Tourism and Economic Growth in South Africa: Evidence from Linear and Nonlinear Cointegration Frameworks

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Tourism is increasingly being recognized as an essential component of economic growth in South Africa. The purpose of this study is to examine cointegration and causal effects between tourism and economic growth in South Africa for annual data collected between 1995 and 2014. To this end, the paper contrasts two empirical approaches; (1) Engle and Granger (1987) linear cointegration framework, and (2) Enders and Granger (1998) nonlinear cointegration framework. Furthermore, two empirical measures of tourism development are used in the study, namely; tourist receipts and number of international tourist arrivals. The empirical results of the linear framework supports the tourism-led growth hypothesis when tourist receipts are used as a measure of tourism development. However, the nonlinear framework depicts bi-directional causality between tourist receipts and economic growth. Also, the linear framework supports the economic-growth-driven-tourism-hypothesis for tourist arrivals whereas the nonlinear framework depicts no causality between tourist arrivals and economic growth.

Key Words: tourism receipts, tourist arrivals, economic growth, South Africa
JEL *Classification:* C5, Z0

Introduction

Tourism development is increasingly being recognized as an important source of revenues as well as a crucial tool in promoting economic growth, alleviating poverty, advancing food security, environmental protection and multicultural peace and understanding across the glove, more especially in developing or emerging economies. According to the United Nations World Tourism Organization (UNWTO), the number of international tourists worldwide in 2014 grew 4.4 percent with an additional 48 million more visitors more than in 2013, to reach a new record of 1 135 million tourists worldwide which saw receipts from international tourism reach an estimated US$ 1 245 billion which is 3.4 percent from its previous year. In fact, it is forecasted that the number of tourists worldwide will reach 1 602 million which will generate receipts of approximately US$2 trillion in revenue (World Tourism Organization 2015). Academically, the acclaimed benefits of tourism towards economic development are not difficult to pinpoint in the literature. For instance, Wang, Zhang, and Lee (2012) highlight that tourism consumption directly stimulates the development of traditional industries such as civil aviation, railway, highway, commerce, food, accommodation and further promotes the development of modern services such as international finance, logistics, information consultation, cultural originality, movie production, entertainment, conferences and exhibitions. Oh (2005) also cites that tourism creates job opportunities; promotes improvements in a country's infrastructure, transfers both new technological and managerial skills into an economy as well as produces foreign earnings that are not only essential to import consumer goods but also to capital and intermediate goods. Moreover, Khalil, Kakar, and Waliullah (2007) note that positive developments in the tourism sector can cause direct and indirect growth of households incomes and government revenues by means of multiplier effects, improving balance of payments and promoting tourism-based government policies. All-in-all, the there is an increasing and unanimously widely-held view that tourism is a fundamental factor of economic growth, even though this has not been concretely imbedded in the theoretical literature concerning growth theory.

South Africa has enjoyed close to 70 years of professional experience in the tourism industry, with prominent developments in the industry being traced back to 1947, when the South African Tourist Co-operation (SATOUR) was formed as a separate entity from the publicity arm of the South African Railways and Habours, which formerly dealt with tourist matters (Grundlingh 2006). However, the SATOUR was established in wake of the apartheid era, when the National Party (NP) become the ruling political party in South Africa in 1948 and implemented a legal system of political and social segregation of races. The tourism industry was greatly affected by the legacy of apartheid which rendered the tourism market a predominantly regional business, with the whites of neighbouring countries like Rhodesia and Mozambique forming a majority of tourists and long-distance visitors from overseas forming the remaining minority of tourists (Mkhize 1994). Despite experiencing further slumps in the tourism industry during these reigns of apartheid when the United Nations organized a series of international events termed the World Conference Against Racism (WCAR) which discouraged tourist attractions in the country, the post-apartheid years have experienced a boost in the tourism industry and up-to-date, tourism continues to be an essential component in promoting economic development and sustainability within the country. Now, boasting a number of cultural, historical, archaeological and geological sites, post-apartheid South Africa is currently considered a premier tourist destination, not only within the African continent, but also on a competitive global platform. Adding on to this repertoire, the country has hosted a number major international sporting events; inclusive of the Rugby World cup in 1995, the World Cup of Athletics in 1998, the Cricket World Cup in 1998, the African Cup of Nations in 1996 and 2012, the A1 Grand Prix since 2006 and probably the biggest event of them all, the FIFA World Cup 2010. The FIFA World Cup by itself solely attracted more than 309 000 tourists which was a significant contributor to the 8.34 million international visitors to the country in that year. And even more encouraging, foreign arrivals in South Africa reached their highest levels in 2013 with 10 million tourists visiting the country in that year alone and overall, the growth rate of tourists has surpassed that of the world average for over the last decade or so (Saayman and Saayman 2010).

In light of the increasing importance which tourism contributes towards the overall economic development and welfare in South Africa, it is indeed quite surprising that there appears to be very little academic research which explicitly explores the impact which tourism exerts on economic growth within the country. So far the works of Akinboade and Braimoh (2009) and Balcilar, van Eyden, and Inglesi-Lotz (2014) are exceptional case studies and even so, these studies present conflicting empirical evidences. Besides the issues of differences in applied econometric modeling and differences in the time spans of collected data, a plausible reason for the lack of consensus in these studies is their use of linear empirical frameworks. As pointed out by Ridderstaat, Croes, and Nijkamp (2014), the tourism-growth relationship cannot be strictly linear because of the effects of tourism on economic growth adhere to the law of diminishing returns and hence the use of linear frameworks most likely oversimplifies the true underlying relationship among the variables. Taking into consideration the aforementioned, this current paper contributes to the academic literature by examining nonlinear cointegration and causality effects between tourism and economic growth in South Africa between the period of 1994 and 2014. Our choice of econometric modelling

TABLE 1 Summary of Literature Review on Tourism and Economic Growth – Single Country Studies

Author	Country	Year	Methodology	Causal rel.
Balaguer and Cantavella-Jorda (2002)	Spain	1975–1997	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Dubarry (2004)	Mauritius	1952–1999	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Oh (2005)	South Korea	1975–2001	Engle and Granger (1987) ECM and Granger causality tests	EG→TR
Khalil, Kakar, and Waliullah (2007)	Pakistan	1960–2005	Engle and Granger (1987) ECM and Granger causality tests	TR↔EG
Brida, Sanchez–Carrera, and Risso (2008)	Mexico	1980–2007	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Tang and Jang (2009), Akinboade and Braimoh (2009)	USA South Africa	1981–2005 1980–2005	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure and Granger causality tests Granger causality tests	EG→TRTR →EG

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is the momentum threshold autoregressive (MTAR) model of Enders and Silkos (2001) which is merely a nonlinear extension of Engle and Granger (1987) cointegration framework. The principle advantage with the MTAR model, is that unlike other nonlinear models commonly found in the literature, the MTAR model on account of being derived from Hansen's (1999) threshold autoregressive (TAR) framework can facilitate for non-linear cointegration and nonlinear error correction modelling under a singular econometric framework.

Having laid the background to this study, the rest of the paper is arranged as follows. The following section of the paper presents the literature review of the study. The third section outlines the empirical framework used in the study whereas the fourth section of the paper introduces the empirical data and conducts the empirical research. The paper is then concluded in the fifth section of the paper in the form of policy implications of the empirical research and also suggests possible avenues for future research.

TABLE 1 *Continued from the previous page*

Author	Country	Year	Methodology	Causal rel.
Belloumi (2010)	Tunisia	1970–2007	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Kreishan (2011)	Jordan	1970–2009	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Wang, Zhang, and Lee (2012)	China	1984–2009	Engle and Granger (1987) ECM, and Granger causality tests	TR↔EG
Ridderstaat, Croes, and Nijkamp (2014)	Aruba	1972–2011	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure and Granger causality tests	EG→TR
Balcilar, van Eyden, and Inglesi-Lotz (2014)	South Africa	1960–2011	Vector error correction model (VECM) and time-varying VECM (TV-VECM)	TR≠GDP for VECM model TV-VECM

Tourism and Economic Growth: A Review of the Empirical Literature

Advances in the empirical investigation into the relationship between tourism and economic growth has been largely facilitated by advances in applied statistical estimation techniques. For simplicity sake, we categorize the available empirical literature into three strands of works. The first group of empirical studies are those which focused on single country analysis for both developing and developed economies. Belonging to this cluster of studies are the works of Balaguer and Cantavella-Jorda (2002) for Spain, Dubarry (2004) for Maurititus, Oh (2005) for South Korea, Khalil, Kakar, and Waliullah (2007) for Pakistan, Brida, Sanchez-Carrera, and Risso (2008) for Mexico, Tang and Jang (2008) for the US, Akinboade and Braimoh (2009) for South Africa, Belloumi (2010) for Tunisia, Kreishan (2011) for Jordan, Wang, Zhang, and Lee (2012) for China, Ridderstaat, Croes, and Nijkamp (2014) for Aruba and Balcilar, van Eyden, and Inglesi-Lotz (2014) for South Africa. Notably the aforementioned studies have produced a variety of conflicting empirical results, with the studies of Balaguer and Cantavella-Jorda (2002), Dubarry (2004), Brida, Sanchez-Carrera, and Risso (2008), Akinboade and Braimoh (2009), Belloumi (2010) and Kreishan (2011) finding causality running from tourism

TABLE 2 Summary of Literature Review on Tourism and Economic Growth – Panel Data Studies

Author	Countries	Year	Co-integration method	Results
Lanza, Templee, and Giovanni (2003)	13 OECD countries	1977–1992	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR↔EG
Lee and Chang (2008)	OECD & non-OECD countries	1990–2002	Panel cointegration tests, Panel vector error correction model and panel causality tests	TR→EG for OECD countries; TR↔EG for non OECD countries
Seetanah (2011)	19 island economies	1990–2007	Generalized method of moments (GMM) method and panel causality tests	TR↔EG
Caglayan, Sak, and Karymshakov (2011)	30 American, 34 Asian, 37 European, 13 East Asian, 6 South Asian, 5 Central Asian, 7 Oceanian, 24 Sub-Saharan, and 28 Latin American & Caribbean countries	1995–2008	Pedroni (1999) panel co-integration method and panel causality tests.	EG→TR for American, Latin American and Carribean countries; TR→EG for East Asian, South Asian and Oceania countries; TR≠EG for Middle East, Asia, North Africa, Central Asia and Sub-Saharan countries

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to economic growth (i.e. tourism-led-growth-hypothesis or TLGH), and the studies of Oh (2005), Tang and Jang (2009) and Ridderstaat, Croes, and Nijkamp (2014) finding causality to run from economic growth to tourism (i.e. economic-growth-driven-tourism-hypothesis or EGDTH) and other studies like Khalil, Kakar, and Waliullah (2007), Wang, Zhang, and Lee (2012) and Balcilar, van Eyden, and Inglesi-Lotz (2014), advocating for bi-directional or feedback causality between the two variables (i.e. reciprocal hypothesis or RH).

The second strand of empirical studies are those which investigate the tourism-growth relationship for panels of countries and these studies can be further sub-divided into two sub-groups. The first sub-group

TABLE 2 *Continued from the previous page*

Author	Countries	Year	Co-integration method	Results
Samimi, Somaye, and Soraya (2011)	20 developing countries	1995–2008	Johansen and Juselius (1990) cointegration procedure and granger causality tests	TR↔EG
Dritsakis (2012)	7 Mediterranean countries	1980–2007	Panel cointegration panel granger causality tests.	EG→TR
Chiou (2013)	10 transition countries	1988–2011	Panel causality tests	TR≠EG for Bulgaria, Romania and Slovenia;TR→EG for Cyprus, Latvia and Slovakia;EG→TR for Czech Republic and Poland;TR↔EG for Estonia and Hungary
Aslan (2013)	10 Mediterranean countries	1995–2010	Panel granger causality tests	EG→TR for Spain, Italy, Tunisia, Cyprus, Croatia, Bulgaria & Greece;TR≠EG for Malta & Egypt

are those which individually apply single country analysis to a panel of countries. Inclusive of these studies are Chiou (2013) for Bulgria, Romania, Slovenia, Cyprus, Latvia, Slovakia, Czech Republic, Poland, Estonia and Hungary and also the study of Aslan (2013) for Spain, Italy, Tunisia, Cyprus, Croatia, Bulgaria, Greece, Malta and Egypt. The second sub-group of these studies are those which used panel data estimation techniques to evaluate the tourism-growth relationship amongst a panel of economies. Belonging to this group of studies are Lanza, Templee, and Giovanni (2003) for OECD countries, Lee and Chang (2008) for OECD and non-OECD countries, Seetanah (2011) for Island economies, Caglayan, Sak, and Karymshakov (2011) for American, Asian, European, South Asian, Central Asian, Oceania, sub-Saharan, Latin American and Caribbean countries, Samimi, Somaye, and Soraya (2011) for developing coutries and Dritsakis (2012) for Mediterranean countries. Apart from the issue of conflicting empirical results amongst the different authors,

TABLE 3 Summary of Literature Review on Tourism and Economic Growth – Nonlinear Studies

Author	Country/Countries	Year	Methodology	Results
Po and Huang (2008)	88 developed and developing countries	1995–2005	3-regime panel threshold autoregressive model of Hansen (1999)	When TR/EG ≤ 4.05% or TR/EG > 4.73% then TR and EG are positively related; When 4.05% < TR/EG ≤ 4.73%, then TR and EG are insignificantly related.
Adamou and Clerides (2009)	Cyprus	1960–2007	Quadratic spline regression estimates	When TR/EG ≤ 20%, then TR and EG are positively related; When TR/EG > 20%, then TR and EG are insignificantly related.
Chang, Khamkaew, and McAleer (2012)	131 East Asian, Pacific, European, Central Asian, Latin America, Caribbean, Middle East, North African, North American, South Asian and Sub-Saharan African countries	1991–2008	3-regime panel threshold autoregressive model of Hansen (1999)	When TR/EG ≤ 14.97% or 14.97 < TR/EG ≤ 17.5%, then then TR and EG are positively related; When TR/EG > 17.5%, then TR and EG are insignificantly related.
Wang (2012)	10 countries in the 2008 Country Brand Index	1996–2006	2-regime threshold autoregressive model of Hansen (1999)	When exchange rate depreciation > −6.59%, then there is positive relationship between TR and EG; When exchange rate depreciation > –6.59%, then there is a negative relationship between TR and EG.

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these panel data studies are criticized for generalizing their results over entire populations with differing economic disparities. A conspicuous example of this can be observed for the case of China whereby the panel study of Caglayan, Sak, and Karymshakov (2011) reports causality running from tourism to economic growth for Asian countries whereas the single country case study of Wang, Zhang, and Lee (2012) finds causality running from economic growth to tourism.

The third strand of empirical studies are those which have hypothe-

TABLE 3 *Continued from the previous page*

Author	Country/Countries	Year	Methodology	Results
Brida, Lanzilotta, and Sebestian (2013)	MERCOSUR countries	1990–2011	Non-parametric cointegration and causality tests	TR→EG for Brazil, Paraguay and Uruguay TR↔EG for Uruguay and Argentina.
Hatemi-J et al. (2014)	G7 countries	1995–2012	Hatemi-J asymmetric panel causality tests	Asymmetric causality: TR→EG for Canada & Italy; EG→TR for France, Italy & Japan Symmetric causality: TR→EG for Germany; France & US; EG→TR for Canada & Germany.
Pan, Liu, and Wu (2014)	15 OECD countries	1995–2010	Panel smooth transition regression model	When lagged exchange rate > −2.629%, then positive effects of TR on EG are magnified; When two-period lagged inflation rate > 5.03%, then the positive effects of TR on EG are magnified.

sized on a nonlinear relationship between tourism and economic growth. As clarified in Wang (2012), it is quite possible that a linear framework oversimplifies the tourism-growth relationship and that the underlying relationship between the variables is indeed complex and nonlinear in nature. Empirically, the evidence in support of a nonlinear tourism-growth relationship is found in the works of Po and Huang (2008), Adamoou and Clerides (2009), Chang, Khamkaew, and McAleer (2012), Wang (2012), Brida, Lanzilotta, and Sebestian (2013), and Pan, Liu, and Wu (2014). And if this literature be narrowed down to empirical studies which exclusively attempt to model both nonlinear cointegration as well as nonlinear causal relations between the variables, then the study of Brida, Lanzilotta, and Sebestian (2013) solely satisfies this criteria. Therefore, we optimistically note the potential for growth in this particular field of empirical investigation when one considers the rapid expansion in the availability of statistical tools which can enable researchers to carry out such analysis. Having efficiently highlighted important empirical developments in the tourism-growth literature, we present a summary of a comprehensive portion of the literature in tables 1–3. For the sake of convenience, we segregate the summarized empirical studies into single-country studies, panel-data studies and nonlinear studies.

Empirical Framework

ENGLE AND GRANGER (1987) LINEAR COINTEGRATION FRAMEWORK

We begin our empirical framework by specifying our baseline empirical model via the following two long run regression equations:

$$\text{GDP}_t = \alpha_{00} + \alpha_{10}\text{TR}_t + \varepsilon_{t1}, \tag{1}$$

$$\text{TR}_t = \alpha_{01} + \alpha_{11}\text{GDP}_t + \varepsilon_{t2}, \tag{2}$$

where GDP_t is the gross domestic product; TR_t is the measure of tourism which in our study is given by two measures (i) the first being international tourism receipts; and (ii) the second being the number of international tourist arrivals, and the term ε_{ti} is the long run regression error term. According to the Engle and Granger's (1987) cointegration theorem, long-run convergence along a steady state path can exist when two preliminary conditions are met. Firstly, there actual time series variables must be integrated of order $I(1)$. The second condition is that the error term from the long-run regression must be integrated of a lower order $I(0)$. Once these two conditions are satisfied, one can then proceed to model the long run regression error terms as the following error correction models (ECM):

$$\text{GDP}_{t-1} = \sum_{i=1}^{p} \alpha_{i1}\Delta\text{GDP}_{t-i} + \sum_{i=1}^{p} \beta_{i1}\Delta\text{TR}_{t-i} + \lambda_1\varepsilon_{t-1,1}, \tag{3}$$

$$\text{TR}_{t-1} = \sum_{i=1}^{p} \alpha_{i1}\delta\text{GDP}_{t-i} + \sum_{i=1}^{p} \beta_{i1}\Delta\text{TR} \sum_{t-i} +\lambda_1\varepsilon_{t-1,1}, \tag{4}$$

where Δ is a first difference operator and is that lagged error correction term which acts as an error correction mechanism in the ECMS. From the ECMS regressions (3) and (4), granger causality testing can be facilitated by examining whether the regression coefficients from the lagged variables from the TEC models (i.e. α_k for GDP and β_k for TOUR) are significantly different from zero. Four distinct theoretical hypotheses are thereafter examined from our causality analysis.

Under the first hypotheses, the regression coefficients of the tourism variable are found to be significantly different from zero, whereas the coefficients of the economic growth variable are not significantly different from zero. This is known as the tourism-led-growth-hypothesis (TLGH). Under the second hypothesis, the regression coefficients of the economic growth variable are significantly different from zero, whereas the coefficients of the tourism variable are not significantly different from zero. This is known as the economic-growth-driven-tourism-hypothesis (EGDTH). Under the third hypothesis the regression coefficients of both the economic growth and tourism variables are both found to be significant different from zero and this is known as the reciprocal hypothesis (RH). Under the fourth hypothesis, the regression coefficients from both the tourism and economic growth variables are not significantly different from zero.

ENDERS AND GRANGER (1998) NONLINEAR COINTEGRATION FRAMEWORK

As a nonlinear extension to Engle and Granger's (1987) linear cointegration framework, Enders and Granger (1998) begin on the premise of assuming that error terms from the long-run regressions (1) and (2) should be modelled as the following nonlinear cointegration functions:

$$\varepsilon_{ti} = \rho_1 \varepsilon_{t-1}(\varepsilon_{t-1} < \tau) + \rho_2 \varepsilon_{t-1}(\varepsilon_{t-1} < \tau), \quad (5)$$

$$\varepsilon_{ti} = \rho_1 \varepsilon_{t-1}(\Delta\varepsilon_{t-1} < \tau) + \rho_2 \varepsilon_{t-1}(\Delta\varepsilon_{t-1} < \tau), \quad (6)$$

where τ is the threshold variable whose value is unknown a prior and ultimately governs the asymmetric behaviour among the error terms. Regressions (5) and (6) are known as threshold autoregressive (TAR) and momentum threshold autoregressive (MTAR) model specifications, respectively. Since the MTAR model relies on the first differences of the lagged residuals, $\Delta\varepsilon_{t-1}$, this specification effectively captures large and smooth changes in a series whereas the TAR model specification is designed to capture the depth of swings the equilibrium relationship. In each of the TAR and MTAR specifications, the threshold variable is modelled in two forms. Under the first form, the value of the threshold is zero whereas under the second form, the threshold value is determined through grid search method as illustrated in Hansen (1999). In the latter case, the threshold models are known as consistently-estimated threshold autoregressive (C-TAR) and consistently-estimated momentum threshold autoregressive (C-MTAR) model specifications. In testing for cointegration effects in regressions (5) and (6), Enders and Granger (1998) as well as Enders and Silkos (2001) suggest testing for (i) normal cointegration effects; and (ii) asymmetric cointegration effects. These cointegration tests are respectively implemented under the following null hypotheses:

$$\text{H}_0^{(i)} : \rho_1 = \rho_2 = 0, \tag{7}$$

$$\text{H}_0^{(ii)} : \rho_1 = \rho_2. \tag{8}$$

As is the case of the linear cointegration framework, once the aforementioned null hypotheses are rejected, then one can introduce a threshold error correction (TEC) framework, which for the TAR model assumes the following specification:

$$\begin{pmatrix} \Delta\text{GDP}_t \\ \Delta\text{TR}_t \end{pmatrix} = \begin{cases} \lambda^+\varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^+ \Delta\text{GDP}_{t-k}^+ + \sum_{i=1}^{p} \beta_k^+ \Delta\text{TR}_{t-k}^+, \text{ if } \varepsilon_{t-1} < \tau \\ \lambda^-\varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^- \Delta\text{GDP}_{t-k}^- + \sum_{i=1}^{p} \beta_k^- \Delta\text{TR}_{t-k}^-, \text{ if } \varepsilon_{t-1} < \tau \end{cases}. \tag{9}$$

Whereas for the case of the MTAR model, the TEC framework assumes the following function:

$$\begin{pmatrix} \Delta\text{GDP}_t \\ \Delta\text{TR}_t \end{pmatrix} = \begin{cases} \lambda^+\varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^+ \Delta\text{GDP}_{t-k}^+ + \sum_{i=1}^{p} \beta_k^+ \Delta\text{TR}_{t-k}^+, \text{ if } \varepsilon_{t-1} < \Delta\tau \\ \lambda^-\varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^- \Delta\text{GDP}_{t-k}^- + \sum_{i=1}^{p} \beta_k^- \Delta\text{TR}_{t-k}^-, \text{ if } \varepsilon_{t-1} < \Delta\tau \end{cases}. \tag{10}$$

From the above TAR-TEC and MTAR-TEC model specifications, the presence of asymmetric error correction effects as opposed to linear error correction effects can be tested through the following null hypothesis:

$$\text{H}_0^{(iii)} : \lambda^+\xi_{t-1}^+ = \lambda^-\xi_{t-1}^-. \tag{11}$$

Similar to the case for the linear cointegration framework, granger causality is facilitated in the TEC model by determining whether the regression coefficients from the lagged time series variables significantly differ from zero. The hypotheses tested from the causality analysis under the nonlinear models are similar to the ones discussed under the linear empirical framework.

Data and Empirical Analysis

EMPIRICAL DATA

In examining linear and nonlinear cointegration trends between tourism and economic growth the for case of South Africa, this study employs three time series for empirical use, namely; the international tourist receipts in US$ (TR(R)), the number of international tourist arrivals (TR(A)) and the gross domestic product (GDP) given in US$ at a constant base of 2005. As inferred by Ridderstaat, Croes, and Nijkamp (2014), tourism receipts suffer more during times of crisis as tourists tend to trade down

TABLE 4 Unit Root Test Results

Time series	Unit root tests	
	ADF	PP
TR(R)	0.91 (−2.29)**	−0.99 (−3.16)**
TR(A)	1.55 (−2.74)***	−0.76 (−5.28)***
GDP	0.14 (−2.83)***	0.43 (−3.06)**

NOTES Unit root tests results on first differences of the time series are reported in parentheses. *p*-values reported in parentheses. *, **, and *** denote significance levels of 10, 5 and 1 percent, respectively. All unit root tests are performed with a constant and no trend.

and travel of shorter periods of time whereas international tourist arrivals are only slightly distorted during these periods. Therefore, given these slight differences in measures of tourism, our study opts to simultaneously use both of these measures of tourism to ensure a more robust empirical analysis. In further trying to ensure consistency, all data has been collected from the World Tourism Organization yearbook of tourism statistics and has been collected on a yearly basis for the periods of 1994 and 2014. However, given the relatively small sample size of this data collection, we further interpolate the data into quarterly data in order to increase the sample size from 20 to 80 observational units.

UNIT ROOT TESTS

As a preliminary step towards examining linear and nonlinear cointegration trends between tourist arrivals and economic growth, on one hand, and between tourist arrivals and economic growth, on the other hand, one must examine the integration properties of the aforementioned time series variables. To this end, we employ the augment Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests to the data and report our findings below in table 4. Regardless of whether the ADF or PP unit root tests are used, all the time series variables are found to be first difference stationary variables (i.e. integrated of order I(1)). As should be noted, this result satisfies a previously-discussed condition of the Engle-Granger (1987) cointegration theorem, thus permitting us to proceed with a more formal cointegration analysis of the time series data.

LINEAR COINTEGRATION ANALYSIS

Having confirmed first difference stationarity of the time series variables, we proceed to examine linear cointegration effects between TR(A) and GDP, on one hand, and between TR(B) and GDP, on the other hand. We

TABLE 5 Maximum Eigen and Trace Test Results for Cointegration

Cointegration	H_0	H_1	Eigen	90% CV	Trace	90% CV
TR(A) & GDP	$r \geq 1$	$r = 1\ (r \geq 2)$	3.78	10.49	2.65	6.50
	$r \leq 0$	$r = 0\ (r \geq 1)$	17.52*	16.85	18.37	15.66
TR(B) & GDP	$r \leq 1$	$r = 1\ (r \geq 2)$	6.01	6.50	5.62	6.50
	$r \leq 0$	$r = 0\ (r \geq 1)$	13.09*	12.91	18.66	15.66

NOTES * denotes a 10% significance level. The alternative hypotheses of the trace tests are stated in parentheses.

begin our linear cointegration analysis by subjecting the two sets of time series variables to the Johansen and Juselius (1990) Eigen and Trace tests for cointegration rank.

As is evident by the results of the Eigen and Trace tests statistics for cointegration as reported in table 5, both the Eigen and Trace test statistics reject the null hypothesis of cointegration effects for both sets of time series variables up to a cointegration rank of 1 at a 10 percent level of significance. In light of these encouraging or optimistic results, we proceed to estimate long run ordinary least squares (OLS) regressions; the associated error correction models (ECMS) and further perform granger causal tests based on the ECMS. The results of the aforementioned analysis are collectively reported in table 6.

In referring to the empirical results reported in table 6, we firstly take note of a significantly positive relationship between tourism and economic growth for both measures of tourism. The respective elasticities of 0.14 for TR(A) and 0.27 for TR(R), indicates that a 1 percentage increase in the number of tourist arrivals results in a 0.14 percent increase in economic growth whereas a 1 percentage increase in the dollar value of tourist receipts results in 0.27 percent increase in the levels of economic growth. Secondly, from our ECMS we find a significant and negative error correction (EC) term for both sets of regressions whereas the difference lagged variables are, for a majority of cases, insignificant. This result points to significant long run relations between tourism and economic growth, whereby such relations are deficient in the short-run. Lastly, our causality tests for the two sets of regressions, as reported in table 7, point unidirectional causality running from tourism receipts to economic growth and also from economic growth to number of international tourists. These causality result is in accordance with those obtained by Balaguer and Cantavella-Jorda (2002) for Spain, Dubarry (2004) for

TABLE 6 OLS Long-Run Regression and Error Correction Model Estimates

Long-run	TR(R)	GDP	TR(A)	GDP
α_{0i}	−9.68 (0.00)***	1.56 (0.00)***	−1.44 (0.03)*	0.62 (0.00)***
α_{1i}	6.52 (0.00)***	0.14 (0.00)***	3.37 (0.00)***	0.27 (0.00)***
Error correction	ΔTR(R)	ΔGDP	ΔTR(A)	ΔGDP
ε_{t-1}	−0.74 (0.39)	−0.04 (0.01)*	−1.41 (0.77)	−0.12 (0.03)*
ΔTR_{t-1}	0.64 (0.44)	0.05 (0.01)**	0.01 (0.75)	0.02 (0.03)
ΔTR_{t-2}	0.50 (0.49)	0.03 (0.02)	0.43 (0.53)	0.05 (0.02)*
ΔTR_{t-3}	0.25 (0.48)	0.04 (0.02)*	−0.40 (0.61)	−0.01 (0.03)
ΔTR_{t-4}	0.30 (0.50)	0.03 (0.02)	0.12 (0.43)	0.01 (0.02)
ΔGDP_{t-1}	−7.90 (9.26)	−0.08 (0.35)	10.29 (8.46)	0.97 (0.04)*
ΔGDP_{t-2}	−0.77 (8.62)	−0.19 (0.32)	−7.41 (8.80)	−0.54 (0.39)
ΔGDP_{t-3}	−1.24 (9.12)	0.04 (0.02)*	11.34 (10.13)	0.83 (0.45)
ΔGDP_{t-4}	3.94 (6.95)	0.18 (0.26)	−9.86 (7.77)	−0.23 (0.35)

NOTES *p*-values reported in parentheses. *, **, and *** denote significance levels of 10, 5 and 1 percent, respectively.

TABLE 7 Linear ECM-Based Causality Tests

Item	GDP	TR(R)	Item	GDP	TR(A)
GDP	–	3.08 (0.07)*	GDP	–	1.98 (0.16)
TR(R)	0.49 (0.62)	–	TR(A)	3.58 (0.05)*	–

Mauritius, Brida, Sanchez-Carrera, and Risso (2008) for Mexico, Akinboade and Braimoh (2009) for South Africa, Belloumi (2010) for Tunisia, Kreishan (2011) for Jordan, Lee and Chang (2008) for OECD countries, Caglayan, Sak, and Karymshakov (2011) for Asian countries and Chiou (2013) for Czech Republic and Poland. Notably, the obtained results contradict those obtained by Balcilar, van Eyden, and Inglesi-Lotz (2014) for South Africa who establish no causality between tourism using a linear VECM model.

NONLINEAR COINTEGRATION ANALYSIS

Having investigated linear cointegration effects between the time series variables, we now divert our attention towards examining possible nonlinear cointegration and causal relations among the same sets of variables. As should be remembered, we carry out the nonlinear cointegration analysis under 4 forms of threshold models, namely; TAR, C-TAR, MTAR and

TABLE 8 Threshold Cointegration and Threshold Error Correction Tests

x	*y*	TAR-TEC			C-TAR-TEC		
		H_0^i	H_0^{ii}	H_0^{iii}	H_0^i	H_0^{ii}	H_0^{iii}
TR(R)	GDP	4.13 (0.04)*	0.20 (0.66)	1.88 (0.20)	4.15 (0.04)*	0.23 (0.64)	0.24 (0.64)
GDP	TR(R)	3.34 (0.06)*	0.79 (0.39)	4.59 (0.05)*	4.51 (0.03)*	2.53 (0.13)	3.41 (0.09)*
TR(A)	GDP	3.14 (0.07)*	0.45 (0.51)	2.66 (0.13)	4.13 (0.04)*	1.91 (0.19)	1.49 (0.10)
GDP	TR(R)	2.77 (0.09)*	0.42 (0.52)	2.68 (0.12)*	3.97 (0.04)*	2.25 (0.15)	2.60 (0.12)*
		MTAR-TEC			C-MTAR-TEC		
		H_0^i	H_0^{ii}	H_0^{iii}	H_0^i	H_0^{ii}	H_0^{iii}
TR(R)	GDP	4.05 (0.04)*	0.10 (0.76)	0.74 (0.41)	8.07 (0.00)***	5.46 (0.03)*	4.09 (0.07)*
GDP	TR(R)	2.81 (0.09)*	0.01 (0.95)	3.76 (0.08)*	3.32 (0.06)*	0.76 (0.40)	3.76 (0.08)*
TR(A)	GDP	2.84 (0.08)*	0.01 (0.98)	2.82 (0.10)*	5.51 (0.01)*	4.53 (0.04)*	5.48 (0.04)**
GDP	TR(A)	3.12 (0.07)*	0.95 (0.34)	0.08 (0.79)	5.50 (0.02)*	4.59 (0.05)*	2.39 (0.11)*

NOTES *p*-values reported in parentheses. *, **, and *** denote significance levels of 10, 5 and 1 percent, respectively. *y* represents the dependent variable and *x* represents the independent variable.

C-MTAR. Hereafter, the methodology is carried out in four consecutive steps/processes. Firstly, we test for significant nonlinear cointegration and error correction effects. To recall, we employ three main testing hypotheses namely, (i) testing for cointegration, (ii) testing for nonlinear cointegration, and (iii) testing for nonlinear error correction effects. Secondly, we estimate the threshold error terms derived from the long-run regression equations. Thirdly, we estimate the associated threshold error correction models (TECM). And lastly, we carry out causality tests under the TECM frameworks.

In referring to the tests for cointegration as reported in table 8, we firstly note that all of the threshold cointegration regressions reject the null hypothesis of cointegration. This result clearly indicates that there must be some sort of meaningful relationship which exists between the two time series variables. However, in subjecting the threshold regres-

TABLE 9 C-MTAR-TEC Regression Estimates and Causality Test Results

Item	TR(R)	GDP	TR(A)	GDP	GDP	TR(A)
$\rho_1\varepsilon_{t-1}$	−0.85 (0.00)***		−0.12 (0.08)		−0.44 (0.26)	
$\rho_2\varepsilon_{t-1}$	−0.06 (0.84)		−1.13 (0.00)***		−0.89 (0.03)*	
τ	−0.197		0.203		−0.043	
$\alpha_k^+\Delta GDP_{t-k}^+$	0.51 (0.11)*	6.57 (0.32)	0.67 (0.06)*	6.75 (0.17)	0.01 (0.99)	0.01 (0.71)
$\alpha_k^-\Delta GDP_{t-k}^-$	−1.97 (0.07)*	−6.45 (0.04)*	0.13 (0.70)	4.27 (0.62)	−4.22 (0.67)	−0.24 (0.69)
$\beta_k^+\Delta GDP_{t-k}^+$	0.01 (0.55)	0.60 (0.07)*	0.02 (0.60)	0.17 (0.74)	4.27 (0.47)	0.59 (0.11)
$\beta_k^-\Delta GDP_{t-k}^-$	0.08 (0.03)**	0.66 (0.37)	−0.22 (0.70)	−3.73 (0.64)	4.29 (0.70)	1.94 (0.72)
$\lambda^+\varepsilon_{t-1}$	−0.01 (0.04)*	−1.05 (0.01)*	0.02 (0.72)	0.16 (0.80)	0.78 (0.32)	1.45 (0.26)
$\lambda^-\varepsilon_{t-1}$	−0.01 (0.69)	−0.08 (0.85)	−0.05 (0.08)*	−1.47 (0.00)***	−0.04 (0.03)*	−0.08 (0.06)*
Causality tests						
$H_0 : y \rightarrow x$	2.57 (0.11)*		1.18 (0.34)		2.19 (0.16)	
$H_0 : x \rightarrow y$	2.71 (0.11)*		0.14 (0.87)		0.18 (0.84)	
Diagnostic tests						
DW	1.93		1.96		1.91	
p-value	0.50		0.49		0.41	
LB	0.98		0.99		0.99	
JB	4.61		4.49		4.35	

NOTES *p*-values reported in parentheses. *, **, and *** denote significance levels of 10, 5 and 1 percent, respectively. *y* represents the dependent variable and *x* represents the independent variable.

sions under our second and third hypotheses concerning threshold cointegration effects and threshold error correction effects, our results become less optimistic as we find that only three threshold cointegration regressions manage to simultaneously reject the null hypothesis of no threshold cointegration effects and of no threshold error correction effects. These three threshold regressions are all C-MTAR-TEC specifications in which (i) GDP is regressed on TR(A), (ii) TR(A) is regressed on GDP, and (iii) GDP is regressed on TR(R). In light of these results, we proceed to estimate the three C-MTAR-TEC regressions as plausible asymmetric specifications which can depict the nonlinear cointegration in the tourism-growth correlation.

Table 9 presents the estimation and causality analysis of the three C-MTAR-TEC models. We note that the all three estimated threshold models satisfy the asymmetric convergence condition of the threshold error terms $\rho_1, \rho_2 < 0$ and $(1 - \rho_1)(1 - \rho_2) < 1$. As mentioned by Enders and Siklos (2001) this condition ensures the stationarity of the threshold error terms hence validating the notion of asymmetric cointegration between the sets of time series data. We also note that when GDP is regressed on TR(A)and also when TR(A) is regressed on GDP, then $\rho_1 > \rho_2$, hence indicating that positive deviations from equilibrium are eradicated quicker than negative ones. However, when TR(R) is regressed on GDP, then $\rho_1 < \rho_2$ thus negative deviations from equilibrium are eradicated faster than positive ones. Furthermore, and more encouraging, we observe that all threshold error correction terms from the three estimated regressions manage to produce at least one significantly negative error correction coefficient, a result which further validates the notion of long-run asymmetric equilibrium convergence amongst the variables. In lastly turning to our causality analysis, as reported at the bottom of table 9, we observe bi-directional causality between tourist receipts and economic growth. Encouragingly, these results concur with those obtained from the TV-VECM model used in the study of Balcilar, van Eyden, and Inglesi-Lotz (2014) for South Africa as well as in the study of Brida, Lanzilotta, and Sebestian (2013) for the case of Uruguay and Argentina using non-parametric causality tests. However, we find no causal effects between tourist arrivals and economic growth.

Conclusion

Primarily motivated by the absence of academic evidence depicting the empirical relationship between tourism and economic growth in South Africa, our study endeavoured into investigating both linear and threshold cointegration and causality effects between the variables for interpolated quarterly data constructed from yearly data collected between 1994 and 2014. As a further methodological extension of our analysis, we use two empirical measures of tourism, namely; the dollar value of tourism expenditure receipts and the number of international tourist arrivals into the country. As a by-product, our overall empirical strategy offers a singular approach to exploring both linear and nonlinear cointegration relations between tourist receipts and economic growth, on one hand, and between tourist arrivals and economic growth, on the other hand. The three principal findings of our empirical analysis can be summarized as follows. Firstly, we observe a common finding of significant cointegration relations between tourism and economic growth regardless of whether a linear or nonlinear framework is used or regardless of whether tourist receipts or number of tourist arrivals is used a measure of tourism. Secondly, the linear framework indicates a unidirectional causality running from tourism receipts to economic growth whereas there is a unidirectional causal flow from economic growth to tourist arrivals. In effect, the aforementioned results offer support in favour of tourism-led-growth-hypothesis between tourist receipts and economic growth whilst the economic-growth-driven-tourism-hypothesis is supported between tourist arrivals and economic growth. Notably the result of tourism-led-growth-hypothesis between tourist receipts and economic growth is similar to that obtained in the study of Akinboade and Braimoh (2009) for South Africa. Thirdly, the nonlinear framework indicates bi-direction causality between tourist receipts and economic growth as well as no causal relations between tourist arrivals and economic growth. Accordingly, this supports the reciprocal hypothesis and no causality effects, respectively. Again, the finding of the reciprocal hypothesis between tourist receipts and economic growth concurs with that obtained by Balcilar, van Eyden, and Inglesi-Lotz (2014) for South Africa.

In deriving the key policy implications derived from our empirical analysis, we rationalize our results as follows. The finding of causality from tourist receipts to economic growth under the linear framework is expected since most African countries still use their income to improve the level of tourism infrastructure and sites that are available in these countries in order to win tourist to their destination so that there will be an increase in the level of economic activities in the sector, which will thereby accelerate long-run economic growth (Kareem 2013). For instance, a key driver of economic growth has been the recent liberalisation of South African airspace, which has seen an increasing number of international airlines carrying out more weekly flights between South Africa and other countries. Moreover, the finding of bi-directional causality between tourist receipts and economic growth under the nonlinear framework is not irrational since this implies that whilst tourism receipts improves economic growth, such improvements in economic growth are the used to improve infrastructure which, in turn attracts tourists back into the country. This result has also been re-iterated by the department of Environmental Affairs and Tourism, which claims that 40 percent of business visitors returned to the country within a few years of their first visit, while 18 percent of business tourists went on leisure trips prior to their business activities and 22 percent of them did the same afterwards. Incidentally, this further rationalizes the finding of uni-directional causality running from economic growth to the number of international tourist seeing that tourist infrastructure attracts the number of international tourists into the country who then spend their expenditure when they arrive in the country, which, in turn contributes to improved economic growth.

Overall, our study implies that South Africa can improve her economic growth performance, not only by investing in the traditional sources of growth such as investment in physical and human capital as well as through technological advancements but can also strategically harness the contribution of the tourism industry towards such economic growth. Therefore, it is recommended that special emphasis be paid to the domestic tourism industry as means of fostering higher economic growth and policymakers can consider integrating tourism development programs into major economic development plans such as the highly popularized Millennium Development Goals (MDG). In particular, sustainable developments within the local tourism sector can assist in addressing the MDG's global challenges such as poverty, hunger and unemployment through the direct contribution which the tourism adds to economic growth. Therefore, by generating wealth, the South African tourism sector can play a significant role in the achievement of MDG goals by creating opportunities for entrepreneurship, opportunities for employment and, via its multiplier effects, generate income from the primary sector of the economy inclusive of trade, manufacturing, construction and agriculture.

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