



REVISITING THE TOURISM-LED GROWTH HYPOTHESIS IN A DUAL MODEL USING MWALD GRANGER CAUSALITY ANALYSIS



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ABSTRACT

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This study reinvestigates the tourism-led growth hypothesis in Taiwan by applying the Johansen co-integration and Modified Wald (MWALD) causality tests to long-term data from 1958 to 2017. We employ both bivariate (international tourist arrivals and real GDP) and trivariate (international tourist arrivals, international tourist expenditures, and real GDP) models. We find that there is a long-run relationship between the three variables, and that there is a unidirectional Granger causality running from economic growth to international tourist arrivals in both bivariate and trivariate models, supporting the tourism-led growth hypothesis. In addition, the existence of bidirectional Granger causality between the real GDP and international tourist expenditures suggests that policymakers should relax regulations to increase tourism flows to promote economic growth.

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1. INTRODUCTION

Over the past decades, tourism has become one of the rapidly growing sectors of the world economy, and the contribution of tourism expansion to economic growth has drawn significant attention from a policy perspective. Taiwan has been ranked among the top four export-oriented economies in the Asian region (Jin and Shih, 1995) and had maintained its status of being among the top two until the year of 2000. In 2002, the Taiwanese government recognized the importance of the tourism sector in the economy, and came to believe that tourism expansion may gradually lead to potential high economic growth. Thus, the Taiwanese government considered it worthwhile to introduce some useful policies to stimulate tourism activities. For example, the Taiwanese government attempted to bring about a significant change in tourism policy by relaxing tourist regulations since Taiwan's separation from Mainland China in 1949. Thereafter, the Congress introduced the Doubling Tourist Arrivals Plan (DTAP) to release a series of national development plans entitled "Challenge 2008," which was designed to promote the tourism industry. According to the Annual Statistics of Tourism 2012, Taiwan's international tourist arrivals accounted for 5.3 percent of the Taiwan's GDP in 2004, which increased to 7.8 percent in 2009. Despite major global events such as the terrorist attacks that took place in the US on September 11, 2001 and the global financial crisis in 2008 and 2009, which led to a temporary global economic recession in the following two years, tourism expansion in Taiwan has been stable. This may unveil the tourism industry's crucial contribution to Taiwan's economic growth. In addition, according to the latest United Nations World Tourism Organization (UNWTO)

report, international tourist arrivals have consistently grown by 4% and have remarkably grown by 7% since 2017. Furthermore, international tourist expenditure has been increasing steadily since 2010. This increasing tendency is expected to continue in 2018 at a rate of approximately 5% to 6%.

It is commonly believed that tourism expansion has a long-run positive effect on economic growth, and that it promotes economic growth in several ways. First, tourism development is necessary for the accumulation of foreign exchange earnings for developing countries, which in turn can be used to finance the imported capital goods utilized in the production process (Tomohara, 2016). Second, tourism activities can benefit other sectors of the economy such as construction, transportation, and hospitality, as well as cities of environmental improvement. Third, a successful tourism industry has the ability to create market demand and job opportunities, which in turn leads to higher household income and tax revenue for the government through augmented multiplier effects (Tang *et al.*, 2015; Liu *et al.*, 2017). Finally, the tourism industry can be considered as an imperative factor in the transmission of knowledge economy through human capital development. In other words, higher economic growth can be achieved not only by improving the factors of labor and capital but also by escalating tourism expansion. Therefore, the mutual relationship between tourism expansion and economic growth must be considered by policymakers (Balaguer and Cantavella-Jorda, 2002; Matarrita-Cascante, 2010) and the tourism-led growth hypothesis is worthy of analysis.

A growing number of studies in the tourism literature have discussed the relationship between tourism expansion and economic growth, using the causality test developed by Granger (1969). The existing literature on this topic has put forward four hypotheses. The first hypothesis is the so-called “tourism-led economic growth” hypothesis that assumes tourism boosts economic growth, which results from the economic benefits of tourism. This hypothesis interprets that a unidirectional causality runs from tourism expansion to economic growth, which has been supported by; Balaguer and Cantavella-Jorda (2002); Lanza *et al.* (2003); Carrera *et al.* (2008); Ghartey (2013) and Tang and Tan (2015); Mishra and Rout (2016) and Ohlan (2017). The second hypothesis is the “economic-driven tourism growth” hypothesis (Narayan, 2004; Oh, 2005; Payne and Mervar, 2010) which asserts that economic growth may contribute to tourism expansion, and that a unidirectional causality runs from economic growth to tourism expansion. The third hypothesis is the so-called “reciprocal or feedback” hypothesis (Durbarray, 2004; Kim *et al.*, 2006; Lee and Chang, 2008; Corrie, 2013; Shahzad *et al.*, 2017) which postulates a bidirectional causality between economic growth and tourism expansion. This hypothesis observes a reciprocal relationship between economic growth and tourism expansion. Specifically, increasing the economic growth of a country fosters the development of tourism-related sectors in the domestic country as potential resources, which is available for any kind of tourism infrastructure, and any proliferation of tourism activities may lead to international exchange income accumulation, which feeds back to economic performance. The fourth hypothesis is the “no-causality” hypothesis, which demonstrates a neutral relationship between economic growth and tourism expansion. This hypothesis has been supported by Eugenio-Martin and Morales (2004); Chen and Chiou-Wei (2009); Katircioglu (2009) and Brida *et al.* (2010) for different countries.

The main purpose of this study is to reexamine the tourism-led growth hypothesis by incorporating the factor of international tourist expenditures into the MWALD causality test (Toda and Yamamoto, 1995) to enhance the integrity of empirical results. So far, most of the existing literatures usually consider the case of multiple countries to take advantage of numerous data, in order to facilitate comparison of the causality analysis; however, their empirical results are undetermined owing to missing data for some countries or inappropriate model selection. In this study, in an attempt to improve the empirical credibility of our findings, we construct two models (bivariate and trivariate models) to compare the long-run and causality relationships between variables. We also use sufficient and continuous year data for a single country, and consider both the international tourists arrivals and expenditures simultaneously to analyze the tourism-economic growth nexus.

The remainder of this study is organized as follows. Section 2 discusses the data and introduces the econometric methods, including the Johansen co-integration test and MWALD causality tests. Section 3 reports the empirical results. Finally, Section 4 concludes the study and discusses policy implications.

2. METHODOLOGY AND DATA

2.1. Model Classification

To compare the difference between the tourism-led growth and the existence of co-integration, we employ the bivariate and trivariate models, which are denoted as Eq. (1) and Eq. (2), respectively.

$$\ln Y_t = \alpha_{11} + \alpha_{12} \ln TA_t + \varepsilon_{1t} \quad (1)$$

$$\ln Y_t = \alpha_{21} + \alpha_{22} \ln TA_t + \alpha_{23} \ln TE_t + \varepsilon_{2t} \quad (2)$$

where Y_t denotes the real GDP, which can represent economic growth, TA_t represents the international tourist arrivals, TE_t denotes the international tourist expenditures in the domestic country, and ε_t is the usual error term.

All the three variables are measured in US million dollars and taken as logarithms before conducting the empirical analysis. We used long-term time series data ranging from 1958 to 2017. The data sources are the World Bank 2017, the Directorate General of Budget, Accounting and Statistics, Executive Yuan, Taiwan, and the tourism statistics database of the Taiwan Tourism Bureau.

2.2. Unit Root Test - Augmented Dickey Fuller (ADF)

To avoid the spurious problem of regressions, we use the Augmented Dickey–Fuller (ADF) test to examine the stationarity among the selected variables (Granger and Newbold, 1974). The ADF test detects the explanatory variables' serial correlation of their lagged values from the following regression:

$$\Delta x_t = \delta_0 + \delta_1 t + \delta_2 x_{t-1} + \sum_{i=1}^n \Delta x_{t-i} + \mu_t \quad (3)$$

where Δx_t denotes the lag terms of the first difference operator, δ_0 is a constant, δ_1 is the coefficient on a time trend, t denotes the lag terms of the autoregressive process, and μ_t represents the usual error term of autocorrelation. The unit root test is evidenced under the null hypothesis $\delta_2 = 0$ against the alternative hypothesis of $\delta_2 < 0$, and the Akaike information criterion (AIC) rule helps to determine the optimal lag orders of regression in Eq.(3).

2.3. Johansen's Co-Integration Test

Johansen and Juselius (1990) show that a long-run co-integrating relationship may exist among variables once the stationarity is confirmed in data sets. In this study, we apply the Johansen multivariate co-integration test to examine the existence of a long-run relationship among Y_t , TA_t , and TE_t . The reason for applying the Johansen co-integration test is that when the integration orders of variables are all in consistency, the Johansen co-

integration test can be performed accurately, even though the error term is non-normal distribution or the lag terms in the vector error-correction model (VECM) are mislaid (Gonzalo, 1994; Clarke and Mirza, 2006).

To investigate the long-run co-integration relationship, we employ the VECM model along with Eq. (3) as follows:

$$\Delta V_t = \alpha U_t + \tau V_{t-1} + \sum_{i=1}^{n-1} \gamma_i \Delta V_{t-i} + \varepsilon_t \quad (4)$$

where V_t stands for the endogenous variables (Y_t , TA_t , and TE_t), τ is the matrix of parameters of the co-integrating vector that contains the long-run information of V_t regarding the co-integrating rank r . Therefore, if all the endogenous variables in V_t are integrated of order one (i.e., $I(1)$), the number of co-integrating rank (r) can be obtained by using the likelihood ratio (τ_{trace}) and likelihood maximum (τ_{max}) test to select the applicable rank of criterion in Eq. (5) and Eq. (6), respectively:

$$\tau_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\tau}_i), \text{ hypothesis } H_0: k \leq r ; H_1: k > r \quad (5)$$

$$\tau_{max}(r, r+1) = -T \ln(1 - \hat{\tau}_{r+1}), \text{ hypothesis } H_0: k = r ; H_1: k = r + 1 \quad (6)$$

where $\hat{\tau}$ is the estimated eigenvalue and T represents the numbers of observations. In Eq.(5) and Eq.(6), τ_{trace} and τ_{max} in the null hypothesis (H_0) of co-integrating vectors r are tested against their alternative hypothesis (H_1) if they are at least larger than the critical values k (Johansen, 1991;1994).

2.4. Modified Wald (MWALD) Causality Test

While the Johansen multivariate co-integration approach uncovers the long-run co-integration information, it does not reveal the causal relationships. In this study, we construct an augmented Vector Autoregression (VAR) model along with the MWALD causality test developed by Toda and Yamamoto (1995) in order to explore the tourism-led growth hypothesis. The reasons for using the MWALD causality test are that it is simple to use and the pre-testing for the co-integration properties is not required as long as the estimation of the augmented VAR assures the asymptotic distribution of the Wald test. Therefore, the MWALD causality test is adaptive regardless of whether the arbitrary integrated orders of variables, non-co-integrated or co-integrated (Zapata and Rambaldi, 1997). To implement the MWALD causality test, we incorporate the augmented VAR models into the bivariate model of Eq. (7) and trivariate model of Eq. (8) as follows:

$$\begin{aligned} \begin{bmatrix} \ln Y_t \\ \ln TA_t \end{bmatrix} &= [A_{20}] + [A_{21}] \begin{bmatrix} \ln Y_{t-1} \\ \ln TA_{t-1} \end{bmatrix} + [A_{22}] \begin{bmatrix} \ln Y_{t-2} \\ \ln TA_{t-2} \end{bmatrix} + \dots [A_{2h}] \begin{bmatrix} \ln Y_{t-h} \\ \ln TA_{t-h} \end{bmatrix} \\ &+ [A_{2p}] \begin{bmatrix} \ln Y_{t-p} \\ \ln TA_{t-p} \end{bmatrix} + [\varepsilon_{2t}] \end{aligned} \quad (7)$$

$$\begin{bmatrix} \ln Y_t \\ \ln TA_t \\ \ln TE_t \end{bmatrix} = [A_{30}] + [A_{31}] \begin{bmatrix} \ln Y_{t-1} \\ \ln TA_{t-1} \\ \ln TE_{t-1} \end{bmatrix} + [A_{32}] \begin{bmatrix} \ln Y_{t-2} \\ \ln TA_{t-2} \\ \ln TE_{t-2} \end{bmatrix} + \dots + [A_{3h}] \begin{bmatrix} \ln Y_{t-h} \\ \ln TA_{t-h} \\ \ln TE_{t-h} \end{bmatrix} \\ + [A_{3k}] \begin{bmatrix} \ln Y_{t-k} \\ \ln TA_{t-k} \\ \ln TE_{t-k} \end{bmatrix} + [\varepsilon_{3t}] \quad (8)$$

where $\ln Y_t$ is the natural log of real GDP as a proxy for economic growth, $\ln TA_t$ is the natural log of international tourist arrivals, and $\ln TE_t$ is the natural log of international tourist expenditures in the domestic country. We use the Akaike Information Criterion (AIC) rule to determine the optimal lag number of k by $k = h + d_{max}$, and determine the maximum order of integration (d_{max}) to be unity because it demonstrates much better accuracy than other orders of d_{max} (Dolado and Lütkepohl, 1996).

3. EMPIRICAL RESULTS

3.1. Results of Unit Root Test

Examining the stationarity and the degree of integration of variables is the first step in our empirical analysis. Table 1 indicates that the ADF values for $\ln TA_t$, $\ln TE_t$, and $\ln Y_t$ are -1.23, -0.88, and -0.96 at the 10% significance level, implying that the null hypothesis of unit root is not rejected of the level term. Meanwhile, when taking the first difference for these variables, the values of $\ln TA_t$, $\ln TE_t$, and $\ln Y_t$ are -6.72, -4.33, and -3.91, respectively. Thus, the null hypothesis of unit root is rejected at the 10% significance level, which suggests that all the three variables are in their stationarity when taking the first difference. In other words, these variables are integrated of order one, $I(1)$, which are consistent with the findings of Nelson and Plosser (1982). Therefore, the confirmation of stationarity helps us continue the Johansen co-integration test to examine if there exists a long-run relationship among variables.

Table-1. ADF unit root test results

Variables	Level term	First difference
$\ln TA_t$	-1.23(7)	-6.72(8)***
$\ln TE_t$	-0.88(6)	-4.33(7)***
$\ln Y_t$	-0.96(7)	-3.91(2)**

Note: Numbers in parentheses refer to the selected lag orders determined by the AIC rule. ** and *** represents the null is rejected under the 5% and 1% level, respectively.

3.2. Results of Johansen Co-Integration Test

As indicated in Table 2, the value of the likelihood ratio test (τ_{traces}) statistic in the bivariate model is 36.12, which shows that the null hypothesis of no co-integration ($r = 0$) can be rejected at the 1% significance level, and the null hypothesis of co-integration of at most one ($r \leq 1$) cannot be rejected at the 1% significance level with the value of 10.10. Regarding the likelihood maximum test (τ_{max}), the null hypothesis of no co-integration ($r = 0$) can be rejected at the 5% significance level, but the null hypothesis of co-integration of at most one

($r = 1$) cannot be rejected. Apparently, the results of the likelihood ratio and likelihood maximum tests are both consistent. This implies that in the bivariate model, there exists one co-integration relationship and the integrated variables may have a comovement in the long run.

In the case of the trivariate model, we obtain similar results; the null hypothesis of no co-integration ($r = 0$) can be rejected at the 1% significance level with the value of 45.61 and 28.08 in the likelihood ratio test and likelihood maximum test, respectively. Thus, these co-integration results prove that since the variables are all co-integrated, there must exist a long-run relationship among TA_t , TE_t , and Y_t in both the bivariate and trivariate models, and the Granger causality can be conducted as well.

Table-2. Johansen co-integration test results

Model	Likelihood maximum test - $LR(\tau_{max})$			Likelihood ratio test - $LR(\tau_{trace})$		
	$H_0:r = 0$	$H_0:r = 1$	$H_0:r = 2$	$H_0:r = 0$	$H_0:r \leq 1$	$H_0:r \leq 2$
Bivariate model(8)	18.38**	7.66	2.08	36.12***	10.10	2.08
Trivariate model(9)	28.08***	6.93	2.54	45.61***	9.36	2.54

Note: Numbers in parentheses of models refer to the optimal lag orders determined by the AIC rule. r is the co-integration rank. ** and *** represents the null is rejected under the 5% and 1% significant level, respectively, and the critical values are obtained from the asymptotic critical values (Osterwald-Lenum, 1992).

3.3. Results of MWALD Causality Test

According to the Granger causality theory (Granger, 1969) if the variables are in their stationarity and co-integrated, there should be at least one unidirectional causality relationship among them. Thus, we construct the augmented Vector Auto-Regression (VAR) model to prove the MWALD causality relationship, by applying the Toda and Yamamoto (1995) procedure among TA_t , TE_t , and Y_t in both the bivariate and trivariate models.

Table 3 shows the MWALD causality test results for the bivariate model and indicates that at the 5% significance level, the null hypothesis that the real GDP does not Granger-cause international tourist arrivals is rejected. This suggests that the tourism-led growth hypothesis is invalid and there is only a unidirectional Granger causality running from real GDP to international tourist arrivals in the bivariate model.

Table-3. MWALD causality test for the bivariate model

Causality direction	Lag order	MWALD	P-Value
$\ln TA$ does not cause $\ln Y$	9	7.18	0.24
$\ln Y$ does not cause $\ln TA$	8	18.31**	0.05

Note: ** and *** indicate significance at the 5% and 1% level, respectively, and the optimal lag order is determined by the AIC rule.

In Table 4, the trivariate model presents two different results. First, the null hypothesis that the real GDP does not Granger-cause international tourist arrivals is rejected at the 1% significance level. This implies that there is a unidirectional Granger causality running from real GDP to international tourist arrivals. Second, the null hypothesis that the international tourist expenditures (GDP) does not Granger-cause real GDP (international tourist expenditures) is rejected at the 5% (1%) significance level. This result shows that there is a bidirectional Granger causality between real GDP and international tourist expenditures. Compared to the bivariate model, the tourism-led growth hypothesis is strictly approved in the trivariate model based on the above causal results analysis.

Table-4. MWALD causality test for the trivariate model

Causality direction	Lag order	MWALD statistics	P-Value
$\ln TA$ does not cause $\ln Y$	7	9.03	0.25
$\ln Y$ does not cause $\ln TA$	9	28.64***	0.01
$\ln TE$ does not cause $\ln Y$	6	17.01**	0.05
$\ln Y$ does not cause $\ln TE$	8	46.02***	0.00

Note: ** and *** indicate significance at the 5% and 1% level, respectively, and the optimal lag order is determined by the AIC rule.

4. CONCLUSION AND POLICY IMPLICATIONS

This study employed the Johansen co-integration and MWALD causality tests to examine the relationships among the real GDP, international tourist arrivals, and international tourist expenditures in Taiwan. Additionally, we re-investigated the tourism-led growth hypothesis by analyzing both the bivariate and trivariate models, using empirical techniques. First, we applied the ADF test to ensure the stationarity and integration orders of all variables. Thereafter, we employed the Johansen co-integration approach to discover the long-run relationship between the international tourist arrivals (international tourist expenditures) and the real GDP. Second, we constructed an augmented VAR model in both the bivariate and trivariate models to examine the MWALD causal relationship among these variables.

The main findings of the empirical analysis were as follows: (1) The unit root test results verified the stationarity of all variables; (2) The Johansen co-integration test results provided evidence that all variables are co-integrated and there is a long-run relationship among variables in both bivariate and trivariate models; (3) The MWALD causality test results show that there is a unidirectional Granger causality running from real GDP to international tourist arrivals in both bivariate and trivariate models, supporting the tourism-led growth hypothesis. In addition, there is bidirectional Granger causality between real GDP and international tourist expenditures only in the trivariate model.

On the basis of the empirical results, we can put forth two perspectives that may offer policymakers a better understanding of tourism- growth nexus to formulate tourism enticements in Taiwan. First, from the perspective of the tourism expansion policy, the bidirectional Granger causality has already provided evidence that sufficient international tourist expenditures may lead to accumulation of international reserves through exchange rate and further enhance economic growth. On the contrary, higher economic growth implies that more resources can be allocated to tourism through government spending. Therefore, policymakers could consider how to uncover the causal relationship between tourism and economic growth by formulating appropriate tourism policies. For example, by helping the tourism industry expand tremendously, and meanwhile, strengthening the country's economic vitality such as public infrastructure, financial aid of loanable funds, and services training to attract international tourists' travelling and incentives. Second, from the perspective of economic growth, by scrutinizing the tourism expansion policy, the feasible way to develop tourism is to pay more attention to attracting international tourists. For example, negotiate issues for abolishing the traveling visa limitation; shorten visa application procedure, increase the variety of free-tax commodity, or specify traveling expenditure discount for international tourists. In addition, the Granger causality evidence in both bivariate and trivariate models suggests that promoting economic growth as its top priority is a useful policy and this also indirectly supports the tourism-led growth hypothesis.

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