQ(-1) UE(-1) @ D(CE(-1)) D(EG_POS) D(EG_POS(-1)) D(EG_POS(-2)) D(EG_POS(-3)) D(EG_NEG) D(EG_NEG(-1)) D(EG_NEG(-2)) D(EG_NEG(-3)) D(IQ) D(IQ(-1)) D(IQ(-2)) D(IQ(-3)) D(UE) D(UE(-1)) D(UE(-2))

Estimation Equation:

D(CE) = C(1) + C(2)*CE(-1) + C(3)*EG_POS(-1) + C(4)*EG_NEG(-1) + C(5)*IQ(-1) + C(6)*UE(-1) + C(7)*D(CE(-1)) + C(8)*D(EG_POS(-1))

Substituted Coefficients:

D(CE) = 6.0580141713 - 1.36172911395*CE(-1) + 0.194349519074*EG_POS(-1) + 0.681684343248*EG_NEG(-1) - 3.6256028089*IQ(-1) - 0.0243992997058*UE(-1) + 0.57956680629*D(CE(-1)) - 2.44547606043*D(EG_POS(-1))

Table 7 shows Wald test coefficient diagnostic results. The decision criterion is that if we fail to reject null hypothesis i.e., if the variables are equal, then we conclude that there is long-run asymmetry. Table 7 results affirm that the probability, at 10% critical value level, could not reject the equality of C(3) and C(4) which means there is long-run symmetry. These results are further enriched by plotting the NARDL multiplier effects curve, i.e., *Figure 3: Multiplier graph for EG(Pos) and EG(Neg)*. The continuous black line in the middle of the chat shows how the consumption expenditure (CE) adjusts due to positive shocks in economic growth (EG). The black dotted line (overlapping the black line) shows how CE responds to negative shocks in the EG. The pattern of these two lines gives the impression that the dependent variable responds almost in the same way to the positive and negative shocks in the regressors. The bold dash-dotted red line in the middle of the chat is the asymmetry plot; it depicts the difference between the dynamic movements of positive and negative changes in the regressor. The asymmetry plot lies between the upper and lower bounds (i.e., the small dashed red line) of the critical region. Since part of the horizontal zero line lies outside the critical bound region, then the figure affirms the existence of long-run asymmetry.

Table 7: Wald Test:

Test Statistic	Value	Df	Probability
t-statistic	-1.853106	19	0.0795
F-statistic	3.434002	(1, 19)	0.0795
Chi-square	3.434002	1	0.0639
Null Hypothesis: C(3)=C(4)			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(3) - C(4)		-0.487335	0.262983
Restrictions are linear in coefficients.			

4.5 Causality test

Since cointegration exists among the variables, vector error correction (VEC) causality can be estimated. The causality estimation results, as summarized on Table 8, forms a basis for inferring long-run and short-run causality among the variables: In the short-run there is bidirectional causality between consumption expenditure and economic growth; unidirectional causality from income inequality to consumption expenditure; and from unemployment to consumption expenditure. In the long-run there is unidirectional causality from consumption expenditure to economic growth, and from consumption expenditure to unemployment. These results are consistent with the NARDL findings.

Table 8: Causality test - t-statistic approach

Dependent variable	**Independent Variable**	**Coefficient**	**t-Statistic**	**Causality**
D(CE)	C(1) = CE(-1)	-1.1511***	-4.660440	Long-run causality
	C(2) = D(CE(-1))	0.6777***	2.935711	Short-run causality
	C(3) = D(EG(-1))	-1.1569*	-1.662956	Short-run causality
	C(4) = D(IQ(-1))	2.8003*	1.790270	Short-run causality
	C(5) = D(UE(-1))	-0.1678*	-1.793193	Short-run causality
D(EG)	C(7) = CE((-1)	-0.1410*	-1.739705	Long-run causality
	C(8) = D(CE(-1))	0.1350*	1.782344	Short-run causality

	C(9) = D(EG(-1))	-0.4418*	-1.935076	Short-run causality
D(IQ)	C(16) =D(IQ(-1))	-0.3926**	-2.078803	Short-run causality
D(UE)	C(19) = CE(-1)	-1.1720*	-1.792856	Long-run causality

Note: *, **, and *** indicate statistically significant at 10%, 5% and 1% respectively.

4.6 Diagnostic tests

To assess the robustness of our findings, three key tests were carried out: serial correlation LM test, Heteroskedasticity, and normality test. The results are summarized and presented in Table 9. Since the p-value corresponding to the Serial correlation LM test is bigger than 0.05, we fail to reject the null hypothesis and conclude that our model is not suffering from residual autocorrelation. Likewise, the F-test of heteroskedasticity test has a significance of 0.942 which is greater than 0.05. Thus, we reject the null hypothesis and affirm that the residuals are homoscedastic. Finally, the p-value for the normality test is greater than 0.05; we fail to reject the null hypothesis. Therefore, the residuals are multivariate normal.

Table 9: Diagnostic tests				
	Null Hypothesis (Ho)	F-statistic	p-value	Remarks
Serial correlation LM test	There is no problem of serial correlation	2.3237	0.4208	Fail to reject Ho
Heteroskedasticity	The residuals are homoscedastic	0.3426	0.9420	Fail to reject Ho

Normality test	Residuals are multivariate normal	Jarque-Bera: 1.4486	p-value: 0.4846	Fail to reject Ho

4.7 Model stability test

To test for model stability, we employed CUSUM and CUSUM Square Test and the results are depicted by *Figure 2: Model stability: CUSUM & CUSUM Square Test*. The upper part of the figure represents the CUSUM line chart, and the lower part represents the CUSUM Square line chart. The two charts are based on accumulated residuals and aggregate residual squares, respectively. While the CUSUM detects systematic modifications in regression coefficients, the CUSUM Square test detects drastic changes in the permanence of the regression coefficients. The dotted red lines in both charts represent the upper and lower boundary (i.e., control line) of the CUSUM and CUSUM Square chats. The blue lines in the upper chart and lower chart represent CUSUM and CUSUM Square respectively. Therefore, the figure suggests that the model is stable because both the CUSUM and CUSUM Square line charts lie within the 5% specified critical boundary.

Figure 2. Model stability: CUSUM & CUSUM Square Test

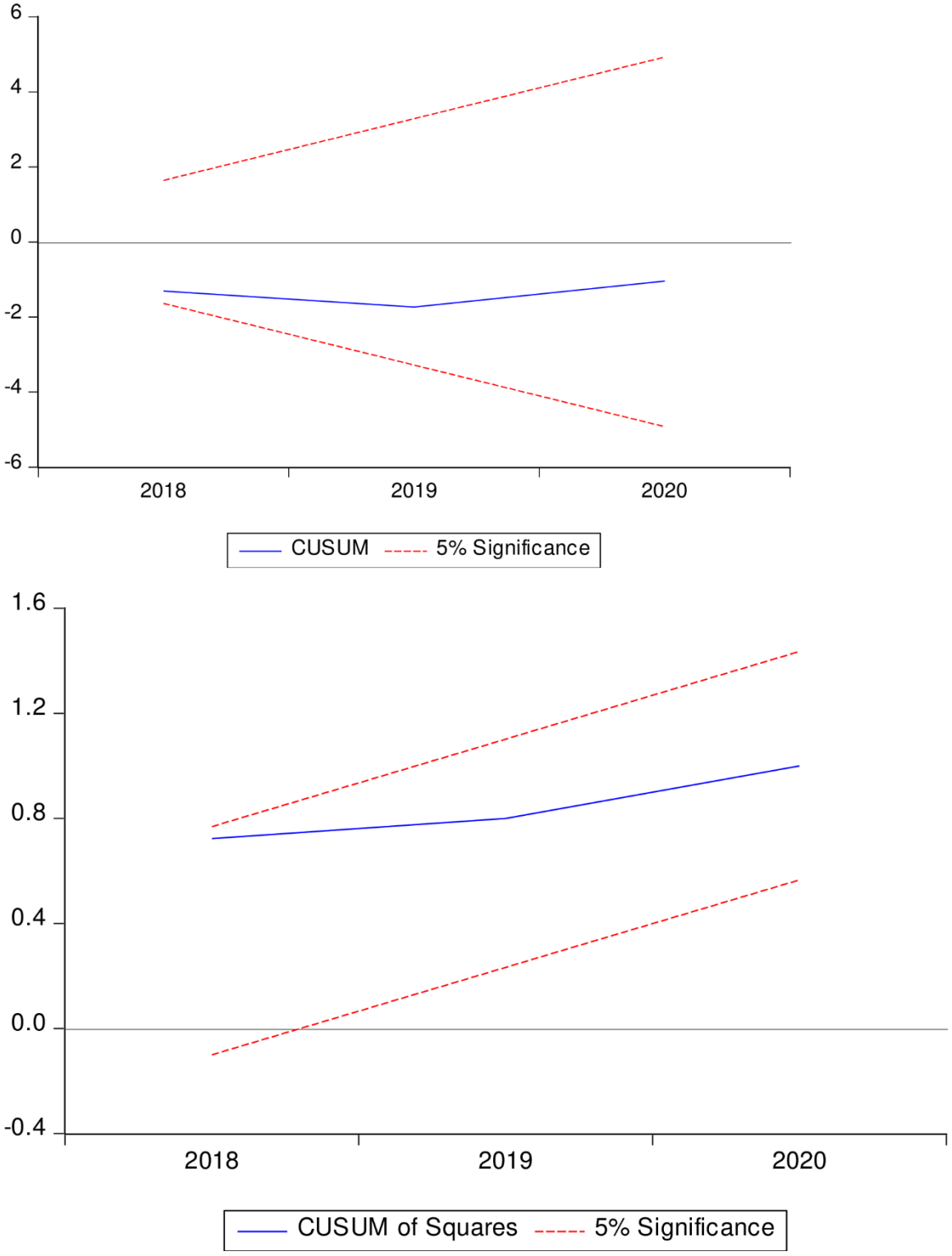
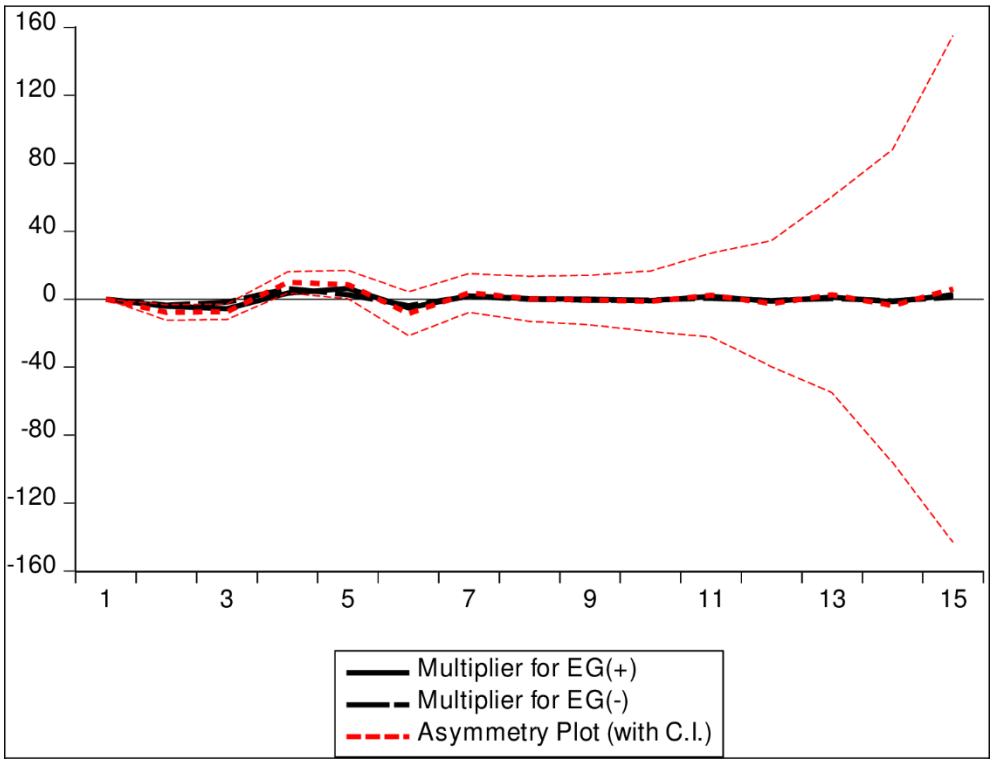


Figure 3: Multiplier graph for EG(Pos) and EG(Neg)



5. Concluding remarks and policy implications

This paper analyzed the impacts of economic growth on per capita consumption expenditure in Tanzania. To capture the long-run asymmetric relationship between consumption expenditure and economic growth, we adopted the nonlinear autoregressive distributed lag (NARDL) model and Wald test. Further, to explore the causal relationship among the variables, (i.e., per capita consumption expenditure, economic growth, income inequality, and unemployment), we employed the Granger causality test approach. The estimated results confirm the presence of long-run asymmetric behavior of economic growth. On the basis of the causality test, in the long-run, changes in income inequality are significant and they account for changes in consumption expenditure. In the short-run, an increase in economic growth is associated with increasing consumption expenditure and vice versa. Besides, the causality test confirms a bidirectional causality between consumption expenditure and economic growth in the short-run. Likewise, in the short-run, there is unidirectional causality from income inequality to consumption expenditure, and from

unemployment to consumption expenditure. In the long-run, the study generated evidence of unidirectional causality from consumption expenditure to economic growth, and from consumption expenditure to unemployment. The causality results are consistent with the NARDL results.

From a policy viewpoint, this research demonstrates some key conclusions, pointing to the applications of the findings: First, the evidence shows that only income inequality is significant in the long-run, and economic growth in the short-run indicating the systemic effect of inequality in the redistribution of income. It affirms that in the case of Tanzania, increased economic growth is necessary for containing consumption deprivation but in the long-run, the rising income inequality interacts with economic growth and dampens the positive poverty-alleviating impact of economic growth. Thus, policy attention should be directed to containing income inequality if increased benefits of economic growth should count significantly in reducing consumption poverty and improving populations' wellbeing. Robust economic growth-related policies to spearhead poverty alleviation must be accompanied by strategies to alleviate income inequality. For the real poor to realize the full benefits of economic growth, it is necessary to institute policy instruments to encourage economic progress and at the same time address the appalling structures which give rise to income inequality. Strengthening collective bargaining rights among the low- and middle-income earners, promoting the adoption of living-wage policies, introduction of stronger minimum wage law, subsidizing the provision of public goods e.g., health care and education, facilitating greater access to higher-income jobs, and promoting workers' rights to resources ownership are some of the recommended programs to contain income inequality.

Second, the short-run bidirectional causality between consumption expenditure and economic growth indicates that policies to promote economic growth will lead to increased consumption expenditure and vice versa. The short-run unidirectional causality from income inequality and unemployment to consumption expenditure underscores the need for policy

instruments to contain both income inequality and unemployment, promote increased consumption expenditure, and improve the population's wellbeing. High- and persistent-income inequality and unemployment erode individuals' ability to access necessities of life due to lack of necessary income and so deepens deprivation poverty. For instance, unemployment is associated with limited autonomous consumption, which is a mere subsistence, and it does not provide multiplying effects for improved wellbeing.

Third, the evidence that in the long-run income inequality influence the level of consumption expenditure and in turn consumption expenditure Granger causes the level of economic growth and unemployment implies that policies to contain income inequality in Tanzania will, in the long-run, carb unemployment and promote economic growth and consumption expenditure. In the long-run, income inequality has a significant sapping effect on economic growth. Thus, since income inequality in Tanzania is mostly manifested in the agriculture sector, (as compared to other sectors), and since the sector hosts the majority of the country's poor, for poverty reduction initiatives to be effective, concerted efforts must be focused on transforming agriculture sector to promote income and employment within the sector. Improved farmers' access to credit facilities, regular hands-on training on improved farming and animal husbandry, processing of agricultural products in situ for value addition, access to simple technologies to reduce post-harvest losses, and improved access to market and resources ownership are some of the recommended strategies to transform the agriculture sector. Besides, policy instruments promoting investment in the agriculture sector are significant for poverty reduction and improved wellbeing. In the case of Tanzania, promoting economic growth, without a simultaneous implementation of robust policies to tackle income inequality which perpetuates poverty at the grassroots, will not deliver the desired long-run results.

The main limitation of our study is the availability of data, i.e., there are no reliable sources of data, for the variables in question, for the period before 1991. As a result, the research had to use a relatively small sample, i.e., data for the period 1991-2020. To address this problem the authors settled for the NARDL methodology because it is a more reliable method in the presence of small samples.

Finally, for future research examining the growth-poverty dilemma in developing countries, we recommend research in the following areas. First, exploration of other factors which are deemed to contribute to the growth-poverty nexus. These include demographic factors (e.g., the influence of rapidly increasing population and its quality on consumption poverty), methodological challenges (e.g., the limited budget and lack of adequate skills needed for data collection, processing, and management by countries' bureau of statistics), and stagnation in the agricultural sector[2]. Second, exclusive investigation of the growth-poverty dilemma from an ethical perspective is under-researched in developing nations. Such an investigation will provide corroborating evidence on the role of ethics in the ongoing efforts to account for the evolution of poverty, thereby addressing the prevailing scenario of growth without prosperity in developing nations. For instance, scholars may consider researching areas such as evaluating commitments of multinational corporations on poverty alleviation, stakeholders' perceptions about the effectiveness of corporate social responsibility as poverty alleviation and wellbeing improvement strategy, and ethical innovation to poverty reduction. Third, we recommend a sectoral analysis to depict the effects of economic growth by sectors and the sectoral impact on poverty alleviation.

[2] For instance, in Tanzania even though the sector hosts over 74% of the population, it is facing multiple challenges such as limited public expenditure, poor access to private land ownership, lack of access to credit facilities, etc.

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PRO-WELLBEING TOURISM: THE DYNAMIC RELATIONSHIP BETWEEN HOUSEHOLD CONSUMPTION EXPENDITURE AND TOURISM GROWTH IN TANZANIA

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Pro-Wellbeing Tourism: The Dynamic Relationship Between Household Consumption Expenditure and Tourism Growth in Tanzania

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Appendices

Appendix 1. Optimal lag length determination

VAR lag order selection criteria
Endogenous variables: LNAGVA LNHCP LNTOUR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	15.04340	NA	7.95e-05	−0.926416	−0.781251	−0.884613
1	88.64277	124.5528*	5.56e-07*	−5.895598*	−5.314938*	−5.728389*
2	95.75135	10.38946	6.65e-07	−5.750104	−4.733949	−5.457488

*Lag order selected by the criterion.
Source: Authors' estimation.

Appendix 2. Johansen cointegration test

[A] Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.448902	28.20277	29.79707	0.0755
At most 1	0.367443	12.71088	15.49471	0.1258
At most 2	0.030423	0.803271	3.841465	0.3701

[B] Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.448902	15.49189	21.13162	0.2559
At most 1	0.367443	11.90761	14.26460	0.1142
At most 2	0.030423	0.803271	3.841465	0.3701

Trace test and Max-eigenvalue test indicate no cointegration at the 0.05 level.
Source: Authors' estimation.

Appendix 3. Unrestricted VAR estimates

	Coefficient	Std. Error	*t*-Statistic	Prob.
C(1)	0.899608	0.068172	13.19622	0.0000
C(2)	0.057963	0.018229	3.179752	0.0022
C(3)	0.050110	0.055131	0.908917	0.3666
C(4)	0.333075	0.543628	0.612690	0.5421
C(5)	−0.418388	0.396212	−1.055970	0.2947
C(6)	0.786476	0.105945	7.423433	0.0000
C(7)	−0.392335	0.320420	−1.224438	0.2250
C(8)	4.336340	3.159550	1.372455	0.1744
C(9)	0.095407	0.179684	0.530974	0.5971
C(10)	−0.077372	0.048046	−1.610364	0.1119
C(11)	0.798163	0.145312	5.492759	0.0000
C(12)	0.254386	1.432868	0.177536	0.8596
Determinant residual covariance		2.23E-07		
Equation: LNHCP = C(1)*LNHCP(−1) + C(2)*LNTOUR(−1) + C(3)*LNAGVA(−1) + C(4)				
R-squared	0.968255	Mean dependent var		6.021541
Adjusted *R*-squared	0.964114	S.D. dependent var		0.190038
S.E. of regression	0.036000	Sum squared resid		0.029808
Durbin–Watson stat	1.919279			
Equation: LNTOUR = C(5)*LNHCP(−1) + C(6)*LNTOUR(−1) + C(7)*LNAGVA(−1) + C(8)				
R-squared	0.868147	Mean dependent var		2.068684
Adjusted *R*-squared	0.850949	S.D. dependent var		0.541949

(*Continued*)

Continued.

	Coefficient	Std. Error	*t*-Statistic	Prob.
S.E. of regression	0.209231	Sum squared resid		1.006886
Durbin–Watson stat	1.756431			
Equation: LNAGVA = C(9)*LNHCP(−1) + C(10)*LNTOUR(−1) + C(11)*LNAGVA(−1) + C(12)				
R-squared	0.860574	Mean dependent var		3.385162
Adjusted *R*-squared	0.842388	S.D. dependent var		0.239008
S.E. of regression	0.094887	Sum squared resid		0.207082
Durbin–Watson stat	2.004397			

Source: Authors' estimation.
c(4), c(8) and c(12) are intercepts of the 3 equations respectively.
From model 1:

- ✓ C(1) is a coefficient of LNHCP(−1) and is significant: LNHCP(−1) affects LNHCP.
- ✓ C(2) is a coefficient of LNTOUR(−1) and is significant: LNTOUR(−1) affects LNHCP.
- ✓ C(3) is a coefficient of LNAGVA(−1) and it is not significant: LNAGVA(−1) does not affect LNHCP.
- ✓ C(4) is the intercept; and it is not statistically significant.

From model 2:

- ✓ C(5) and c(7) are coefficients of LNHCP(−1) and LNAGVA(−1) respectively and they are not significant; so, they don't affect LNTOUR.
- ✓ C(6) is a coefficient of LNTOUR(−1) and it is statistically significant: LNTOUR(−1) affects LNTOUR.
- ✓ C(8) is constant term, and it is not statistically significant.

From model 3:

- ✓ C(9) and c(10) are coefficients of LNHCP(−1) and LNTOUR(−1) respectively, and they are not statistically significant. Thus, LNHCP(−1) and LNTOUR(−1) does not affect LNAGVA.
- ✓ C(11) is a coefficient of LNAGVA(−1) and is significant: LNAGVA(−1) affects LNAGVA.
- ✓ C(12) is the intercept and is not statistically significant.

CHAPTER 5: TOURISM GROWTH AND ENVIRONMENTAL QUALITY

PAPER I:

ENVIRONMENTAL KUZNETS CURVE HYPOTHESIS: A SYSTEMATIC REVIEW

Abstract

Sustainable economic growth deserves in-depth attention of researchers and policymakers because most socio-economic activities leading to economic growth are associated with externalities such as emissions, accumulation of solid wastes, deforestation, soil erosion, etc., which impact the sustainability and quality of natural environment adversely. In this research, we systematically review the literature on the Environmental Kuznets Curve hypothesis to specify emerging research trends and gaps in this area. The review focuses on two categories of published studies: studies centering on a single country and those centering on a group of countries. In each category, five review criteria are studied for each research work: research destination, the period covered, analytical method used, variables employed, and the conclusion drawn on the validation of the Environmental Kuznets Curve hypothesis. The review shows that various researchers have employed varied methodologies and variables to validate the Environmental Kuznets Curve hypothesis. The review established that the Environmental Kuznets Curve hypothesis holds in some countries and regions, but not all. In view of promoting environmental sustainability, the review identifies five unique gaps in the literature and recommends a path for future research on the income-environment relationship as detailed on the evaluation and recommendation section of this review.

Key words:
Economic growth; Environmental Kuznets Curve; Environmental quality; Sustainability

1. Introduction

Environmental sustainability is among the overriding global concerns. Goal 13 of the United Nations Sustainable Development Goals (SDGs) seeks to integrate climate change measures into national policies, strategies, and planning to better care and protect the natural environment. This goal comes as a global initiative to respond to the problem of environmental degradation and the declining quality of the natural environment. Most forms of environmental degradation today such as deforestation, soil erosion, water and air pollution, depletion of mineral resources, etc., are associated with unsustainable human lifestyles and increasing economic activities which are dependent on nature.

Since socio-economic activities that are dependent on nature are inevitable, zero environmental damage is neither possible nor desirable (Helfand & Rubin, 1994; Hussen, 2004). However, the question is what level of environmental damage can be accepted as sustainable? While this question points to the fact that nature has a limited capacity to absorb environmental damages such as pollution and solid wastes, it also underscores the problem of defining sustainability. Economists and ecologists differ in their view of sustainability largely in terms of how they perceive the intergenerational fairness, the ecosystem's carrying capacity, and the substitutability of natural and other resources (Amsler, 2009; Toman, 1992). Related to sustainability is the issue of environmental degradation which happens when human dependence on nature to sustain a particular lifestyle exceeds the nature's capacity to absorb the resulting damages and wastes, and rejuvenate itself (Dinda, 2004). For example, we talk about pollution when the level of emissions is above the absorptive capacity of the local environment. So, a correct reading on the issue of sustainability must start from an interdisciplinary point of view to address both the ambiguity in its meaning and the disagreement on the prospects of attaining it.

Economic activities, which ultimately cause economic growth, merit thorough attention of academicians and policymakers because such activities are associated with some environmental externalities such as emissions, accumulation of solid wastes, deforestation, soil erosion, etc. Thus, some environmental economists have attempted to empirically examine the environmental impacts of various economic activities. Among such studies are those based on the Environmental Kuznets Curve (EKC) hypothesis, which surfaced in the literature from the early 1990s. The hypothesis advances the idea that the relationship between economic growth and environmental damage exhibits the same pattern, i.e., the inverted U-shaped curve, like the per capita income-inequality curve, commonly called the Kuznets curve. Hence, the inverted U-shaped income-environment relationship curve came to be known as the Environmental Kuznets Curve hypothesis (Panayotou, 1993). The EKC hypothesis asserts that environmental damage increases with the increase of income up to a point beyond which environmental damage starts declining as income increases, hence an inverted U-shaped curve.

Attempts to validate the EKC hypothesis have been a preoccupation of several researchers. Most studies on EKC have employed bivariate or multivariate econometric models such that the proxy for environmental damage is placed in the specified model as a dependent variable and the rest of the variables as explanatory variables.

The current research makes a systematic review of literature on the EKC hypothesis. The primary aim of this review is to identify some trends and gaps in the existing EKC literature and thus specify the appropriate direction of future studies. Hence, the research is significant because it synthesizes and presents a comprehensive status of EKC hypothesis research, thereby provides hands-on insights to researchers, policymakers, and governments on some shortcomings in the traditional income-environment approaches. Also, the review helps to re-emphasize how economic policies, which provide framework for various economic activities,

influence the sustainability of the natural environment. It underscores the fact that sustainable environmental quality is integrally involved in any socio-economic decision.

To achieve the above aims, the rest of this paper advances as follows: the current introductory section is followed by a presentation of the basic concepts underlying the EKC hypothesis. Subsequently, part 3 is a review of research studies on the EKC hypothesis. Due to the vast literature on this area, we have limited the review to selected studies published from 2009 onward; we did not attempt to review all the rapidly increasing numbers of studies on this area. The review is organized into two categories: empirical studies that focus on a single country, and empirical studies focusing on more than one country. In both categories, five elements (criteria) are reviewed: the period covered by the study; the destination of the study; the variables and the type of data employed; the econometric method used; and the findings on EKC validation. The specified categories and criteria enhance the comprehension of major research trends and findings. Finally, the study presents some evaluation of the study findings and makes some concluding remarks and recommendation for future research.

2. The Environmental Kuznets Curve Theory: Concept, causes, and implications

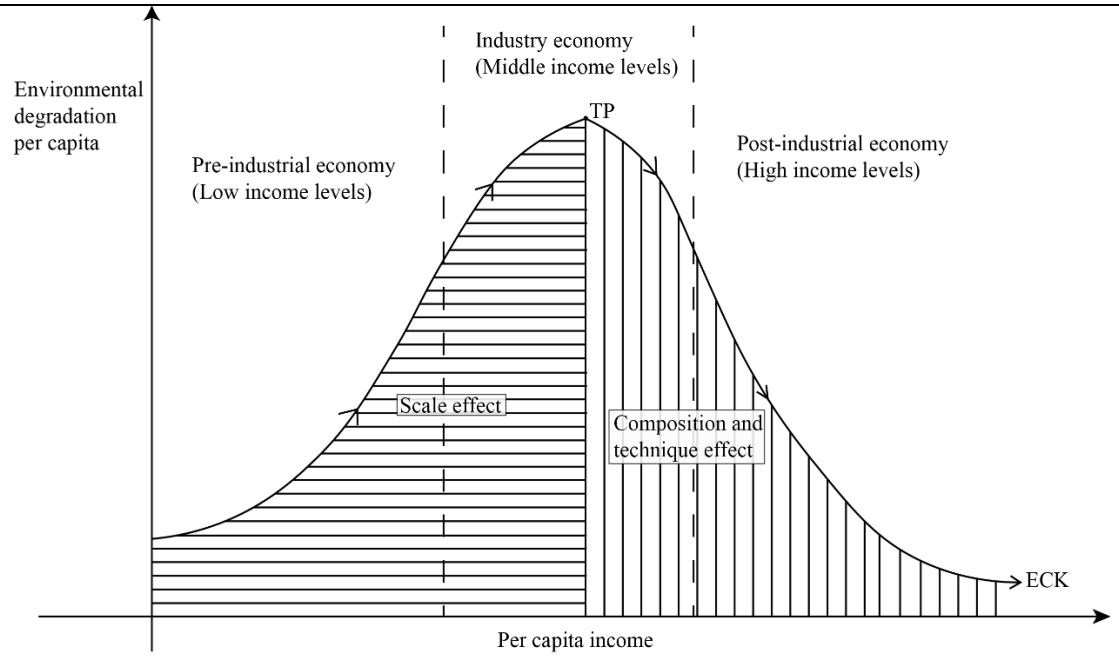
i. Theoretical Framework of EKC Hypothesis

The EKC hypothesis is modeled after the Kuznets' per capita income-inequality curve, which was proposed in 1955 by an American Economist Simon Kuznets. He attested that in the early stages of economic growth, the economy transition from agrarian to industrialized economy, and income inequality increases with increasing income. Then, rapid economic growth and rural-urban migration following a transition to the industrial economy, heighten income inequality between rural and urban population as urban industrial workers experience higher income compared to rural

agricultural workers. Inequality keeps increasing with the rise of income up to a point beyond which it will start declining because the democratization and rise of the welfare state, which is associated with the process of industrialization, will lead to a more equitable sharing of the benefits of rapid growth. In this case, Kuznets propounded that the income-inequality relationship will follow an inverted U-shaped curve (Kuznets, 1955).

Likewise, environmental degradation increases with the rising income per capita up to a threshold level beyond which, the quality of the environment improves with the increase of per capita income. Akin to the income-inequality relationship, the income-environment relationship follows an inverted U-shaped curve as shown in Figure 1.

FIGURE 1: ENVIRONMENTAL KUZNETS CURVE



Source: Authors

The EKC, therefore, depicts the long-run relationship between economic growth and the consequent environmental impacts (Dinda, 2004). According to the EKC hypothesis, initially, environmental degradation increases as economic growth advances from an agrarian economy to an

industrialized economy. In turn, such advancements attract structural changes in the economy: changes towards information-intensive industries and services. The structural changes gradually lead to increasing environmental awareness and regulations, the use of cleaner production technology, and higher demand for improved environmental quality. Then, as the income keeps increasing, environmental degradation starts to increase at a decreasing rate, and once the EKC turning point (TP) is reached, any further increase in income leads to a reduction in environmental damages. Thus, the EKC reflects economic growth natural movement from a clean agrarian economy to an environmentally damaging industrial economy, and then to a clean service economy (Dinda, 2004).

The EKC hypothesis started with the seminal work of Grossman and Krueger, where they carried out an empirical analysis of the environmental impacts of a North America trade agreement. The researchers presented empirical evidence to show that a reduction in trade barriers will have at least 3 significant environmental impacts: it will lead to expansion of economic activities, alter the composition of economic activities, and transform production techniques (Grossman & Krueger, 1991). Among other tests, they studied the relationship between air quality and economic growth using panel data for 42 countries and concluded that at a low level of national income the concentration of sulfur dioxide and smoke increases with per capita GDP but decreases with GDP growth at higher levels of national income.

The pioneering work of Grossman and Krueger immediately attracted more researches. Shafik and Bandyopadhyay (1992), explored the economic growth vs. environmental quality relationship by analyzing the patterns of environmental transformation for countries with varying levels of income, taking various indicators as proxies for environmental damage. They established that income maintains the most consistent significant effect with all the environmental indicators and that as income increases, most

environmental indicators worsen initially, then improve as technology improves and the economy reaches the middle-level incomes.

Then, the World Bank in its 1992 development and environment report popularized the EKC school of thought by contending that the demand for improved environmental quality will increase with an increase in income because it is possible to dedicate more resources to environmental conservation as income increases (Mondiale, 1992).

Given the above 3 initial studies, it can thus be affirmed that the EKC hypothesis essentially shows that a higher level of economic growth is normally associated with a gradual decline of ecological damage following structural changes towards improved technological production and environmental awareness (Panayotou, 1993). To this end, Stern (2004), confirms that improvement in the state of technology entails changes in emission and productivity.

ii. Econometric framework

The EKC hypothesis has been traditionally expressed as a quadratic function where the proxy of environmental damage is set as the dependent variable and the one of economic growth as independent variables. To address the problem of omitted variables bias, several proxies have been suggested as discussed below. The following is the most specified form of an econometric model of income-environment relationship (Farhani & Ur Rahman, 2019; Mitić et al., 2019; Rahman & Kashem, 2017; Shahbaz, Hye, et al., 2013), etc.:

$$EI = \beta_0 + \beta_1 X_1 + \beta_2 (X_1)^2 + \beta_3 X_2 + - - - - + \beta_{(n+1)} X_n + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where EI is the chosen environmental damage indicator. The traditional environmental damage indicators include CO_2 emissions, methane (CH_4),

nitrous oxide (N_2O), fluorinated gases[1], sulfur dioxide (SO_2), and ecological footprint (Britannica, 2020). β_0 is intercept term and β_1, β_2, β_3 - - - $\beta_{(n+1)}$ are slope coefficients to be estimated. X_1 is a proxy for economic indicator and X_2, X_3, - - -, X_n are control variables. ε is a stochastic error term. Normally, all variables included in the model are of logarithmic form to obtain the elasticities directly (Ozturk et al., 2016; Shahbaz, Farhani, et al., 2013; Tiwari et al., 2013).

To ascertain if EKC hypothesis holds in a particular country or region, the sign and the significance of the slope coefficients of the proxies for economic growth, i.e., β_1 and β_2 are examined: If $\beta_1 > 0$ and significant and $\beta_2 < 0$ and significant, then EKC hypothesis is confirmed to exist in that particular economy. The expected signs of the other coefficients depend on the nature of the actual variable and its expected theoretical relationship with the natural environment. The most commonly employed control variables include energy consumption, trade openness, good governance, urbanization, population density, globalization, exports, etc., (Al-Mulali et al., 2016; Aung et al., 2017; Mrabet & Alsamara, 2017; Nasir & Ur Rehman, 2011; Rahman, 2017, 2020c, 2020a; Rahman & Kashem, 2017; Rahman & Vu, 2020; Saidi & Rahman, 2020).

Therefore, EKC represents different phases of a country's economic growth path over time. Other factors remaining equal, a country experiences changes in income and environmental quality at the same time; these two scenarios follow the same curve, i.e., income-environment curve.

iii. Causes of the pattern of environmental Kuznets curve

Several factors have been proposed as responsible for shaping the EKC. The main four are scale, technological and composition effects; income elasticity of environmental quality demand; international trade; and market

[1] The fluorinated gases are halocarbons which include sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons.

mechanism (Dinda, 2004; Sarkodie & Strezov, 2018). These factors are explained briefly as follows:

a) Scale, technological and composition effect

An increase in output is associated with both increased factor (resource) input and increased waste products in terms of pollution, emissions, solid wastes, etc. Increased wastes contribute to lowering the quality of the natural environment. The scale effect, therefore, accounts for the rising part of the EKC since production increases with increasing environmental damages. The composition effect comes to play as the economy experiences some structural changes: initially, environmental degradation increases as the economic structure changes from simple agriculture to mechanized agriculture and consequently to the industrial economy. After attaining a certain level of income per capita, the economy enters a new structural phase – technological effect – in which increased output makes it possible to commit some income for Research & Development and for the acquisition of cleaner production technologies to replace dirty technologies which are normally prevalent at early stages of economic growth. Consequently, degradation starts falling when the economy changes from energy-intensive industries to services and knowledge-based technology-intensive industries (Dinda, 2004; Grossman & Krueger, 1991). Thus, the composition and technological effect accounts for the negatively sloping part of the EKC (Tsurumi & Managi, 2010).

b) Income elasticity of environmental quality demand

At the early stages of economic growth, the main aim of a country is to achieve more growth; less attention is accorded to the quality of the natural environment. Thus, in the early stages of growth, income increases with increasing environmental degradation. However, as income increases, the standard of living also increases up to a point where people start demanding for improved/cleaner natural environment. Such a demand for a better environment triggers some technical transformation in the economy, which

in turn lowers the rate of environmental damage as income increases, and so changes the slope of the environment-income curve from positive to negative. Therefore, after a country has attained a certain level of wealth, the residents' willingness to pay for a cleaner environment increases at a higher proportion than income (Dinda, 2004).

c) International trade

Impacts of international trade on the quality of the environment can be positive or negative depending on the trade and environmental governance policies (Grossman & Krueger, 1995; Grossman & Krueger, 1991). International trade grants access for countries to enter international markets, face competition with others, strive to be efficient in resource allocation, and import cleaner technologies to lower the emissions (Helpman, 1998; Shahbaz et al., 2012). Thus, international trade provides the mechanism to elicit EKC through increased demand for better environmental services because of increased awareness of global standards, and through supply chain such that improved and cleaner technology is being transferred. Alternatively, when not well monitored, international trade depletes natural resources, through excessive exploitation and allows importation of environmentally damaging products such as partially obsolete electronics and vehicles. The depletion of resources and reckless importations increases domestic pollution and the share of CO_2 emissions, which damages the quality of the natural environment (Cole, 2004).

d) Market mechanism

The early stages of economic growth are associated with low technology and the great demand for natural resources, e.g., raw materials, agricultural land. Such a high demand for resources and a low level of production technology is associated with increased degradation. With time, demand for natural resources increases to meet increasing production. Increased production which led to increasing economic growth tends to

create a market for natural resources. At this point, the market mechanism becomes the main force for resource allocation. Ceteris Paribus, a self-regulatory market mechanism for resources traded in markets prevents environmental degradation from continuing to grow with increasing per capita income (Dinda, 2004). Further, Dinda suggests that economic growth has the potential of strengthening market mechanisms in such a way that developing economies can experience a transition from non-market to market resources which are less harmful to the environment. Other market-related factors that account for the shape of the EKC are the consumer behavior of various economic agents, the transition from a command economy to a market economy, and accessibility of information which influences the degree of competition in a market economy (Dinda, 2004; Mitić et al., 2019).

iv. Implications and limitations of the EKC hypothesis

The EKC hypothesis has significant policy implications. According to Beckerman, (1992) and Mohammed (2015), the EKC hypothesis seems to suggest that developing economies need to focus on rapid economic growth which will yield both economic benefits as well as environmental conservation benefits. This is because, as revenue from economic activities increases, more resources will also be available for environmental conservation.

The implied theoretically assumption of EKC has been challenged. For instance, the experiential observations suggest that pollution does not always decrease with growth (Gill et al., 2017). This implies that environmental degradation is not always fully explained as an inevitable consequence of economic growth. The question on whether environmental degradation will grow exponentially or reverse as income increases, depends on a number of factors. In this case, while it is possible to grow out of environmental problems as EKC hypothesis predicts, policies to curb

degradation are necessary (Kumail et al., 2020; Shafik & Bandyopadhyay, 1992; Wang & Ye, 2017).

3. Literature review

Over the past three decades, i.e., from the early 1990s, the EKC hypothesis has been extensively tested but without a unanimous conclusion (Dinda, 2004). For instance, some of the empirical studies support the inverted U-shaped relationship, while others reject it. Further, other studies are skeptical of the methodology and/or variables employed for assessing the EKC hypothesis. In this subsection, we apply the 5 review criteria listed in section one of this paper and review some selected studies on the EKC published from the year 2009 onward.

A. Research studies focusing on a single country

i) Studies focusing on a single country and using autoregressive distributed lag (ARDL) cointegration methodology:

To validate the EKC hypothesis, some researchers have opted to carry out a country-specific study. Most of these studies have employed time-series data and cointegration methodology for analysis. For instance, Nasir and Rehman (2011), utilized time-series data over the period 1972–2008 and examined the relationship between CO_2 emissions, GDP, energy consumption, and trade openness in Pakistan. Using the Johansen cointegration and ARDL approach based on error correction model (ECM) they confirmed the existence of the EKC hypothesis in the long run, but with no evidence found to support the hypothesis in the short run. They concluded that environmental policymakers could recommend short-run growth policies different from long-run ones. Similarly, Saboori et al. (2012), examined the association between economic growth and CO_2 emissions for Malaysia, using data for the period 1980–2009 and tested for the EKC hypothesis utilizing ARDL methodology. An inverted-U shaped relationship between CO_2 emissions and GDP in both short and long-run policies was found, thus supporting the EKC hypothesis.

In India, Tiwari et al. (2013), used the ARDL bounds testing approach to assess the cointegration between CO_2 emissions, international trade, coal consumption and economic growth over the period 1966–2011. The results affirmed the existence of the EKC hypothesis as well as long-run cointegration among the variables. Likewise, in Malaysia Saboori and Sulaiman (2013), investigated the EKC hypothesis using energy aggregated and disaggregated data over the period 1980–2009. ARDL methodology and Johansen–Juselius maximum likelihood approaches were used to test the cointegration relationship. It was found that the EKC is not supported using the energy consumption aggregated data, but holds when disaggregated energy data (i.e., oil, coal, and electricity) were utilized.

After the study of Saboori et al. (2012) for Malaysia, Begum et al. (2015), decided to re-examine the nexus between CO_2 emissions and GDP growth for Malaysia, and introduced population growth in the analysis and shorten the study period to 12 years, i.e., 1970–1980. Unlike Soboori's findings, Begum's ARDL bounds testing approach revealed that the EKC hypothesis is not supported over the study period.

In South America, Robalino-López et al. (2015) investigated the relationship between economic growth, energy consumption, and CO_2 emissions in Venezuela over the period 1980–2025. The study employed the panel cointegration approach and substantiated the existence of the EKC hypothesis in Venezuela. Akin to Robalino-López et al. (2015) study, Bölük and Mert (2015) utilized the ARDL approach to analyze the relationship between CO_2 emissions, electricity generated using renewables and GDP in Turkey during 1961–2010. The results confirmed an inverted U-shaped relationship between per capita CO_2 and income. In the same year, a contrary phenomenon for Tunisia was observed: Ben and Ben (2015), utilized the ARDL approach and VECM Granger causality to examine the relationships between per capita CO_2 emissions, GDP, energy consumption, and international trade for Tunisia during 1980–2009. The

study confirmed that the inverted U-shaped EKC is not supported graphically nor analytically in Tunisia.

Using the ARDL approach, Al-Mulali et al. (2016) conducted a study to validate the EKC hypothesis in Kenya by utilizing time-series data on CO_2 emission per capita, GDP per capita, per capita electricity (from renewable sources), electricity from fossil fuels, financial development index, trade openness, and urban population ratio, over the period 1980–2012. The study confirmed that while urbanization, GDP growth, trade openness and use of fossil fuel energy cause environmental damage, renewable energy consumption contracts it. In addition, the study produced evidence in support of the existence EKC hypothesis in the Kenyan economy.

In Croatia, the EKC hypothesis was examined by Ahmad et al. (2017), using ARDL and VECM methodologies. The study assessed data on CO_2 emissions and real GDP and confirmed the validity of EKC for Croatia in long run; bi-directional causality between CO_2 emissions and income in the short run; and unidirectional causality from income to CO_2 emissions in the long run. Similarly, the EKC hypothesis was tested for Austria using the ARDL method. Methane emissions (CH4), GDP per capita, electricity production from renewable energy sources (excluding hydro), and trade openness were analyzed as variables. The study confirmed an inverted U-shaped income-environment relationship (Benavides et al., 2017). During the same year, similar results were obtained for Myanmar when Aung et al. (2017) conducted a study on economic growth and environmental degradation. The study employed data on a trade intensity, financial openness, a set of selected greenhouse gases (i.e., CO_2, CH_4, and N_2O), GDP growth, and urbanization growth. Using 3 different unit root tests (Phillips-Perron (PP), Augmented Dickey-Fuller (ADF) & Elliott-Rothenbergy-Stock (ERS) tests) and ARDL cointegration method, the study revealed that EKC holds for CH_4, N_2O but not with CO_2.

Ali et al. (2017) endeavored to re-visit the validation of EKC in the context of Malaysia by utilizing time-series data on GDP per capita, financial development, trade openness, foreign direct investments, energy consumption, and CO_2 emissions for 1971–2012. In addition to the ARDL bound testing approach, which was largely used by previous studies, the study also used Dynamic Ordinary Least Square (DOLS). The two methods jointly confirmed the existence of the EKC hypothesis. Similarly, Suki et al. (2020) revisited the study on EKC in Malaysia using Quantile Autoregressive Distributed Lag and quarterly data on globalization and ecological footprints over the period 1970–2018. The study outcomes confirmed the existence of EKC in Malaysia. Further, the study recommended that for environmental sustainability, Malaysia should pay more attention to social and political globalization.

Unlike most of the previous studies which utilized one proxy for environmental damage, Mrabet and Alsamara (2017), decided to undertake a comparative study to validate the EKC hypothesis in Qatar using CO_2 and ecological footprint as independent alternative proxies for environmental damage. Time-series data on trade openness, real GDP, financial development, and energy consumption on the CO_2 emissions and then on the ecological footprint over the 1980–2011 period were investigated using the ARDL model. The result confirms that the EKC hypothesis is not supported in Qatar when CO_2 emission is used as an environmental degradation indicator, but it holds when using the ecological footprint.

In Peru, Zambrano-Monserrate et al. (2018) used ARDL methodology and Granger VECM to analyze the relationship between GDP, CO_2 emissions from energy consumption, total renewable electricity consumption, dry natural gas consumption, and total petroleum consumption (all in per capita terms) during 1980–2011. The study did not support the EKC hypothesis. The researchers recommended that the Peruvian government should implement environmental policies that promote the use of alternative

energy sources, e.g., solar, wind, and hydraulics to minimize greenhouse gas emissions.

ii) Studies focusing on a single country and utilizing other methods than ARDL cointegration methodology

There is another pattern of studies still focusing on a single country but using other methods than ARDL to assess the legitimacy of the EKC hypothesis, e.g., Guangyue and Deyong (2011), utilized provincial panel data on CO_2 emissions and real GDP per capita for China for the period 1990–2007 to examine the existence of EKC. The panel unit root method and Engle-Granger Two-Steps Method confirmed the existence of EKC only on the Chinese central and eastern regions while missing in the western region. Still in China, Liu et al. (2015) carried out a study focusing on the influence of population, income, and technology on energy consumption and industrial pollutant emissions (i.e., exhaust gases, wastewater, and solid waste), using provincial panel data over the period 1990–2012. Unlike Guangyue and Deyong (2011), Liu employed the extended STIRPAT model[2] which confirmed that EKC does not hold for industrial wastes. In the same year, still in China, Hao et al. (2015), used panel data of 29 Chinese provinces from 1995–2012 to predict China's coal consumption through 2020. Data on coal consumption, urbanization, trade openness, and *GDP per capita* were explored. The Fixed Effects (FE) estimator, Biased-Corrected Least Square Dummy variable (LSDVC) model, and Generalized Method of Moments (GMM) methodologies confirmed an inverted-U shaped EKC for coal consumption in China.

In Tanzania, Mohammed Albiman et al. (2015) assessed the association between economic growth, energy consumption and environmental damages by utilizing time-series data on per capita electricity consumption, GDP, and CO_2 emissions over the period 1975–2013. A combination of

[2] The STIRPAT model is the stochastic form of IPAT (acronyms of impacts, population, affluence, and technology). STIRPAT was formulated to examine the eco-environment impacts (I) of population (P), affluence (A) and technology (T), (York et al., 2003).

estimation techniques[3] was used and the results supported the EKC hypothesis.

Following the earlier EKC studies (e.g., Guangyue & Deyong, 2011; Hao et al., 2015; Liu et al., 2015; etc.) on China, Wang and Ye (2017), re-examined EKC for China's city-level of CO_2 emissions, using panel data and spatial econometric modeling i.e., Spatial lag model (SLM) and Spatial Error Model (SEM). The EKC was confirmed at the city-level. It was further affirmed that emissions would not decrease automatically as income increases; policy actions are necessary for reduced emissions. Still in China, Sharif et al., (2020) conducted a study to examine the dynamic relationship between tourism, renewable energy, energy utilization, and Carbon dioxide emission for the period 1974 to 2016. The Morlet partial and multiple Wavelet time frequency approach revealed that in the case of China, tourism can cause increased energy utilization and carbon dioxide emissions. Besides, tourism activities and consequently tourism income facilitates reduction of environmental degradation in the medium long run.

In the USA, Sencer (2017) examined the EKC hypothesis using panel data on 50 U.S. States during 1960–2010. Augmented Mean Group (AMG) and Common Correlated Effects Mean Group Estimator (CCEMG) were employed for analysis. The results were mixed: the AMG estimator strongly validates the EKC hypothesis, while the CCEMG supported the hypothesis only in 10 states. Later, Işık et al. (2019) set forth to re-validate the EKC hypothesis in the USA by limiting the study to only 10 States with leading levels of CO_2 emissions. The real GDP, population, and energy consumption data over the period 1980–2015 were assessed. The panel estimation with cross-sectional dependence methodology confirmed the existence of EKC in 5 states (Florida, Illinois, Michigan, New York, and Ohio).

B. *Multi-country studies*

[3] Toda & Yamamoto non-Causality test, Impulse response & Variance Decomposition, Augmented and Dickey–Fueller test, and Philips & Perron Test of unit root tests.

Some researchers have endeavored to explore the validity of the EKC hypothesis by focusing on more than one country and employing a variety of analytical methods. Among others, the generalized method of moments (GMM) and ARDL are frequently preferred.

i) Multi-countries studies using ARDL cointegration approach

Some researchers have employed the ARDL approach and thereby specifying the ARDL short-run model (when there is no cointegration), VECM (when all variables are cointegrated), or ECM (when not all variables are cointegrated). For example, Apergis et al. (2010) employed VECM to examine the relationships between CO_2 emissions, nuclear energy consumption, renewable energy consumption, and economic growth for a cluster of 19 developed and developing economies over the period 1984–2007. The study results did not support the EKC hypothesis. Likewise, Baek and Kim (2010) implemented a study to analyze the relationships between trade openness, income growth, energy consumption, and CO_2 emissions for G-20 countries for the period 1971–2006. Johansen's maximum likelihood procedure was used to estimate the coefficients of the cointegrated vector autoregression (VAR). The study confirmed that the EKC hypothesis holds only for developed countries.

Pao and Tsai (2010) investigated the relationships between CO_2 emissions, energy consumption and real GDP for Brazil, Russia, India, and China (BRIC countries) during the period 1971–2005, except for Russia (1990–2005). VAR and ARDL error correction model (ECM) confirmed the presence of an inverted U-shaped curve. Similar results were obtained by Jaunky (2011) after carrying out a study to assess the relationship between CO_2 emission and real per capita GDP for 36 high-income countries for the period 1980–2005. The ARDL approach based on VECM affirmed the existence of EKC in those countries.

Using ARDL Bounds test approach, Onafowora and Owoye (2014) examined the relationship between economic growth, energy consumption,

population density, trade openness, and CO_2 emissions in Brazil, China, Egypt, Japan, Mexico, Nigeria, South Korea, and South Africa for the period 1970–2010. The results show that the EKC hypothesis holds only in Japan and South Korea[4]. Subsequently, Alam et al. (2016) investigated the impacts of real GDP, energy consumption, and population growth on CO_2 emissions by utilizing an annual time-series data of India, Indonesia, China, and Brazil for the period 1970–2012. The ARDL bounds test approach was used and generated mixed results: EKC hypothesis holds in the long run and short run in Indonesia and Brazil, while in China it holds in the short run only. The hypothesis is not supported in India.

The absence of the EKC hypothesis has also been noted in some regions. For instance, Zoundi (2017) conducted a study to validate the EKC hypothesis and examine the impacts of renewable energy on CO_2 emissions for 25 selected African countries, during the period 1980–2012. The results of the ARDL methodology provided no support for the EKC hypothesis. Likewise, Beşe and Kalayci (2019), performed a study to validate the EKC hypothesis in UK, Spain, and Denmark by utilizing data on GDP, CO_2 emissions, and energy consumption. ARDL bounds test, Toda and Yamamoto Granger non-causality test, and VAR Granger Causality test were employed for analysis. The results could not support the EKC hypothesis.

ii) Multi-country studies using the Generalized Method of Moment (GMM) approach

Among other econometric methods, the Generalized Method of Moments (GMM) is one of the frequently used methods, especially with cross-sectional panel data. For example, Ibrahim and Law (2014) undertook a study to assess the interaction between per capita CO_2 emissions, real GDP per capita, and energy consumption per capita, using panel data for 69

[4] In the other six countries, the long-run relationship between economic growth and CO_2 emissions follows an N-shaped trajectory and the estimated turning points are much higher than the sample mean.

developed and developing countries over the period 2000–2008. The system GMM found evidence substantiating the presence of EKC.

Ben Youssef et al. (2016) investigated the EKC hypothesis for 56 countries (categorized as high, middle, and low-income countries), using annual panel data on CO_2 emission per capita, the growth rate of per capita energy consumption, the growth rate of per capita financial development, and the growth rate of per capita foreign-trade for the period 1990–2012. The GMM approach confirmed existence of EKC hypothesis. Similarly, Lau et al. (2018) undertook a study to examine the role of institutional quality on EKC for 100 developed and developing nations. The study used a GMM estimator to analyze data on CO_2 emissions, GDP per capita, trade openness, institutional quality, and foreign direct investment. The results supported the EKC hypothesis. Taking a sample of 120 countries, Barra and Zotti (2018) investigated the non-linearity between national income and environmental pollution. Annual data on GDP per capita and CO_2 over the period 2000–2009 were analyzed using the 2-Stage GMM approach. The study confirmed the absence of EKC hypothesis once the issue of (non) stationarity has been considered.

In Asia, Budhi and Widodo (2019) carried out a study to validate the EKC hypothesis in 9 ASEAN countries by utilizing CO_2 emissions, GDP per capita, and energy consumption as variables over the period 2007–2014. The GMM estimation method substantiated the EKC hypothesis in all the 9 countries[5]. In the same year, Lau et al. (2019) undertook a study to assess the EKC hypothesis in 18 OECD countries for the period 1995–2015 by utilizing data on CO_2 emissions, GDP per capita, nuclear electricity, non-renewable electricity, and trade openness. The panel dynamic GMM and FMOLS (Fully Modified Ordinary Least Squares) analysis supported the EKC hypothesis.

Boubellouta and Kusch-Brandt (2020) examined the existence of EKC in thirty high income European countries by utilizing data on e-waste per

[5] These are Brunei, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapura, Thailand, and Vietnam.

capita, information and communication goods exports, population, and GDP per capita for the period 2000–2016. The GMM method confirmed the presence of the inverted U shaped in the selected countries.

iii) *Multi-countries studies using other than the ARDL and GMM methods*

In addition to the ARDL cointegration and GMM approach, some researchers have utilized other methods to assess the validity of the EKC hypothesis in a group of countries. For instance, Orubu and Omotor (2011) used longitudinal data on suspended particulate matter and organic water pollutants, to examine the relationship between per capita income and environmental degradation in 47 African countries during 1990–2002. The Ordinary Least Square method results supported the EKC hypothesis.

Mensah (2014) examines the causal relationship among energy use, real GDP, and CO_2 emissions in the presence of regime shifts in six emerging African economies (Egypt, Ghana, Nigeria, Kenya, Senegal, and South Africa) for the period 1980–2000 using the Gregory and Hansen threshold cointegration and the Toda and Yamamoto Granger causality techniques. The results support the EKC hypothesis. Similarly, Cowan et al. (2014) investigated the causal relationships between electricity consumption, GDP and CO_2 emissions in Brazil, Russia, India, China, and South Africa (the BRICS countries) for the period 1990–2010 using panel causality analysis. The outcome supports the EKC hypothesis.

Considering 9 MENA countries[6], Farhani et al. (2014) employed panel data analysis to assess economic growth – carbon dioxide emissions relationship over the period 1990–2010. The study results confirm the existence of the EKC hypothesis, and that while international trade and energy consumption aggravates the quality of environment, economic growth augments energy pollutants. Likewise, Heidari et al. (2015), used a panel smooth transition

[6] The 9 countries are Algeria, Egypt, Iran, Israel, Jordan, Morocco, Saudi Arabia, Syria, and Tunisia.

regression (PSTR) model to investigate the relationship between economic growth, CO_2 emissions, and energy consumption in Indonesia, Malaysia, Philippines, Singapore, and Thailand (i.e., ASEAN countries) during 1980–2008. They found that the EKC hypothesis is supported in the ASEAN region.

In the European Union (EU), a study on economic growth and environmental quality to validate the EKC hypothesis was carried out by Mazur et al. (2015), using panel data for 28 EU members for the period 1992–2010. Fixed effect and random effect models, as well as the Hausman specification test was employed to analyze data on CO_2 and GDP. No U-shaped relationship was confirmed for all the 28 countries.

Using panel data for some Asia-Pacific countries for the period 1995–2013, Shakouri et al. (2017) examined the impact of economic growth and tourism development on CO_2 emissions. The panel Granger causality assessment confirmed existence of EKC in the selected countries in the region. Further, the study established that GDP is associated with energy consumption which in turn accelerates CO_2 emissions.

Fakih and Marrouch (2019) used a non-parametric model to investigate the relationships between economic growth and the environment by utilizing CO_2 emissions and GDP per capita data for 10 Middle East and North Africa (MENA) countries during 1980–2010. Unlike the parametric study of Farhani et al. (2014), the results do not vindicate the inverted-U shape income-environment relationship. Affirmative results were obtained by Shahbaz et al. (2019), when they took a combination of 86 high, middle, and low-income countries for 1970–2015 and explored the relationship between globalization and energy consumption. Utilizing a cross-correlation method, the EKC hypothesis was supported in 64 countries.

The influence of the internet on environmental quality is gradually being considered in the economic-environment literature. Zhang and Meng (2019) pioneered a study on 115 countries with various levels of per capita

GDP to investigate how internet penetration impacts the income-environment relationship. Data on CO_2 emissions, GDP per capita, investment intensity, internet, electricity consumption, foreign direct investment, total trade, industrialization, urbanization, aging rate, population growth, population density, democracy, and proportion of women in the total labor force over the period 1996–2014 were assessed using functional forms with the quadratic transformation of independent variables. The study supports the EKC hypothesis.

Altıntaş and Kassouri (2020) analyzed CO_2, ecological footprints, renewable energy, and fossil fuel data on 14 European countries for the period 1990–2014, using heterogeneous panel model. The study outcome could not support EKC in Europe when CO_2 emission is a proxy for degradation. The researchers concluded that the EKC hypothesis depends on the environmental indicators used. Likewise, Halliru et al. (2020) examined the impact of financial development, trade openness, human capital, biocapacity and economic growth on carbon dioxide emissions over the period 1970–2017 in the 6 member countries of the economic community of West Africa (ECOWAS). The Panel Quartile Regression method affirmed the absence of EKC in the ECOWAS region

TABLE 1: STUDIES ON EKC HYPOTHESIS - SUMMARY

Variables: AGR = aging rate, BC = biocapacity, CAP = capital, CH4 = methane emissions, CC = coal consumption, CO2, = carbon dioxide emissions, DEM = democracy, EC = energy consumption, ECpc = per capita energy consumption, ELRpc = electricity from renewable sources per capita, ELFpc = electricity from fossil fuels per capita, EF = ecological footprint, ELCpc = per capita electricity consumption, ECGpc = the growth rate of per capita energy consumption, ELRpc = per capita total renewable electricity, ELC = electricity consumption, ELN = non-renewable electricity, FDI = financial development index, FOP = financial openness, FDE = financial development, FDI = foreign direct investment, FDGpc = the growth rate of per capita financial development, FTGpc = the growth rate of per capita foreign trade, FF = fossil fuel, FODI = foreign direct investment, GDPpc = gross domestic product per capita, GDP = gross domestic product, GLB = globalization, HC = human capital, ICTex = information and communication goods exports, IND = industrialization, INT = international trade, INP = industrial pollutant emissions, ITA = International tourists arrivals, INW = internet, INVT = investment intensity, IQ = institutional quality, LAB = labor, N2O = nitrous oxide, NGC = natural gas consumption per capita, NEC = nuclear energy consumption, OWP = organic water pollutants, PUPOP = proportion of urban population, PCpc = petroleum consumption per capita, POPG = Population growth, POP = total population, PTR = trade as percentage of GDP, PD = population density, PECpc = per capita primary energy consumption, REFC = renewable energy & fossil energy consumptions, RSIVA = ratio of the secondary industry value added to GDP, RE = renewable energy, SPM = suspended particulate matter, TRO = trade openness, TI = trade intensity, TECH = technology, TOR = total trade, UGR = urban growth, UR = urbanization, WEEEpc = e-waste per capita, and WLAB = proportion of women in total labor force.

Methodology: ARDL = autoregressive distributed-lagged model, ADF = Augmented Dickey-Fuller test, C-COR = cross-correlation, DOLS = Dynamic Ordinary Least Square, ECM = error correction model, ERS = Elliott-Rothenbergy-Stock test, EG = Engle-Granger two-step cointegration method, FE = Fixed Effects estimator, FMOLS = Fully Modified Ordinary Least Squares, FE = fixed effect model, FQF = Functional forms where regressors are quadratically transformed, GMM = Generalized Method of Moments, GHTC = Gregory and Hansen threshold cointegration, HPMA = heterogeneous panel model analysis, IPS = Im-

Pesaran-Shin test, IRV = Impulse response and Variance, J-J = Johansen–Juselius test, LSDVC = Biased-Corrected Least Square Dummy variable model, LLC = Levin-Lin-Chu test, OLS = Ordinary Least Square, PP = Phillips-Perron test, PCA = Panel causal analysis, PSTR = panel smooth transition regression model, PQR = Panel Quartile Regression, RE = random effect model, STRIPAT = Stochastic Impacts by Regression on Population, Affluence and Technology[7], SLM = Spatial lag model, SEM = Spatial Error Model, TY = Toda and Yamamoto test, VECM = Vector error correction model, VAR = Vector autoregression.

A. Single Country Studies

Author(s)	**Journal**	**Period**	**Destination**	**Methodology**	**Variables**	***Does the EKC hypothesis hold?***
(Al-Mulali et al., 2016)	*Natural Hazards*	1980–2012	Kenya	ARDL & ECM Granger Causality	CO_2, GDP_{pc}, ELR_{pc}, ELF_{pc}, FDI, TRO, PUPOP.	Yes
(Aung et al., 2017)	*Environmental Science and Pollution Research*	1970-2014	Myanmar	ARDL (unit root: ADF, PP, ERS)	CO_2, CH_4, N_2O, GDP, TI, FOP, UGR.	Yes, with CH_4 and N_2O only
(N. Ahmad et al., 2017)	*Energy*	1992Q1 - 2011Q1	Croatia	ARDL, VECM Granger cau'ty	CO_2 and GDP	Yes, in the long-run
(Ali et al., 2017)	*Renewable and Sustainable Energy Reviews*	1971–2012	Malaysia	ARDL, DOLS	GDP_{pc}, FDE, TRO, FDI, EC, and CO_2	Yes

[7] This is a statistical and conceptual model for assessing human impacts on the environment at virtually any scale to the analytic strategy testing Structural Human Ecology Theory (SHE).

(Benavides et al., 2017)	*International Journal of Energy EC & Pol.*	1970-2012	Austria	ARDL	CH4, GDP, ELR, and TRO	Yes, in the long-run.
(Begum et al., 2015)	*Renewable and Sustainable Energy Reviews*	1970-1980	Malaysia	ARDL	CO_2, GDP, EC POPG	No
(Ben & Ben, 2015)	*Renewable and Sustainable Energy Reviews*	1980–2009	Tunisia	ARDL, VECM Granger causality	CO_2, GDP, EC, and INTR	No
(Bölük & Mert, 2015)	*Renewable and Sustainable Energy Reviews*	1961-2010	Turkey	ARDL, ECM Granger causality	CO_2, ELR, and GDP	Yes
(Guangyue & Deyong, 2011)	*Chinese Journal of Population Resources and Environment*	1990–2007	China	EG two-step method	CO2, GDP_{pc}	Yes, for eastern & central regions.
(Hao et al., 2015)	*Energy Policy*	1995-2012	China	FE, LSDVC, GMM.	*CC, TRO, UR, GDP_{pc}, RSIVA*	Yes
(Işık et al., 2019)	*Environmental Science and Pollution Research*	1980-2015	10 USA states	Panel estimation	CO_2, GDP, GDP_{pc}, POP and REFC	Yes, in 5 out of 10 states
(Y. Liu et al., 2015)	*Applied Energy*	1990–2012	China	STIRPAT model	POP, GDP, TECH, EC, INP.	Not hold for INP
(Mrabet & Alsamara, 2017)	*Renewable and Sustainable Energy Reviews*	1980–2011	Qatar	ARDL	GDP, EC, FDE, TRO, CO_2, EF	Holds EF, not with CO_2.
(Mohammed Albiman et al., 2015)	*International Journal of Energy Sector Management,*	1975-2013	Tanzania	TY non-Causality, IRV, Unit root: ADF, PP.	ELC_{pc}, GDPpc, CO_2	Yes

(Nasir & Ur Rehman, 2011)	*Energy Policy*	1972-2008	Pakistan	Johansen cointegration	CO_2, GDP_{pc}, EC_{pc}, TRO	Yes, in the long-run.
(Robalino-López et al., 2015)	*Renewable and Sustainable Energy Reviews*	1980-2025	Venezuela	Panel cointegration	GDP, EC, CO_2	Yes
(Saboori & Sulaiman, 2013)	*Energy Policy*	1980–2009	Malaysia	ARDL, J-J, VECM Granger Causality.	CO_2, EC_{pc}, GDP_{pc}	Hold for disaggregate EC data only.
(Saboori et al., 2012)	*Energy Policy*	1980-2009	Malaysia	ARDL	GDP_{pc}, CO_2	Yes
(Sencer, 2017)	*Renewable and Sustainable Energy Reviews*	1960–2010	50 U.S. States	AMG, CCEMG	CO_2, GDP_{pc}, POPG, EC_{pc}.	Yes, for AMG; partial for CCEMG.
(Suki et al., 2020)	*Journal of Cleaner Production*	1970 – 2018	Malaysia	QARDL	GLB, EF,	Yes
(Tiwari et al., 2013)	*Renewable and Sustainable Energy Reviews*	1966–2011	India	ARDL	CC, GDP, TRO, CO_2	Yes
(Wang & Ye, 2017)	*Spatial Statistics*	2013	China	SLM and SEM	CO_2, GDP_{pc}	Yes
(Zambrano-Monserrate et al., 2018)	*Renewable and Sustainable Energy Reviews*	1980–2011	Peru	ARDL, VECM Granger causality	CO_2, EC, GDP_{pc}, ELR, NGC, PC_{pc}	No

Multi-Country Studies						
Author(s)	**Journal**	**Period**	**Destination**	**Methodology**	**Variables**	***Does the EKC hypothesis hold?***
(Altıntaş & Kassouri, 2020)	*Ecological Indicators*	1990-2014	14 EU countries	HPMA	CO_2, EF, RE, FF.	Yes, with EF; No with CO_2
(Apergis et al., 2010)	*Ecological Economics*	1984–2007	19 deve'd + developing nations	VECM	CO_2, NEC, RE, GDP	No
(Md. M. Alam et al., 2016)	*Ecological Indicators*	1970–2012	India, Indonesia, China, Brazil	ARDL	GDP, EC, POPG, CO_2.	Yes, (Brazil, Indonesia); China in short-run.
(Barra & Zotti, 2018)	*Environmental Economics and Policy Studies*	2000-2009	120 countries	2-Step GMM	GDP_{pc}, CO_2	No
(Ben Youssef et al., 2016)	*Energy Economics*	1990-2012	56 countries	GMM (unit root: LLC, IPS)	CO2, $ECG_{pc,}$ FDGpc, FTGpc	Yes
(Baek & Kim, 2010)	*Journal of East Asian Economic Integration*	1971-2006.	G-20 countries	VAR; Johansen's max. l'hood	TRO, GDP, EC, CO_2.	Yes, for developed economies
(Beşe & Kalayci, 2019)	*Panoeconomicus*	1960-2014	Spain, UK, Denmark	TY, ARDL,	GDP, CO_2, EC	No
(Budhi Utomo & Widodo, 2019)	*Economics Department, FEB Gadjah-mada University*	2007-2014	9 ASEAN countries	GMM	CO_2, GDP_{pc}, EC	Yes
(Boubellouta & Kusch-	*Journal of Cleaner Production*	2000-2016	28EU + 2	GMM	$WEEE_{pc}$, ICT_{ex}, GDP_{pc}	Yes

Brandt, 2020)						
(Cowan et al., 2014)	*Energy Policy*	1990–2010	BRICS countries[8]	PCA	ELC, GDP, CO_2	Yes
(Farhani, Shahbaz, et al., 2014)	*Economic Modelling*	1990-2010	9 MENA countries	PCA, VECM Granger.	CO2, GDP, EC, INT, CAP, LAB	Yes
(Fakih & Marrouch, 2019)	*International Advances in Economic Res'*	1980-2010	MENA countries[9]	Non-parametric model	CO_2, GDP_{pc}	No
(Halliru et al., 2020)	*Journal of Cleaner Production*	1970-2017	6 ECOWAS countries (West Africa)	PQR	FDE, TOR, HC, BC, GDP, CO_2	No
(Heidari et al., 2015)	*International Journal of Electrical Power & Energy Systems*	1980–2008	5 ASEAN countries	PSTR	GDP, CO_2, EC	Yes
(Ibrahim & Law, 2014)	*Renewable and Sustainable Energy Reviews*	2000–2008	69 dev'd & dev'ing countries	GMM	CO_2, GDP_{pc}, EC_{pc}	Yes
(Jaunky, 2011)	*Energy Policy*	1980-2005	36 high-income countries	ARDL and VECM	CO_2, GDP_{pc}	Yes
(Lau et al., 2018)	*Advances in Pacific Basin Business, Economics and Finance*	2002-2014	100 developed + developing nations	GMM	CO_2, GDP_{pc}, TRO, IQ, FODI	Yes

[8] Brazil, Russia, India, China, and South Africa.
[9] 10 countries from North Africa and Middle East.

(Lau et al., 2019)	*Economic Modelling*	1995-2015	18 OECD countries	GMM and FMOLS	CO_2 GDP_{pc}, NEC, ELN, TRO.	Yes
(Mensah, 2014)	*Energy Policy*	1980-2000	6 African emerging economies[10]	GHTC, TY Granger causality	EC, GDP, CO_2	Yes
(Mazur et al., 2015)	*International Journal of Management and Economics*	1992-2010.	28 EU countries	FE and RE models	CO_2, GDP_{pc}	No
(Onafowora & Owoye, 2014)	*Energy Economics*	1970-2010	8 countries[11]	ARDL	CO_2, GDP_{pc}, EC_{pc}, INT, PTR, PD.	Yes, in Japan and South Korea
(Orubu & Omotor, 2011)	*Energy Policy*	1990-2002	47 African Countries	OLS	GDP_{pc}, SPM, OWP.	Yes
(Pao & Tsai, 2010)	*Energy Policy*	1971–2005	BRIC countries	VAR and ECM	CO_2, EC, GDP	No
(Shahbaz et al., 2019)	*International Journal of Finance & Economics*	1970-2015	86 countries (high-middle-low income)	C-COR	GLB, EC	Yes in 64 countries
(Shakouri et al., 2017)	*Anatolia*	1995-2013	12 Asia-Pacific countries	Panel Granger causality	CO_2, EC, GDP_{pc}, ITA,	Yes
(Zhang & Meng, 2019)	*Sustainability*	1996-2014	115 countries	FQF	CO_2, GDPpc, INVT, INW, ELC, FDI, TOR, IND,	Yes

[10] Egypt, Ghana, Nigeria, Kenya, Senegal, and South Africa
[11] Brazil, China, Egypt, Japan, Mexico, Nigeria, South Korea, and South Africa.

					URB, AGR, POG, PD, DEM, WLAB	
(Zoundi, 2017)	*Renewable and Sustainable Energy Reviews*	1980-2012	25 African Countries	ARDL	CO_2, GDP_{pc} PEC_{pc}, ELR_{pc}.	No

4. Evaluation, Discussions, and Recommendations

i) Evaluation and Discussions

The pioneer works of Grossman and Krueger (1995), Mondiale (1992), Shafik and Bandyopadhyay (1992), and Panayotou (1993) inspired a lot of researches primarily seeking to empirically validate the EKC hypothesis either in a single country or in a group of countries. There is also a couple of works such as Dinda (2004), Gill et al. (2017) and Purcel (2020) giving a critical consideration of the EKC hypothesis rather than seeking to validate it in a particular country or region. In overall, we observed some specific trends in the literature, and we summarize the main four as follows:

a. Proxies for the environmental and economic indicator

Most scholars have utilized time-series data on CO_2 emissions as a proxy for environmental damage in both the country-specific and multi-country studies on EKC. For instance, 85% of all the works reviewed (i.e., 41 out of 48) utilized CO_2 as a proxy for environmental degradation. The remaining studies used other environmental pollutant indicators such as ecological footprints, nitrous oxide, sulfur dioxide, suspended particles in the air and water, and e-wastes. Likewise, there is a heavy reliance on GDP as a proxy for an economic indicator. For instance, 96% of all the studies reviewed (i.e., 45 out of 48) employed data on GDP (either as real GDP or real GDP per capita) as a proxy for the economic indicator.

b. The centrality of energy consumption for validating the EKC hypothesis

There is a growing consensus that energy consumption is a significant variable for validating the EKC hypothesis. This is because 64% of the studies reviewed (30 out of 48) used energy consumption as one of the principal control variables. Energy consumption is used in empirical models in various forms such as fossils, nuclear, renewables, electricity from non-renewable sources,

etc. In particular, it has been affirmed that fossil fuel is the most notorious element distorting environmental sustainability (Altıntaş & Kassouri, 2020; Sarkodie & Strezov, 2018). Other variables frequently employed by both country-specific and multi-country studies include trade openness, population growth, democracy, internet penetration, globalization, institutional quality, financial openness, foreign direct investment, etc., (Al-Mulali et al., 2016; Ben Youssef et al., 2016; Lau et al., 2018; Zhang & Meng, 2019). Further, it has been affirmed that normally GDP growth, primary energy consumption from fossils, urbanization, and trade openness degrade the environment in both the short run and long run (Al-Mulali et al., 2016).

c. Popular econometric estimation methods for validation of the EKC hypothesis

Several econometric methods and tests have been employed to validate the EKC hypothesis. Single country studies have largely used the autoregressive distribute-lagged model (ARDL) as a key method for analysis. Of all the single country studies reviewed, 77% used the ARDL cointegration approach. Other frequently used methods under this category of studies include Granger Causality based on vector error correction model (VECM), Generalized Method of Moments (GMM), and panel cointegration analysis. It also appears that the availability of data has largely influenced the choice of the period to be studied and somewhat the method to be employed. Besides, there is overwhelming evidence on the use of supplementary tests to reinforce the reliability of the various models. These include ADF and PP tests for unit root, CUSUM and CUSUMSQ tests for model stability, Johansen–Juselius test for cointegration of time series, etc.

Concerning the multi-country studies, various methods are being explored, starting from the most traditional approaches such as OLS estimations to the most recent and sophisticated approaches such as ARDL. Nevertheless, based

on the works reviewed, 56% of research on multi-country utilized GMM and ARDL methodologies.

d. Empirical evidence in support of the EKC hypothesis

As regards the overall validation of the EKC hypothesis, 37 studies out of 48, i.e., 77% of all the studies reviewed, produced some evidence to support the existence of an inverted U-shaped curve, and so affirmed the EKC hypothesis in the long run, short run, or both. The percentage figure here includes multi-country studies with mixed results, i.e., where EKC holds for some countries but not all in the group. The rest, i.e., 23% (11 out of 48) failed to validate the hypothesis.

ii) Gaps in the literature and recommendation for further research

The current study observed some gaps in the existing EKC hypothesis literature. We summarize the main four as follows. First, most of the studies on the EKC hypothesis are focusing largely on Asia and Middle East countries. For instance, Malaysia and China are among the Asian countries which have been researched extensively. The USA, South America, and Europe are also reasonably researched. Nevertheless, there are very few studies focusing on Africa, and especially in sub-Saharan Africa. For instance, out of the 48 studies reviewed, only 2 focused on a specific African country (Al-Mulali et al., 2016; Mohammed Albiman et al., 2015), while only 8 multi-country studies included African countries. More research on the EKC hypothesis focusing especially on sub-Saharan Africa is highly recommended to develop a more comprehensive global picture on how socio-economic activities impact the quality of the natural environment and thereby form a basis for more sustainable income-environment policies.

Second, most of the studies seeking to validate the EKC hypothesis in a single or group of countries, utilize CO_2 as an indicator for environmental

degradation. However, this indicator is not comprehensive enough because it does not capture all the consequences of human dependence on nature. For instance, we observed that out of 48 studies reviewed, 41 studies, i.e., 85%, utilized data on CO_2. The reliance on CO_2 is justified for two reasons: CO_2 is the leading pollutant out of the 5 most notorious greenhouse gases (Britannica, 2020). Furthermore, CO_2 data are more established and easily accessible as compared with data for other environmental pollutants. Nevertheless, as a single indicator, CO_2 does not give a comprehensive picture of environmental degradation. This is because CO_2 emissions reflect the rate at which the natural environment is damaged by excessive CO_2 emissions resulting from various activities; it does not capture other forms of emissions nor other forms of environmental degradation such as deforestation, solid and liquid wastes, toxic wastes, etc. A more comprehensive indicator is necessary. For instance, Altıntaş and Kassouri, (2020) and Mrabet and Alsamara (2017) suggest the use of ecological footprint (EF) for it is a more comprehensive indicator of the extent of human dependence on nature to sustain a particular lifestyle. Out of the 48 works reviewed, only 3 works used EF as a proxy for environmental degradation. The upcoming researchers need to factor in EF in their investigation to generate more evidence on the suitability of comprehensive indicators for environmental degradation.

Third, the EKC hypothesis has been widely tested but not many studies have taken a step to include a robust environmental damage forecasting application. For instance, environmental logistic curve (ELC) can be used to extend the EKC to predict CO_2 for a particular country. Therefore, for future studies we recommend the inclusion of a robust forecasting aspect using relevant forecasting techniques such as weighted moving average, exponential smoothing, trend projection, seasonal indexes, etc., as it may be appropriate to forecast approximate future impact of growth on the natural environment.

Fourth, most EKC studies have not paid adequate attention on the ambiguity of meaning of sustainability and disagreement on the prospects to achieve environmental sustainability (Holdren et al., 1995; Toman, 1992). Approaching environmental degradation as primarily a consequence of economic activities, one risks losing focus on the fact that degradation can depend on a number of factors. Besides, the literature confirms that economists and ecologists are not in agreement on some basic environmental tenants. For instance, most economists consider ecosystem carrying capacity as dynamic and so assume that technological innovation and resource substitution can balance for its fluctuations. On the contrary, ecologists perceive nature's carrying capacity as limited and so come to an assumption that human impacts must be strictly monitored to avoid overrunning the carrying capacity (Amsler, 2009; Holdren et al., 1995; Toman, 1992). Moving forward, interdisciplinary studies are the panacea to the ambiguity and disagreement on the concept of sustainability. In this case, future EKC studies by economists must incorporate more explicitly the work of ecologists into economic value analyses. Likewise, ecologists must always consider the complexity surrounding human behavior and the processes of social decision.

Finally, most studies are using aggregate GDP data as a proxy for economic growth. For instance, 93% of all the studies reviewed used real GDP or real GDP per capita as a proxy for economic growth. However, we observe that although aggregate data such as real GDP gives a comprehensive picture of aggregate economic growth, the income-environment relationship may not be uniform across a particular country or all the sectors in an economy. For instance, the income-environment relationship between rural and urban or between the industrial sector and agricultural sectors will ideally be quite different. At present, most studies on EKC have concentrated on aggregate country-specific scenario or group of countries; no adequate studies are

focusing on key regions and sectors of an economy to inform the findings based on overall GDP. This view is also maintained by Guangyue and Deyong (2011), and Wang and Ye (2017). Therefore, future studies must consider data disintegration, e.g., among provinces; rural versus urban, and across sectors. Activities of different sectors have different levels of impacts on the environment, and so sectoral assessment will buttress the countrywide assessment and make it possible to target certain sectors when defining country-level environmental protection regulations.

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PAPER II:

INVESTIGATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM DEVELOPMENT: EVIDENCE FROM TANZANIA

Abstract

Tourism growth is an important component for welfare improvement in the host destination, but it can be associated with environmental degradation. The aim of the current study is to assesses the environmental impacts of tourism growth in Tanzania, using time series data for the period 1995 – 2017. It utilizes ecological footprints data as a proxy for environmental damage, tourism receipt as an economic indicator, and primary energy consumption, urban population, and trade openness as control variables. The study employs Autoregressive Distributed Lag Bounds Testing, Vector Error Correction Model (VECM) and Granger causality test for analysis and Wild Bootstrap approach to check the accuracy of the computed statistics. The VECM Granger causality test shows that in the case of Tanzania, international tourism revenue and trade openness compact environmental degradation, while urbanization and primary energy consumption accelerate it. Besides, while long run cointegration exist among the variables, the environmental Kuznets curve hypothesis was not ascertained in Tanzania. Therefore, Tanzania must adopt more proactive urban planning strategies to achieve sustainable urbanization thereby improve the quality of the environment. Additionally, it is important for Tanzania to make a strategic use of trade and tourism receipts, such as investment on renewable energy, to lessen dependence on fossil fuel, and improve environmental sustainability. So, the study opens new policy perspectives with wide international relevancy as outlined in the policy implication section.

Key words:

Environmental Kuznets Curve Hypothesis, Environmental quality, Tanzania, Tourism development, Vector error correction.

1. Introduction

Tourism is among the fastest growing sectors and a significant contributor to the overall economic growth of the developing economies. For instance, the World Travel and Tourism Council economic impact report affirms that in 2019, Tanzania tourism sector contributed 10.7% of the GDP and 11.1% of the total employment countrywide (WTTC, 2020). Likewise, in the same year the sector contributed 6.9% and 6.5% to GDP and total employment respectively in Africa (WTTC, 2020). Given the increasing contribution of the tourism sector to GDP and employment, policymakers in developing countries such as Tanzania have singled out tourism development as among the major suitable drivers of poverty reduction for it is has consistently proved to be a reliable source of employment (Adiyia et al., 2017; Kimaro & Ndlovu, 2017; Kyara et al., 2021b, 2021a). Besides, it has been affirmed that the rapid growth of tourism is rather a global phenomenon, and it is likely to continue for a while (WTTC, 2019). Therefore, Tanzania is pitching on tourism growth for an improved livelihood because tourism is one of the country's best source of employment for poverty alleviation

In developing countries where nature and culture tourism are domineering forms of tourism, tourism activities are highly associated with the quality of natural environment. For instance, expansion of tourism triggers growth of transport infrastructures and hospitality industry which in turn impact on the environment in terms of increased pollution, waste increase, destruction of biodiversity, depletion of natural resources, etc. It is in this background we observe that the consistent tourism growth in Tanzania, and beyond, shows that tourism development is associated with environmental degradation (Kyara et al., 2021b). For example, to sustain the annually increasing number of international tourists' arrival in Tanzania, more hotels and cottages are being built; more roads, railways, and airports are in the pipeline and the existing ones are being expanded. Such infrastructural developments are necessary for improved income and in turn improved livelihood of those at the bottom of the pyramid although not without a significant violation of nature. For example, construction and transportation activities which are directly associated with tourism growth may

involve forests clearing, land degradation, noise pollution, destruction of natural habitats, increased carbon dioxide (CO_2) emission leading to increased air and water pollution, and increased littering. All these add pressure on local resources and if not well managed they trigger various forms of environmental degradation (Choi and Turk, 2011; Ibrahim, 2018;Šimková and KASAL, 2012; WTTC, 2019).

Most developing countries in sub-Saharan Africa have singled out tourism as a tool for poverty alleviation. However, there are hardly empirical studies measuring the impacts of tourism development on the environment. Narrative studies dominate the assessment of the environmental impact of tourism growth, and most of them lack solid quantitative analysis, (Zhong et al., 2011). Consequently, some of the environmental policies are based on narrative studies and imported empirical evidence from studies conducted elsewhere, (Assante et al., 2012; Bateman and Fleming, 2017; Rahman, 2020a; Sherafatian-Jahromi et al., 2017), which may not reflect the actual country experience. To narrow this gap, the current study takes Tanzania as a case in point and assess the impacts of tourism growth on environment. Tanzania is chosen because of its fastest growing tourism sector (as compared with other sub-Saharan African countries), the vast stock of tourism resources in the country, and the sector's consistently significant contribution to GDP annually (Kyara et al., 2021; WTTC, 2020). Some studies have affirmed that economic activities are associated with negative ecological impacts, which tend to increase as economy grows, (das Neves Almeida et al., 2017). Therefore, as tourism sector in Tanzania expands and spearhead the country's economic growth, the overall environmental externalities of economic growth are likely to increase. To balance sustainability of ecosystem and economic growth in Tanzania, it is necessary to have substantial empirical evidence to support formulation and evaluation of sustainable tourism related policies.

The current research has two objectives. First, taking Tanzania as a case in point, the study makes an empirical assessment of the environmental impacts of tourism to inform tourism and environmental policy formulation in Tanzania. In that way, it will add a voice to Tanzania's tourism and environmental

sustainability literature by bringing in some of the missing empirical evidence. Second, the study will investigate the Environmental Kuznets Curve (EKC) hypothesis[1] for Tanzania. To the best understanding of the authors, this hypothesis has not been tested in Tanzania using environmental footprints (EF) as a comprehensive environmental damage indicator.

This study makes three unique scientific contributions to the tourism literature: First, it employs EF as environmental damage indicator and tourism revenue as an economic indicator, to generate empirical evidence on whether the on-going growth of the tourism sector in Tanzania comes with significant environmental externalities. To the best understanding of the authors, no study in Tanzania has used EF and tourism revenue to estimate environmental impacts of tourism growth. Elsewhere, this kind of empirical study considered CO_2 emission as an environmental indicator (Al-mulali, 2012; Ozturk and Al-Mulali, 2015; Rahman, 2020a; Shahbaz et al., 2013). Unlike CO_2 emission, EF is a more comprehensive indicator of environmental damage for it considers the overall impact of human activities on the ecosystem and the extent the human economy depends on the scarce world stock of natural resources such as minerals, soil, clean water, and living organism (Ozturk et al., 2016).

Second, by focusing on tourism sector impacts on the natural environment, the study is introducing a new trend of assessing environmental quality by focusing on economic activities of a specific sector (proxied by sectoral income) to shade more light on the traditional trend of focusing on aggregate economy, proxied by GDP. The sectoral specific assessment will significantly improve the traditional aggregate approach, by providing relevant data to show which sector has greater influence on the national environmental damage data and so set policy targeting sectors with more environmental damaging activities. Third, the study will pioneer verifying whether the EKC hypothesis exists in Tanzania. So far, the

[1]The concept of EKC Hypothesis was first developed by economist Simon Kuznets in the1960s. The EKC hypothesis postulates an Inverted-U-shaped relationship between different pollutants and per capita income, i.e., environmental pressure increases up to a certain level as income goes up; then after a certain level of income some part of the income is invested in the environment and the ecology is restored. Detailed exploration of EKC hypothesis is presented under literature review section.

existing tourism literate provides no evidence of a research work carried to test this hypothesis using Tanzanian EF data.

To achieve the study objectives, we first review the literature of some selected works on tourism growth and environment. Then an environmental damage model is constructed and estimated using time series data for the period 1995 – 2017. We utilize EF as an environmental damage indicator, tourism receipt as an economic indicator, and energy consumption, urban population, and trade openness as control variables. The sources of data and the rationality for using these variables are explained in subsection 3.1 and 3.2 of this paper. Stationarity analysis is done using the Augmented Dickey-Fuller (ADF) test, and then the cointegration relationship among the variables will be assessed using the ARDL bounds testing procedure. Causal relationship among the variables is examined using the VECM Granger causality test. Additional diagnostic tests i.e., serial correlation and normality tests, are performed to assess the reliability of the model. Finally, bootstrapping approach is employed to ascertain the accuracy of the computed statistics.

2. Literature Review

a. Theoretical Framework of EKC Hypothesis:

The EKC hypothesis is modeled after the Kuznets' per capita income-inequality curve, which was proposed in 1955 by an American Economist Simon Kuznets. He attested that in the early stages of economic growth, the economy transition from agrarian to industrialized economy, and income inequality increases with increasing income. Then, rapid economic growth and rural-urban migration following a transition to the industrial economy, heighten income inequality between rural and urban population as urban industrial workers experience higher income compared to rural agricultural workers. Inequality keeps increasing with the rise of income up to a point beyond which it will start declining because the democratization and rise of the welfare state, which is associated with the process of industrialization, will lead to a more equitable sharing of the benefits of rapid growth. In this case, Kuznets propounded that the income-inequality relationship will follow an inverted U-shaped curve (Kuznets, 1955).

Likewise, environmental degradation increases with the rising income per capita up to a threshold level beyond which, the quality of the environment improves with the increase of per capita income. Akin to the income-inequality relationship, the income-environment relationship follows an inverted U-shaped curve. The EKC, therefore, depicts the long-run relationship between economic growth and the consequent environmental impacts (Dinda, 2004). According to the EKC hypothesis, initially, environmental degradation increases as economic growth advances from an agrarian economy to an industrialized economy. In turn, such advancements attract structural changes in the economy: changes towards information-intensive industries and services. The structural changes gradually lead to increasing environmental awareness and regulations, the use of cleaner production technology, and higher demand for improved environmental quality. Then, as the income keeps increasing, environmental degradation starts to increase at a decreasing rate, and once the EKC turning point (TP) is reached, any further increase in income leads to a reduction in environmental damages. Thus, the EKC reflects economic growth natural movement from a clean agrarian economy to an environmentally damaging industrial economy, and then to a clean service economy (Dinda, 2004).

The EKC hypothesis started with the seminal work of Grossman and Krueger, where they carried out an empirical analysis of the environmental impacts of a North America trade agreement. The researchers presented empirical evidence to show that a reduction in trade barriers will have at least 3 significant environmental impacts: it will lead to expansion of economic activities, alter the composition of economic activities, and transform production techniques (G. M. Grossman & Krueger, 1991). Among other tests, they studied the relationship between air quality and economic growth using panel data for 42 countries and concluded that at a low level of national income the concentration of sulfur dioxide and smoke increases with per capita GDP but decreases with GDP growth at higher levels of national income.

The pioneering work of Grossman and Krueger immediately attracted more researches. (Shafik & Bandyopadhyay, 1992), explored the economic growth vs. environmental quality relationship by analyzing the patterns of environmental transformation for countries with varying levels of income, taking various indicators as proxies for environmental damage. They established that income maintains the most consistent significant effect with all the environmental indicators and that as income increases, most environmental indicators worsen initially, then improve as technology improves and the economy reaches the middle-level incomes. Then, the World Bank in its 1992 development and environment report popularized the EKC school of thought by contending that the demand for improved environmental quality will increase with an increase in income because it is possible to dedicate more resources to environmental conservation as income increases (Mondiale, 1992).

Considering the above 3 initial studies, it has been affirmed that the EKC hypothesis essentially shows that a higher level of economic growth is normally associated with a gradual decline of ecological damage following structural changes towards improved technological production and environmental awareness (T, 1993). To this end, Stern (2004), confirms that improvement in the state of technology entails changes in emission and productivity.

b. Tourism growth and the quality of environment

Tourism industry and related economic activities are usually perceived as a geographical and economic phenomenon, while undermining the associated environmental issues. Nevertheless, such activities have negative social and environmental externalities (Ohl et al., 2007; Ozturk et al., 2016; Rahman, 2017). For instance, unchecked soaring numbers of tourists' arrivals excite excessive pressure on resources and facilities in the host environment such as lodges, hotels, water, energy, and transportation. Ultimately, unsustainable pressure on the natural environment is associated with increased pollution (e.g., through increased CO_2 emissions and littering), natural resources depletion and

disruption of cultural traditions, social processes, and livelihood systems (Al-Mulali, Solarin, & Ozturk, 2016; Njoya & Seetaram, 2018)

Increased numbers of tourist arrivals above the host environment carrying capacity, has immediate economic returns accompanied with negative environmental impacts which tend to erode the long-run economic returns from the tourism sector itself; unchecked mass tourism carries potential seeds for eliminating specific features or uniqueness of an area or product itself (Ozturk and Al-Mulali, 2015; Shahbaz et al., 2013). Established ways to ensure sustainable tourism include consistent monitoring and evaluation of tourism and tourism-related activities, effective urban planning, adopting environmentally friendly travel infrastructure and optimal exploitation of natural resources (Castellani and Sala, 2008; Choi and Turk, 2011; Janjua et al., 2021; Mandić, 2019; Ozturk and Al-Mulali, 2015; Patterson et al., 2007; Šimková and Kasal, 2012; WTTC, 2019). Besides, the International Labour Organization (ILO) has summarized three fundamental pillars of sustainable tourism as environmental integrity, economic development, and social justice (Modica, 2015).

In line with the ILO pillars of sustainable tourism, to address some statistical gaps in the tourism-environment literature, the World Tourism Organization (UNWTO) is leading the efforts towards expanding tourism statistical analysis beyond economic focus to embrace associated features such as social-cultural and environmental impacts (UNWTO, 2018). Adequate statistical analysis is a need for formulating effective policies that can harness tourism benefits and manage the associated negative externalities (Assante et al., 2012; Bateman and Fleming, 2017; Zhong et al., 2011). Although small economies, such as Tanzania, depends on tourism revenue to grow her economy, there are only few detailed empirical studies focusing at measuring the impacts of economic activities such as tourism on the environment in such economies (Akinboade and Braimoh, 2010; Al-Mulali et al., 2016; Kara and Mkwizu, 2020; Njoya and Seetaram, 2018; Odhiambo, 2011; Wamboye et al., 2020). In the case of Tanzania, there is still much reliance on descriptive methodology as compared to quantitative analytical

approach thereby falling short of adequate empirical analysis for dependable policy formulation (Anderson, 2015; Anderson and Sanga, 2019; Buzinde et al., 2014; Gardner, 2012; Shoo and Songorwa, 2013).

Modern econometric methods such as Granger Causality, Vector Autoregressive, nonlinear autoregressive distributed lag model and Fully Modified Ordinary Least Square, are regularly used to investigate the relationship between economic activities and environmental degradation (Al-Mulali et al., 2016; Kara and Mkwizu, 2020; Koengkan et al., 2020; Njoya and Seetaram, 2018; Nkalu et al., 2020; Odhiambo, 2011; Sherafatian-Jahromi et al., 2017; Wamboye et al., 2020), and between economic growth and CO_2 emissions to validate the ECK hypothesis (Azam et al., 2018; Ozturk and Al-Mulali, 2015; Rahman, 2020a; Shahbaz et al., 2013).

The above literature affirms that globally, uncontrolled tourism growth threatens natural environment. Further, the review confirms that empirical studies assessing environmental impacts of economic activities were conducted largely in Asia, North America, and the Middle East, (Al-mulali, 2012, p. 201; G. Grossman & Krueger, 1995; G. M. Grossman & Krueger, 1991; Rahman, 2017; Shahbaz, Hye, et al., 2013; Shahbaz et al., 2012; Sherafatian-Jahromi et al., 2017), only a few focused on Africa, South of the Sahara (Kohler, 2013; Shahbaz, et al., 2013). Those which focused on Africa, none has attempted to use tourism revenue and EF as proxies for economic indicator and environmental damage, respectively. In the case of Tanzania, there are only a few empirical studies on environmental impacts of tourism growth (Mohammed et al., 2015). At least to the best knowledge of the authors, the EKC hypothesis has not been validated in Tanzania using EF as an environmental damage indicator and tourism revenue as an economic indicator. Likewise, the comprehensive relationship between urbanization and environmental quality has not been empirically assessed in Tanzania. Therefore, the need for generating adequate quantitative evidence regarding the environmental impacts of tourism growth in Tanzania is the gap the current study intends to address.

3. Methodology

3.1 Data and variables

To assess environmental effects of economic activities such as tourism development, the current paper will utilize the following variables:

a) Ecological footprints:

The CO_2 emissions have been regularly used as a proxy for environmental damages (Galeotti et al., 2006; Kusumawardani & Dewi, 2020; Mohammed et al., 2015; Ozturk and Al-Mulali, 2015; Rahman, 2020a). Gradually, EF is being endorsed as a more comprehensive indicator of environmental damage because it takes into account the overall human dependence on the environment to sustain a particular lifestyle, and so it is a more reliable measure of sustainability (Castellani & Sala, 2008; Elshimy & El-Aasar, 2020; Figge et al., 2017; Hopton & White, 2012; Ozturk et al., 2016; Rojas-Downing et al., 2018).

b) International tourism receipts

To assess the impacts of tourism expansion on the environment, the current study employ data on international tourism receipts, measured in constant US$, as a proxy for sectoral economic growth. Although GDP is traditionally used as an economic indicator to provide a comprehensive picture of the overall relationship between economic growth and the environment, for sectoral planning and policy formulation, it is also appropriate to assess how economic activities of various sectors impact on the environment (Ozturk et al., 2016).

c) Primary energy consumption:

Since increased economic activities such as tourism stimulate additional demand for energy (e.g., electricity, fossil fuels, solar, etc.), the current study employs time series data on primary energy consumption (EC), measured in Kilotonne of oil equivalent (ktoe), to assess its influence on the quality of natural environment. In developing countries such as Tanzania where access to

clean and renewable energy is still limited, human activities especially fossil fuel combustion in the manufacturing and transport sector are responsible for the rapidly increasing greenhouse gases in the atmosphere (Rafferty and Petruzzello, 2020).

d) Trade openness:

To assess the impact of international trade on the environment, the current study utilizes timeseries data on the sum of Tanzania's merchandise exports and imports as a proxy for country's openness to international trade. While international trade is growing rapidly in Tanzania, and by extension in sub-Saharan Africa, empirical studies on the impact of trade on the environment are quite scant as compared to extensive studies on key Tanzania's trading partners such as Middle East, Asia, and North America, where trade-environment nexus has been extensively examined. When international trade not well monitored, it can deplete natural resources, (such as sea and forest products, minerals, and oil) through excessive exploitation and allows importation of environmentally damaging products such as obsolete electronics and vehicles.

e) Urbanization

The current study utilizes urban population data (thousands of people living in urban areas) as a proxy for urbanization because urbanization is confirmed to go hand in hand with increased urban population (Al-mulali, Weng-Wai, Sheau-Ting, & Mohammed, 2015; Apergis & Ozturk, 2015; Liu, Li, & Ding, 2021; Ozturk & Al-Mulali, 2015; Ozturk et al., 2016). Increasing urbanization is associated with mounting urban population, increased industrialization, expansion of physical infrastructures, etc., which exerts additional pressure on the natural resources such that the rate of exploitation supersedes the natural rate of renewal.
Table 1 summarizes the type and sources of data employed in this study.

Table 1: Description of variables and data sources

Variable	**Description**	**Data sources**

Ecological footprints (EF); measured in global hectares (gha).	Proxy for environmental damage	(Network, 2019)
International tourism receipts (TOR); measured in constant US$.	Proxy for tourism growth	(WDI, 2021; NBS, 2021)
Primary energy consumption (EC); measured in Kilotonne of oil equivalent (ktoe).	Proxy for energy consumption	(IEA, 2021)
Urban population (UP); thousands of people living in urban areas.	Proxy for urbanization	(WDI, 2021)
Trade openness (TR); the sum of country's merchandise exports and imports	Proxy for country's openness to international trade.	(WDI, 2021)

3.2 Econometric model specification:

To assess the environmental impacts of tourism growth and to test the EKC hypothesis for Tanzania, the study employs time series data for 1995 – 2017. The selection of this period is based on the availability of reliable data and the significant growth registered by the tourism sector during this period. Importantly, the ecological footprint data for Tanzania are only available up to year 2017. Besides, year 1995 coincides with the period when Tanzania started implementing major macroeconomic and political reforms which elicited significant managerial and productivity changes in the tourism sector. The study formulates a time series model using EF as an environmental indicator and international tourism receipts as an economic indicator. Following section 3.1, EF also depends on other factors, which influence the quality of the natural environment. These include the rate and type of primary energy consumption;

the growth of population especially in the urban areas; the effectiveness of the leading government; the amount and type of goods and services traded, etc.

Following Farhani and Rahman (2019), Ozturk et al. (2016), Rahman (2020b) and Shahbaz et al. (2013), the general empirical model can be expressed as follows:

$$EF = f(TOR, EC, TR, UP) \quad (1)$$

Where: EF symbolizes ecological footprints measured in global hectares (gha). EF is a measure of humans' dependence on natural resources to sustain a particular lifestyle. It measures the demand versus the scarce supply of nature. EF is a more comprehensive proxy for environmental damage as compared with the traditional proxy, CO_2 emissions (Ozturk et al., 2016). TOR signifies the international tourism receipts; they are expenditures by international inbound visitors plus payments to national carriers for international transport. EC denotes the total primary energy consumption, measured in Kilotonne of oil equivalent (ktoe). UP designates thousands of people living in urban areas as defined by the country's statistics office. The UP is used here as a proxy for urbanization. TR represents total trade openness, which is the sum of country's merchandise exports and imports.

For estimation, this study employs the Bounds Testing approach to Cointegration and autoregressive distributed lag (ARDL) methodology. Three key advantages of ARDL methodology are: first, the approach takes the satisfactory number of lags. Second, it provides a user-friendly way of deriving the error correction model without losing long-run information. Third, its handy in the presence of small and finite sample data size (Bano, Alam, Khan, & Liu, 2021; Haug, 2002; Jalil & Mahmud, 2009; Narayan & Smyth, 2005). Thus, equation (1) can be log-transformed to make it a linear equation and get direct elasticities from the coefficient values (Farhani and Rahman, 2019; Ozturk et al., 2016; Shahbaz et al., 2013) as follows:

$$LNEF_t = \beta_0 + \beta_{tor}LNTOR_t + \beta_{ec}LNEC_t + \beta_{up}LNUP_t + \beta_{tr}LNTR_t + \mu_t \quad (2)$$

Where: LN denotes natural logarithms of the variables. β_0, β_{tor}, β_{ec}, β_{up}, and β_{tr} are slopes coefficients to be estimated. μ is an error term and t is the period from 1995 to 2017. To test the validity of the EKC hypothesis, LNTORS, which is the square of LNTOR must be introduced in equation (2) as shown below:

$$LNEF_t = \beta_0 + \beta_{tor}LNTOR_t + \beta_{tor2}LNTORS_t + \beta_{ec}LNEC_t + \beta_{up}LNUP_t + \beta_{tr}LNTR_t + \mu_t \quad (3)$$

The EKC hypothesis demonstrates the nexus between environmental damage and income (Laverde-Rojas, Guevara-Fletcher, & Camacho-Murillo, 2021). It postulates that income and environmental damage are positively related at the early stages of economic growth. Then, as income increases, this relationship reaches a stationary point beyond which income and environmental damage are negatively related. Therefore, the curve explaining the relationship between income and environmental damage is an inverted U-shaped curve. To ascertain if the EKC hypothesis exists in Tanzania, the study will examine the sign and the significance of the slope coefficients β_{tor} and β_{tors}. If $\beta_{tor} > 0$ and significant and $\beta_{tors} < 0$ and significant, then EKC hypothesis in Tanzania is affirmed.

The expected sign of β_{ec} is positive because increased primary energy consumption will be associated e.g., with a higher generation of CO_2 emission which is harmful to the environment. Likewise, the expected sign of trade openness is negative i.e., $\beta_{tr} < 0$, if the nature of the goods and services traded are environmental-friendly due to the existence of effective environmental policies. However, $\beta_{tr} > 0$ if pollutant domestic industries, import of pollutant commodities, and similar environmental damaging activities are significantly operational in the economy (Grossman and Krueger, 1995; Halicioglu, 2009). Finally, the sign of β_{up} can be positive or negative depending on the level of effective checks and balance to the urban growth. The check on urban population growth is one of the fundamental attributes of sustainable urbanization. Consequently, when environmental policy decisions effectively utilize strategies to improve urban planning, then β_{up} takes a negative sign. The vice versa is also true.

3.3 Estimation Strategies - Cointegration methodology

In the cointegration analysis, we estimate equation (3) and examine the existence of a long-run relationship among the variables. One of the challenges of using time series data is the risk of generating spurious regression results whenever the series data are non-stationary. Differencing the series makes them stationary but prevents long-run analysis (Jalil and Mahmud, 2009). To circumvent this problem, the bounds testing approach to Cointegration and ARDL methodology by Pesaran et al. (2001) is broadly used as a reliable approach to assess the impacts of economic growth on the environment (Ang, 2007; Farhani et al., 2014; Jalil and Mahmud, 2009; Kohler, 2013).

First, we perform stationarity test because cointegration tests assume that the variables are integrated of the same order. To this end, we employ the Augmented Dickey-Fuller (ADF) test, (Dickey and Fuller, 1979). Time series regression is sensitive to lag length. So, the second step will involve determination of optimal lag length. Third, we endeavor to establish if there is a cointegration relationship between the variables in equation (3) by utilizing *bounds testing of cointegration* (Pesaran et al., 2001; Rahman and Kashem, 2017; Shahbaz et al., 2013; Shahbaz et al., 2012). Bounds testing is a necessary and first step of ARDL methodology; it helps to ascertain if the variables are cointegrated and inform our decision on the appropriate form of ARDL cointegration regression to estimate. In the event that all the series are cointegrated of the same order, we will perform Johansen cointegration test on equation (3) and compare the results with the one from bounds testing (Johansen and Juselius, 1990). If cointegration exists among the regressors in equation (3), then the ordinary least squares (OLS) approach is the ideal estimation method and the resulting parameters will be consistent (Alves and Bueno, 2003). The bounds testing for cointegration inform the choice of the form of ARDL cointegration regression to estimate: Vector Error Correction Model (VECM) if all the equations are cointegrated, Error Correction Model (ECM) if only some equations are cointegrated, and ARDL short-run form only if there is no cointegrating equation.

3.4 ARDL error correction regression

The general ARDL error correction model consists of an error correction term (ECT) which is used for adjusting disequilibrium in the cointegration relationships. The ARDL error correction regression tests long-run and short-run relationships among cointegrated variables. Following Farhani et al. (2014), Farhani & Rahman (2019), Manzoor et al. (2021), Saayman & Saayman (2015), Shahbaz et al. (2013), and Shahbaz et al. (2012), this study seek to first estimate the ARDL error correction model representation of equation (3), which is specified below:

$$\Delta LNEF_t = \beta_0 + \beta_1 LNEF_{t-1} + \beta_2 LNTOR_{t-1} + \beta_3 LNTORS_{t-1} + \beta_4 LNEC_{t-1} + \beta_5 LNUP_{t-1} + \beta_6 LNTR_{t-1} + \sum_{i=1}^{p} \beta_7 \Delta \ln EF_{t-i} + \sum_{j=0}^{q} \beta_8 \Delta \ln EC_{t-j} + \sum_{k=0}^{r} \beta_9 \Delta \ln TOR_{t-k} + \sum_{l=0}^{p} \beta_{10} \Delta \ln TORS_{t-l} + \sum_{m=0}^{v} \beta_{11} \Delta \ln UP_{t-m} + \sum_{n=0}^{z} \beta_{12} \Delta \ln TR_{t-n} + \mu_t \quad (4)$$

Where: Null hypothesis of no cointegration is depicted as: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$.

Following Farhani et al., (2014), Farhani and Rahman, (2020b) and Shahbaz et al., (2013), at the second stage of ARDL, the error correction model is built as follows:

$$\Delta LNEF_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta \ln EF_{t-i} + \sum_{j=0}^{q} \alpha_2 \Delta \ln EC_{t-j} + \sum_{k=0}^{r} \alpha_3 \Delta \ln TOR_{t-k} + \sum_{l=0}^{s} \alpha_4 \Delta \ln TORS_{t-l} + \sum_{m=0}^{v} \alpha_5 \Delta \ln UP_{t-m} + \sum_{n=0}^{z} \alpha_6 \Delta \ln TR_{t-n} + \lambda ECT_{t-1} + \varepsilon_t \quad (5)$$

Where: ECT_{t-1} are residuals obtained by estimating the long-run cointegration model i.e., equation (4). Δ denotes the first difference, and λ is the coefficient of the ECT, i.e., the adjustment coefficient. The ECT epitomizes long-run representation. Estimation of equation (5) is sensitive to lag length, and so appropriate lag length criterion has to be used (Ouattara, 2004; Shahbaz et al., 2013).

Following the studies of Jalil and Mahmud (2009), Kyara et al. (2021), Ozturk and Acaravci (2013), Rahman and Kashem (2017) and Shahbaz et al., (2013), the causality, if any among the variables, will be examined using the Granger causality test. Finally, subsidiary tests, i.e., Residual Serial Correlation LM Test and Normality Test will be carried out.

3.5 Wild bootstrap approach

To evaluate the accuracy of the model statistics, the study employs bootstrapping approach – a re-sampling methods which quantify and explain the accuracy of calculated statistics. In data science, bootstrapping is used as a key to a better understanding of the model statistics; it provides scientific insights on the accuracy level of computed statistics (Bello et al., 2021; Bootstrapping, 2021). Thus, bootstrapping is useful for model validation.

4. Empirical Findings

The variables in equation (3) were subjected to the ADF stationarity test and the results are summarized in Table 2. The variables are integrated of different orders: order zero of integration, hereafter denoted as I(0), and order one of integration, hereafter denoted as I(1). Since there is no variable is integrated of order 2, specifying ARDL model is the most ideal approach. Further, these results attest that Johansen Cointegration test cannot be applied to test for cointegration because the variables are cointegrated of different orders.

Table 2. Unit root test - Augmented Dickey-Fuller Test
Null Hypothesis (H_o): The series has unit root, and it is not stationary

Variable	**Stationary at:**	**ADF-statistic**	**P-value**	**Remark**
LNEF	1st difference	-3.9886	0.0065	Reject H_o
LNTOR	1st difference	-5.7823	0.0003	Reject H_o

LNTORS	1st difference	-6.3302	0.0001	Reject H_o
LNEC	1st difference	-3.3372	0.0292	Reject H_o
LNTR	Level	-3.8574	0.0180	Reject H_o
LNUP	Level	-4.9178	0.0040	Reject H_o

The results presented in Appendix 1 show that lag 1 is suggested by final prediction error (FPE), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) criteria. Traditionally, the SC is the most used criteria as compared with FPE and HQ. So, the study takes lag 1 as proposed by SC.

Since we have a combination of I(0) and I(1), Bounds test as proposed by Pesaran et al., (2001) is an ideal test for cointegration (Saayman & Saayman, 2015). Taking each variable in equation (3) in turn as the dependent variable and perform bounds testing, we establish that when LNEF, LNTOR, LNTORS, LNEC, and LNTR are dependent variable, the resulting equations are cointegrated at the 5% level. The Bounds testing results are summarized in Table 3.

Table 3: ARDL Long Run Form and Bounds Test

Null Hypothesis (H_o): There is no cointegrating equation Criteria: Reject the H_o if the F-statistic is above the I(O) value					
Dependent variable	F-Statistic	Critical value for I(0)	Critical value for I(1)	Outcome	Cointegration
LNEF	3.8988	2.62	3.79	Reject H_o	Cointegration exist
LNTOR	640.1658	2.62	3.79	Reject H_o	Cointegration exist

LNTORS	662.1102	2.62	3.79	Reject H_o	Cointegration exist
LNEC	11.4367	2.62	3.79	Reject H_o	Cointegration exist
LNTR	3.8923	2.62	3.79	Reject H_o	Cointegration exist
LNUP	26.4109	2.62	3.79	Reject H_o	Cointegration exist

Since there is cointegration across all equations, then the appropriate form of ARDL to be estimated is Vector Error Correction Model (VECM).

Appendix 2a and 2b present Vector Error Correction Model (VECM) estimation results and the corresponding p-values, respectively. These results form a crucial part of this research: they display both the short-run estimates and error correction term (ECT) estimates. Coefficients C(1), C(9), C(17), C(25), C(33) and C(41) are error correction terms (ECT_{t-1}) in model 1 to 6 respectively. In order to confirm a long run relationship among D(LNEF), D(LNTOR), D(LNTORS), D(LNEC), D(LNTR) and D(LNUP), we run coefficient test for C(1), C(9), C(17), C(25), C(33) and C(41). Appendix 2b confirms that C(33) and C(41) are not statistically significant, meaning that there is there is neither long run relationship between LNEF and LNTR, nor between LNEF and LNUP. The rest of the ECT_{t-1} coefficients i.e. C(1), C(9), C(17), and C(25) are statistically significant meaning that there is long run relationship among LNEF, LNTOUR, LNTORS, LNEC, and LNTR. Further, testing the significance of the other coefficient one by one we observe that C(3), C(4), C(6), C(7), C(8), C(9), C(25),C(29), C(31),C(32) and C(47) are significant; their corresponding p-values are smaller than 0.05.

The key model of interest in our study is model 1 i.e.,:

D(LNEF) = C(1)*(LNEF(-1) + 5.99030094107*LNTOR(-1) - 0.571768335353*LNTORS(-1) - 2.33139609733*LNEC(-1) + 0.630597223598*LNTR(-1) + 4.11832498114*LNUP(-1) - 91.5923470799) + C(2)*D(LNEF(-1)) + C(3)*D(LNTOR(-1)) + C(4) *D(LNTORS(-1)) +

C(5)*D(LNEC(-1)) + C(6)*D(LNTR(-1)) + C(7) *D(LNUP(-1)) + C(8).

(6)

Since:

C(3) is statistically significant, then D(LNTOR(-1)) effects D(LNEF)

C(4) is statistically significant, then D(LNTORS(-1)) effects D(LNEF)

C(6) is statistically significant, then D(LNTR(-1)) effects D(LNEF)

C(7) is statistically significant, then D(LNUP(-1)) effects D(LNEF)

The results in Appendix Tables 2a and 2b display significant positive error correction terms, except C(33) and C(41) which are positive and insignificant. Normally, the error correction term (ECT) is expected to take any value such that $-1 \leq ECT \leq 0$. In our case, since the error correction terms are positive this implies that the process will not converge in the long run; there are some long-run instabilities. The positive sign of the error correction terms in this study can most probably be ascribed to the number of observations of the data employed, i.e., to assess environmental impacts of tourism growth, annual time series data for 23 years were utilized. This is a limited observation, and it is bound to limit long run estimation. In practice, for a long run estimation using annual time series data, anything from 60 observations or more is most preferred. Hence, based on the study objectives and the variables employed, the relevant possible data available is for the period 1995 to 2017. Therefore, the assessment is limited to exploring the short run series, which is based on model 1, i.e., equation 6. In equation 6, which is the key model of interest in our study, C(3), C(4), C(6), C(7), C(8) are significant coefficients of the short run variables i.e., D(LNTOR(-1)), D(LNTORS(-1)), D(LNTR(-1), D(LNUP(-1)), and constant term respectively.

With reference to Appendix 2b, while tourism revenue and international trade lessen environmental degradation due to their negative relationship with EF, primary energy consumption and urban population increase environmental degradation due to their positive effect on the EF. The coefficient of primary energy consumption is not significant, but it contributes to environmental damage; it is positive as expected. In essence, a 1% increase in tourism revenue

and international trade leads to 2.01% and 0.31%, respectively, decrease in EF. Likewise, a 1% increase in primary energy consumption and urban population leads to 0.086% and 7.86% increase of EF, respectively. Further, we observed that $\beta_{TOR} < 0$ and significant, and $\beta_{TORS} > 0$ and significant. Therefore, the test confirms the absence of the EKC hypothesis in Tanzania.

The ARDL bounds testing for cointegration confirmed cointegration among the variables in equation (3). To examine the causality among the variables, we implemented VECM Granger causality test and Wald Coefficients test. The VECM Granger causality results are already implied in Appendix 2b. It is affirmed that D(LNEF) is significantly explained by D(LNTOR), D(LNTORS), D(LNTR) and D(LNUP). To know if the significant coefficients have causal effect to the dependent variable i.e., D(LNEF), we carry out Wald Coefficient diagnostic test. Table 4 presents output of a joint significant test for ECT_{t-1} coefficients and then for coefficients of model one i.e., when D(LNEF) is the dependent variable.

Table 4: Wald test – Coefficient Diagnostic Test

	ECTt-1 coefficients	Model 1 coefficients
Null hypothesis (Ho):	C(1)=C(9)=C(17)=C(25)=0	C(3)=C(4)=C(6)=C(7)=0
Chi-square	58.4065	36.3352
P-values	0.0000	0.0000
Remarks	Reject Ho. Conclusion: The joint significant test is statistically significant	Reject Ho. Conclusion: The coefficients are jointly statistically significant

Therefore, the VEC Granger Causality Test confirms a long-run causality between LNTOR and LNEF, LNTORS and LNEF, LNTR and LNEF, and LNUP and LNEF.

The serial correlation and normality tests were carried out and the results are summarized in Appendix 3. The Breusch-Godfrey Serial Correlation LM Test shows that for all lags, the p-values are greater than 0.05. This means that there are no residual autocorrelations. Further, the normality test, which seeks to test the null hypothesis that the residual values are multivariate normal, shows that the p-values for the two components as well as the Jarque-Bera test are greater than 0.05. In this case, we fail to reject the null hypothesis and so conclude that the residuals are multivariate normal. The serial correlation and normality test results are summarized in Appendix 3. In sum, the model diagnostic test results portray significant policy implications as detailed under the policy implication section of this research.

Wild bootstrap estimation results: The wild bootstrap estimation was carried out to confirm the accuracy of the VECM computed statistics (Enilov & Wang, 2021). The results show that the coefficients of LNTOR, LNTORS, LNEC and LNUP are all significant at 95% confidence interval. Thus, as observed under VECM estimation, the wild bootstrap test confirms that based on 95% biased corrected accelerated confidence interval, tourism is an accurate and important predictor of environmental quality. These results corroborate the earlier VECM estimation in Appendix 2a and 2b.

5. Discussion

The key limitation in most of the previous literature in assessing income-environment nexus is that most of the previous studies employed data on CO_2 emissions when investigating income-environment relationship, while CO_2 represent only a small proportion of entire environmental damage. Therefore, the current research employed data on ecological footprint, which is a more representative proxy for environment damage. The VECM results show that urbanization and the primary energy consumption are the main factors that increase environmental damage because of their negative effect on ecological footprint, while tourism activities and international trade lessen it by its negative impact on ecological footprint. A 1% increase in urbanization and primary energy

consumption leads to increase ecological footprint by 7.86% and 0.085% respectively. Likewise, a 1% increase in tourism activities and international trade leads to 2.01% and 0.31% decrease in ecological footprint, respectively. Further, the regression affirms positive relationship between the square of tourism revenue (TORS) and EF; a 1% increase in the TORS will lead to 0.18% increase in environmental damages due to its negative impact on EF.

In line with the VECM results, we observe that some of the urban environmental challenges experienced in Tanzania such as untreated domestic sewage disposal; poorly managed industrial and solid waste culminating into water and air pollution; excessive use of fossil fuel to meet increasing demand for transport, light and heating; emergence of shanty towns; etc., are ramifications of unchecked rapidly increasing urbanization especially in major cities such as Dar es Salaam, Arusha, and Mwanza. Currently, urban settings in Tanzania, unlike the rural counterparts, presents better means of livelihood opportunities, and so catalyze the rural-urban migration. These finding are consistent with the findings of Adedoyin et al. (2020) Al-mulali et al. (2015), Capps & Ramírez (2015), Maiti & Agrawal (2005), Ozturk & Al-Mulali (2015), Ozturk et al. (2016), Liu et al., (2021), etc. In sum, the rapidly increasing urban population in Tanzania are likely to culminate into a more serious environmental problems such as reduction of ground water re-charge due to excessive evapotranspiration and expanding paved surfaces. These will further lead to drying underground water wells and lead to acute environmental, health, and socioeconomic hazards.

In the case of Tanzania, the positive relationship between energy consumption and ecological footprints confirms that primary energy consumption causes environmental degradation. This is largely so due to Tanzania's high dependence on fossil fuel as source of domestic and industrial energy. About 70.9% of Tanzania's electricity draws from fossil fuel; a source well known as a major cause of pollution due to its huge contribution to CO_2 emission (AFREC, 2015). This statistic remains valid to date because since then there has not been major diversification of energy sources in Tanzania. Besides, road and air has remained

as common means of transport across the country, which in turn generate a lot of CO_2 emissions. Thus, the booming tourist arrivals and tourism activities in Tanzania generates additional demand for gas, diesel, and motor gasoline, thereby putting additional pressure on the environment. The positive relationship between energy consumption and environmental quality has been also illustrated by several past studies, (Ang, 2007; Farhani et al., 2014; Marrero, 2010; Ozturk & Al-Mulali, 2015; Saboori & Sulaiman, 2013).

According to our results, the current effect of primary energy consumption on ecological footprint is not significant. This is because the overall amount of energy consumed is still low. Over 60% of the country's population have no access to grid electricity; they rely on unclean energy sources i.e., fossil fuel and wood (Felix and Gheewala, 2012). However, it is only a matter of time the expansion of tourism sector and other sectors will exert additional pressure on energy consumption to environmentally unsustainable level. For instance, Tanzania has a plan to enhance access to grid-connected electricity to realize her rural electrification initiative, thereby promote emergence of small-scale industries in rural areas for improved livelihood. Likewise, the country is aiming at becoming a semi-industrialized economy by 2025 and with an average annual GDP growth rate of at least 7%. However, these plans are not supported with a proportionate initiative to widen the access to clean and renewable energy. In particular, Tanzania's rural electrification initiatives comes with seeds for environmental degradation (Felix & Gheewala, 2012) because such initiatives are not proportional with efforts to create affordable access to clean and renewable energy. As greater proportion of the population gain access to the current grid electricity which hugely derives from unclean sources such as fossil fuel and gas, more environmental damages will be impending.

According to the World Bank (2020ed.), the trade sector in Tanzania contributed 21.82% of GDP in 2018 and 25.68% in 2017. The results of this study affirm that trade openness contracts the EF in Tanzania. Similar results were observed by Le, et al., (2016), Shahbaz et al., (2013), etc. This means that the type of goods

and services which Tanzania trades with the rest of the world are by and large environmental-friendly. It follows therefore, Tanzania can take advantage of international trade revenue to finance environmental protection strategies.

Likewise, tourism revenue displays negative relationship with EF, and so compact environmental damages. Therefore, although tourism-related activities such as construction can undermine the quality of natural environment (Ohl et al., 2007; Ozturk et al., 2016; Rahman, 2017), in the case of Tanzania, presupposing effective policies are in place; income from tourism can significantly be utilized to contain the country's environmental degradation. For instance, promoting community-based conservation by empowering the local community is one of the areas which the government must invest more (Robinson & Makupa, 2015). The negative relationship between tourism revenue and environmental degradation has also been reported by other researchers (Al-Mulali et al., 2016; Farhani et al., 2014; Li, Zhang, Liu, & Xue, 2006)

Contrary to the inverted U-shaped curve predicted by EKC hypothesis, we observed that β_{tor} is negative and significant, while β_{tors} is positive and significant. This implies that at the beginning tourism revenue compacts environmental damages, but as revenue increases over time it will have significant negative impact on the quality of the environment unless the country adapts sustainable tourism growth measures. Therefore, urbanization strategies, as depicted by measures to monitor the urban population growth, have not helped in forming an inverted U-shaped relationship between tourism revenue and environmental degradation in Tanzania. In the long-run, tourism growth, as projected by LNTORS, causes significant damages to the environment. In comparison with countries where the EKC hypothesis is established (Al-mulil 2016; Ozturk et al., 2016), the levels of energy efficiency and renewable energy in Tanzania is very low.

As for the future research on tourism and environment the authors recommend use of panel data and assess the impact of tourism growth on the quality of the natural environment in Eastern Africa region. This is because international trade

in the region, including tourism, among most of the eastern Africa countries especially Tanzania, Kenya, Uganda and Rwanda, is growing rapidly and country specific political and economic policies are gradually more dependent on the policies of the neighboring states, but so far no study has been carried to assess the reginal impacts of growth on the environment.

6. Conclusion and policy implications

This study investigated the relationship between ecological footprints and tourism revenue, primary energy consumption, trade openness and urbanization in Tanzania for the period 1995 – 2017. The VECM Granger causality test confirm that in the case of Tanzania, while urbanization and primary energy consumption accelerate accelerates environmental degradation, international tourism revenue and trade openness compacts it. Besides, the results confirm long-run relationship among the variables and absence of the EKC hypothesis. The absence of EKC hypothesis implies that Tanzania's efforts to safeguard the environment are still below the desired threshold. If Tanzania, and by extension the sub-Saharan Africa, is to attain sustainable development, more proactive scientific research on environmental degradation to inform formulation and implementation of environmental policies and regulations, are inevitable.

The study also affirmed that proceeds from international trade and tourism activities can be used to alleviate environmental damages. Thus, ceteris puribus, promoting sustainable tourism will ultimately lead to improved environmental quality if good governance is nurtured and policymakers formulate and implement effective tourism policies. In the case of Tanzania, urban population control and enforcing compliance with environmental regulations are basic tools for reducing country's pressure on the natural environment. Such compliance can only come about if effective policies and good governance exists. For improved governance, improved democracy and public-private partnerships are crucial to empower residents to take responsibility for improved environmental quality. At present, freedom of expression and public-private partnership in Tanzania are impeded by the prevailing underlying unhealth sociopolitical conditions such as closing civic

space, increasingly overgrown executive branch, inadequate political competition, underdeveloped civil society, unhealthy barriers to accessing information, low public accountability, etc., (USAID, 2020). Timely access to information and existence of effective civic society are some of necessary preconditions for effective advocacy in favor of environmental quality.

Following the preceding analysis, the following are some key policy and managerial implications. First, to improve environmental quality, Tanzania needs to adopt a scale-up strategy to enhance access to clean and renewable energy thereby alleviating excessive dependence on fossil fuels. For example, policies to improve public transport infrastructures, will reduce the demand for motor gasoline to operate private vehicles. Similarly, imparting an environmental safeguarding awareness to the tourists and the public will help reduce energy usage. Such environmental protection awareness campaigns covering best practices on the use of environmental resources such as electricity and water, avoiding unnecessary private drive, garbage disposal, littering, etc. can be imparted to the public by means of leaflets, video clips, recorded briefs, etc. They should also be made a compulsory welcome package to tourists, as well as a non-optional component in the curriculum of secondary and primary education. The same strategy can be adopted by most sub-Saharan African countries which share similar experience with Tanzania.

Second, in the case of Tanzania, in the short-run, trade compacts ecological footprints and hence alleviates the natural environment. Appropriate and effective trade-related policies, guidelines, and regulations such as prohibiting industries with obsolete technologies; regulating the importation of used motor vehicles and unnecessary and obsolete plastics and electronic items; and continued public environmental awareness will further strengthen the current positive contribution of international trade on environmental conservation efforts in Tanzania, and by extension in sub-Saharan Africa. Such efforts should be accompanied with more deliberate strategies for channeling greater part of tourism and trade revenue to support environmental safeguarding programs.

Third, Tanzania needs turn-around policies to alleviate the impacts of the missing strong urban governance: the unplanned rapid urban population growth changes the quality of the natural environment due to unsustainable consumption patterns. For instance, the rapidly increasing urban population is associated with unsustainable demand for energy, durable commodities, water and sanitation, and an excessive built environment. This in turn pollutes the natural environment. Also, urbanization in major cities such as Dar es Salaam, Arusha and Mwanza is associated with flooding leading to downstream water pollution because the unplanned city expansion interferes with the natural water runoff patterns. Since the government lacks adequate resources and expertise to manage urbanization, we recommend policies promoting public-private partnership to help form priorities that are shared and implemented broadly by the public, the private institutions, and individuals. Strong and participatory urban governance is critical for sustainable environmental progress.

Fourth, for a sustainable environment Tanzania needs to set strategies to promote timely and accurate data collection, research, and publications. Lack of robust statistical data and scientific publications is a chronic problem across sub-Saharan Africa (Kyara et al., 2021b). Building a big and accessible public database for vital statistics will promote scientific research and publications which is a basis for good policy formulation. The current lack of good statistics implies that urban indicators that would inform sustainable environment decisions are missing.

Declarations

Authors' contribution statement

V.C. Kyara: Conceived and designed the experiment, performed the experiments, analyzed and interpreted the data; wrote the paper.

M.M. Rahman: Analyzed and interpreted the data; wrote the paper.

R. Khanam: Analyzed and interpreted the data; wrote the paper.

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Appendices:

Appendix 1: Optimal lag determination

Lag	LogL	LR	FPE	AIC	SC	HQ
0	37.55078	NA*	0.001477	-3.711856	-3.417781	-3.682625
1	39.11304	1.837956	0.001410*	-3.778005	-3.434917*	-3.743901*
2	39.68041	0.600738	0.001527	-3.727106	-3.335006	-3.688131
3	40.34545	0.625925	0.001652	-3.687700	-3.246587	-3.643853
4	41.79908	1.197108	0.001652	-3.741068	-3.250943	-3.692349
5	41.88789	0.062690	0.001978	-3.633870	-3.094732	-3.580278
6	44.26991	1.401185	0.001858	-3.796460*	-3.208309	-3.737996

* Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Appendix 2a: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1
LNEF(-1)	1.000000
LNTOR(-1)	5.990301
	(1.18330)
	[5.06237]
LNTORS(-1)	-0.571768
	(0.08872)
	[-6.44479]
LNEC(-1)	-2.331396
	(0.60508)
	[-3.85303]
LNTR(-1)	0.630597
	(0.10661)
	[5.91513]
LNUP(-1)	4.118325

	(0.63764)					
	[6.45874]					
C	-91.59235					
Error Correction:	D(LNEF)	D(LNTOR)	D(LNTORS)	D(LNEC)	D(LNTR)	D(LNUP)
CointEq1	0.219642	0.457661	6.041383	0.263892	0.305456	-0.002564
	(0.03744)	(0.20172)	(2.53208)	(0.07276)	(0.19811)	(0.00310)
	[5.86619]	[2.26876]	[2.38594]	[3.62689]	[1.54187]	[-0.82693]
D(LNEF(-1))	-0.137147	-0.756966	-9.602880	0.037669	0.135779	0.007026
	(0.20553)	(1.10731)	(13.8992)	(0.39940)	(1.08747)	(0.01702)
	[-0.66729]	[-0.68361]	[-0.69089]	[0.09431]	[0.12486]	[0.41283]
D(LNTOR(-1))	-2.012528	-5.136495	-65.43757	0.259964	-0.291734	0.041440
	(0.64490)	(3.47446)	(43.6123)	(1.25321)	(3.41220)	(0.05340)
	[-3.12069]	[-1.47836]	[-1.50044]	[0.20744]	[-0.08550]	[0.77603]
D(LNTORS(-1))	0.180167	0.420862	5.387790	0.004745	0.037013	-0.003438
	(0.05197)	(0.27997)	(3.51426)	(0.10098)	(0.27495)	(0.00430)
	[3.46705]	[1.50324]	[1.53312]	[0.04699]	[0.13462]	[-0.79904]

D(LNEC(-1))	0.085958	0.195709	2.780088	-0.508873	0.381892	-0.001844
	(0.12666)	(0.68237)	(8.56527)	(0.24612)	(0.67014)	(0.01049)
	[0.67867]	[0.28681]	[0.32458]	[-2.06754]	[0.56987]	[-0.17584]
D(LNTR(-1))	-0.310294	-0.190384	-2.892341	-0.188022	-0.075069	0.004742
	(0.07267)	(0.39153)	(4.91457)	(0.14122)	(0.38451)	(0.00602)
	[-4.26978]	[-0.48626]	[-0.58852]	[-1.33140]	[-0.19523]	[0.78799]
D(LNUP(-1))	7.861684	14.86865	210.6155	10.48322	12.37798	0.818159
	(1.84876)	(9.96040)	(125.025)	(3.59262)	(9.78191)	(0.15309)
	[4.25241]	[1.49278]	[1.68458]	[2.91798]	[1.26540]	[5.34445]
C	-0.405476	-0.707486	-9.977387	-0.434991	-0.561154	0.009575
	(0.09101)	(0.49032)	(6.15461)	(0.17685)	(0.48153)	(0.00754)
	[-4.45537]	[-1.44291]	[-1.62112]	[-2.45961]	[-1.16535]	[1.27053]
R-squared	0.756183	0.405337	0.418311	0.719202	0.264007	0.879570
Adj. R-squared	0.624897	0.085134	0.105094	0.568003	-0.132297	0.814724
Sum sq. resids	0.010982	0.318764	50.22415	0.041470	0.307442	7.53E-05
S.E. equation	0.029065	0.156590	1.965552	0.056480	0.153783	0.002407
F-statistic	5.759811	1.265875	1.335532	4.756662	0.666172	13.56384

Log likelihood	49.54065	14.17447	-38.95343	35.58890	14.55421	101.8573
Akaike AIC	-3.956252	-0.588045	4.471755	-2.627514	-0.624211	-8.938795
Schwarz SC	-3.558339	-0.190132	4.869669	-2.229601	-0.226297	-8.540882
Mean dependent	-0.003812	0.074583	1.035537	0.054757	0.083001	0.049725
S.D. dependent	0.047456	0.163713	2.077763	0.085933	0.144520	0.005591

Determinant resid covariance (dof adj.)	1.94E-17
Determinant resid covariance	1.09E-18
Log likelihood	255.4759
Akaike information criterion	-19.18819
Schwarz criterion	-16.50227

Appendix 2b: Summary of Vector Error Correction Estimates with p-values

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.219642	0.037442	5.866192	0.0000
C(2)	-0.137147	0.205529	-0.667289	0.5066
C(3)	-2.012528	0.644897	-3.120694	0.0025
C(4)	0.180167	0.051966	3.467050	0.0009
C(5)	0.085958	0.126655	0.678675	0.4994
C(6)	-0.310294	0.072672	-4.269784	0.0001

C(7)	7.861684	1.848758	4.252414	0.0001
C(8)	-0.405476	0.091009	-4.455366	0.0000
C(9)	0.457661	0.201723	2.268756	0.0260
C(10)	-0.756966	1.107310	-0.683608	0.4962
C(11)	-5.136495	3.474461	-1.478357	0.1433
C(12)	0.420862	0.279971	1.503237	0.1368
C(13)	0.195709	0.682369	0.286808	0.7750
C(14)	-0.190384	0.391529	-0.486258	0.6281
C(15)	14.86865	9.960402	1.492776	0.1395
C(16)	-0.707486	0.490319	-1.442910	0.1530
C(17)	6.041383	2.532081	2.385936	0.0195
C(18)	-9.602880	13.89924	-0.690893	0.4917
C(19)	-65.43757	43.61232	-1.500438	0.1375
C(20)	5.387790	3.514264	1.533121	0.1293
C(21)	2.780088	8.565274	0.324577	0.7464
C(22)	-2.892341	4.914574	-0.588523	0.5579
C(23)	210.6155	125.0255	1.684580	0.0961
C(24)	-9.977387	6.154610	-1.621124	0.1090

C(25)	0.263892	0.072760	3.626892	0.0005
C(26)	0.037669	0.399397	0.094314	0.9251
C(27)	0.259964	1.253206	0.207439	0.8362
C(28)	0.004745	0.100983	0.046992	0.9626
C(29)	-0.508873	0.246124	-2.067544	0.0420
C(30)	-0.188022	0.141221	-1.331400	0.1869
C(31)	10.48322	3.592625	2.917984	0.0046
C(32)	-0.434991	0.176854	-2.459611	0.0161
C(33)	0.305456	0.198108	1.541865	0.1272
C(34)	0.135779	1.087467	0.124858	0.9010
C(35)	-0.291734	3.412198	-0.085497	0.9321
C(36)	0.037013	0.274954	0.134617	0.8933
C(37)	0.381892	0.670141	0.569868	0.5704
C(38)	-0.075069	0.384513	-0.195232	0.8457
C(39)	12.37798	9.781909	1.265395	0.2095
C(40)	-0.561154	0.481532	-1.165350	0.2474
C(41)	-0.002564	0.003100	-0.826928	0.4108
C(42)	0.007026	0.017019	0.412832	0.6809
C(43)	0.041440	0.053400	0.776026	0.4401

C(44)	-0.003438	0.004303	-0.799042	0.4267
C(45)	-0.001844	0.010488	-0.175840	0.8609
C(46)	0.004742	0.006018	0.787992	0.4331
C(47)	0.818159	0.153086	5.344455	0.0000
C(48)	0.009575	0.007536	1.270526	0.2077
Determinant residual covariance		1.09E-18		
Observations: 21				
R-squared	0.756183	Mean dependent var		-0.003812
Adjusted R-squared	0.624897	S.D. dependent var		0.047456
S.E. of regression	0.029065	Sum squared resid		0.010982
Durbin-Watson stat	2.090179			

Appendix 3: Model Diagnostic tests

[3.1] Vector Error Correction Residual Normality Tests

Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	Df	Prob.		Component	Kurtosis	Chi-sq	Df	Prob.
1	1.393147	6.793006	1	0.009		1	5.499217	5.46532	1	0.019
2	0.181019	0.114687	1	0.735		2	3.611500	0.32719	1	0.567
3	0.554692	1.076890	1	0.299		3	2.738554	0.05981	1	0.807
4	-0.335247	0.393366	1	0.531		4	2.565540	0.16516	1	0.684

5	0.438139	0.671881	1	0.412		5	4.545450	2.08986	1	0.148
6	-0.070764	0.017527	1	0.895		6	2.579327	0.15485	1	0.694
Joint		9.067357	6	0.170		Joint		8.26219	6	0.220

Component	Jarque-Bera	Df	Prob.
1	12.25833	2	0.002
2	0.441877	2	0.802
3	1.136700	2	0.566
4	0.558527	2	0.756
5	2.761745	2	0.251
6	0.172372	2	0.917
Joint	17.32955	12	0.138

[3.2] Serial Autocorrelation LM Test

Null Hypothesis(H_0): no serial correlation

F-Statistic	0.704565	p-value F-statistic	0.4154
Obs R-squared	1.054123	p-value Chi-square	0.3046
Decision:	Failed to reject H_0 because all p-value > 0.05		

[3.3] White's Heteroscedasticity Test

Null hypothesis (Ho): The residuals are homoscedastic

F-Statistic	0.668627	p-value F-statistic	0.6765
Obs R-squared	4.642323	p-value Chi-square	0.5904
Decision:	Failed to reject H_0 because all p-value > 0.05		

CHAPTER 6: CONCLUSION AND POLICY IMPLICATIONS

This research sought to investigate the impacts of tourism expansion on economic growth, poverty alleviation, and environment in Tanzania. The research identified three study objectives and three research questions as itemized in section 1.5. The current chapter seeks to consolidate the major research findings and draw some concluding remarks and policy implications. The findings are grouped under each research objective, and they respond to the three research questions as summarized below.

6.1.1 Tourism expansion and economic growth: Causality analysis

The first objective of this study was to empirically investigate the actual nature of tourism-economic growth relationship in Tanzania. Associated with this objective is the research question one, i.e., What is the causal direction, if any, between tourism expansion and economic growth in Tanzania? Chapter 2 endeavored to address this question in two levels: first the chapter presented a historical-critical review of tourism policy and planning in Tanzania, and second presented empirical investigation of the impacts of tourism expansion on economic growth. The findings for each level are summarized below.

a. Rethinking tourism policy and planning

Motivated by the global movement emphasizing a need for inclusive and sustainable tourism, part one of Chapter 2 presented a historical critical review of the tourism policy and planning in Tanzania. The review aimed at generating systematic understanding of the evolution of tourism policy and planning and provide a framework for rethinking about the industry's policy and planning for more sustainable tourism. To trace the evolution of the tourism policy, the study reviewed some historical planning and policy documentations, and identified some macroeconomic and political changes that influence and shape the tourism industry in Tanzania. Then, the study endeavored to identify some systemic challenges that affect sustainability of the tourism sector in Tanzania.

The review finds that the 1970s and 1980s communal self-reliance policy (*Ujamaa)*, the mid 1980s and 1990s structural adjustment programs (SAPs), the 1991 Tourism Policy, the 2002 integrated tourism master plan, the 1992 constitutional reform, and the Tourism Act 2008 are some of the major macroeconomic and political changes which have significantly shaped and influenced the orientation and performance of the tourism sector in Tanzania. Likewise, the ambiguity of the term sustainability in tourism, limited accessibility to knowledge and information, and inadequate collaboration among the industry's stakeholders are some of the observed systemic challenges affecting sustainable tourism development in Tanzania and by extension in sub-Saharan Africa.

From a policy perspective, the current tourism policy needs re-orientation to update it from its 1991 formulations (and subsequent review in 1999) to reflect the influence of predominant internal and external macroeconomic changes which have a significant bearing on the performance of the tourism sector. The current policy is lagging and unable to fully respond to the prevailing political and economic realities; it calls for timely review. For instance, the policy lacks a broader scope to accommodate the changes that are brought by the re-establishment of the Eastern African Community in late 1999, the on-going increasing access and use of internet and social media for business communication and marketing, increasing foreign direct investment into the tourism sector and related sectors, raising awareness of socioeconomic consequences of climate change, etc. All these changes need an up-to-date policy framework that is capable of guiding sectoral changes and fueling a mechanism for translating growth into an improved quality of life in the population. Some of the key areas which the revised policy must give pride of place include laying out strategies for enhancing collaboration/linkages within the tourism sector and with other sectors, give preferential attention to tourism products diversification to broaden the tourism income base, and support and empower local and international private investors (as essential partners with the government) with the appropriate entrepreneur skills.

For tourism to foster a sustainable development and alleviate poverty, Tanzania needs to undertake a fundamental shift of policy emphasis from trickle-down growth approach to an inclusive approach to growth. Currently, most policies and development plans in Tanzania are founded in the traditional trickle-down economics approach, which is a top-down approach. Top-down approach has not succeeded in effectively allocating the increasing benefits of economic growth to the poor households. For instance, to maximize tourism benefits for the poor, the poor must be deliberately empowered and effectively involved in all stages of tourism policy and planning to the sharing of tourism development proceeds. Training in tourism related skills, enhancing access to credit facilities, fostering and safeguarding host communities' rights to tourism resources, promoting effective participation in the governance of the tourism industry, etc., are recommended strategies for empowerment of the host community for greater involvement in the tourism activities.

b. Tourism expansion and economic growth

Prompted by the problem of limited empirical studies that investigated tourism-economic growth in Tanzania, the researcher investigated an empirical insight into the actual nature of tourism-economic growth, by applying the Granger causality and Wald test method to analyze time-series data on international tourism receipt, real gross domestic product, and real effective exchange rate over the period 1989–2018. The Impulse Response Function was also utilized to provide insight into the qualitative nature of the relationships and the length of time that is necessary for the causal effect to take place. The findings confirm the existence of tourism-led growth hypothesis, i.e., a unidirectional causality from tourism development to economic growth. A 1% growth in tourism income elicits 0.38% increase in GDP.

From a policy perspective, the existence of unidirectional causality from tourism expansion to economic growth implies that Tanzania can confidently and effectively boost her economic growth by enacting and implementing economic policies that promote tourism expansion. Further, the evidence confirms that

tourism development is of crucial importance for economic development and the improved wellbeing of the population. Hence, subsidizing the tourism sector will lead to multiple benefits: stimulate economic growth, empower the poor through additional employment, create markets for traditional products, etc. In the case of Tanzania, improving transport and hospitality infrastructures, refining the quality of domestic tourism products to meet international standards, aggressive and targeted marketing of tourism sector, embracing strategies to lower domestic cost of living, improving the exchange rates, maintaining political stability and the rule of law, and discouraging unnecessary bureaucratic procedures that hinder free travels are some of the recommended strategies to increase tourism income.

Above all, promotion of private investment especially in hotels and resorts, will bolster the ongoing government infrastructure development efforts, geared to open new tourism destinations in the country. Increased local and foreign private direct investment in the tourism sector will be timely in generating the needed additional capital and entrepreneurial skills, to complement those provided by the government, for a vibrant and sturdy tourism business. Besides, the private sector has the essential entrepreneur skills and linkages needed for a modern and dynamic sector.

For sustainable tourism, promotion of private investment in hotels and resorts must go hand in hand with strengthening the unique tourism approach of targeting the tourism market segment, which is less affected by financial and economic shocks. This approach has enabled the country to attain a high-value, low-density (HVLD) tourist destination status. This approach must be sustained and enhanced because it promotes sustainable tourism. The HVLD approach exhibits great potential of meeting the needs of the current tourists and the destinations while at the same time protecting and enhancing the future tourism needs, thereby making tourism growth sustainable. The approach is consistent with the International Labour Organization's pillars of sustainable tourism, i.e., social justice, economic development, and environmental integrity.

6.1.2 Economic growth threshold and poverty alleviation

The second objective of this research was to assess the economic growth threshold that is necessary for a mass exit from poverty. To address this objective the empirical study in Chapter 3 analyzed the impact of economic growth on per capita household consumption expenditure. Hence Chapter 3 empirically answers research question two, i.e., What is the specific level of GDP growth beyond which poverty level will start falling significantly?

The chapter employed a nonlinear autoregressive distributed lag (NARDL) model to assess the empirical relationship between per capita consumption expenditure, economic growth, income inequality, and unemployment in Tanzania for the period 1991–2020. Also, the Wald test, based on NARDL output, was used to explore the long-run symmetry between consumption expenditure and economic growth. The estimated results confirmed the presence of a long-run asymmetric behavior between economic growth and consumption expenditure. Also, in the long run, changes in income inequality are significant and they aggravate consumption expenditure. In the short run, increasing economic growth is associated with increasing consumption expenditure and vice versa. As for causality, the study confirmed a long- run unidirectional causality from consumption expenditure to economic growth, and from consumption expenditure to unemployment. Likewise, the study observed short-run bidirectional causality between consumption expenditure and economic growth, short-run unidirectional causality from income inequality to consumption expenditure, and from unemployment to consumption expenditure.

From a policy perspective, the evidence showing that only income inequality is significant in the long run, and economic growth in the short run indicates the systemic effect of inequality in redistribution of income. It affirms that in the case of Tanzania, increased economic growth is necessary for containing consumption deprivation but in the long run the rising income inequality interacts with economic growth and dampens the positive poverty-alleviating impacts of economic growth. Thus, policy attention should be directed to contain income

inequality if increased benefits of economic growth is to count significantly in reducing consumption poverty and improving population wellbeing. Strengthening collective bargaining rights among the low- and middle-income earners, promoting adoption of living-wage policies, introducing stronger minimum wage law, subsidizing provision of public goods, e.g., health care and education, facilitating greater access to higher-income jobs, and promoting workers' rights to ownership of resources are some of the recommended programs to contain income inequality.

Moreover, the short-run bidirectional causality between economic growth and consumption expenditure is evidence that policies to promote economic growth in the short run will ultimately lead to increased consumption expenditure and vice versa. Likewise, the short-run unidirectional causality from income inequality and unemployment to consumption expenditure, underscores the need for policy instruments to contain both income inequality and unemployment, promote increased consumption expenditure, and improve population wellbeing. High- and persistent-income inequality and unemployment erodes individuals' ability to access necessities of life due to lack of necessary funds and so deepens consumption deprivation.

The evidence that in the long run income inequality influences the level of consumption expenditure and in turn consumption expenditure Granger causes the level of economic growth and unemployment implies that policies to contain income inequality in Tanzania will in the long run curb unemployment and promote economic growth and consumption expenditure. In the long run, income inequality has a significant sapping effect on economic growth's poverty-alleviating potential. Therefore, economic growth has a significant explanation about poverty but not all about the evolution of poverty.

The study concludes that in the case of Tanzania, income inequality must be aggressively managed for the poor to experience improved wellbeing as an outcome of improved economic growth. For instance, since income inequality in Tanzania is mostly manifested in the agriculture sector, (as compared to other

sectors), and since the sector hosts majority of the country's poor, for poverty reduction initiatives to be effective, concerted efforts must be focused on transforming the agriculture sector to promote income and employment within the sector. Improved farmers' access to credit facilities, regular hands-on-training on improved farming and animal husbandry, processing of agricultural products locally for value addition, access to simple technologies to reduce post-harvest losses, and improved access to market and ownership of resources are some of the recommended strategies to transform the agriculture sector.

6.1.3 Impacts of tourism expansion on poverty alleviation and the environment

The third objective of this study was to assess and document the impacts of tourism expansion on poverty alleviation and the environment in the context of Tanzania. To address this objective, Chapter 4 assessed the dynamic relationship between household consumption expenditure and tourism growth to gauge the extent to which tourism growth impacts consumption deprivation poverty. Then, Chapter 5 assessed the environmental impacts of tourism growth. Hence, Chapters 4 and 5 empirically answer the research question three, i.e., What is the impact of tourism expansion on the environment and poverty alleviation, especially among the poor households? The analysis of the two aspects – i.e., tourism growth impacts on consumption deprivation and the quality of natural environment - and the corresponding findings are summarized below.

a. Tourism growth and consumption deprivation poverty

Prompted by the need for a statistical approach capturing the population wellbeing to complement measures of market activities, Chapter 4 measured the material wellbeing in Tanzania by studying the dynamic relationship between tourism development and consumption deprivation poverty. The empirical assessment of the annual data on per capita household final consumption expenditure, international tourism receipts, and agricultural value-added for the period 1990– 2017 using Vector Autoregressive (VAR) model, pairwise Granger causality, and Impulse Response Function (IRF) confirmed a unidirectional causality from tourism revenue to consumption expenditure. Likewise, both

tourism and agricultural development were found to impact significantly and positively on the population's living standards.

These findings have weighty policy implications; the unidirectional causality from tourism expansion to consumption expenditure is evidence that policies to promote tourism development will ultimately lead to alleviation of consumption deprivation poverty and enhance population wellbeing. Therefore, tourism-based welfare improvement policies, especially at grassroots, where most of the poor are found, must be given greater priority. In particular, at least three policy changes must be implemented if the poor households must experience improved wellbeing from the additional tourism sector income. First, wages and salaries paid to personnel in the tourism sector need to be competitive with other sectors and reflect the actual cost of living. Besides, the sector needs to give fair employment opportunities to women and have them earn as much as men in a similar positions and credentials. Such a move is necessary because women and children are the majority population in Tanzania and yet they are the most vulnerable among the poor.

Second, Tanzania needs to strengthen participation of the poor people in the tourism sector by upholding inclusivity in planning, decision making and understanding the experiences of the poor. Other ways to strengthen participation of poor people in the tourism sector include empowering them and enabling them to own and run key operations within the sector and beyond and accord them fair priority when it comes to recruitment to fill ordinary managerial and operational positions.

Third, to amplify the tourism growth and its consequent impact on the welfare of the poor, a policy instrument is needed to accelerate and improve the development of infrastructures. For instance, since Tanzania has no adequate resources for infrastructure development, a policy instrument to channel a portion of tourism revenue to infrastructural development is necessary, for in turn it will maximize tourists' experience, lead to more tourism income and improved welfare.

Additionally, policies to promote production, consumption, diversification, and improvement of tourism products to meet international standards, will in turn, integrate other sectors such as transport and agriculture, thereby leading to multiple benefits to the poor such as rapid and mass employment, improved demand for agricultural products, increased market for traditional products, provision of transport and other tourist related services. In this manner, tourism development becomes an engine of growth and an effective tool for poverty alleviation and overall welfare improvement.

b. Environmental impacts of tourism growth

    i) *Systematic review of literature on the Environmental Kuznets Curve Hypothesis*

Chapter 5 began with a systematic review of literature on the Environmental Kuznets Curve (EKC) hypothesis to specify emerging research trends and gaps in income-environmental quality literature. Four major research trends were observed. First, carbon dioxide (CO_2) emissions are the most preferred proxy for environmental damages. On average, 85% of all the income-environment empirical studies employ CO_2 as a proxy for environmental damages. Likewise, on average 96% of all studies use GDP as a proxy for economic indicator. This implies that there is a need for diversification of proxies for economic and environmental indicators to enrich research experience and allow a more diverse comparison of findings.

Second, the study observed a growing consensus that energy consumption is a significant variable for validating EKC hypothesis. On average, 64% of all EKC studies use energy consumption as a principal variable. Further, the study attested that primary energy consumption from fossil fuel, GDP growth, urbanization, and trade openness is repeatedly reported as the factor which tends to degrade the environment.

Third, the ARDL and GMM econometric methods, supported by other subsidiary tests such as the ADF test and Johansen-Juselius test, are the most popular

methods for analysis found in the literature. Besides, the choice of method is largely dictated by availability of data.

Fourth, about 77% of EKC studies produce evidence to affirm the EKC hypothesis in the long run, short run, or both. Nevertheless, most of these studies are based on data from higher and middle-income economies.

The study identified some gaps in the EKC hypothesis literature which future studies need to endeavor to address. The key gaps include: first, most of the studies on the EKC hypothesis are focusing largely on Asia and Middle East countries. Malaysia, China, and the USA are among the countries which have been researched extensively. Nevertheless, there are very few studies that focus on Africa, especially on sub-Saharan Africa. It is estimated that only 4.2% of all ECK studies on a single country focus on a specific African country.

Second, most of the studies seeking to validate the EKC hypothesis in a single or group of countries, utilize CO_2 as an indicator for environmental degradation. However, this indicator is not comprehensive enough because it does not capture all the consequences of human dependence on nature. CO_2 emission does not give a comprehensive picture of environmental degradation because emissions reflect the rate at which the natural environment is damaged by excessive CO_2 emissions resulting from various activities. It does not capture other forms of emissions nor other forms of environmental degradation, such as deforestation, over grazing, solid and liquid wastes, toxic wastes, etc. A more comprehensive proxy for environmental damage is necessary for a more comprehensive and reliable EKC hypothesis test result.

Third, the EKC hypothesis has been widely tested but not many studies have taken a step to include a robust environmental damage forecasting application. For instance, the Environmental Logistic Curve (ELC) can be used to extend the EKC to predict CO_2 for a particular country. Therefore, for future studies the study recommends the inclusion of a robust forecasting aspect using relevant forecasting techniques such as weighted moving average, exponential

smoothing, trend projection, seasonal indexes, etc., as it may be appropriate to forecast the approximate future impact of growth on the natural environment.

Fourth, most EKC studies have not paid adequate attention to the ambiguity of the meaning of sustainability and disagreement on the prospects to achieve environmental sustainability. Approaching environmental degradation as primarily a consequence of economic activities, one risks losing focus on the fact that degradation can depend on several factors. Besides, the review confirmed that economists and ecologists are not in agreement on some basic environmental tenants, e.g., with regards to the nature of ecosystem carrying capacity – is it dynamic or limited?

Fifth, most studies are using aggregate GDP data as a proxy for economic growth. For instance, 93% of all the studies reviewed used real GDP or real GDP per capita as a proxy for economic growth. However, we observe that although aggregate data such as real GDP gives a comprehensive picture of aggregate economic growth, the income-environment relationship may not be uniform across a particular country or all the sectors of an economy. For instance, the income-environment relationship between rural and urban or between the industrial sector and agricultural sectors will ideally be quite different. At present, there are no adequate studies focusing on key regions and sectors of an economy to inform the findings based on overall GDP.

Considering the findings from the review, the researcher carried out an empirical study to investigate the environmental externalities of tourism development in Tanzania.

ii) Investigating environmental externalities of tourism development

The second part of Chapter 5 assesses empirically the environmental impacts of tourism development in Tanzania. The study employed Autoregressive Distributed Lag (ARDL) Bounds Testing, Vector Error Correction Model (VECM), and Granger causality to analyze annual data on ecological footprints, international tourism receipts, primary energy consumption, urban population,

and trade openness for the period 1995–2017. Wild Bootstrap approach was also used to check the accuracy of the computed statistics. The findings lend evidence of unidirectional causality from tourism revenue and trade openness to ecological footprints. Likewise, there is unidirectional causality from urbanization to ecological footprints. The causal relation results show that while tourism growth and trade openness compact environmental degradation, urbanization aggravates environmental damages. Primary energy consumption was found to accelerate environmental damage due to its positive relationship with ecological footprints, but its impact is not significant. Besides, the study submits that the EKC hypothesis is absent in Tanzania.

Policy wise, the significant negative relationship between tourism expansion and environmental degradation, and between trade openness and environmental degradation is evident that revenue from foreign trade and tourism sector can sustainably be used to alleviate environmental degradation in Tanzania. Every 1% increase in tourism growth and trade openness reduces environmental degradation by 2% and 0.3% respectively. Therefore, investment on renewable energy to reduce dependence on fossil fuel, improvement of transport infrastructure, and promoting community-based conservation by empowering the local community are some of the critical areas recommended to be financed by the proceeds from trade and tourism sector for improved environmental quality.

The evidence that urbanization and energy consumption both maintain positive relationships with environmental degradation, underscore significant policy implications: the positive relationship implies that Tanzania needs to adopt proactive urban planning strategies as well as promoting the generation and consumption of clean energy to attain sustainable urbanization and improve the quality of environment. Some of the observable consequences of unplanned urbanization, especially in major towns such as Dar es Salaam, Arusha and Mwanza include untreated domestic sewage disposal, poorly managed industrial and solid waste, culminating in water and air pollution; excessive use of fossil fuel to meet increasing demand for transport, light and heating, emergence of shanty towns, etc. At present, urban settings in Tanzania, unlike the rural

counterparts, present better means of livelihood opportunities; a situation which in turn fuels rural-urban migration and thereby further undermines environmental integrity in urban areas. The rapidly growing urban population in Tanzania is likely to lead to more severe environmental issues such as reduction of groundwater re-charge due to excessive evapotranspiration and expanding paved surfaces, which further lead to acute environmental, health, and socioeconomic hazards. The study recommends policies to promote access to basic amenities such as education and health, and programs which create more job opportunities in the rural areas to slow down the rural-urban migration. This will limit unsustainable urbanization which is associated with unsustainable demand for energy.

Moreover, the absence of the EKC hypothesis in Tanzania signifies that the current urbanization strategies (as depicted by measures to monitor the urban population growth) and efforts to access clean energy, have not helped in forming an inverted U-shaped relationship between tourism revenue and environmental degradation in Tanzania. Strategies to expand the country's investment on renewable energy, e.g., through subsidy and import tax waiver on solar appliances, are critical in enabling the country to address the consequent effects of the prevailing low levels of energy efficiency and promoting use of renewable energy.

6.2 Study limitations and recommendations for future research

The current study experienced limitations in terms of accessibility of locally compiled statistical data. For instance, while the Tanzania National Bureau of Statistics estimates poverty head count data approximately every 4 to 5 years, yet there are no estimates available for the period before the year 2000 nor are the annual time series poverty head count data available. Other significant data, such as real GDP, international tourism revenue, and real exchange rate, were not locally published for the period before 1980. This becomes a serious limitation in making empirical analysis covering more than four decades. While accessing the national documentation centers is a challenge in terms of bureaucracy, retrieving information is even more difficult due to the weak and out modeled

cataloging system. Only a few recent pieces of information, largely from 1995, are kept in electronic form and can be accessed online by the public. The fundamental data such as annual time series data on ecological footprints, income inequality, and poverty headcount are not available in either the national or other local databases.

To mitigate the shortage of data and inconsistencies exhibited by some locally published data, the researcher had to rely on alternative dependable international data sources such as the World Development Indicators database, International Monetary Fund database, and United Nation Economic Commission for Africa database. Investment in the Tanzania National Bureau of Statistics in terms of adequate annual operations budget, making working tools available, and ensuring staff ongoing training is recommended to mitigate the challenges around data availability and accuracy.

Future research is needed to better understand the impacts of tourism development on economic growth, poverty alleviation, and the environment at regional level, e.g., rural areas versus urban areas, Tanzania mainland versus Zanzibar Iceland, etc. Such information will strengthen welfare and environmental based policies targeting parts of the country with distinctive socioeconomic situations and needs. Moreover, future research on this area may consider the use of panel data to bring together e.g., the Southern African Development Community (SADEC) region and compare the impact across the countries to adding a new perspective on the country specific studies.

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