Investigating Asymmetry in Tourism and Growth Relationship in the Pacific Island Countries: Any Lessons for Policy Makers?

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Abstract

The global economy has been devastated by the Covid-19 pandemic, which began in the first quarter of 2020. The unprecedented damages in terms of loss of lives, livelihoods, and interruptions in international travel have caused deep contractions in small islands and developing countries, which are known for their dependency on tourism. This paper empirically examines the relationship between tourism and economic growth in the selected Pacific Island Countries (PICs). Adopting a panel nonlinear autoregression distributed lagged (NARDL) approach, we account for potential nonlinearities in the relationship and empirically determine the asymmetric response of per capita GDP to positive and negative tourism shocks. Our analysis depicts that tourism and per capita GDP have a significant asymmetric relationship. The estimates show that a decrease in tourism earnings has a larger negative impact on economic growth when compared to the positive outcome of the same size rise in tourism earnings. The negative impact of tourism is also found to be more pronounced in the long run. The results are robust to different tourism indicators and sub-sample periods. ICT and the financial market as control variables have a significant positive effect on economic growth. The study findings have some policy implications for PICs.

Keywords: Asymmetry; Covid-19; Economic Growth; Pacific Island Countries; Tourism

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Introduction

International tourism, which as a key economic sector, in fact in many cases as a single engine of growth, has been contributing to the economic growth of small island nations in the Caribbean, the South Pacific, and Indian Ocean regions. This sector has been hit hard by the current Covid-19 pandemic, since early 2020. The pre-pandemic international tourism arrivals were at record levels in 2019 with 1.4 billion, having risen from 25 million in the period before the introduction of jet airlines in the 1950s. This is also attributed presently more due to the spread and increased use of information communication and technology (ICT)[1] since the early 2000s. The latter has been hailed as the fourth industrial revolution for speeding up and making booking of travel and accommodation by "a click of the mouse". The world tourism receipts from travel expenditure and stay in hotels and resorts rose from US$901 billion in 2009 to US$1,462 billion in 2018 at an annual average growth of 4.6% (UNWTO, 2019). As a result, tourism activity has raised job opportunities and improved livelihoods, notably in the informal sector. The small and medium enterprises, more or less part-time are now meeting various interests of travellers, such as domestic tours to places of historical sites, production of handicrafts and ethnic meals, and other products of unique cultural interest. These tourism activities are now also more in the hands of part-time women entrepreneurs, which is noted as a welcome phenomenon (UNWTO, 2019).

However, the ongoing, seemingly uncontrolled spread of the Covid-19 pandemic aided by the emergence of new variants of the virus in the first quarter of 2021 and in the face of shortages of vaccines, has now totally engulfed the globe. The pandemic has severely disrupted economic activities and trade in goods and services, including tourism. The year-end review by Behsudi (2020) noted that in the first half of 2020, tourist arrivals decreased by more than 65 percent, compared to 8 percent during the global financial crisis in the first decade of the New Millennium and 17 percent during the SARS epidemic of 2003. A more recent review by World Tourism Organization (UNWTO) shows that international tourist arrival has declined by 67 percent in 2020 due to the Covid-19 pandemic (UNWTO, 2020). Although the International Monetary Fund (IMF) World Economic Outlook (2021) shows a global economic growth estimate of 6 percent for 2021, the composition has changed. There is a growing gap among advanced, emerging, and developing countries, with a projection of 4.9 percent for 2022. The Covid-19 pandemic has also reduced the per

[1]The ICT has revolutionized tourism industry rendering travel, accommodation, and arrangement of tours much easier, more accessible, and less expensive than ever before.

capita income by 6.3 percent in emerging and developing countries compared to 2.8 percent in advanced economies. It was also feared that the tourism-dependent economies would fare much worse. The Caribbean countries were expected to experience a decline in growth by 12 percent while other Pacific Island countries would experience a much deeper fall in their GDP[2]. The Asian Development Outlook Supplement of July 2021 (Asian Development Bank, 2021) updating all previous forecasts, projected that PICs were to grow by a modest 0.3% in 2021. It was expected that Fiji would face another year of contraction as it faced a recent increase in COVID-19 cases[3].

The UNCTAD has cautioned that when other domestic sectors might recover, Covid-19 would have a long-lasting effect on international tourism. This is attributed to the fears of a continuous outbreak of the Covid-19 pandemic in developed countries, resulting in the loss of travellers' confidence and the likelihood of restrictions for an extended period on international travel (UNCTAD, 2020). Aware of these difficulties, an earlier estimate by UNWTO (2020) was that earnings from tourism alone would fall to US$910 billion in 2020 from US$1.2 trillion recorded in 2019 and the recovery to levels of the pre-Covid-19 years is unlikely by 2023.

In the Pacific, tourism is the key pillar of livelihood and economic development. In 2019, the travel and tourism industry accounts for 12.8% of total employment in the Pacific, which is about 2.45 million jobs. In terms of its contribution to overall economic output, the industry adds about 11.6%, which is US$194.1 billion (WTTC World Travel and Tourism Council, 2021). Against these global and Pacific backgrounds, this paper focuses on the five selected PICs, to examine the tourism and economic growth relationship. Having a deeper understanding of important economic sectors like tourism, with respect to their effect on economic growth will provide useful information for policy decisions. The main objective of this study is to disentangle the nature of the relationship between tourism and economic growth by accounting for possible asymmetry. The asymmetric analysis produces a more comprehensive picture. In the economic literature, empirical studies have been dominated so far by linear models, which assumed the absence of any asymmetry. Disregarding such intrinsic nonlinearities in macroeconomic variables may misguide inference. To achieve this objective, we extend the previous study on PICs by Jayaraman and Makun (2020) by examining the tourism-growth nexus employing the recently designed nonlinear ARDL procedure by Shin et al. (2014). In addition,

[2] The Pacifc as a region contracted by 5.8% in 2020 due to Covid-19 pandemic.
[3] It is estimated that the GDP will decline by 4.1% in 2021. The economic growth was negative 15.7% in 2020.

we look at the tourism-growth asymmetric relationship in conjunction with financial sector development and ICT, as a contingent factor in the travel and tourism industry (World Bank, 2018).

The paper is organised along the following lines. The next section looks at the tourism sector, ICT, and macroeconomic indicators in the Pacific Island countries. The third section provides economic literature on tourism and economic growth. The fourth section outlines the theoretical framework, data, and methodology for empirical analysis. The fifth section presents the results of the empirical analysis, and the last section provides a conclusion with policy implications.

Tourism in Pacific Island countries

Tourism is of critical economic importance in the Pacific. Until the Covid-19 pandemic, the tourism industries in the PICs were gradually growing, with countries diversifying their sources of tourists from regional and international markets. International travel and tourism in the Pacific are mostly in terms of short-haul visitors from Australia and New Zealand. Other markets are China, the USA, and Europe including the United Kingdom.

Table 1. Key tourism source markets for PICs under study (2019)

Source	Fiji	Solomon Islands	Tonga	Vanuatu	Oceania
Australia	41%	38%	48%	52%	14%
New Zealand	23%	7%	21%	13%	11%
United States	11%	7%	13%	na	9%
China	5%	na	2%	na	13%
United Kingdom	2%	na	na	na	6%
Rest of the World	18%	38%	11%	28%	47%

Source: WTTC (2020). na denotes 'not available".

Table 2. International tourist arrivals (Thousands)

Country	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Fiji	691.7	754.8	792.3	842.9	870.3	894.4	140.6
Samoa	130.7	136.1	145.2	155.1	167.7	173.9	20.5
Solomon Islands	20.1	21.6	23.2	25.7	27.9	28.9	4.1
Tonga	50.4	53.7	59.1	62.1	54.1	67.5	8.9
Vanuatu	108.8	79.3	95.1	109.1	115.6	120.6	21.9

Source: NSOs and SPTO (2021)

International tourist arrivals have been rising in the PICs, although tourist arrivals are relatively low with respect to other destinations like Southeast Asia. Fiji, with a relatively developed industry among the other Pacific Islands, has served over 800 thousand visitors in 2019. The tourism industry contributed over 30% of GDP. Samoa and Vanuatu had smaller industries with over 170 and 120 thousand tourists, respectively. However, the Covid-19 pandemic which started in early 2020 devastated these economies by severely impacting the tourism industry.

Table 3. Tourism in the Pacific Island countries (2019)

Country	Contribution to GDP (millions)	Contribution to GDP (%)	Contribution to jobs (000s)	Percent of total employment	International visitor spending (millions)	Percent of total exports
Fiji	3727.4	32.0	88.2	25.3	28886.6	50.6
Solomon Islands	1024.8	9.3	28.1	8.4	690.0	13.9
Tonga	139.5	18.5	5.9	14.8	129.2	61.6
Vanuatu	38500.1	35.8	29.3	36.4	36486.0	72.5
Oceania average	194.1*	11.6	2.5	12.8	42.9*	9.8

Note: Values are in local currencies, except for Oceania, which is in USD. * denote in billions. Source: WTTC (2020).

Table 3 shows the contribution of tourism in the countries under study is a close one-third of GDP. While it is one-third in Vanuatu, the least is in the case of the Solomon Islands. Further, Vanuatu ranks number one, followed by Fiji in regard to the creation of jobs by tourism. Visitor spending as a percent of total earnings from exports of goods and services tops in Vanuatu followed by Tonga and Fiji.

The success of tourism is attributed to the steadily rising foreign direct investment (FDI) in the tourism industry. Hill and Athukorala (1998) observed that although traditionally FDI inflows were primarily those seeking to exploit natural resources, there had been an increasing trend in FDI inflows in service and manufacturing sectors. Later in the 20th century, the hotel industry, and the development of resorts along with golf courses received greater attention from overseas investors (Jayaraman & Choong, 2006). The rising FDI since the late 1990s in tourism has helped tourism to emerge as a highly and most significant economic sector contributing to the provision of jobs in all tourism-related activities.

Support Factors

As PICs are at distance from North America and Europe, the role of ICT became critically important as early as in the first decade of the New Millennium. However, the lack of capacity and infrastructure show PICs coming late into the technological revolution. The ICT in the PICs remains a developing sector with ongoing reforms to connect atolls and efficiently link industries and enhance productivity (Kumar et al., 2016). ICT is crucial for communication and creating opportunities for various economic activities including tourism. The demand for data-based ICT services in the region is increasing, similar to the world trend. In particular, the demand for mobile broadband is rapidly increasing due to mobile subscriptions services being the primary and most widespread source of internet access across the region (ITU, 2021).

Acknowledging the role of ICT in tourism development as immense by overcoming the hurdles posed by distance from source markets in regard to flight booking and purchase of air tickets, and booking for accommodation and tours, reducing the cost for travellers to a substantial extent, World Bank (2018) describes ICT as the game-changer. It is also visualized that ICT would play a significant role in other sectors in the future (World Bank, 2018).

Table 4. ICT Indicators for Pacific Island countries

Country	Mobile Cellular Subs per 100 inhabitants (2017)	Percent of individuals using the internet (2017)	ICT Development Index (ranking) (2017)*
Fiji	118	66	4.49(105)
Samoa	64	34	3.30(129)
Solomon Islands	71	12	2.11(154)
Tonga	59	41	4.34(109)
Vanuatu	80	26	2.81(136)

Source: International Telecommunication Union (20021). * ICT development index is a composite index based on eleven ICT related indicators to reflect changes in ICT development. The last ranking was done in 2017 with a total of 176 countries.

Macroeconomic Indicators

Table 5 on key macroeconomic indicators shows the impact of Covid-19 on the countries under study. We have data on Fiji, Samoa, and the Solomon Islands on key indicators. Data on Tonga and Vanuatu are incomplete. Among all the key indicators, the most important one is the growth rate which has stunningly fallen to a negative double-digit zone in Fiji. On the other hand, negative growth was smaller in Samoa and Solomon Islands. The fiscal balance and current account balance did not deteriorate much in 2020. External debt in the case of Fiji went up in 2020, whereas in Samoa we have no data. In regard to the Solomon Islands, external debt has remained the same. Foreign reserves have gone up in all the countries under study, mainly because of support from Pacific islanders remitting funds from overseas. Remittances show healthy growth in 2020. The above data only partially reflects the Covid-19 impact.

Table 5. Key Macroeconomic indicators

	Fiji			Samoa			Solomon Islands			Tonga			Vanuatu		
Indicator	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**
Growth rate (%)	3.8	-0.4	-15.7	0.7	2.4	-9.2	3	1.2	-4.5	0.3	0.7	na	2.9	na	na
Inflation (%)	1.42	2.37	-1.26	2.02	2.17	0.33	3.46	1.63	2.96	Na	na	na	2.33	2.76	na
Fiscal Balance (% of GDP)	-4.6	-4	-3.4	27.5	102	na	1.5	-1.5	-2.4	2.9	3.1	na	8.4	na	na
CAB (% of GDP)	-8.4	-12.7	-13.75	2.8	4	-9.7	-3.3	-8.9	-1.6	4.4	-0.5	na	9.4	na	na
External Debt (% of GNI)	18.8	20.2	27.8	54	50.1	na	20.6	22.3	22.3	36	34.7	na	43.6	44.6	na
Foreign Res($ mill)	851.6	947.2	2200	151.3	169.3	270.5	580.3	529.1	655.1	202.9	206.2	289.2	413.5	504.9	606.5
FDI (% of GDP)	8.4	5.86	na	2.03	0.12	na	1.58	2.08	na	4.06	0.34	na	4.1	3.73	na
Remittances(% of GDP)	5.11	5.21	7.14	17.93	17.2	18.6	1.26	1.62	1.77	37.5	37.2	na	3.83	8.06	8.89

Source: World Bank (2021) and ADB (2021).

Literature review

The tourism activities and economic growth literature date back to 1997, largely to the pioneering study by Sheldon (1997).

Since then, the substantial research literature on tourism activities and growth nexus has emerged. The subject was examined using one of the two settings: a country-specific setting and a panel and cross-country setting. Some of the examples of country-specific studies on tourism and growth are Durbarry (2004) for Mauritius; Nowak et al. (2007) for Spain; Kumar (2014) for Kenya; Ishikawa and Fukushige

(2007) for Japan; Katircioglu (2009); for the Turkish and Dritsakis (2004) for Greece. Examples of panel studies include Wu et al. (2018); Holzner (2010); Kumar and Kumar (2013); Lee and Chang (2008); Narayan et al. (2010); Roque and Raposo (2016) and Seetanah (2011).

Numerous empirical investigations have confirmed the positive impact of tourism activities on economic growth. Studies like Balguer and Cantavella (2002) in Jordan; Brida et al. (2008) in Mexico; Lee and Chang (2008) in OECD countries; Jaforullah (2015) for New Zealand and Gunter et al. (2017) for Caribbean countries. However, the outcomes of the causality direction test varied among these studies. This could be due to different proxies of variables, datasets, and analysis techniques. Further, other factors such as differences in cultural traditions, political situation, and economic policies could be the reason for such results (Ozturk, 2010). Table 6. presents a summary of some selected studies including magnitude effects and causality direction viz. tourism and economic growth.

As observed, studies on the tourism-growth nexus focused on estimating the magnitude of growth effects and causality. It is also observed that there is an increasing diversification in the estimating technique used. With a few exceptions (Oh, 2005; Katircioglu, 2009), the literature suggests that generally, international tourism drives economic growth (Brida et al., 2016; Lee & Chang, 2008; Fayissa et al., 2008; Seetnah, 20011; Kumar & Kumar, 2012; Chang et al., 2012).

However, the information provided from this research is based on the premise of symmetric assumption and does not necessarily consider the inherent presence of asymmetries. Literature on asymmetry (see e.g. Balke & Fomby, 1997; Psaradakis et al., 2004) suggest that insight from the linear analysis is inadequate for credible inference. Anoruo and Elike (2015) emphasize macroeconomic variables can have differential nonlinear properties. Therefore, accounting for plausible asymmetries is needed to obtain a more comprehensive behaviour of variables. The asymmetry (nonlinear) model separates variables into positive and negative components and determines the differential effect of the shocks as reactions to the shock of economic variables may change. While few studies have examined tourism asymmetry and economic growth nexus (Eyuboglu & Eyuboglu, 2019; Kumar et al., 2016; Kumar & Stauverman, 2016), the Pacific Island countries remain unexplored in this area. Our study, therefore, contributes to the literature by examining tourism asymmetry in a panel of PICs using a nonlinear ARDL approach of Shin et al. (2014).

Table 6. Tourism - growth literature review: A summary

Author	Period	Country	Frequency	Variables	Methodology	Causality	Effect
Balaguer and Cantavella-Jorda (2002)	1975-1998	Spain	Quarterly	Tourist earnings, exchange rate	VECM	T→GDP	+
Durbarry (2004)	1952-1999	Mauritius	Annual	Tourism earnings, capital stock, human capital, labor	VECM	T↔GDP	+
Cortez-Jimenez and Paulina (2006)	1954-2000	Italy	Annual	Tourist earnings, capital stock, human capital	VECM	T↔GDP	+
Kim et al. (2006)	1971-2003	Taiwan	Quarterly and Annual	Tourist earnings	VECM	T↔GDP	+
Lee and Chang (2008)	1990-2002	OECD	Annual	Tourist earnings	Panel	T→GDP	+
Narayan et al. (2010)	1988-2004	PICs	Annual	Tourist earnings	Panel FMOLS	T→GDP	+
Seetanah (2011)	1990-2007	Panel of Islands (19)	Annual	Tourist earnings	GMM	T↔GDP	+
Tang and Tan (2015)	1975-2011	Malaysia	Annual	Tourist earnings, political stability	VECM	T→GDP	+
Stauvermann et al. (2018)	1980-2014	Sri-Lanka	Annual	Tourist earnings, capital stock, exchange rate, labor	ARDL	T→GDP	+

Notes: GDP - Gross Domestic Product. ARDL - Autoregressive Distributed Lag approach. na refers to not applicable. T→GDP - causality relationship from tourism to GDP. T↔GDP - the bidirectional relationship amid tourism and GDP. PICs - Pacific Island Countries. + is a positive effect of tourism on GDP.

Study material and method

Theoretical and empirical background

The present study examines the relationship between tourism and economic growth in a multidimensional framework. In addition to tourism, we also consider the core role of technological innovation and financial market liberalisation. International tourism, the spread of technology, and the development of financial markets are crucial for Pacific Islands towards promoting growth linkages (Kumar & Kumar, 2020; Jayaraman & Makun, 2020; Pratt & Harrison, 2015; Harrison, 2004). The essence of tourism-led growth can be seen by the reality that the tourism industry is the major driver of GDP in many Pacific Island countries. The tourism sector generates substantial foreign exchange earnings and jobs as well as strengthening inter-sectoral integration that spurs economic activity (Pratt, 2015; Kumar & Kumar, 2012). Similarly, technology innovation and financial market liberalisation are becoming a major conduit for economic growth that not only improves the production structure and enables sustainable growth but also helps to transform the tourism and travel industry (Jayaraman & Makun, 2020; Khan et al., 2020).

Based on this premise, it is accomplished that theoretical and empirical foundations are not necessarily substituted but rather examine a different aspect of the same phenomenon. This study's objective is based on a wider theoretical/empirical perspective. In doing so we follow Akadiri et al. (2020) and Razzaq et al. (2021) amongst others and construct the following linear model that examines the impact of growth in tourism, the spread of ICT, and financial sector development on economic growth.

$$y_{ti} = \beta_1 TOR_{ti} + \beta_2 ICT_{ti} + \beta_3 FSD_{ti} + \varepsilon_{ti} \quad (1)$$

Where y_{ti} is real GDP per capita- a synonymous measure of economic growth. TOR_{ti} is tourism variable, ICT_{ti} is information and communications technology, and FSD_{ti} is financial sector development. $\beta_{1,2,....4}$ are associated parameters to be estimated. ε_{ti} is residual and t is the time dimension.

Data and variable description

The study includes five major Pacific Island countries, namely Fiji, Samoa, Solomon Islands, Tonga, and Vanuatu, and covers a period of 25 years for which data are available. Real GDP

per capita is employed as a proxy for economic growth and measured in constant (2010) prices. The data series on tourism is represented by tourism earnings and tourism arrivals. ICT is represented by mobile subscription per 100 inhabitants and FSD by broad money as a percent of GDP. The relevant data series were obtained from *World Development Indicators* (World Bank, 2021). The variables were appropriately transformed into natural logs, which would enable us to obtain elasticity estimates from the results of regression analysis. Tables 7 and 8 provide the descriptive statistics of these variables and the correlation matrix, respectively. Fiji has the largest mean tourism earnings and tourism arrivals among the five Pacific countries. The correlation matrix shows that tourism indicators are positively correlated with per capita income. Further, we find ICT and financial markets are also positively correlated with per capita income.

Table 7. Summary statistics for Pacific Island Countries

	Fiji					Samoa				
	LGDPP	**LTE**	**LTA**	**LFSD**	**LMOB**	**LGDPP**	**LTE**	**LTA**	**LFSD**	**LMOB**
Mean	3.5618	8.7924	5.7832	1.7640	1.2562	3.5175	7.8996	5.0319	0.3149	1.0282
Median	3.5630	8.8481	5.7380	1.7931	1.5996	3.5375	7.9073	5.0365	0.3012	1.2631
Maximum	3.6675	9.0945	6.0116	1.8702	2.0783	3.5853	8.2253	5.1987	0.6108	1.8900
Minimum	3.4946	8.4639	5.6375	1.6015	-0.5471	3.4138	7.5856	4.8325	0.0856	-0.3515
Std. Dev.	0.0488	0.2172	0.1118	0.0943	0.8715	0.0552	0.2465	0.1054	0.1683	0.7893
Skewness	0.5738	-0.1588	0.5368	-0.4239	-0.8339	-0.7218	-0.0737	-0.1568	0.2393	-0.4161
Kurtosis	2.6160	1.4655	2.1624	1.7014	2.3415	2.2570	1.3521	1.8768	1.7164	1.5572
Jarque -Bera (p)	0.5111	0.3245	0.4275	0.3321	0.2291	0.3721	0.3583	0.6005	0.4947	0.3534
Observations	22	22	22	22	22	18	18	18	18	18
	Solomon Island					**Tonga**				
	LGDPP	**LTE**	**LTA**	**LFSD**	**LMOB**	**LGDPP**	**LTE**	**LTA**	**LFSD**	**LMOB**
Mean	3.2112	7.4062	4.1868	1.4704	0.6761	3.5689	7.3179	4.7419	1.6217	0.9657
Median	3.2229	7.5571	4.2373	1.4840	0.8811	3.5622	7.2380	4.7760	1.6427	1.6566
Maximum	3.2914	7.9638	4.4609	1.6363	1.8683	3.6450	8.1959	4.9731	1.7512	2.0246
Minimum	3.1151	6.2041	3.7160	1.2909	-1.1937	3.5019	6.7709	4.4624	1.4307	-0.9059
Std. Dev.	0.0498	0.5229	0.2233	0.1169	1.1393	0.0417	0.3671	0.1448	0.0921	1.1155
Skewness	-0.2599	-0.8441	-0.7652	-0.1243	-0.2985	0.3672	0.4065	-0.3763	-0.6082	-0.7898
Kurtosis	2.1150	2.4834	2.5332	1.6023	1.4889	2.3039	2.3970	2.1712	2.5200	1.8410
Jarque -Bera (p)	0.6170	0.2396	0.3093	0.3970	0.2982	0.5867	0.5865	0.5206	0.4104	0.1355
Observations	22	22	22	22	22	25	25	25	25	25
	Vanuatu					**Panel summary statistics**				
	LGDPP	**LTE**	**LTA**	**LFSD**	**LMOB**	**LGDPP**	**LTE**	**LTA**	**LFSD**	**LMOB**
Mean	3.4360	8.1203	5.2223	1.9605	0.7296	3.4595	7.8955	4.9892	1.4813	0.9249
Median	3.4394	8.0949	5.2051	1.9682	0.9593	3.5019	7.8482	4.9638	1.6427	1.3401
Maximum	3.4589	8.5119	5.5527	2.0311	1.9340	3.6675	9.0945	6.0116	2.0311	2.0783
Minimum	3.3915	7.6532	4.8921	1.8751	-1.1429	3.1151	6.2041	3.7160	0.0856	-1.1937
Std. Dev.	0.0183	0.3004	0.2425	0.0414	1.1586	0.1402	0.6438	0.5580	0.5515	1.0421
Skewness	-0.9767	-0.0802	0.1051	-0.2682	-0.5024	-0.9261	-0.1130	-0.0986	-1.4567	-0.6657
Kurtosis	3.2287	1.3877	1.4045	2.2487	1.6446	2.8098	2.5195	2.3297	3.8447	1.9389
Jarque -Bera (p)	0.1445	0.2691	0.2739	0.6531	0.2409	0.0003	0.5210	0.3233	0.0000	0.0012
Observations	24	24	24	24	24	111	111	111	111	111

Note: Variables are in log (L) form. GDPP is per capita gross domestic product, TE is tourism earnings, TA is tourism arrivals, FSD is financial sector development, and MOB is the mobile subscription.

Table 8. Correlation matrix

	Panel correlation with TE					Panel correlation with TA			
	LGDPP	LTE	LFSD	LMOB		LGDPP	LTA	LFSD	LMOB
LGDPP	1.000	0.463	0.013	0.362	LGDPP	1.000	0.683	-0.012	0.306
LTE	0.463*	1.000	0.232	0.562	LTA	0.683**	1.000	0.213	0.400
LFSD	0.013**	0.232*	1.000	0.098	LFSD	0.012*	0.213	1.000	0.091
LMOB	0.362*	0.562**	0.098**	1.000	LMOB	0.306	0.400**	0.091**	1.000

Note: Variables are in log (L) form. GDPP is per capita gross domestic product, TE is tourism earnings, TA is tourism arrivals, FSD is financial sector development, and MOB is a mobile subscription. * and ** denotes significance level at 1% and 5%.

Methodology

As the key objective of this paper is to examine the asymmetric relationship between tourism and economic growth in Pacific Island countries, we use the recently developed NARDL model intended by Shin et al. (2014). Shin et al. (2014) extended Pesaran et al. (2001) linear ARDL to nonlinear ARDL cointegration. Unlike the linear model, the asymmetric model capture asymmetries and estimates the differential effect of positive and negative shocks. This is essential because growth responses to different macroeconomic shocks are not always identical. Further, this approach accounts for the potential heterogeneity effect and is suitable when the integration order(s) of the series are mixed (Salisu & Isah, 2017). Following Shin et al. (2014), asymmetric tourism impact on economic growth can be derived from Equation (1) is as follows:

$$\Delta ly_t = \alpha_{0i} + \alpha_{1i} ly_{t-1} + \alpha_{2i} lICT_{t-1} + \gamma_{3i}^{+} lTOR_t^{+} + \gamma_{3i}^{-} lTOR_t^{-} + \alpha_{4i} lEXP_{t-1} + \sum_{i=1}^{n} \beta_{1i} \Delta ly_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{2i} \Delta lICT_{t-i} + \sum_{i=0}^{n} \beta_{3i}^{+} \Delta lTOR_{t-i}^{+} + \sum_{i=0}^{n} \beta_{3i}^{-} \Delta lTOR_{t-i}^{-} + \sum_{i=0}^{n} \beta_{4i} \Delta lEXP_{t-i} + \mu_i + \varepsilon_t$$

(2)

Where $lTOR_t^{+}$ and $lTOR_t^{-}$ are the positive and negative partial sum derivation computed as:

$$lTOR_t^{+} = \sum_{t=1}^{n} \Delta lTOR_t^{+} = \sum_{t=1}^{n} \max(\Delta lTOR_{t,} 0),$$

$$lTOR_t^{-} = \sum_{t=1}^{n} \Delta lTOR_t^{-} = \sum_{t=1}^{n} \min(\Delta lTOR_{t,} 0).$$

Where $lTOR_t = lTOR_0 + lTOR_t^+ + lTOR_t^-$. The elasticity coefficient of $lTOR_t^+$ and $lTOR_t^-$ is computed as: $\phi^+ = -\frac{\gamma_{3i}^+}{\alpha_{1i}}$ and $\phi^- = -\frac{\gamma_{3i}^-}{\alpha_{1i}}$.

The error correction representation of Equation (2) yields the following:

$$\Delta ly_t = \rho ECM_{t-1} + \sum_{i=1}^{n} \beta_{1i} \Delta ly_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta lICT_{t-i} + \sum_{i=0}^{n} \pi_{3i}{}^{+} \Delta lTOR_{t-i}^{+}$$
$$+ \sum_{i=0}^{n} \pi_{3i}{}^{-} \Delta lTOR_{t-i}^{-} + \sum_{i=0}^{n} \beta_{3i} \Delta lEXP_{t-i} + \mu_i + \varepsilon_t \quad (3)$$

The error correction term (ρECM_{t-1}) estimates the equilibrium asymmetric relationship in the specified model and the associated parameter (ρ) captures the adjustment rate. The short-run positive and negative changes in tourism earnings are captured by π_{3i}^+ and π_{3i}^- respectively. To test for the long run and short run symmetry, the standard Wald test is applied. The null hypothesis ($H_{null} : \phi^+ = \phi^-$) for long run symmetry is tested against the alternative hypothesis ($H_{alt} : \phi^+ \neq \phi^-$). Similarly, the short-run symmetry of tourism is tested by evaluating the null hypothesis ($\sum_{i=0}^{n} \pi_{3i}{}^{+} = \sum_{i=0}^{n} \pi_{3i}{}^{-}$).

Results and discussion

We begin the empirical analysis by addressing the stationary properties of the series in the model. An essential element of the NARDL model is that variables should not be integrated order of more than one. Ouattara (2004) argues that the result could be erroneous if the series are of I(2). Thus, it is important to determine the order of integration of the variables. To do this we applied panel unit root tests. The heterogeneous panel data model is commonly used where non-stationary is an issue. We used two different types of panel unit root tests. The first type of panel unit root test involves the null hypothesis of unit root with a common process (Levin et al., 2002). The second type assumes unit root with individual unit root process (Im et al., 2003; Maddala & Wu, 1999 -Fisher-ADF; Maddala & Wu, 1999 -Fisher-PP). Table 9 provides the results of the panel unit root test. The series are found to have unit root in level form. However, in the first difference form, all the variables are integrated of one [(I(1)]. Nonetheless, our estimation framework in the context of this study takes into consideration heterogeneity and unit root concerns in the panel data setting.

Table 9. Panel unit root test results

Variables	Test statistics (p-values)				
Panel A: Level form	LLC	IPS	MW (ADF)	MW (PP)	Int order
Ly	1.731(0.257))	0.869 (0.192)	13.004 (0.223)	10.972 (0.358)	-
lTE	0.346 (0.635)	2.167 (0.984)	1.960 (0.996)	4.194 (0.938)	-
lFSD	0.932 (0.177)	0.909 (0.818)	5.001 (0.891)	5.114 (0.883)	-
lMOB	2.649 (0.619)	0.023 (0.491)	8.628 (0.567)	14.421 (0.154)	-
Panel B: Difference form					
Ly	0.650(0.041)**	2.466(0.006)**	23.376(0.009)**	32.427(0.000)*	I (1)
lTE	2.798(0.002)*	3.866(0.000)*	33.781(0.000)*	96.722(0.000)*	I(1)
lFSD	3.496(0.005)*	3.240(0.000)*	29.272(0.001)*	36.306(0.000)*	I(1)
lMOB	3.628(0.000)*	2.038(0.021)**	19.448(0.034)**	31.633(0.000)*	I(1)

Note: LLC and IPS indicate Levin et al. (2002) and Im et al. (2003) panel unit root tests. MW (ADF) and MW (PP) represent Maddala and Wu (1999) Fisher-ADF and Fisher-PP panel unit root tests, respectively. The LLC, IPS, MW (ADF), and MW (PP) all inspect the null hypothesis of a unit root. The values in brackets are the probabilities. * and ** indicate significance levels at 1% and 5% levels.

Next, we estimate the asymmetric tourism-growth model for the panel of five PICs. We use both the Pooled Mean Group (PMG) estimator and the Mean Group (MG) estimator (Pesaran et al., 1999). These are prominently used methodologies in panel estimation. The PMG and MG estimators are subjected to the Hausman test to determine the better estimator of the two (Salisu & Isah, 2017)[4]. The result of the Hausman test is reported in the respective tables. Our results indicate the null hypothesis cannot be rejected and that the PMG estimator is the efficient estimator for modelling the tourism-growth nexus. Therefore, the result of only the PMG estimator is reported and discussed in this paper. According to Bahmani-Oskooee and Bohl (2000), the long-run relationship between variables depends on lag order. On the other hand, taking too many or too few lags can invalidate the model in capturing essential information (Stock & Watson, 2012). Considering this essential feature, we used one lag following SBC criteria as optimal lag order.

We separate our analysis into three parts. First, we evaluate the tourism-economic growth nexus without asymmetry (Table 10a). Second, we take into account

[4] The MG estimator-relies on estimating *N* time-series regression and takes the average coefficient (Blackburne & Frank, 2007), whereas the PMG estimator takes the combination of pooling and averaging of coefficients. The null hypothesis is that the PGM is an efficient estimator while the alternative hypothesis is that the MG is an efficient estimator. In addition to panel regression analysis, the PMG and MG estimators also estimate the short-run coefficient of individual units.

asymmetry (Table 10b). Third, we re-estimate the first and second models using alternative tourism measures for robustness check (Table 6). Also, we include one additional column (b) in Tables 10 and 11 to examine the findings after eliminating the dominant country from the entire panel. This analysis is motivated by our initial preliminary analysis of descriptive statistics provided in section 4, where Fiji is considered as a dominant or influential country on the basis of the average value of their tourism earnings. The idea here is to examine whether the dominant country has any possible outlier effect on the overall result of the analysis.

Table 10 shows the long run and short run dynamics of symmetric and asymmetric effects of tourism earnings on per capita GDP. Beginning with the results of the symmetric model (see Table 10a); the estimated elasticity coefficient shows that, regardless of the size of tourism earnings of the countries included in the sample, per capita GDP response is consistent with changes in tourism earnings in terms of sign and significance. Consistent with the literature (Kumar & Stauvermann, 2016), we find a significant positive effect of tourism earnings on per capita GDP. This finding reinforces our preliminary correlation analysis in which two variables are positively correlated (see Table 8). In terms of the magnitude of the coefficient, however, we find that estimates of the full sample are slightly greater than the sub-sample estimates both in the long run and short run. In other words, the response of per capita GDP to changes in tourism earnings tends to be higher when Fiji is included, although per capita GDP is tourism inelastic. This indicates that the income of these island nations is susceptible to tourism-related shocks. This is not surprising given virtually all the sampled Pacific countries are tourism-dependent. Hence, any shock to tourism is likely to have an impact on domestic economic activity including government finances.

Table 10. Panel results for tourism earnings-GDP per capita nexus

Variable	(a) Full sample of five PICs		(b) Full sample (less Fiji)	
A: Symmetric Models				
Variable	Coefficient	P-value	Coefficient	P-value
lTE	0.051	0.071***	0.046	0.000*
lMOB	0.105	0.021**	0.089	0.000*
lFSD	0.341	0.000*	0.005	0.009**
ΔlTE	0.016	0.130	0.014	0.796
$\Delta lMOB$	0.011	0.371	0.021	0.410
$\Delta lFSD$	0.108	0.043**	0.102	0.010**
Constant	0.083	0.265	0.064	0.665
Trend	0.001	0.039**	0.001	0.048**
ECM_{t-1}	-0.304	0.008**	-0.109	0.002**
Hausman Test (X^2)	1.288 (0.260)		0.529 (0.314)	
Log Liklihood	333.641		259.762	
Observation	111		89	
B: Asymmetric Models				
$lTE^{+}(pos)$	0.087	0.005**	0.058	0.002*
$lTE^{-}(neg)$	0.142	0.000*	0.198	0.007***
lMOB	0.047	0.015**	0.053	0.162
lFSD	0.346	0.001**	0.812	0.056***
$\Delta lTE^{+}(pos)$	0.162	0.046**	0.006	0.8122
$\Delta lTE^{-}(neg)$	0.093	0.031**	0.056	0.036**
$\Delta lMOB$	0.009	0.587	0.014	0.480
$\Delta lFSD$	0.095	0.002**	0.112	0.083***
Constant	1.921	0.064***	0.123	0.0401**
Trend	0.001	0.025**	0.028	0.050**
ECM_{t-1}	-0.485	0.006**	0.658	0.003*
Hausman Test (X^2)	0.477 (0.186)		0.758 (0.394)	
Log Liklihood	381.119		253.627	
Observation	111		89	

Note: *, ** and *** indicate statistical significance at 1%, 5% and 10% respectively. "+" and "-" denote positive and negative partial sums, respectively. The probability value for the Hausman test is in the brackets.

With respect to the asymmetric model, in the long run, the positive and negative partial sum decompositions of tourism earnings exert a positive and statistically significant effect on the per capita GDP for Pacific countries. Similar to symmetric analysis, the per capita GDP of PICs countries is tourism inelastic both in the long run and short run, irrespective of whether change is positive or negative. However, the coefficient magnitude is higher for negative changes in tourism than positive. This implies that a decline in tourism earnings will have a relatively larger adverse impact on economic growth than the positive effect of tourism because of a rise in tourism earnings. Specifically, a one percent increase in tourism earnings causes about a 0.09 percent ($lTE^{+}(pos)$= 0.087) increase in per capita GDP. When tourism earnings declines by one percent, it causes per capita GDP to fall by 0.14 percent ($lTE^{-}(neg)$= 0.142). In the short run, while the overall response of per capita GDP is the same (positive) for both negative and positive shocks in tourism, PICs countries respond more to positive changes ($\Delta lTE^{+}(pos)$ =0.162) in tourism than negative change ($\Delta lTE^{-}(neg)$ =0.093). The result, however, does not reject the asymmetry outcome observed in the long term but points to the view that adverse long-run response to shocks is not immediate. Thus, PICs may be responding to adverse shock in a positive way in the short term, but if shocks persist with time (i.e. in long term) countries tend to respond negatively.

Column (b) of Table 10 provides sub-sample estimates based on dominant countries. We use the mean value of tourism earnings for each country to identify countries with high average tourism earnings. Using this method, we find Fiji has higher mean statistics compared to other countries (see Table 6). To assess this sensitivity, we exclude Fiji from regression estimates. We find a similar result as in the symmetric model. The sign and statistical significance of the tourism-economic growth remain the same both in the full sample and sub-sample (excluding Fiji). In terms of the magnitude of the positive and negative shocks of tourism, there is a slight difference between the two sample regressions. Technically, the result implies that the analysis is insensitive to the dominance of one country at least with respect to direction and relationship significance.

Further, the effect of economic controls such as financial market (*FSD*) and information and communications technology (*MOB*) have a positive and statistically significant effect on economic growth in the long run. Like other developing economies, ICT is being adopted quite rapidly in PICs in the last few decades and is increasingly by rural and poor households (Foster & Horst, 2018). In addition, the overall trend effect accounting for other exogenous factors positively influences per capita GDP. The error correction term, which measures the adjustment dynamics has emerged with the correct negative sign and is statistically significant. However, it is observed that the magnitude of the adjustment is lower in the symmetric model (ECM_{t-1} = -0.304) than in the asymmetric model (ECM_{t-1} = -0.485). This implies that asymmetric analysis exerts superior specification of the model and adjustment to the equilibrium path.

Sensitivity analysis

In this section, we further evaluate the sensitivity of our result with respect to the employment of different measures of the tourism variable. To undertake this exercise, we re-estimate all the models by replacing the indicator for tourism (tourism earnings) with tourism arrivals. The results for the symmetric and asymmetric tourism arrivals are provided in Table 11, which also includes sub-sample estimates, respectively. Looking at the results and comparing them with our main findings, the direction of the relationship and significance of the estimates are generally the same in all regression models. As expected, however, there are few differences with respect to the size of the impact. Nonetheless, the results suggest that our estimates are robust to tourism indicators. In other words, irrespective of the tourism indicator, our conclusion remains steady.

Table 11. Panel results for tourism arrivals-GDP per capita nexus

Variable	(a) Full sample of five PICs		(b) Full sample (less Fiji)	
A: Symmetric Models				
Variable	Coefficient	P-value	Coefficient	P-value
lTA	0.007	0.059***	0.112	0.026**
lMOB	0.022	0.001**	0.022	0.014**
lEXP	0.122	0.008***	0.209	0.018**
ΔlTA	0.037	0.264	0.008	0.736
$\Delta lMOB$	0.018	0.133	0.009	0.402
$\Delta lFSD$	0.103	0.128	-0.067	0.102
Constant	0.652	0.000*	0.806	0.031**
Trend	0.001	0.021**	0.001	0.051**
ECM_{t-1}	-0.271	0.000*	0.222	0.028**
Hausman Test (X^2)	0.601 (0.161)		0.231(0.137)	
Log Likelihood	336.704		271.874	
Observation	111		89	
B: Asymmetric Models				
$lTE^{+}(pos)$	0.057	0.065***	0.074	0.051**
$lTE^{-}(neg)$	0.287	0.068***	0.248	0.061**
lMOB	0.006	0.000*	0.001	0.091***
lFSD	0.353	0.000*	0.516	0.001*
$\Delta lTE^{+}(pos)$	0.064	0.000*	0.106	0.382
$\Delta lTE^{-}(neg)$	0.128	0.010**	0.142	0.094***
$\Delta lMOB$	0.011	0.381	0.008	0.354
$\Delta lFSD$	0.094	0.003**	0.092	0.010**
Constant	0.082	0.256	0.677	0.115
Trend	0.003	0.004*	0.002	0.084***
ECM_{t-1}	-0.422	0.001**	0.346	0.000*
Hausman Test (X^2)	0.193 (0.261)		0.379 (0.239)	
Log Likelihood	365.909		266.485	
Observation	111		89	

Note: *, ** and *** indicate statistical significance at 1%, 5% and 10% respectively. "+" and "-" denote positive and negative partial sums, respectively. The probability value for the Hausman test is in the brackets.

Conclusion and implications

This study examines the tourism-economic growth relationship within the context of selected PICs. Essentially, we test whether the per capita GDP of PICs responds asymmetrically to shocks in tourism activity. While there are studies on tourism and growth relationship largely based on linear model assumptions, this paper attempts to offer some insights about nonlinearities and heterogeneity in tourism-economic growth nexus using panel data of selected Pacific countries. Few studies have substantiated the essence of conducting distinct nonlinearities as noted previously. We consider asymmetries by employing the nonlinear panel ARDL approach of Shin et al. (2014) initially applied in time series analysis. This approach is analogous to the unit root heterogenous panel model except it precludes potential asymmetries. Hence, apart from analysing nonlinearities in the tourism-economic growth relation, we also consider country differences and non-stationarity, which is an essential feature of panel econometric analysis. Practically, there may be some differences in cross-sections, and considering heterogeneity allows those variations to be captured in estimation.

For comparative purposes, we also examine the symmetric nexus. In the symmetric version, we find a positive and statistically significant relationship between tourism and economic growth (per capita GDP), which is consistent with theoretical expectation and extant literature. Our result also reveals that per capita GDP responds asymmetrically to changes in tourism activity. While the positive shock in tourism earnings increase per capita income and negative shock adversely affects income, the response of income seems to be stronger when there is a negative shock to tourism in the long run. It is observed that the magnitude of the adjustment is lower in the symmetric model than in the asymmetric model, implying that asymmetric analysis exerts superior specification. Our results are insensitive to dominant country effects and robust to alternative tourism indicators. The effect of ICT and the financial market as control variables are found to be both growth-enhancing and significant.

However, some limitations of the study and areas for future research remain. For instance, our estimation model is reduced form and therefore can be augmented to take into consideration other factors in the tourism-growth nexus, such as exchange rate and human capital. Secondly, the PICs tourism demand model can be developed with respect to the source markets to better understand the tourism dynamics.

From a policy perspective, our findings highlight that PICs are vulnerable to negative shocks. In the context of the current economic crisis unleashed by Covid-19, they would face challenges in regard to tourism earnings and by extension in domestic economic activity. It is envisaged that tourism is not likely to bounce back to the pre-Covid-19 level in the short to medium term (McGarry, 2020), thus tourism development innovation needs to be more focused on improving tourism earnings. To this end initiating small elite ventures and understanding tourist willingness to spend on Pacific tourism products and services will be essential. Currently, PICs are not in the category of 'value for money or cheap-end location' relative to other locations such as Bali, Phuket, and Sri Lanka (Westoby et al., 2020). Thus, attracting a large number of tourists including low-end visitors will require revamping and strategizing including quality of services and pricing. Fiji, for instance in response to the Covid-19 shock, has relaxed tourism-related fiscal tax (Fiji Government Budget, 2020), which is expected to make tourism services less expensive. Going forward, consistency in policies and response to shocks will be pivotal to sustaining the tourism sector and growth prospects. In addition, given the high dependence on the tourism sector, the income responsiveness to positive and negative shocks to tourism is important for policymakers since the upward and downward shocks in tourism by the same size are not likely to have the same effect on income. Thus, with asymmetry presence in tourism and economic growth relationship, policymakers and investors may incorporate this information in their development plans. Further, investment in improving the financial sector liberalization and ICT pervasiveness should intensify to supplement tourism services. Financial services and ICT are fundamental in generating economic activity. The spill over from these services will have a positive impact on tourism and the overall economic growth process (Jayaraman & Makun, 2020). Thus, national policy initiatives should also focus on fostering financial markets and ICT inclusion in the tourism sector. Further, the findings of the negative shock of tourism may also call for a new direction. Aside from tourism, as a single growth driver, PICs have to open a new chapter. The new direction lies in developing agricultural resources and assisting hardworking farmers tilling land adding value to agricultural output, especially cash crops including fruits, vegetables, and traditional sugar production. The PICs have to "re-harvest" to commercialise agriculture by making large tracts of land presently unused under a very restrictive land tenure system. The use of these productive resources should be liberalised to generate jobs and income.

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