Natural disasters and tourism-led economic growth
A case study of Fiji: 1980-2014

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Abstract

Although tourism in recent years has emerged as engine of growth in Fiji, the uncertainties associated with the disastrous impact of tropical cyclones have been causing greater anxieties in recent times with increase in the number of cyclones each year hitting the South Pacific region. This paper focuses on the effects of cyclones on tourism and growth in Fiji. The data on damages inflicted by past annual cyclones are scanty. The quantitative estimates are based more on anecdotal evidence than on systematic assessments. Given these constraints, the paper attempts to undertake an empirical study through employing a bi-nary variable for cyclone, along with conventional variables.

I. Introduction

Fiji's tourism industry has emerged to be the engine of growth in recent years. Its international airport at Nadi has been the gateway to South Pacific ever since the 1960s and continues to remain the main hub for airline connections between passengers flying out of Australia and New Zealand as well as for passengers from North America to other Pacific Island Countries (PICs)[1]. The air traffic is being catered to by airlines of Australia and New Zealand and by Fiji Airways, formerly known as Air Pacific, which was once owned by major PICs but now fully owned by Fiji.

[1] The 14 Pacific island nations namely Cook Islands, Fiji, Marshall Islands, Nauru, Niu, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu are the members of an intergovernmental organization known as Pacific Islands Forum (PIF), headquartered in Fiji's capital Suva. The other two are Australia and New Zealand. The two advanced nations bear the brunt of operating expenditures of PIF. There is a parallel organization, known as Pacific Islands Development Forum (PIDF) without Australia and New Zealand, which was set up in 2012 by Fiji after its suspension from PIF following a military coup in late 2006.

As a result of foreign direct investment flowed in the tourism sector over last five decades in preference over to manufacturing because of very small size of domestic market, Fiji has now world-class tourist resorts and hotels which are mostly owned by well known international hotel and resort chains. These resorts and hotels are concentrated close to Nadi, the international airport tapering down to the area around the banks of the river Sigatoka, all in the Western Division, which receives less rainfall and hence is sunnier than Central Division where the capital city, Suva is situated. However, as cyclonic disturbances during the cyclone season, November to April affect mostly the Western Division, overseas investors have seen the need for locating their new resorts and hotels in other less cyclone prone areas including small islands.

Besides international travel by air, since the mid 2000s the growing popularity of cruise ship travel among the affluent senior citizens in Europe as well as in Australia and New Zealand has proved beneficial for Fiji. These ships arrive only at the country's two sea ports, Suva and Lautoka in the Western Division. Their visits do not extend beyond a day and they do not utilize any hotel facilities on land. However, they make short trips to places of historical interest and museums and return to their ships.

Empirical studies in the past, including those by Narayan *et.al* (2010) for Fiji and the most recent survey on small island developing states, commissioned by Commonwealth Secretariat and the World Bank (Hampton and Jeyacheya 2013), focused on the connection between tourism and growth hypothesis in the South Pacific region. However, the impact of natural disasters on tourism on growth in detail was not examined in detail. This paper makes an attempt to go beyond the past studies by specifically including cyclone as a variable besides the conventional variables, which are employed in the tourism-led growth studies. This paper is organized on the following lines: Section II reviews trends in tourism besides presenting a brief literature survey of tourism and growth; Section III describes the trend in Fiji's tourism sector. Section IV lists the past annual occurrences of cyclones with estimates of damages and other details. Section V outlines the modeling and methodology procedures and presents results; and the final Section VI presents a summary with some policy conclusions

II. Brief Review of Studies on Tourism and Growth

Hampton and Jeyacheya (2013), while presenting a brief survey on tourism and inclusive growth, reminds us that tourism is not an industry within the UN SIC system, but it is a form of final demand (Benyon, Jones and Mundya 2009). The latter has many components, which include accommodation, meals, tours and entertainment such as local cultural shows (Jones 2010). Younger groups who prefer to undertake more adventurous trips are also those who cannot afford high costs of accommodation often seek inexpensive stays and meals besides trips away from beaches and urban centres. Greater availability of inexpensive boarding services such as home stays and inns have sprung up in PICs to cater to the needs of the needs of back-pack youth groups.

In the context of constraints to growth posed by factors, such as low physical endowments in term of land area and poor quality of soil, often subject to land tenure difficulties, which limit the range and possibilities of exports of agricultural commodities, the unique combination of sun, surf and sands is offering greater scope for earnings from tourism as an export[2]. Table 1 presents data on the share of tourism earnings in the respective gross domestic products of PICs.

Table 1. Pacific Island countries: Contribution of tourism to GDP (percent)

Year	Fiji	PNG	Samoa	Soloman Islands	Tonga	Vanuatu
1995-99 (ave)	18.4	0.3	15.1	2.3	5.5	22.5
2000-04 (Ave)	20.0	0.1	15.5	1.0	4.3	25.4
2005-09 (Ave)	23.6	0.1	17.7	5.3	5.3	28.8
2010	26.3	0.0	18.7	7.6	7.3	34.5
2011	25.3	0.0	17.6	7.4	6.8	31.4
2012	24.9	0.0	18.4	6.4	9.6	34.3
2013	23.1	0.0	17.1	6.7	10.4	39.2
2014	-	0.0	18.1	5.5	-	34.8

Source: United Nations World Tourism Organisation (UNWTO) (2016)

It has been well recognized that tourism encouraged by both domestic investor friendly and liberal foreign direct investment policies (Jayaraman *et al* 2014) creates additional jobs and generates more incomes. Thus, tourism has a multiplier effect through increasing business activity in both formal and informal sectors and improving the livelihoods of people in agriculture and retail trade. However, it is not yet clear how much of the tourism earnings are actually retained in the country and how much of it is leaked by way of imports from rest of the world, as PICs have to import a variety of consumer goods ranging from toilet paper to food and beverages to satisfy the high-ended tourists from advanced countries . While foreign trade is part of open economy policies pursued by PICs, policy makers have been focusing their attention on how to strengthen the backward linkages from tourism to agriculture and other support services by shifting their emphasis from small family run farms to large, mechanized and irrigated farming. It is expected that commercial farming would ensure high quality as well consistent supplies to hotels and resorts as well as encouraging domestic processed consumer goods (Chand 2015).

[2] Earnings from tourism were difficult to quantify in the earlier years, which have presented problems not only in presentation for a given SIDS but also maintain uniformity in standards in terms of reporting for cross country comparison. The reporting procedures from the formal sector comprising hotels and resorts, restaurants and entertainment centers in the vicinity of tourists' stays have been streamlined over the years. Periodical visitor surveys by the Bureaus of statistics and other agencies including the Tourism Councils in SIDs have been able to improve the database.

Studies on Tourism and Growth nexus

Tourism, as an export of service enables the country earning valuable foreign exchange, which is used for importing capital goods for investing in growth enhancing areas of the economy. Further, as tourism creates additional jobs and incomes, the governments strive hard to exploit them by resorting to taxes on consumption of services, aside from airport taxes and hotel taxes. The additional tax revenues are devoted to fund public expenditures, aimed at speeding up growth and development in the economies of island nations. There are a large number of empirical studies that are available to confirm the contribution of tourism to growth. They include individual country studies as well as panel studies, covering as large as possible number of countries, both developed and developing countries together with small island nations[3], which confirm the contribution of tourism to growth.

Figini and Vici (2009) have broadly decided the empirical studies in two groups: (i) multiplier approach, where tourism is treated as an exogenous variable, being a component of aggregate demand with an impact of positive nature, when it is given a boost; and (ii) application of trade and endogenous growth theories to tourism sector's role. The first group of studies has been criticized as being static and that they do not explain the long run impact of tourism.

One of the earliest studies was by Balaguer and Cantalvella-Jorda (2002) falls into the first group. The two authors employed a double log model with two explanatory variables in their study on Spain for investigating tourism impact on real gross domestic product (RGDP) growth. They used the elasticity estimates of tourism earnings and real exchange rate on RGDP, which were found both positive and significant. The second approach of two sector endogenous growth models, where productivity is a major ingredient, is employed by Lanza and Pigliaru (1995). The two authors argue that if technological progress is higher in the manufacturing sector than in the tourism sector, tourism specialization is growth enhancing if and only if the change in the terms of trade between tourism and manufacturing goods more than balances the technological gap in the tourism sector.

Following Lanza and Pigliaru (1995) model in their studies on small economies, Candela and Cellini (1997) showed that in small island economies it is easier for the terms of trade offsetting the technology gap, as the opportunity cost of specialization is small. In a subsequent paper, Lanza and Pigliaru (2000) picked up the idea and argued that since in small island economies, the natural resources endowments related tourism sector is more dominant than the almost absent or negligible manufacturing sector, " the tourism dependent country can take advantage of the presence of natural resources even when the increase in the terms of trade does not balance the technological gap , the exploitation rate of tourism resources can increase sufficiently to correct the technological gap and to enhance growth" .

Leading empirical studies on tourism-growth nexus in island countries include Dritsakis (2004), Durbarry (2002, 2004) Gunduz and Hatemi (2005), Kim, Chen and Jang (2006) Noriko and Mototosugu (2007). They have convincingly shown the existence of a long –run relationship between tourism and economic growth. Besides these studies, which were on specific countries, there are two panel studies, one by Narayan et al. (2010) and another by Seetanah (2011).

[3] A competent survey is available in Seetanah (2011)

Narayan et al (2010) studied impact of tourism on growth in four six PICs, namely Fiji, Papua New Guinea (PNG), Solomon Islands and Tonga covering a period of 17 years (1988-2004). Only two variables were employed: the dependent variable, log of real GDP and log of tourist arrivals. In his panel study of 19 countries, comprising Fiji and Papua New Guinea from the Pacific region, Mauritius and Seychelles from the Indian Ocean region and the rest being from the Caribbean, covering a 13-year period (1990-2007), Seetanah (2011) unlike Narayan et al. adopted an augmented Solow growth model by including investment in physical capital, in the absence of a consistent times series of capital stock for all 19 countries. This approach is along the lines of Durbarry (2004), and Eugenio- Martin et.al (2004). Seetanah (2011) employed a double logarithmic model with the dependent variable per capita; and the explanatory variables, besides investment, secondary school enrollment representing human capital, exports and imports as percent of GDP representing the openness of the economy and tourist arrivals and economic freedom index. Being a double logarithmic model, the coefficients indicate output elasticities. The Seetanah study (2011) remains the most up- to- date study on the tourism-led growth hypothesis.

III. Trends in Fiji's tourism

Fiji is one of the leading economics amongst the Pacific island nations, whose key indicators are given in Table 2. Its population is less than a million and with no oil or gas resources or major mineral resources unlike Papua New Guinea which has the largest land area (452, 860 sq.km) with a well diversified export base, comprising both mineral and non-mineral exports. However Fiji it is the only upper middle income country in the region with its per capita income at US$ 4,530. Its small but significant manufacturing base together with its relatively skilled labour resource has made Fiji a leading tourism destination in the Pacific. Its traditional export earning sugar has now been replaced by tourism.

Table 2: Fiji: Selected key indicators

Land Area (sq.km)	18,270
Population in '000 (2015)	892
Per Capita GNI (US$) (2015))	4,530
Aid Per Capita in US$ (2010-14)	105
Aid as percentage of GDP (2011-14)	2.3
Human Development Ranking (2015)	90/188
Annual Average Growth Rate (%) (2011-15)	3.6
Annual Average Inflation (%) (2011-15)	3.1
Overall Budget Balance (% of GDP)(2010-14)	-2.4
Current Account Balance (% of GDP) (2011-15)	-5.5

Source: Reserve Bank of Fiji (2016), United Nations Economic and Social Commission for Asia and Pacific (2016), World Bank (2016a).

Table 3 shows that tourism in Fiji is the most dominant foreign earner. With its earnings at F$1560 million, being 17.1 percent of GDP, tourism replaced sugar (with its earnings at F$144 million, being 1.6 percent of GDP). Substantial foreign direct investment by well known international chains of resorts and hotels and domestic investors, who were inspired by FDI to try their hand, have made Fiji a popular, attractive and safe tourist destination in the South Pacific for all categories of tourists, most importantly families travelling with children during the vacation periods in Australia, New Zealand and North America during Christmas and Easter holiday season. Its close proximity to Australia and New Zealand (ANZ) as well as direct non-stop flights by Fiji Airways from Los Angeles, Seoul, Hong Kong, China and Singapore have contributed to tourism growth. The emergence of Nadi, the country's premier international airport is now the Pacific hub for making connections to Solomon Islands, Samoa and Vanuatu by all international business travelers.

Table 3: Fiji's major sources of foreign earnings (percent of GDP)

	1996-00	2001-05	2006-10	2011	2012	2013	2014	2015
Sugar	7.6	5.1	3.3	1.7	2.5	1.8	2.4	1.6
Gold	2.3	1.7	0.9	2.1	1.9	1.3	1.1	1.0
Garments	8.2	5.3	1.7	1.4	1.3	1.4	1.2	1.2
Fish	1.8	1.9	2.4	1.5	0.8	1.2	0.9	1.1
Lumber	1.3	0.9	0.9	0.9	1.0	1.1	1.1	1.0
Molasses	0.4	0.2	0.3	0.4	0.2	0.2	0.2	0.2
Coconut Oil	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.05
Others	4.7	6.0	6.7	7.0	6.9	6.2	6.1	6.3
Total	26.5	21.3	16.3	15.1	14.7	13.3	12.9	12.4
Services								
Tourism Earnings	13.8	14.5	16.5	19.0	18.3	17.2	16.4	17.1
Unrequitted Transfers								
Aid	1.9	2.0	1.8	2.1	2.7	2.2	2.0	N/A
Remittances	1.7	5.8	5.5	4.2	4.8	4.9	4.6	N/A
Capital Flows								
Foreign Direct Investment	1.1	4.1	9.8	11.0	6.7	3.8	7.6	7.6

Source: Reserve Bank of Fiji (2016), United Nations Economic and Social Commission for Asia and Pacific (2016) World Bank (2016a).

From the late 1990s, introduction of cruise ship trips to Fiji for holiday makers as well as for the rich retirees from Europe, which were only confined to Vanuatu and New Caledonia in the past years, have boosted tourism to new heights. Cruise ship passengers arriving in the two ports of Fiji, namely Lautoka and Nadi normally spend just a day, arriving in the early hours of the day and leaving around sunset visiting places of historical interest of colonial heritage in and around Suva and sugar city of Lautoka. These trips have become increasingly popular and as a result during the non-cyclone months, May to October, cruise ships have increased their weekly trips to Fiji, one arrival a day alternating between Suva and Lautoka[4].

The annual data series of tourist arrivals are reported for Fiji for the first time since January 2016 by International Monetary Fund (IMF) as part of International Financial Statistics in the form of index (Table 4), besides being reported by UNWTO (2016). The cruise ship arrivals are given in Table 5.

Table 4: Tourist arrivals

Averages	Fiji ('000)	PNG ('000)	Samoa ('000)	Soloman Is.('000)	Tonga ('000)	Vanuatu ('000)
1995-99	520.0	60.6	74.4	12.9	34.4	88.0
2000-04	461.0	56.2	91.0	5.8	45.6	102.4
2005-09	580.3	97.2	113.8	13.8	63.7	173.8
2010	692.0	140.0	122.0	20.5	65.0	237.7
2011	734.0	158.0	121.0	22.9	68.4	248.9
2012	741.0	168.0	126.0	23.9	57.1	321.0
2013	768.0	174.0	116.0	24.4	56.7	357.0
2014	781.0	182.0	120.4	20.1	NA	329.0

Source: United Nations World Tourism Organization (2016)

Table 5: Number of cruise passengers for Fiji

Year	cruise passengers
Avg.1996-2000	14200
Avg.2001-2005	8800
Avg.2006-2011	45200
2012	80000
2013	110000
2014	88000

Source: United Nations World Tourism Organization (2016)

[4] The data series of cruise ship passenger arrivals, assembled as an independent series are available only from 1995.

The latest study by World Bank (2016b) reports that in 2013 tourism receipts for all PICs amounted to US$1.4 billion, which happens to be a record as a record 1.37 million overnight visitors arrived in 2014 for all 11 PICs. Fiji, Papua New Guinea, Palau, Samoa and Vanuatu emerged as top five destinations in the region. Two thirds of visitors arriving in PICs are from Australia and New Zealand, while the United States, China, Japan and Europe have shown significant growth potential. The World Bank (2016b) estimates PICs can gain as much as US$1.8 billion per year from additional revenues and create up to 128,000 additional jobs by 2040.

IV. Cyclones and other natural disasters

Bonte and Cook (2013) report ten[5] out of top thirty countries experiencing damages from natural disasters are in the Pacific region. This is based on estimated average annual losses from natural disasters, as percentages of respective GDPs. The United Nations Office for Disaster Risk Reduction ((UNISDR) 2012)'s estimates reveal that annual average damage has been around US$50 million per year over a recent ten year period in Fiji alone. Hsiang and Jina (2014) estimated that annual catastrophic cyclones can reduce per capita income significantly by as much as 7.4 percent to 14.9 percent in PICs. Table 6 shows the estimates of the cyclone damages from 1980 to 2016.

[5] The ten PICs are: 1)Vanuatu 2) Niue 3) Tonga 4) Federal States of Micronesia(FSM) 5) Solomon Islands 6) Fiji 7) Marshall Islands 8) Cook Islands 9) Palau and 10) Samoa.

Table 6: Fiji: Estimates of the cyclone damages: 1980-2016

Year	Names of Cyclone	Category of Cyclone	Number of Deaths	Damages in F$ million
1980	Wally	1	16	NA
1982	Mark	3	NA	NA
1982	Oscar	5	NA	NA
1985	Erick	3	23	132.09
1985	Nigel	3	incl. above	NA
1985	Gavin	4	7	NA
1985	Hina	3	3	NA
1986	Martin	3	2	NA
1986	Rajah	3	1	43.97
1990	Rae	2	3	91.95
1990	Sina	3	NA	34.45
1990	Mike	NA	NA	NA
1992	Fran	5	NA	NA
1992	Joni	4	NA	5.27
1993	Kina	3	23	324.83
1994	Thomas	4	NR	NA
1995	Gavin	4	25	50.13
1997	June	2	0	156
1999	Dani	4	12	6.56
2001	Paula	4	1	2.8
2003	Ami	3	19	59.6
2006	Jim	3	4	0.03
2008	Cliff	3	0	6.1
2008	Daman	4	0	0.62
2008	Gene	3	8	65.25
2009	Mick	2	3	68.25
2010	Thomas	4	2	93.37
2012	Evan	4	0	NA
2016	Winston	5	44	NA
2016	Zena	3	NA	NA
1980-2016	Total	30	173	1142.27

Source: Pole and Bola (2012), Fiji Times (2012).

Economic costs of natural disasters

A recent study by World Bank (2016c) estimates that natural disasters of all kinds including earthquakes and cyclones during 1950-2014 affected about 9.2 million people in the South Pacific region, causing approximately 10,000 reported deaths, and resulting in $US5 billion in associated damage costs. The most comprehensive single country study to date on the economic costs of natural disasters is in regards to Fiji, which was undertaken, nearly two decades ago by Benson (1997). Economic costs are divided into three categories: direct costs, indirect costs and secondary effects (Andersen, 1991, Bull, 1992, Otero and Marti, 1995)[6]. Focusing on impact of natural disasters on tourism, Benson (1997) observed that little attention appeared to have been paid to the hazard vulnerability of the sector. The situation continues to remain the same. Many of Fiji's tourist resorts are located in coastal areas, "often positioned at vantage points to ensure the best views". Thus, most of the tourist resorts are particularly vulnerable to cyclones and sea surges and to the extent that they are built on reclaimed land, earthquakes.

Tourist resorts and hotels are located along the southwest coastal line of about 150 kilometers of Viti Levu. Cyclones each year are unpredictable. As long the cyclones do not affect the Viti Levu's coastal areas, which have the highest concentration of tourist infrastructures, damages to the economy have been damages to economy and loss of lives are relatively low.

The last, the most destructive cyclone, prior to the Tropical Cyclone Winston (TCW) of February 2016, was in 1984 when Cyclone Oscar destroyed much of the tourist infrastructure in the Western Division. It resulted in about F$12 million damage to the Regent of Fiji hotel in Nadi as well as damaging other hotels in the Nadi area and on the Coral Coast. The cyclone Sina of 1990 destroyed the Warwick Hotel to a substantial extent; which was followed by Cyclone Joni in December 1992 causing considerable damage to tourist resorts (Benson 1997).

The most destructive cyclone faced by Fiji to date is TCW of February 2016. Fortunately, the tourist areas were spared. It affected the sparsely populated eastern islands first; and after making the landfall on the main island, Viti Levu, it blew over the northern coastal line across Viti Levu. The Nadi international airport and tourist resorts and hotels in the Western Division remained mostly unaffected. The TCW of February 2016 is considered to be most devastating disaster with damages of more than $1 billion. The damages inflicted were upon farm lands in the populated areas depending on sugar and other crops as well as communications, including bridges and roads.

[6] While direct costs cover physical damage to capital assets, including buildings and infrastructure, inventories of finished, intermediate and raw materials, destroyed or damaged by the actual impact of a disaster, besides standing crop losses. Indirect costs relate to include damage to flow of goods and services including lower output from damaged or destroyed assets and infrastructure; loss of earnings due to damage to marketing infrastructure such as roads and ports and to lower effective demand; and the costs associated with the use of more expensive inputs following the destruction of cheaper usual sources of supply. They also include the costs in terms of both medical expenses and lost productivity arising from increased incidence of disease, injury and death. Secondary effects concern both the short- and long-term impacts of a disaster on overall economic performance, such as deterioration in trade and government budget balances and increased indebtedness as well as the impact on the distribution of income or the scale and incidence of poverty.

More than direct damages, adverse publicity in the media soon after tropical cyclones has now come to be seen a most destructive fall out of all. The economic costs tend to linger on as they are reflected in the cancellation of air travel, hotel bookings and car rentals and the like for the next three or more months[7]. For this reason, soon after evaluation of damages inflicted by TCW of February 2016, the government undertook a major campaign during the months of April to June in 2016 in the tourism markets including Australia, New Zealand and North America to assure the world that the tourist infrastructure and Nadi airport were all intact and Fiji Tourism was back in the business. However, domestic press reports of spread water borne diseases and airborne illnesses such as eye infection in the wake of TCW of February 2016, kept tourists at bay for a while. Tourist arrivals dipped in March to May 2016 as well[8], although recovery of sorts began in late July 2016.

As noted by Benson (1997), tourism industry is vulnerable to natural disasters although less so than other sectors, development of tourism which has proven to be the number one foreign exchange earner, offers immense opportunities to mitigate the overall impact of disasters on the country's foreign-exchange earnings. In this context, the latest study on C*limate and Disaster Resilience,* by the World Bank (2016c) estimates the highest adaptation costs for PICs will be in regard to coastal protection. The main components are beach nourishment in areas with high tourism revenue, besides sea and river dike construction and port upgrade. Further, existing buildings in the coastal regions, cyclone wind retrofitting options are needed which would reduce expected losses by 35- 50 percent. All new constructions would need to incorporate the code improvements necessary to ensure greater resilience to the current and future distribution of cyclone risks. No doubt, the retrofitting expenditures of public buildings will be the responsibility of the government and funds have to be sourced from within or foreign sources, aid or loan assistance from international funding agencies. On the other hand, expenditure on retrofitting and construction of new structures of hotels and resorts and restaurants and other entertainment joints have to be in accordance with the approved codes will have to be borne by the owners in the private sector.

Specifically focusing on Fiji, the World Bank (2016c) has estimated that Fiji would have to spend US$ 329 million per year by 2040 and it would be at least US$ 229 million per year by 2020. The annual cost is estimated to be 3 percent of GDP, which is higher than the cost of coastal adaptation estimated in other regions of the world: 0.8 percent for Sub-Saharan Africa and 0.4 percent for other regions. The higher costs are attributed to greater need for components such as construction and maintenance of seawalls. As funding requirements for these components are substantial, PICs would be seeking assistance from international funding agencies. Fiji and other PICs have already started working on the next steps in this regard in consultation with other stakeholders[9].

[7] For example, in the wake of Cyclone Kina of January 1992, which struck the Western Division, visitors from Australia declined by 2.1% year on year in the January and by 20 percent n February whilst visitors from New Zealand and other Pacific islands fell by 9.1and 5.8% respectively year on year in the same month. Earnings per head of tourist were also estimated to fall by about half in January 1993 as many tourist activities were cancelled

[8] Tourist arrivals were in the last quarter October to December of 2015 were 194 656 and the first quarter of 2016 January to March were 158 069 (RBF 2016)

[9] One of the proposals which have been agreed to by PICs in a workshop on 'Climate Change Financing Initiatives" sponsored by UN Economic Commission for Asia and Pacific (UN ESCAP), held in Fiji in August 2016 is to work on a regional level to formulate bankable projects for seeking funds from international agencies (Fiji Times 2016).

V. Modeling, methodology and Results

As our objective is to undertake an econometric analysis of the role of cyclones in the tourism-led-growth growth analysis, we employ a production function approach with conventional variables of real GDP and capital stock and labour as conditional variables. Besides these we include others as shift variables, which are also considered as policy variables specifically affecting growth process. As we do not have adequate data base for cyclone damages, we use a dummy variable for cyclone.

Model

Our choice of the model stems from the Cobb-Douglas production function and is along the lines employed by Luintel *et al.* (2008) and Rao *et al.* (2008) with constant returns and Hicks – neutral technical progress.

$$y_t = A_t k_t^{\alpha} \qquad 0 < \alpha < 1 \tag{1}$$

Where

y = per capita output;
A= stock of technology;
k = capital stock per capita;

Our objective is to study the impact of tourism (tourism arrivals, TA represented by index) on per capita output (y). Additionally, two policy variables are added. One is the real exchange rate index (*REER)*, with nominal exchange rate being defined as units of Fiji dollar per unit of US dollar; and the other is *OPEN*, (sum of exports and imports as percent of GDP). The REER which is the product of nominal exchange rate and ratio of foreign price index to domestic price index would reflect the impact of fiscal and monetary policies pursued by the country authorities. The other policy variable, *OPEN* would represent the degree of liberalized policies pursued by government in regard to exports and imports.

It is therefore plausible to assume that:

$$A_t = f(TA_t, REER_t, OPEN_t) \quad (2)$$

where,

TA = index number representing tourist arrivals;
REER = real exchange rate index and
OPEN = ratio of trade to GDP in percent

We enter *TA, REER and OPEN* as shift variables into the production function, noting capital per capita as the fundamental and conditioning variable explaining output per capita:

The Cobb-Douglas production model is modified as:

$$A_t = A_0 e^{gT}\, TA_t^{\beta}\, REER_t^{\delta}\, OPEN_t^{\theta} \quad (3)$$
$$y_t = (A_0 e^{gT}\, TA^{\beta}\, REER_t^{\delta}\, OPEN_t^{\theta})\, k_t^{\alpha} \quad (4)$$

For the purpose of econometric estimation, the above model can be written as:

$$Ly_t = \alpha_0 + \alpha_1 Lk_t + \alpha_2 LTA_t + \alpha_3 LREER_t + \alpha_4 LOPEN_t + \sum \beta_m dum_{mt} + e_t \quad (5)$$

where
Ly_t = natural logarithm of real gross domestic product per capita (in US dollars in 2005 prices);
Lk_t = natural logarithm of real capital stock per capita (in US dollars in 2005 prices).
LTA_t = natural logarithm of TA as percent of GDP;
$LREER_t$ = natural logarithm of real exchange rate;
$LOPEN_t$ = natural logarithm of openness [(X+M)/GDP]
dum_{mt} is a vector of dummy variables (dum_{1t}, dum_{2t} dum_{3t}) to capture effects of three coups in 1987, 2000 and 2006; currency devaluation in 2009; and cyclone affecting the country periodically; and e_t is the random error term.

The hypotheses to be tested are: (i) *Lk* is directly associated with L*y*; (ii) LTA positively influences *Ly;*(iii) *LREER* is positively associated with *Ly;* (iv) *LOPEN* is positively associated with *Ly;* (v) the dummy variable for coup is negatively associated with *Ly;* (vi) dummy variable for devaluation is directly associated with *Ly* and (vii) dummy variable for cyclone is negatively associated *with Ly*.

Data

The period included in this study is from 1980 to 2014. We utilize the data series of capital stock of Fiji in constant prices released from *Penn Tables* (Federal Reserve Bank, 2014). All the other data series are sourced from *World Development Indicators* (World Bank, 2016a). Table 7 presents summary statistics of variables used in the analysis.

Table 7. Summary statistics of the variables

Period/Year	Per capita GDP (constant US$)	Capital stock per capita (constant US$)	TA Index	REER (FJ$/US$) (Index)	OPENN [(X+M)/GDP] (%)
1980-89 (ave)	2721	7936	34	157.5	95.9
1990-99 (ave)	3054	8468	51	119.7	118.3
2000-04(ave)	3438	9364	63	109.5	128.5
2005-09(ave)	3637	10325	87	113.8	117.3
2010	3622	10861	100	100.0	121.7
2011	3688	11059	107	103.4	128.2
2012	3726	12100	105	106.6	128.9
2013	3828	12375	104	107.6	136.4
2014	3946	12656	110	106.6	129.4

Source: Capital stock from the Federal Reserve (2015) ; TA index series is from IMF(2016); and other data series from World Bank (2016a)

Methodology

Since the number of observations is not large enough, we resort to the autoregressive distributed lag (ARDL) procedure, developed by Pesaran *et al*. (2001). Although bounds testing does not require unit root tests to ensure the variables employed are integrated of the same order, we conduct unit root tests and make certain that the results obtained are robust. The existence of a long run relationship between the variables is examined from the bounds test.

The ARDL bounds testing model is a general dynamic specification, which applies lags of the dependent variable and the lagged and contemporaneous values of the explanatory variables, through which short-run impacts can be directly assessed and long-run relationship indirectly estimated[10].

[10] The use of this technique is also based on its advantages over the conventional cointegration procedure. See, for example, Pesaran et al. (2001), Narayan and Smyth (2005), Akinlo (2006), among others for the advantages and applications of ARDL.

An ARDL model of Equation (6) is constructed as follows:

$$\Delta Ly_t = \alpha_0 + \beta_0 Ly_{t-1} + \beta_1 Lk_{t-1} + \beta_2 LTA_{t-1} + \beta_3 LREER_{t-1} + \beta_4 LOPEN_{t-1} + \sum_{i=1}^{p} \beta_{0i} \Delta Ly_{t-i} + \sum_{i=0}^{p} \beta_{1i} \Delta Lk_{t-i} + \sum_{i=0}^{p} \beta_{2i} \Delta LTA_{t-i} + \sum_{i=0}^{p} \beta_{3i} \Delta LREER_{t-i} + \sum_{i=0}^{p} \beta_{4i} \Delta LOPEN_{t-i} + \mu_t \quad (6)$$

The bound test is tested by using equation (6). For simplicity, the dummy variables which are included in the analysis, which capture the effects of coup, currency devaluation and cyclones are not shown in the ARDL model. The bounds test equation (6) is repeated by using other explanatory variables as dependent variable to determine the number of cointegrating vectors in the model.

There are two steps in the ARDL bound testing approach. First, we estimate Equation (6) by ordinary least squares techniques. Second, the existence of a long-run relationship can be traced by imposing a restriction on all estimated coefficients of lagged level variables equal to zero. Hence, bounds test is based on the F-statistics (Wald statistics) with the null hypothesis of no cointegration (H_0: $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$) against its alternative hypothesis of a long-run cointegration relationship (H_1: $\beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$).

Since the F-statistics used for this test has a nonstandard distribution, Pesaran *et al*. (2001) have generated two different sets of critical values for given significance levels. The first set assumes that all variable are integrated of order zero, *I(0),* and the second set assumes all variables are integrated of order one, *I(1).* If the computed F-statistic is greater than the upper critical bounds value, then the null hypothesis is rejected. In contrast, if the computed F-statistic is smaller than lower critical bounds value, it indicates no long-run relationship between variables. If the computed F-statistic lies between lower and upper bounds values, then the test becomes inconclusive. To enhance the robustness of results, the computed F-statistic is also compared with the critical values provided in Narayan (2005) which consider the properties of small sample size.

After checking whether the relationship flowed only in one direction and that it was from the explanatory variables to the dependent variable by an error correction model by applying Granger-causality approach. We went beyond OLS and adopted GMM to remove any endogeneity bias. Lastly, the Vector Error Correction Model (VECM) is applied to determine the direction of causality.

Results and interpretation

Table 8. Unit root test results

Variables	ADF Test		Ng and Perron Test, MZa	
	Level (constant with trend)	1st Difference (constant without trend)	Level (constant with trend)	1st Difference (constant without trend)
Ly	-2.29	-7.46**	-8.40	-15.83**
Lk	0.31	-4.16**	-0.40	-13.11**
LTA	-2.65	-7.83**	-15.21	-17.90**
LREER	-1.58	-4.14**	-4.79	-14.53**
LOPEN	-2.55	-5.98**	-9.57	-16.42**

Note: The critical values for ADF test are based on Mckinnon (1996). The optimal lag is selected on the basis of Akaike Information Criterion (AIC). The Ng and Perron critical value is based on Ng and Perron (2001), and the optimal lag is selected based on Spectral GLS-detrended AR based on SIC. The null hypothesis of the test is: a series has a unit root. The asterisk ** denotes the rejection of the null hypothesis at the 5% level of significance.

From Table 8, it is seen that variables employed in the study are not found stationary at level but they are stationary at first difference. Though unit root tests are not needed for bound tests, test results confirm the results obtained for cointegration relationship are robust and free from bias.

Table 9. Results of bounds test for cointegration

Dependent variable	Computed F-statistic
Ly	9.73***
Lk	1.80
LTA	2.00
LREER	2.02
LOPEN	1.23

Critical value	Pesaran et al. (2001)[a]		Narayan (2005)[b]	
	Lower bound	Upper bound	Lower bound	Upper bound
1%	3.74	5.06	4.590	6.368
5%	2.86	4.01	3.276	4.630
10%	2.45	3.52	2.696	3.898

Note:
[a] Critical values are obtained from Pesaran et al. (2001), Table CI(iii) Case III: Unrestricted intercept and no trend, p. 300.
[b] Critical values are obtained from Narayan (2005), Table case III: unrestricted intercept and no trend, p. 10.
*, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

The results obtained from Table 9 confirm that there is only one cointegration equation after ensuring that the linkage is in only one direction and the relationship runs from all explanatory variables only to *Ly*. In other words, the variables are cointegrated in the long run when Ly is the dependent variable.

Having confirmed the existence of a long-run relationship between the variables from the bounds tests, we resort to the Generalized Method of Moments (GMM) estimation procedure for eliminating any bias due to potential endogeneity problem in explanatory variables. The long run equation was arrived at by using instrumental variables estimators. Instrumental variables employed in the estimation procedure include the differenced of the level of explanatory variables and the differenced of lagged of the explanatory variables.

While estimating the GMM equations, we found the dummy variable for cyclone emerged with significance. Hence, the two non-significant dummy variables for coup and devaluation were dropped. The final equation is shown below:

$$Ly = 0.309Lk^{**} + 0.253LTA^{***} + 0.339LREER^{***} + 0.199LOPEN^{**} - 0.022\,D3^{*} + 1.678 \quad (7)$$
$$(2.029) \qquad (5.067) \qquad (3.346) \qquad (2.629) \qquad (-1.722) \qquad (0.98)$$

Adj. R^2 =0.885 *S.E. of Regression =0.046* *Sargan test p-value = 0.988*

(the figures in brackets denote the" t" values)

From the above equation, all the coefficients are found statistically significant. The coefficients of Lk, *LTA*, LREER and *LOPEN* have the expected positive signs, confirming that they are positively associated with the dependent variable, *Ly*. The dummy for cyclone has a significant and negative impact on Ly. The share of capital stock is 0.31 which is consistent with the stylistic values obtained in similar production function studies for developing countries (Rao et.al 2008; Rao and Takirua 2010)

Sargan test of over-identifying restrictions is applied to check on the validity of instruments used. The test examines the possibility of a correlation between the residuals and the instrument variables. There is no instrument misspecification if null hypothesis of the Sargan test cannot be rejected. From the Sargan test result, there is no instrument misspecification. This implies that the instruments are valid.

Table 10. VECM Granger causality

Dependent variable	ΔLy	ΔLk	ΔLTA	ΔLREER	ΔLOPEN	ECT(-1)
ΔLy	-	5.381**	21.911***	3.276*	7.339**	-0.105*
						(-1.825)
ΔLk	1.432	-	1.860	1.346	14.996***	-0.082
						(-0.791)
ΔLTA	3.613*	1.754	-	4.387*	0.436	-0.024
						(-0.067)
ΔLREER	2.371	2.261	1.744	-	1.255	-0.114
						(-0.826)
ΔLOPEN	0.168	0.957	0.172		-	-0.049
						(-0.312)

Note: Figures without bracket indicate the F-statistic value and coefficient for the ECT(-1). Figure in bracket is the t-statistics for the ECT. *,**,and *** denote significance at 10%, 5% and 1% respectively.

Table 10 shows the results of VECM Granger causality test. The error correction term (ECT) is significant only in the equation with *Ly* as the dependent variable. This is consistent with the bound test where there is only one long run relationship between the variables. In other words, Lk, LTA, LREER and LOPEN Granger cause Ly in the long run. The negative sign of the ECT which is in conformity with theoretical expectations indicates the existence of long run restoration in the equilibrium, when there is a short run shock in the model.

In terms of short run causality, we observe that there is bidirectional causality between Ly and LTA. This implies there is a feedback effect between growth and tourism and they are interdependent on each other. Other than bidirectional causality, unidirectional or one-way causality is found running from Lk, LTA, LREER and LOPEN to Ly, from LOPEN to Lk and from LREER to LTA.

VI. Conclusions and policy recommendations

Although tourism has now emerged as an engine of growth in PICs, there are growing uncertainties in regard to its future. There are concerns regarding of impacts of cyclones, as they now appear to have become regular, annual occurrences, causing immense loss of lives and damages to infrastructure.

This paper undertook a study on tourism led growth nexus in Fiji with a specific dummy variable for cyclone as data series on a consistent basis over a thirty year period are not available. The results show that dummy variable along with other conventional variables in a production function model emerged significant indicating the need for corrective mechanisms have to be put in place. Governments are now aware that all structures of housing and buildings and roads and other communication facilities have to be cyclone resistant.

As the expenditure estimates over a twenty year period (World Bank 2016c) for undertaking retrofitting of current public sector buildings and facilities together with re-construction of roads and other communication networks are beyond the financial capacity of national governments, PICs are now making a regional and collective efforts to seek assistance with a mix of aid from advanced countries and loans on a concessional basis from international funding agencies.

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