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Exploring the Nexus Between Tourism and Output in Cook Islands: An ARDL Bounds Approach

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Abstract Tourism plays an important role in the development of Cook Islands. In this paper we examine the nexus between tourism and growth using quarterly data over the period 2009Q1–2014Q2 using the recently upgraded ARDL bounds test to cointegration tool, Microfit 5.01, which provides sample adjusted bounds and hence is more reliable for small sample size studies. We perform the cointegration using the ARDL bounds test and examine the direction of causality. Using visitor arrival and output in per capita terms as respective proxy for tourism development and growth, we examine the long-run association and report the elasticity coefficient of tourism and causality nexus, accordingly. Using unit root break tests, we note that 2011Q1 and 2011Q2 are two structural break periods in the output series. However, we note that this period is not statistically significant in the ARDL model and hence excluded from the estimation. Subsequently, the regression results show the two series are cointegrated. The long-run elasticity coefficient of tourism is estimated to be 0.83 and the short-run is 0.73. A bidirectional causality between tourism

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and income is noted for Cook Islands which indicates that tourism development and income mutually reinforce each other. In light of this, socio-economic policies need to focus on broad-based, inclusive and income-generating tourism development projects which are expected to have feedback effect.

Keywords Tourism · Economic growth · Small island economy · ARDL approach · Causality test · Cook Islands

1 Introduction

A number of small and developing countries are heavily dependent on tourism as its major source of income and employment. Notably, international tourism grew by 5 % in 2013 in terms of tourist arrivals, thus showing a record increase of 52 million people travelling the world over in a single year from its already achieved milestone of 1 billion tourists in 2012. Subsequently, the most recent (2013) tourist arrival number stands around 1087 million and is projected to grow further. In terms of monetary contribution, international tourism receipts has reached US$1159 billion worldwide in the same year compared to US$1078 billion the previous year (World Tourism Organization 2014).

The emergence of new destinations besides Europe and North America has further spurred the growth in numbers and revenues. Asia and the Pacific recorded the strongest growth (6 %) followed by Europe and Africa (5 %). Moreover, China has become the dominating tourism source market contributing around US$129 billion to international tourism. Amidst these developments, the prospects for 2014 are strongest for Asia and the Pacific, as well as Africa.

Noting the optimism in the tourism sector, this study examines the nexus between economic growth and tourism in Cook Islands with the aim to examine the tourism led growth (TLG) hypotheses. We undertake this study for the following reasons: (1) Cook Islands is one of the economies in the Pacific which is heavily dependent on tourism as its major source of employment and income, (2) tourism receipts and visitor arrival to Cook Islands has been fairly stable and resilient at least over the past two decades, (3) the advancement in econometric tools such as Microfit (Mfit) 5.01 enables one to examine the link between tourism and economic growth for a country like Cook Islands which is constrained by small sample size and is to date, absent from tourism literature; (4) a study as such will provide policy levers to economic planners and facilitate policy dialogues viz. development in the small island economies of the Pacific.

Cook Islands is located in the South Pacific Ocean, northeast of New Zealand and between American Samoa and French Polynesia. The Islands comprise of 15 main islands which are divided into two distinct groups (Table 1). One is the Southern Cook Islands which comprise of 8 volcanic isles and the other is the Northern Cook Islands which comprise of 7 coral atolls and are scantly populated. The Island is small and geographically isolated from major markets. Other evident constraints which resonate with similar islands in the region include poor infrastructure, limited manufacturing base and heavy dependence on aid and imports. The Island is self-governing and in free association with New Zealand which retains the primary responsibility for external affairs. Additionally, Cook Islands nationals have the privilege of being citizens of New Zealand.

The GDP (gross domestic product) per capita is around NZ $15,501. The resident and the total population is 14,300 and 18,600 people, respectively (Table 2). The average

Table 1 Population composition for Cook Islands

Census year	2001	2006	2011
Total population	18,027	19,342	17,794
Southern Islands			
Rarotonga	12,188	13,890	13,095
Aitutaki	1946	2235	2038
Mangaia	744	640	572
Atiu	623	570	480
Mauke	470	391	307
Mitiaro	230	219	189
Manuae	–	–	–
Northern Islands			
Pukapuka	664	507	451
Manihiki	515	356	239
Penrhyn	357	255	213
Rakahanga	169	141	77
Nassau	72	75	73
Palmerston	48	63	60
Suwarrow	1	–	–

–, data not available

Source Ministry of Finance and Economic Management, Government of the Cook Islands

Table 2 Selected key indicators of Cook Islands

Land area (thousand km^2)	236.7
Resident population (in thousands 2012)	14.3
Total population (in thousands 2012)	18.6
GDP per capita in 2012 (at 2006 constant NZD)	15,501.4
Aid per capita (NZD 2012)	1005.0
Aid as a percentage of GDP (2012)	7.8
Annual average change in real GDP (%, 2009–2012)	0.8
GDP deflator—average percentage increase (2009–2012)	2.5
Fiscal balance as a percentage of GDP—average (2009–2012)	−1.4
Trade deficit a percent of GDP—average (2009–2012)	−35.5

Source Ministry of Finance and Economic Management, Government of the Cook Islands and Authors' own calculations; and OECD, and ADB database

annual growth rate of real output is around 2 % (2001–2012). The primary industries include agriculture, fishing and pearl farming and harvesting that collectively contribute an average of 6 % to GDP.[1] Notably, pearls are the dominant export commodity in the economy. The secondary sectors (construction, utilities such as electricity and water, mining and manufacturing) collectively make up about 8 % of GDP.

Services sector dominates the economy and contributes around 85 % towards the GDP. Within the services sector, the major sub-sectors are wholesale and retail trade (20.6 %), restaurants and accommodation (19 %), transport and communication (14.6 %) and banking and finance (11.1 %).

[1] The sectoral numbers are based on the national account statistics of Statistics of Cook Islands in 2013 and authors' own calculations. We use data from 2013 national account for discussion from here on. http://www.mfem.gov.ck/mfemdocs/stats/statistical-series/national-accounts/764-quarterly-gdp-june-2014-tables.

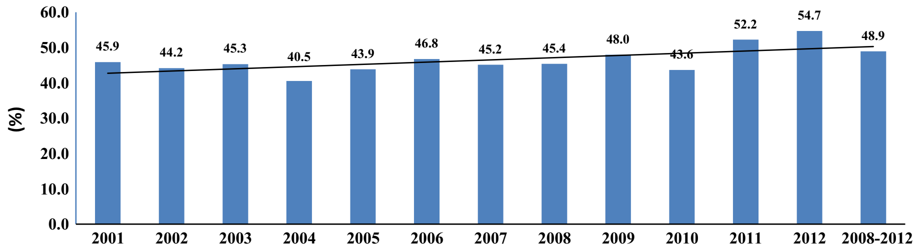

Fig. 1 Tourism receipts (% GDP). *Source* Ministry of Finance and Economic Management, Government of the Cook Islands and Authors' own calculations

Table 3 Visitor arrivals in Cook Islands (1995–2014)

	1995–2008 (average per annum)	2009	2010	2011	2012	2013	2014
New Zealand	*31,464*	*63,536*	*67,487*	*75,186*	*82,362*	*79,125*	*79,959*
Australia	*9065*	*14,795*	*16,841*	*18,538*	*20,921*	*22,802*	*22,033*
Europe	*19,100*	*12,448*	*10,557*	*10,290*	*9485*	*9379*	*9472*
USA	5793	3997	4328	4455	4590	4689	4955
Canada	3531	2069	2262	2044	2082	2160	1873
Asia	530	676	780	687	833	1017	1267
French Polynesia	1146	1120	838	643	622	513	439
Other	1169	2588	1172	1271	1489	1473	1460
Total	71,798	101,229	104,265	113,114	122,384	121,158	121,458

The italicized rows indicate the top three source countries for Cook Islands

Source Ministry of Finance and Economic Management, Government of the Cook Islands and Authors' own calculations

Tourism is the major driver of economic activities in Cook Islands. As noted from Fig. 1, the tourism receipts as a share of GDP were about 48.9 % between 2008 and 2012, and visitor arrival numbers grew by 4.8 % on an average from 1995 to 2014 (Table 3). The top three dominating source markets based for visitor arrivals to Cook Islands are New Zealand (65.8 %), Australia (18.1 %) and the Europe (7.8 %; Table 4). The main purpose of visiting Cook Islands by tourists includes vacation (79 %), wedding and honeymoon (11.1 %) and visiting friends and relatives (8.1 %; Table 5).

Against this background, we examine the nexus between tourism and growth Cook Islands. The rest of the paper is organised as follows. In Sect. 2, we document a brief survey of tourism-growth studies. In Sect. 3, we present the model, data and method. Section 4 provides the results, and in Sect. 5, we conclude with some policy relevant discussions.

2 A Brief Literature Survey

Tourism sector is defined from demand and supply side, respectively. In terms of the demand side, the sector refers to "the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure,

Table 4 Percentage of visitor arrivals by country in Cook Islands (1995–2014)

	1995–2008 (average)	2009	2010	2011	2012	2013	2014
New Zealand	*44*	*62.8*	*64.7*	*66.5*	*67.3*	*65.3*	*65.8*
Australia	*13*	*14.6*	*16.2*	*16.4*	*17.1*	*18.8*	*18.1*
Europe	*27*	*12.3*	*10.1*	*9.1*	*7.8*	*7.7*	*7.8*
USA	8	3.9	4.2	3.9	3.8	3.9	4.1
Canada	5	2	2.2	1.8	1.7	1.8	1.5
Asia	1	0.7	0.7	0.6	0.7	0.8	1
French Polynesia	2	1.1	0.8	0.6	0.5	0.4	0.4
Other	2	2.6	1.1	1.1	1.2	1.2	1.2
Total	100	100	100	100	100	100	100

The italicized rows indicate the top three source countries for Cook Islands

Source Ministry of Finance and Economic Management, Government of the Cook Islands and Authors' own calculations

Table 5 Purpose of visit to Cook Islands (total visitors, %)

	1995–2008 (average)	2009	2010	2011	2012	2013	2014
Vacation	*83.3*	*73.3*	*72.6*	*74.8*	*74.8*	*74.9*	*75*
Wedding and honeymoon	–	*9.3*	*11.6*	*10.9*	*10.8*	*11.1*	*11.1*
Visit friends or relatives	*9.5*	*9.2*	*9.2*	*8.8*	*8.9*	*8.1*	*8.1*
Business	3.1	2.4	2.4	2.3	2.3	2.2	2.2
Conference	1.1	0.9	1	0.8	0.8	1.2	1.2
Employment	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Other	2.7	4.6	3.1	2.2	2.2	2.2	2.2
Total	100	100	100	100	100	100	100

The italicized rows indicate the top three reasons for visitor arrivals to Cook Islands

Source Ministry of Finance and Economic Management, Government of the Cook Islands and Authors' own calculations

business and other purposes"; and from supply side, the sector "measures the demand for goods and services generated by visitors to a destination" (Boniface and Cooper 2005, p.17). In other words, the focus in supply side is on the contribution of tourism to other sectors such as investment, consumption, employment, GDP and taxation. For our purpose, we shall consider the supply-side definition of tourism and examine the sector's contribution to GDP.

The pioneering work on economic growth and tourism development dates back to at least as early as Sheldon (1997). It has been argued that tourism and economic growth can have unidirectional and/or bidirectional effects (Payne and Merver 2010). First, the economic growth led tourism (TLG) hypothesis states that a number of factors can boost tourism development. These include (a) effective government policies and institutions, (b) adequate investment in both physical and human capital, and (c) stability in international tourism. Second, the hypothesis asserts that tourism is the driving

Table 6 Sample of studies examining causality and elasticity of tourism

Country region	Period	Periodicity	Causality	Elasticity	References
Spain	1975–1997	Quarterly	$TUR \rightarrow Y$	0.30	Balaguer and Cantavella-Jordà (2002)
Greece	1960–2000	Quarterly	$TUR \leftrightarrow Y$	0.31	Dritsakis (2004a)
Mauritius	1952–1999	Annual	$TUR \leftrightarrow Y$	0.77	Durbarry (2004)
Spain	1964–2000	Annual	$TUR \leftrightarrow Y$	1.07	Cortez-Jimenez and Paulina (2006)
Italy	1954–2000	Annual	$TUR \leftrightarrow Y$	0.08	Cortez-Jimenez and Paulina (2006)
Taiwan	1971–2003 and 1956–2002	Quarterly/annual	$TUR \leftrightarrow Y$	0.02–0.10	Kim et al. (2006)
Spain	1960–2003	Annual	$TUR \leftrightarrow Y$	0.06	Nowak et al. (2007)
42 African countries	1995–2004	Annual	$TUR \rightarrow Y$	0.03	Fayissa et al. (2008)
Mexico	1980–2007	Quarterly	$TUR \rightarrow Y$	0.69	Brida et al. (2008)
Portugal	1993–2001	Annual	$TUR \rightarrow Y$	0.01	Proença and Soukiazis (2008)
OECD countries	1990–2002	Annual	$TUR \rightarrow Y$	0.36	Lee and Chang (2008)
Non-OECD countries	1990–2002	Annual	$TUR \leftrightarrow Y$	0.50	Lee and Chang (2008)
Colombia	1987–2007	Quarterly	$TUR \rightarrow Y$	0.51	Brida et al. (2009)
Chile	1988–2008	Annual	$TUR \rightarrow Y$	0.81	Brida and Risso (2009)
Uruguay	1987–2006	Quarterly	$TUR \rightarrow Y$	0.42	Brida et al. (2010)
4 Pacific Island countries (Fiji, Solomon Islands, PNG, Tonga)	1988–2004	Annual	$TUR \rightarrow Y$	0.72	Nayaran et al. (2010)
19 Island economics	1990–2007	Annual	$TUR \leftrightarrow Y$	0.03–0.14	Seetanah (2011)
Fiji	1980–2008	Annual	$TUR \leftarrow Y$	0.23	Kumar and Kumar (2012)
Kenya	1978–2010	Annual	$TUR \leftarrow Y$	0.08	Kumar (2014b)
Vietnam	1980–2010	Annual	$TUR \leftrightarrow Y$	0.03	Kumar (2014a)
Malaysia	1975–2012	Annual	N	0.26	Kumar et al. (2015a)
Malaysia	1975–2011	Annual	$TUR \rightarrow Y$	0.14	Tang and Tan (2015a)
Malaysia	1991–2014	Quarterly	$TUR \rightarrow Y$	0.24–0.31	Tang and Tan (2015b)
Cook Islands	2009–2014	Quarterly	$TUR \leftrightarrow Y$	0.83	Present study

$TUR \rightarrow Y$ tourism Granger cause economic growth, $TUR \leftarrow Y$ economic growth Granger cause tourism, $TUR \leftrightarrow Y$ bi-directional causation between tourism and economic growth, N neutrality or no evidence of causation between tourism and economic growth

force of economic growth and that tourism is expected to create positive externalities in the economy. A number of studies attempt to examine the two streams of effects either in a country-context and/or at regional level. Some notable studies that have examined the magnitude impact and causality nexus of tourism on growth is summarized in Table 6.

3 Modelling Strategy

3.1 Framework

We use the standard Cobb–Douglas type production function and define the GDP per capita equation as:

$$y_t = TUR_t^{\alpha} \tag{1}$$

where y_t = real GDP per capita as a measure of economic growth and TUR = visitor arrival per capita which is a proxy for tourism development. The $\alpha > 0$ is the share or elasticity coefficients of tourism. Hence after taking the logarithm of (1), we obtain the basic equation for estimation as:

$$\ln y = \pi + \theta T + \alpha ln\, TUR + \varepsilon \tag{2}$$

where ln y = log of real GDP per capita, ln TUR = log of visitor arrival per capita (in percent), α = elasticity coefficient of tourism, π = constant term, $T \in \{TB_y, Trend\}$, such that TB_y = structural break in y-series dummy identified through break test, *Trend* is the time trend variable, and ε = error term. Equation (2) is used to estimate long-run relationship once a cointegration is identified.

3.2 Data and Methods

We draw our sample data from the reports published by Cook Islands Statistics Office (CISO). The quarterly data for GDP are at constant 2006 NZ (New Zealand) dollars and are available from 2009Q1 (March) to 2014Q2 (June). The data on visitor arrivals is available from 1993Q1 to 2014Q4. Hence, the sample data used are from 2009Q1 to 2014Q2.

To examine the cointegration relationship and hence the existence of a long-run association between the variables, we use the autoregressive distributed lag (ARDL) procedure developed by Pesaran et al. (2001). There are a number of advantages for using the ARDL procedure. First, it is relatively simple and recommended for a small sample size (Ghatak and Siddiki 2001; Narayan 2005; Pesaran et al. 2001). Second, in this approach, it is not required to test for unit roots and it is possible to investigate cointegration irrespective of the order of integration. In other words, the variables can be integrated at most of order one, that is, either I(0), I(1) or a combination of both. Nevertheless, the ARDL procedure is not designed to accommodate I(2) variables. Hence, to ensure that the maximum order of integration is indeed one, we emphasize the need to conduct the unit root tests. Moreover, conducting the unit-root tests helps in conducting a robust causality assessment, particularly when using the technique proposed by Toda and Yamamoto (1995). Subsequently, we use the augmented Dickey–Fuller (ADF), Phillips–Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests to examine the time series properties of the variables and compute the unit root statistics.

We also examine the break in series using the Perron (1997) and Zivot and Andrews (1992) unit root test of unknown single structural break in a series. The reason we include both tests is to detect breaks in series using different tests to examine any inconsistency. In case where a test report different break periods, we include both in the estimation as plausible two breaks in the series.

3.3 ARDL Procedure

Since we do not have any prior information regarding the direction of the long-run relationship between y, and TUR, we construct the following ARDL equation:

$$\Delta \ln y_t = \beta_{10} + \beta_{11} \ln y_{t-1} + \beta_{12} \ln TUR_{t-1} + \sum_{i=1}^{p} \alpha_{11i} \Delta \ln y_{t-i} + \sum_{i=0}^{p} \alpha_{12i} \Delta \ln TUR_{t-i} + \varepsilon_{1t} \tag{3}$$

To examine the cointegration relationship, the steps used are as follows: First, Eq. (3) is estimated by ordinary least square technique. Second, the existence of a long-run relationship is traced by imposing a restriction on all estimated coefficients of lagged level variables equating to zero. Therefore, the null hypothesis of no cointegration (H_{null}: $\beta_{i1} = \beta_{i2} = 0$) is examined against the alternative hypothesis of existence of long-run cointegration (H_{ALT}: $\beta_{i1} \neq 0$; $\beta_{i2} \neq 0$). If the computed F-statistics falls above the upper critical bound, $(F - stat > I(1)_{critical})$, then the null hypothesis of no conintegration is rejected. Alternatively, if the test statistics falls below the lower bounds $(F - stat < I(0)_{critical})$, then the null hypothesis is accepted. In case when the F-statistics falls within the upper and lower bounds, $(I(0)_{critical} < F - stat < I(1)_{critical})$ the outcome is inconclusive. However, in case where $n < 30$, one may resort to other procedures (Cheung and Lai 1995; Sephton 1995; Tang and Abosedra 2014). Moreover, the updated version of Microfit software (Mfit 5.01) by Pesaran and Pesaran (2009), the successor of Microfit 4.1 (Pesaran and Pesaran 1999) also enables one to compute the critical F- and W-statistics at the corresponding 90 and 95 % bounds by stochastic simulations using 20,000 replications with the given sample size. Accordingly, we use Microfit 5.01 to compute the bounds and examine the critical F- and W-statistics against the respective computed bounds to make the conclusion.

3.4 The Toda–Yamamoto Approach to Granger Non-causality Test

Next, to examine the direction of causality, we use the Granger causality test proposed by Toda and Yamamoto (1995; T–Y approach). The test has the advantage that the presence of non-causality can be examined irrespective of whether the variables are I(0), I(1) or I(2), not cointegrated or cointegrated of an arbitrary order. In order to carry out the Granger non-causality test, the model is presented in the following VAR system:

$$\ln y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \ln y_{t-i} + \sum_{j=k+1}^{d\max} \alpha_{2j} \ln y_{t-j} + \sum_{i=1}^{k} \delta_{1i} \ln TUR_{t-i} + \sum_{j=k+1}^{d\max} \delta_{2j} \ln TUR_{t-j} + \lambda_{1t} \tag{4}$$

$$\ln TUR_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \ln TUR_{t-i} + \sum_{j=k+1}^{d\max} \beta_{2j} \ln TUR_{t-j} + \sum_{i=1}^{k} \theta_{1i} \ln y_{t-i} + \sum_{j=k+1}^{d\max} \theta_{2j} \ln y_{t-j} + \lambda_{2t} \tag{5}$$

where the series are defined in (4)–(5). The null hypothesis of no-causality is rejected when the p values falls within the (conventional) 1–10 % of level of significance. Hence, in (4), Granger causality from TUR to y implies $\delta_{1i} \neq 0 \forall i$; and in (5) y Granger causes TUR if $\theta_{1i} \neq 0 \forall i$.

The Toda and Yamamoto (1995) non-Granger causality test requires that the maximum lags should not exceed the sum of the maximum order of integration (d) and the lag-length (l) selected for the ARDL estimation. Moreover, in conducting the causality tests, it is important to examine the properties of inverse roots of the AR (auto-regressive) characteristics polynomial diagram to ensure dynamic stability of the ARDL model. In order to obtain a robust causality result, the inverse roots, I_R, should lie within the positive and the negative unity, that is, $|I_R| \leq 1$. In case where the I_R lies outside the unit circle, this has to be corrected by using either: (1) appropriate lags greater than the ones selected for endogenous variables, (2) trend variable, and/or (3) the structural break period dummies as exogenous (instruments) variables in the VAR equation.

4 Results

4.1 Descriptive Statistics and Correlation Matrix

The descriptive statistics and correlation matrix are provided in Table 7. As noted, the tourism (measured by visitor arrival per capita in percent) and GDP per capita are positively correlated.

4.2 Unit Root Results

The conventional unit results (Table 8) indicate all variables are I(0), or stationary in their first difference within the 1 and 5 % levels of statistical significance.

As noted, the break period reported by both tests in the visitor arrival series is 2011Q1 (Table 9). However, we note that in the GDP per capita series, the break period reported by Perron (1997) and Zivot and Andrews (1992) test is 2011Q1 (Jan–Mar) and 2011Q2 (Apr–Jun), respectively. The two break periods point to the new developments in tourism in Cook Islands. We noted that in between 29 June, 2011 and 2 July, 2011, Cook Islands hosted the second kite surfing event for the first time on the waters of Aitutaki lagoon. Moreover, based on the unit root test results (Tables 9, 10) we note that the maximum order of integration is one.

Table 7 Descriptive statistics and correlation matrix (2009Q1–2014Q2)

Statistics	y	TUR
Mean	3447.7	30,721.1
Median	3498.1	31,550.5
Maximum	4460.9	41,441.0
Minimum	2672.2	21,667.0
SD	491.05	6037.3
Skewness	0.4680	0.1248
Kurtosis	2.7037	2.0362
Jarque–Bera	0.8836	0.9086
Probability	0.6429	0.6349
y	1.0000	–
TUR	0.8312	1.0000

Table 8 Unit root tests

Variables in log form	ADF		PP		KPSS	
	Level	1st difference	Level	1st difference	Level	1st difference
ln y	−1.0841 [4]	−4.7463 [2][a]	−3.5530 [20][c]	−6.3783 [8][a]	0.1460 [8][c]	0.2011 [8][c]
ln TUR	−0.5832 [2]	−20.0979 [1][a]	−4.2789 [15][b]	−5.6811 [8][a]	0.1301 [2][b]	0.0694 [2][a]

The ADF and PP critical values are based on Mackinnon (1996) and KPSS are based on Kwiatkowski et al. (1992). The optimal lag based on the Akaike information criterion for ADF and bandwidth for PP and KPSS are automatically determined by Eveiws 8. All variables assume intercept and trend. The null hypothesis for ADF and Phillips–Perron tests is that a series has a unit root (non-stationary) and for KPSS, the series is stationary

[a,b,c] Stationarity of series 1 %, 5 % and 10 % level of significance, respectively

Table 9 Unit root tests with break in intercept

Variables	Perron (1997)				Zivot and Andrews (1992)			
	Level		1st difference		Level		1st difference	
	PP-stat	T_B	PP-stat	T_B	ZA-stat	T_B	ZA-stat	T_B
ln y	−4.6529 [0]	2011Q1	−9.8143 [1][a]	2010Q3	−3.5523 [4]	2011Q2	−6.8214 [2][a]	2010Q3
ln TUR	−4.1681 [0]	2011Q1	−30.8075 [1][a]	2010Q3	−3.2221 [2]	2011Q1	−6.2957 [4][a]	2012Q2

T_B = break period

[a] Statistical significance at 1 % level

Table 10 Lag length selection

Lag	LL	Adj-LR	FPE	AIC	SC	HQ
0	31.8082	–	0.00239	−3.20092	−3.05252	−3.18045
1	32.2560	0.69656	0.00256	−3.13956	−2.94170	−3.11228
2	*36.3060*	*5.84989*[a]	*0.00183*[a]	*−3.47844*[a]	*−3.23111*[a]	*−3.44434*[a]
3	36.3595	0.07134	0.00206	−3.37327	−3.07648	−3.33235
4	36.3648	0.00652	0.00234	−3.26275	−2.91650	−3.21501

The italicized row indicates the selected lag-length based on the respective criterion

Adj-LR adjusted sequential modified LR test statistic (each test at 5 % level), *FPE* final prediction error, *AIC* Akaike information criterion, *SC* Schwarz information criterion, and *HQ* Hannan–Quinn information criterion

Source Authors' estimation using Eviews 8 and Mfit 5.0

[a] Lag order selected by the criterion

4.3 Lag-Length Test

After confirming the existence of a long-run relationship between *y* and *TUR*, we examine the optimum lag-length for the ARDL specification based on a set of criterion: Adj-LR—lag order adjusted sequential modified LR test statistic (each test at 5 % level), FPE—final prediction error, AIC—Akaike information criterion, SC—Schwarz information criterion, and HQ—Hannan–Quinn information criterion. Based on these criteria, the optimum lag-length of 2 is selected (Table 10).

Table 11 Results of bounds test at 95 % level: ARDL (2,0)

$ln\,y\vert ln\,TUR$, constant, trend	Computed stat.	Critical bounds	
		I(0)	I(1)
F-stat.	10.7264	7.9366	8.8841
W-stat.	21.4528	15.8732	17.7681

Source Authors' estimation using Eviews 8 and Mfit 5.01 (Pesaran and Pesaran 2009)

4.4 Bounds Test for Cointegration

Importantly, we carried out a preliminary investigation and noted that the break periods dummy from Table 9 shows a positive coefficient but is not statistically significant in the ARDL long-run and short-run estimations. Further, we note that the break periods do not have any influence on the overall conclusion regarding the cointegration relationship. Therefore, we exclude the break periods dummy from the final estimation.[2] The results of the bounds tests (Table 11) confirm the presence of a long run association between GDP per capita ($ln\,y$) and visitor arrivals ($ln\,TUR$). Specifically, the computed F-statistics and W-statistics is 10.7264 and 21.4528, respectively, which is above the respective upper bounds of 8.8841 and 17.7681.

Next, we review the diagnostic tests from the ARDL lag estimates and parameter stability in the model. The ARDL lag estimation results precede the final long-run and short-run. The tests include: Lagrange multiplier test of residual serial correlation (χ^2_{sc}), Ramsey's RESET test using the square of the fitted values for correct functional form (χ^2_{ff}), normality test based on the test of skewness and kurtosis of residuals (χ^2_n) and heteroscedasticity test based on the regression of squared residuals on squared fitted values (χ^2_{hc}). The results show the equation has performed relatively well as the disturbance terms is normally distributed and serially uncorrelated with homoscedasticity of residuals (Table 12). The CUSUM and CUSUM of Squares plot indicates the parameters of the model are dynamically stable over time (Fig. 2a, b).

4.5 Long Run and Short-Run Estimation

Given the high dependency of the economy on tourism, we note that tourism as a structural sector is highly supportive to the short-run and long run growth (Table 13: Panel a, b). We note that the respective tourism elasticity coefficient is 0.73 and 0.83 ($\Delta ln\,TUR_t = 0.7337; ln\,TUR = 0.8312$) and statistically significant at 1 % level. This implies that a 1 % increase in visitor arrival is expected to increase GDP (in per capita terms) by 0.73 and 0.83 %, in the short-run and the long-run, respectively. Further, other countries having long-run elasticity coefficient similar to Cook Islands are Chile (0.81; Brida and Risso 2009) and New Zealand (0.83; Lim et al. 2008a, b). Notably, the long-run travel (visitor) elasticity estimated for Cook Islands is high relative to some other countries

[2] At best the break tests picked up the major event in Cook Island. However, in the presence of small sample size, it is usual that break period dummy tend to be not statistically significant and inclusion of it can distort the cointegration coefficients and diagnostic test results (Kumar et al. 2015a, b).

Table 12 ARDL (2, 0) lag estimates with dependent variable ($ln\,y$)

Regressor	Coefficient	SE	t-ratio
$ln\,y_{t-1}$	−0.1963	0.08338	−2.3544[b]
$ln\,y_{t-2}$	0.3136	0.10872	2.8848[b]
$ln\,TUR_t$	0.7337	0.06595	11.1249[a]
Constant	6.9605	0.79633	8.7407[a]
Trend	−0.0063	0.00288	−2.1843[b]

$R^2 = 0.9488$; $\bar{R}^2 = 0.9351$; $S.E.R. = 0.0354$; $F\text{-}Stat.\ F(4,15) = 69.4174$; $\bar{x}_y = 8.1500$; $\hat{\sigma}_y = 0.1391$; $SSR = 0.0188$; $LL = 41.2971$; $AIC = 36.2971$; $SBC = 33.8078$; $DW\text{-}stat. = 2.5273$; χ^2_{sc}: $\chi^2(1) = 7.0669$; χ^2_{ff}: $\chi^2(1) = 1.2694$; χ^2_n: $\chi^2(2) = 4.0743$; χ^2_{hc}: $\chi^2(1) = 0.0942$; $N = 22$

Lag estimate is selected based AIC

Source Authors' estimation using Mfit 5.01

[a,b] Statistical significance at 1 % and 5 % level, respectively

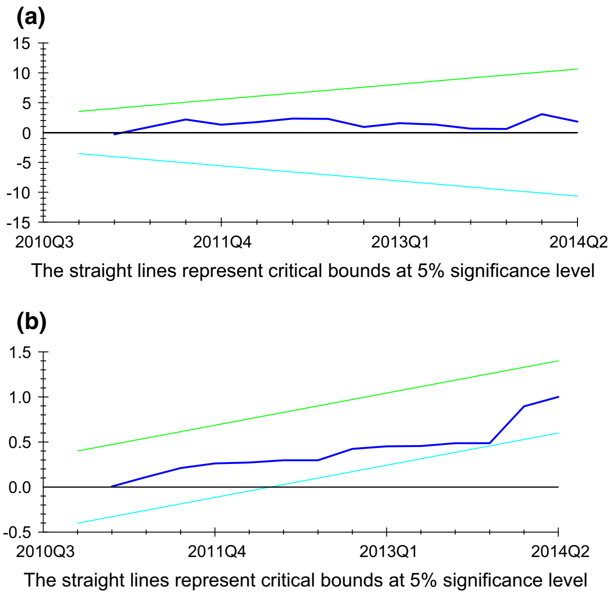

Fig. 2 **a** Cumulative sum of recursive residuals. **b** Cumulative sum of squares of recursive residuals

and we note that the long-run elasticity is very close to that of New Zealand (Lim et al. (2008a).[3]

Moreover, as noted from the short-run results (Table 13: Panel b), the coefficient of the GDP per capita in lag-one period ($\Delta ln\,y_{t-1} = -0.3136$) is negative and statistically significant at 5 % level, which implies that policies specific to income has a lagged negative effect. Similarly, we note that the coefficient of trend is marginally negative in the short-run ($Trend = -0.0063$) and long-run ($Trend = -0.0071$) and is statistically significant at 5 and 10 % level, respectively. The negative coefficients of lagged output and trend variable are an indication disappointing impact of weak macroeconomic policies.

[3] Given the relatively high tourism elasticity coefficient, tourism in Cook Islands can be regards as a super luxury good. Moreover, a relatively high visitor elasticity coefficient is expected for Cook Islands since it is an ideal destination for tourists (sea, sand and sunshine).

Table 13 Estimated long run coefficients and error correction representation

Panel a. Long-run: dependent variable $ln\, y$				Panel b. Short-run: dependent variable $\Delta ln\, y$			
Regressor	Coefficient	Standard error	t-ratio	Regressor	Coefficient	Standard error	t-ratio
$ln\, TUR$	0.8312	0.13996	5.9387[a]	$\Delta ln\, y_{t-1}$	−0.3136	0.1087	−2.8848[b]
Constant	7.8857	0.02561	307.94[a]	$\Delta ln\, TUR_t$	0.7337	0.0659	11.1249[a]
Trend	−0.0071	0.00388	−1.8385[c]	Trend	−0.0063	0.0029	−2.1843[b]
				ECM_{t-1}	−0.8827	0.0997	−8.8526[a]

Short-run dynamics test statistics

$R^2 = 0.9554$; $\bar{R}^2 = 0.9435$; $S.E.R. = 0.0354$; $\bar{x}_y = 0.0063$; $\bar{\sigma}_y = 0.1491$; $F\text{-}Stat.\ F(4,15) = 80.3183$; $S.S.R. = 0.01884$; $LL = 41.2971$; $AIC = 36.2971$; $SBC = 33.8078$; $DW\text{-}stat. = 2.5273$

Source Authors' estimation using Mfit 5.01

[a,b,c] Statistical significance at 1 %, 5 % and 10 % level, respectively

Table 14 Granger non-causality test

	Excluded (X)	Dependent (***Y***)	
		ln y	*ln TUR*
$\underbrace{X \longrightarrow Y}_{causes}$	*ln y*	–	8.181636[b] (0.0167)
	ln TUR	26.70042[a] (0.0000)	–

Degrees of freedom (df) = 2

Source Authors' estimation using Eviews 8

[a,b] Statistical significance at 1 % and 5 % level, repectively

p values are in the parenthesis. Significance indicates presence of causality from X to Y (X → Y)

Nevertheless, for a small economy like Cook Islands which has narrow agriculture and manufacturing base, high dependency on imports and aid inflows, low export base, and low productivity, it is likely that the impact of economic policies may not be able to provide the necessary space for growth and hence results in low or negative impact on growth. Moreover, a negative trend coefficient can also be a reflection of poor management skills, low and unproductive investment activities, and out-migration of skilled workers elsewhere that results in growth-retarding effect.[4]

Finally, the coefficient of the error-correction term ($ECM_{t-1} = -0.8827$) is statistically significant at 1 % level, negative, and as expected, $-1 < ECM_{t-1} < 0$, for the short-run dynamic equation. The magnitude of the coefficient implies that on average, 88 % of any disequilibrium between the output, and tourism (per capita) is corrected within one year, hence indicating a relatively speedy convergence to the long-run equilibrium.

4.6 Causality Assessment

From the unit root results (Tables 8, 9), we note that the maximum order of integration is 1 ($d_{\max} = 1$), and the optimal lag length (k) chosen using a set of criterion (Table 10) is 2. Hence the maximum lags (l) that can be used to carry out the non-causality tests is 3 ($l = d_{\max} + k \leq 3$). Given the maximum limits on lag-length for causality, we take $l = 2$

[4] Rao and Takirua (2010) highlight similar issues in Kiribati, which is a small island economy.

Table 15 Average tourism elasticity approximated from income elasticity of selected studies

Country/region	Income	References	Tourism
Mercosur and Chile	0.74	Gardella and Aguayo (2002)	1.35
Hong Kong	1.53	Song et al. (2003)	0.65
Hong Kong	1.92	Song and Wong (2003)	0.52
Greece	3.34	Dritsakis (2004a, b), Li et al. (2006)	0.30
Australia	19.19	Lim (2004)	0.05
Aruba	4.42	Croes and Vanegas (2005)	0.23
France	2.82	Li et al. (2006)	0.35
Italy	1.94	Li et al. (2006)	0.52
Portugal	1.78	Li et al. (2006)	0.56
Spain	3.81	Li et al. (2006), Munoz (2007)	0.26
Croatia	4.66	Mervar and Payne (2007)	0.21
Taiwan	1.30	Lim et al. (2008a, b)	0.77
New Zealand	1.20	Lim et al. (2008a)	0.83
Tunisia	2.06	Ouerfelli (2008)	0.48
Hong Kong	1.32	Song et al. (2010)	0.76

Tourism elasticity is calculated as a reciprocal of income elasticity

since this lag ensure that the causality model is dynamically stable, that is, $|I_R| \leq 1$. The results of the causality tests are presented in Table 14. We note a bidirectional causality between output per capita and visitor arrival per capita duly supporting the feedback hypothesis.

5 Conclusion

In this paper, we explore the nexus between tourism and growth in Cook Islands. We use the quarterly data over the period 2009Q1–2014Q2 and the ARDL bounds procedure to examine the long-run association. Further, we estimate the short-run and long-run impact and assess the direction of causality. The results show that visitor arrivals and output in per capita terms are cointegrated. Moreover, the short-run and the long-run elasticity are 0.73 and 0.83, respectively. The causality nexus show evidence of a bidirectional causation between output and visitor arrival, duly supporting the feedback hypothesis. The paper therefore singles out tourism as a key sector and driver of growth in Cook Islands (Table 15).

The results provided are robust due to the updated tool for examining cointegration (Mfit 5.01; Pesaran and Pesaran 2009) which duly supports small sample size studies. However, some caveats to the study are in order. We agree that availability of longer time series data and data on other relevant country specific indicators such as investment level and tourism receipts (besides visitor arrivals) can further enhance the underlying model specification (Kumar and Kumar 2012); and longer time series data will also provide meaningful impacts of structural breaks which at times cannot be shown, at least empirically, in a small sample space. Having said that, the causality result of Cook Islands supports the feedback hypothesis which are in line with studies done for other countries such as Greece (Dritsakis 2004a, b), Mauritius (Durbarry 2004), Spain and Italy (Cortez-Jimenez and Paulina 2006; Nowak et al.

2007), Taiwan (Kim et al. 2006), non-OECD countries (Lee and Chang 2008), 19 island economies (Seetanah 2011) and Vietnam (Kumar 2014a).

The development and sustainability of tourism in the developing small island economies are constrained by factors like huge distance from western world, poor infrastructure and lack of advanced technology. The main issue which also applies to other developing Pacific Island countries (PICs) is that they are heavily dependent on tourism as a major source of income. Subsequently, these small island economies are to some extent vulnerable to the economic developments and policies in the source countries. This is obvious from the source market data provided in Table 3. Notably, the number of visitors from the countries which have been hit hardest by the global financial crisis of 2008 has decreased sharply in the observed period. This decline is evident from the major source countries such as Europe (−50 %), Canada (−46 %) and USA (−14 %). This means even if the economy and government of Cook Islands perform effectively, its development will still be dependent on the economic development in the source countries. Hence, it is important for developing PICs to become the choice of destination for citizens of existing source countries and tap into the growing Asian economies. However, to make this possible and noting that Asia has a huge tourist source market, being receptive of Asian culture and promoting Asian languages and cultural diversity to support tourism for business purposes will be an advantage for the developing PICs. Moreover, creating a balance between ensuring the PICs culture and island lifestyle has a distinct presence at the international level and the effective use of modern technologies to create virtual connectedness with the rest of the world will be pertinent for the sustainable development of the region.

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