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Abstract

This paper explores the validity of the tourism-led growth hypothesis for Thailand using quarterly data during 1995 and 2014. The results from the analysis show that the relationship between tourism receipts and real GDP is nonlinear without asymmetric adjustment. The nonlinearity in this relationship is found from the results of threshold cointegration tests. The causality analysis indicates no causality running from tourism receipts to real GDP in both the long run and the short run. The finding in this paper gives some policy implications.

Keywords: Tourism receipts, economic growth, threshold cointegration, Granger causality
JEL Classification: C22, F14

1. Introduction

Besides the export-led growth hypothesis, the tourism-led growth hypothesis has been widely explored by many researchers. Some researchers posit that tourism is a long-run economic growth factor. Balaguer and Cantavella-Jorda (2002) examine the role of tourism in the Spanish long-run economic development. They find that the Spanish economic growth is sensible to persistent expansion of international tourism. Similarly, Nikolaos (2004) investigates the impact of tourism on long-run economic growth in Greece under a multivariate framework. The evidence for Greece supports the tourism-led growth hypothesis. Carrera et al. (2008) examine the impact of tourism on long-run economic growth in Mexico and find evidence of the validity of the tourism-led growth hypothesis from the results of a linear cointegration analysis. However, Oh (2005) finds that the tourism-led growth hypothesis does not hold for South Korea. Recently, Ertugrul and Mangir (2015) validate the tourism-led growth hypothesis for Turkey. Phiri (2015) employs both linear and nonlinear cointegration tests and finds evidence that supports the tourism-led growth hypothesis for South Africa under the linear cointegration analysis. On the contrary, Brida et al. (2016) examine the validity of the tousim-led growth hypothesis for Argentina and Brazil using both linear and nonlinear conintegration techniques. They find that the tourism-led growth hypothesis holds only in the case of Brazil under a nonlinear cointegration model analysis.

For Southeast Asian economies, Lee and Hung (2010) find that tourism imposes a positive impact on Singapore's economic development in the long run. This finding is found under Granger causality analysis. Tang (2011) reinvestigates the validity of tourism-led growth hypothesis for Malaysia during January 1995 and February 2009 using linear cointegration analysis and finds that international tourism arrivals and economic growth exhibit a long-run relationship in all 12 different disaggregated tourism markets of the country. Untong (2014) employs linear cointegration techniques to examine the validity of the tourism-led growth hypothesis for Thailand and finds that this hypothesis is valid during 1980-2012, but is not valid during 1960 to 1979. Therefore, the level of tourism specialization seems to play an important part in the tourism-growth nexus.

Tourism receipts are one of main sources of foreign exchange income for Thailand and other emerging market economies. In addition, tourism development can create employment opportunities in the tourism sector. Tourism industry has been gradually more important to the Thai economy. In 2005, the ratio of tourism receipts and total exports of the country was 9 percent. This ratio increased to 15 percent in 2014. The average ratio was approximately 12 percent per annum. The growing importance of tourism can enhance economic growth for the Thai economy. This paper attempts to investigate whether tourism leads to economic growth by using the recently available quarterly data during 2005 and 2014. In other words, the paper tests the tourism-led growth hypothesis for Thailand. To answer this empirical issue, both linear and non-linear cointegration tests are used. The possibility of nonlinearity in the tourism-growth nexus has been ignored in many previous studies. The present paper contributes to the literature because it provides evidence that the significantly positive long-run relationship between tourism receipts and real GDP is nonlinear. The paper is organized as follows. The next section describes the data and empirical methodology. Section 3 presents empirical results. Concluding remarks are in Section 4.

2. Data and Methodology

2.1 Data

The data from 2005Q1 to 2014Q4 are used to examine the validity of the tourism-led growth hypothesis. The series of net tourism receipts and consumer price index are obtained from the website of the Bank of Thailand. The series of real tourism receipts is obtained by deflating the series of net tourism receipts by consumer price index.[1] The series of real GDP is obtained from the database of the National Economic and Social Development Board. Both series are expressed in billion of baht (domestic currency). All series are transformed into logarithmic series.

2.2 Estimation methods

Since the long-run relationship between tourism receipts and real GDP can be linear or nonlinear, two types of tests for cointegration are used: (1) EG cointegration test and (2) threshold cointegration tests. The EG cointegration test of Engle and Granger (1987) comprises two steps of estimation. The first step is the OLS estimate of the long-run equilibrium relationship, which is expressed as:

$$gdp_t = \gamma_0 + \gamma_1 tr_t + e_t \quad (1)$$

where *gdp* is the log of real GDP, and *tr* is the log of real tourism receipts, and *e* is the error term.

The second step is the test for unit root in the estimated residual (*e*) by the following equation:

$$\Delta e_t = \rho e_{t-1} + \beta \Delta e_{t-1} + u_t \quad (2)$$

where the t-statistic of the coefficient of the lagged residual term is compared with the critical value provided by MacKinnon (1991). If the t-statistic is larger than the critical value statistic, the null hypothesis of no cointegration is rejected. On the contrary of the t-statistic is smaller than the critical value statistic, the null hypothesis is accepted.

The EG cointegration test implicitly assumes a linear adjustment mechanism. However, this test is misspecified when the adjustment is asymmetric.

[1] The number of tourists or the number of tourist arrivals does not seem to be suitable because different types of international tourists spend different amounts of money. Therefore, tourism receipts are used.

The models that take into account of asymmetric adjustment mechanism are recently developed for cointegration tests. There are modified models of the EG test. The first model is known as threshold autoregressive model (TAR) developed by Enders and Granger (1998) and Enders and Siklos (2001), which is a nonlinear extension of the EG framework. The nonlinear cointegration function is specified as:

$$\Delta e_t = I_t \rho_1 e_{t-1} + (1 - I_t)\rho_2 e_{t-1} + v_t \quad (3)$$

where Δ is first difference operator, I_t is the Heaviside indicator function such that It is one if e_{t-1} is greater than or equal to τ and It is zero if e_{t-1} is smaller than τ, and τ is the value of the threshold. The lagged first difference of the error term can be augmented to Eq. (3).

According to the TAR model, the necessary and sufficient conditions for the sequence of e_t is ρ_1 is less than zero, ρ_2 is less than zero, and $(1+\rho_1)(1+\rho_2)$ is less than one. Since the value of τ is unknown, this value is to be estimated. In some circumstance, the value of τ might be set to zero so that the cointegrating vector coincides with the attractor.

For the momentum threshold autoregressive (MTAR) model, the Heaviside indicator function in Eq. (3) is defined as M_t, which is one if Δe_{t-1} is greater than or equal to τ, and it is zero if Δe_{t-1} is less than τ.

If the threshold cointegration is found, one can proceed with the Granger causality test by the threshold error correction model (TECM). The TECM is specified as:

$$\Delta gdp_t = \alpha + \lambda_1 Z_{t-1} + \lambda_2 (1 - Z_{t-1}) + \sum_{t=1}^{k} \delta_i \Delta gdp_{t-i} + \sum_{t=1}^{k} \phi_i \Delta tr_{t-1} + u_i \quad (4)$$

where $Z_{t-1} = I_t e_{t-1}; M_t e_{t-1}$ and $(1 - Z_{t-1}) = (1 - I_t)e_{t-1}; (1 - M_t)e_{t-1}$ depending on the type of the threshold models specified above. The joint significance of two of the λ coefficients indicates long-run causality and the joint significance of $\Phi_i s$ indicates short-run causality. The lagged first difference of the right-hand side variables can be determined by Schwarz information criterion.

3. Empirical Results

Among various conventional unit root testing procedures, the PP test of Phillips and Perron (1988) is used to test for stationarity property of each variable with a small sample size. The results are reported in Table 1.

Table 1
Results of PP tests for unit root, 1995Q1-2014Q4.

Variable	PP statistic (constant)	Bandwidth
gdp	-1.066	15
Δ*gdp*	-12.939***	11
tr	-1.633	19
Δ*tr*	-10.757***	12

Note: *** denote significance at the 1 percent level.

The results in Table 1 reveal that the real GDP and tourism receipts series are not stationary in their level, but stationary in their first differences. Therefore, it can be argued that both series are I(1) series.

Due to the possibility on nonlinearity stationarity of variables, the non-linearity stationary test proposed by Kapetnious et al. (2003) can be used to test whether the two series are nonlinear stationary. The approximated equation of this test can be expressed as:

$$\Delta x_t = \mu + \delta x_{t-1}^3 + \sum_{t-1}^{k} b_i \Delta x_{t-i} + u_t \qquad (5)$$

where *x* is the series of variables in question, *u* is an i.i.d. error with zero mean and constant variance. The null hypothesis that $\delta = 0$ is tested against the alternative hypothesis that $\delta < 0$. The acceptance of the null hypothesis indicates the presence of unit root in a series and vice versa. The results of nonlinear unit root tests are reported in Table 2.

Table 2
Results of nonlinear unit root tests, 1995Q1-2004Q4.

	t-statistic	lag
gdp	0.001	3
Δ*gdp*	74.666***	3
tr	0.002	3
Δ*tr*	2.145**	3

Note: The optimal lag length is determined by Schwerz Information Criterion, *** and **denotes significance at the 1 and 5 percent, respectively.

The results in Table 2 suggest that the variables are I(1) series. The tests are significant at least at the 5 percent level. Therefore, the TAR and MTAR models are suitable for nonlinear cointegration tests.

The estimates of the second step of the EG model and the short-run adjustment between real GDP and tourism receipts under the TAR and MTAR models are reported in Table 3.

Table 3
Estimates of the short-run adjustment between tourism receipts and real GDP, 1995Q1-2014Q4.

	EG test	Threshold (τ=0)	Momentum (τ=0)
ρ_1	-3.026	-0.611	-0.618
	(0.180)	(0.193)	(0.196)
ρ_2	-	-0.524	-0.560
		(0.244)	(0.260)
J	1	0	0
Φ	-	7.331	7.120
$\rho_1=\rho_2$	-	0.078	0.033

Note: Standard error in perenthesis,
J is the lag length,
Φ is the joint F-test for the null hypothesis that $\rho_1=\rho_2=0$.

The second column of Table 3 reports the results of EG cointegration test. The ADF test is performed on the residual series obtained from the estimate of the long-run equilibrium equation, Eq. (1), with one-period lag of the augmented term. The ADF statistic is -3.026, which is smaller than the critical value of 3.130 at the 10 percent level. Therefore, the null hypothesis of unit root in the residuals cannot be rejected. In other words, there is no long-run relationship between real GDP and real tourism receipts under the analysis of cointegraton by the EG test, which is a linear adjustment model.

For the threshold cointegration models specified in Eq. (3), the threshold value is set to zero for both TAR and MTAR models. The estimated coefficients, ρ_1 and ρ_2, are reported in columns 3 and 4. The absolute values of these coefficients are less than one. Recall that these negative values of these coefficients meet the requirement of necessary condition for convergence. In addition, the sufficient condition for convergence is also met. The Φ-statistic for the null hypothesis that $\rho_1=\rho_2=0$ lead to a rejection of the null hypothesis of no cointegration at the 10 percent level in both models. However, the test-statistic for the null hypothesis that $\rho_1=\rho_2$ cannot be rejected. Therefore, it can be concluded that there is cointegation between real GDP and tourism receipts without asymmetric adjustment in the short-run.

For the estimates of the residuals for both TAR and MTAR models, the threshold value is estimated using the sequentially determined thresholds method that minimizes the sum of squared errors. The threshold value is 0.0135. With positive value of the threshold, the estimation results are repeated. It is found that the results are similar to the results in Table 3. The repeated estimation results are shown in Table 4.

Table 4
Estimates of the short-run adjustment between tourism receipts and real GDP, 1995Q1-2014Q4.

	Threshold (τ=0.0135)	Momentum (τ=0.0135)
ρ_1	-0.563	-0.588
	(0.202)	(0.178)
ρ_2	-0.596	-0.550
	(0.228)	(0.288)
J	0	0
Φ	7.284	7.285
$\rho_1=\rho_2$	0.011	0.013

Note: Standard error in perenthesis,
J is the lag length,
Φ is the joint F-test for the null hypothesis that $\rho_1=\rho_2=0$.

The results in Table 4 show that there is nonlinear long-run relationship between real GDP and tourism receipts, but without asymmetric adjustment.[2] The existence of nonlinear cointegration without asymmetric adjustment leads to an interpretation of the long-run relationship between tourism receipts and real GDP as shown in Table 5.

Table 5
Estimate of the long-run relationship between tourism receipts and real GDP, 1995Q1-2014Q4.

Dependent variable: *gdp*				
Variable	Coefficient	Std. Error	t-statistic	p-value
tr	0.231***	0.231	19.239	0.000
Intercept	6.414***	0.062	103.056	0.000

Note: *** indicates significance at the 1 percent level.

[2] The F statistic or Φ statistic will lead to a rejection of cointegration if only one coefficient, ρ_i, is negative when the null hypothesis $\rho_1 = \rho_2 = 0$ is tested. In this paper, the two coefficients are negative. Therefore, the test should be suitable.

In Table 5, a 1 percent increase in real tourism receipts leads to 0.23 percent increase in real GDP. In the sense of causality, the estimate of Eq. (4) using the MTAR model is reported in Table 6.

Table 6
Estimate of the long-run and short-run causality, 1995Q1-2014Q4.

Dependent variable: Δgdp			
Variable	Coefficient	t-statistic	p-value
$M_t e_{t-1}$	-0.126	-0.431	0.670
$(1-M_t)e_{t-1}$	-0.375	-0.842	0.362
Δgdp_{t-1}	-0.448	-1.463	0.155
Δgdp_{t-2}	-0.244	-0.842	0.407
Δgdp_{t-3}	-0.033	0.117	0.907
Δtr_{t-1}	0.006	0.103	0.918
Δtr_{t-2}	-0.060	-0.998	0.327
Δtr_{t-3}	-0.127**	-2.448	0.021

Note: ** denotes significance at the 5 percent level.

The results in Table 6 show that the coefficients of the threshold error correction terms for both higher and lower regimes are insignificant. Therefore, there is no long-run causality running from tourism receipts to real GDP. The joint Wald F test also indicates no long-run causality (F=0.485 with p=value = 0.621). In addition, the joint Wald F test for short-run causality gives the F-statistic = 2.253 with p-value = 0.110, and thus the test also rejects the existence of the short-run causality.

The main finding in this paper supports the validity of the tourism-led growth hypothesis under the framework of nonlinear cointegration tests, which is contrary to the finding by Oh (2005) for South Korea. However, the finding is line with other studies, such as those of Blaguer and Cantavellar-Jorda (2002) for Spain, Nikolaos (2004) for Greece, Carrera et al. (2008) for Mexico, Ertugrul and Mangir (2015) for Turkey, and Brida et al. (2016) for Brazil. In the case of Brazil, cointegration with asymmetric adjustment is found under the analysis of the MTAR model.

In a cross-country analysis, Adamou and Clerides (2008) find that specialization in the tourism sector can stimulate economic growth with diminishing returns. In other words, the contribution of tourism will become minimal after a certain level of specialization is reached. However, the level of specialization for Thailand might not be mature enough. Therefore, the contribution of tourism to economic growth will continue in the future. Based upon the results from this paper, tourism development seems to be necessary.

4. Concluding Remarks

The validity of the tourism-led growth hypothesis has been quite widely explored by many researchers using conventional or linear cointegration techniques. However, the long-run relationship between real GDP and tourism receipts that cannot be detected by any linear cointegration test might indicate the possibility of a nonlinear relationship between the two variables. In this paper, threshold cointegration tests become relevant in that the tests allow for nonlinearity in the underlying data generating process of variables. Recent quarterly data are available from the first quarter of 2005 to the fourth quarter of 2014. The data are applied to both linear and nonlinear cointegration tests. One of the important finding in this paper is the presence of a nonlinear long-run relationship between real GDP and tourism receipts for Thailand. Even though the adjustment toward long-run equilibrium is not asymmetric, but the adjustment is nonlinear. Furthermore, there is no causality running from tourism receipts to economic growth in both the long run and the short run. Based upon the results from this study, sustainable development of tourism seems to be necessary since it can be one of the main factors enhancing real GDP and thus

economic growth of the country. However, environmental preserving is also important when tourism development and specialization are promoted.

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