

# Structural breaks, tourism development and economic growth: Evidence from Taiwan

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## Abstract

Our paper differs from previous studies by examining the issue of whether regime changes have broken down the stability of the long-run relationships between tourism development and real GDP in Taiwan for the 1959-2003 period. We empirically investigate the co-movements and the causal relationships among real GDP, tourism development and the real exchange rate in a multivariate model. We use two different tourism variables - international tourism receipts and number of international tourist arrivals. To employ the unit root tests and the cointegration tests allowing for a structural break, the empirical evidence clearly shows that the causality between tourism and economic growth is bi-directional. Lastly, the international and cross-strait political change, economic shocks, and the relaxing of some tourism control and policies would break down the stability of the relationships between tourism development and economic growth. Overall, we do find the structural breakpoints, and they look to match clearly with the corresponding critical economic, political or tourist incidents.

**Keywords:** Tourism development; Economic growth; Structural break; Taiwan

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## 1. Introduction

The Asia Pacific region has become a hastily growing tourism destination and has even exceeded the Americas to become the world's second largest tourist-receiving region since 2001. As part of the emerging market in tourism, Taiwan has an abundance and diversity of natural and cultural resources, offering great potential for the

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development of tourism. The main purpose of this paper is to investigate whether regime changes have broken down the stability of the long-run relationship between tourism development and real GDP in Taiwan. We empirically examine the co-movements and the causal relationships among real GDP, tourism development and the real exchange rate in a multivariate model. To employ the unit root tests and the cointegration tests allowing for a structural break, the empirical evidence clearly shows that the causality between tourism and economic growth is bi-directional. Moreover, international and cross-strait political changes, economic shocks, and relaxing of some tourism control and policies would break down the stability of the relationship between tourism development and real GDP.

Taiwan has always been a great travel destination for business travelers and tourists from neighboring countries. Over the period 1960-2000, total tourist arrivals to Taiwan increased from 23,636 to 2,624,037. International tourism revenue of Taiwan increased from US\$1.477 million in 1960 to US\$3.738 billion in 2000 (see Table 1). Further analysis of overseas visitors by country shows that came from countries within the neighboring Asian region, which provided nearly 77% of all visitors in 2004. The top five of Taiwan's tourist-source residences in 2004 were Japan, Hong Kong and Macau region, United States, South Korea, and Singapore.

To date there are very few empirical studies that have investigated inbound tourism development in Taiwan. For instance, Huang and Min [23] established a model for Taiwan's inbound demand to predict the volume of visitor arrivals after the 921 earthquake in 1999. Wang [64] provides empirical evidence using the grey theory and fuzzy time series to predict tourism demand. Furthermore, Min [42] employs a seasonal autoregressive integrated moving average (SARIMA) model for measuring the impact of the Severe Acute Respiratory Syndrome (SARS) on Taiwan's inbound demand over the period from March 2003 to July 2003. Kim et al. [28] examine the causal relationships between tourism development and economic growth in Taiwan. Thus far, these empirical studies for Taiwan have not undertaken structural breaks in the relationships between tourism development and economic growth.

Over the past several decades, the island's economic and tourist developments have covered a somewhat volatile time of economic incidents, international political shocks, and the adjustment of tourism regimes in Taiwan. Will these changes cause structural

breaks in the relationship between tourism development and economic growth in Taiwan?

In the 1960s and 1970s, tourism in Taiwan grew very fast. Over the late 1970s to the early 1990s, Taiwan faced a turbulent international political relationship and world economic crises, which eroded the growth of Taiwan's tourism development. After the United States Government changed its diplomatic recognition from Taipei to Beijing on January 1, 1979, this policy prompted Taiwan to face a difficult relationship with mainland China and the international community. Only around 30 countries maintain formal diplomatic relations with Taiwan at the moment. Substantial relations between Taiwan and those countries without diplomatic relations were confronted with many challenges, including foreigners applying for visas and the rights of international airlines. This severe international political situation resulted in a prolonged slowdown of Taiwan's tourism growth. The grim situation has also been aggravated by two oil price shocks, occurred respectively in 1973 and in 1979, and the change of Taiwan's exchange rate regime in 1987. Being in the presence of the circumstances, Taiwan's government relaxed some tourism controls and policies to reinvigorate the tourism industry in the stage. First, in the 1980s the government established six national parks and 12 national scenic areas. Furthermore, there was the lifting of travel restrictions - for example, the government's institution of a five-day visa-free entry program for 15 countries in 1994.

Over the last decade the growth rate of tourist arrivals to Taiwan has risen again, which is attributed to many factors. As well as the above tourism policies, the rapid economic growth of the neighboring Asian countries has also fueled overseas arrivals to Taiwan.<sup>1</sup> The fast economic growth rate of Taiwan has also brought more business visitors, which exceeded tourist visitors to become the first group from 1998 to 2000. Another important reason is that the policy for mainlanders visiting Taiwan experienced a gradual door opening from 1988 as there was an initial reconciliation between Taiwan and mainland China.

In recent years, Taiwan's tourism development is still facing many uncertainties and

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<sup>1</sup> Over the period of 1960 to 1985, four Asian countries, including Singapore, Hong Kong, Taiwan, and South Korea, had average annual growth rates of per capita GDP all over 6%, which was faster than most global countries. From 1993 to 1996 other Asian countries, such as Malaysia, Thailand, and Indonesia, also had fast annual growth rates of per capita GDP.

challenges, including economic disturbances of the Asian financial crisis in 1997, and natural damages of Taiwan's 921 earthquake in 1999, and human diseases of the SARS epidemic in 2003. Some advantages may vitalize Taiwan's tourism industry in the future. First, the opening up of Taiwan tourism to mainlanders was permitted starting from 2002, which will effectively boost tourism development. After many traditional industries moved into mainland China, tourism development has recently become a major policy in Taiwan for increasing employment and economic growth. For example, the Doubling Tourism Arrivals Policy is proposed by the government of Taiwan. This plan sets to double the number of tourists visiting Taiwan in 2008.

The purpose and contribution of this paper are as follows. In the beginning, we tested Taiwanese data for the last 50 years, which may be effected greatly by economic shocks, political incidents, or tourism policy alterations. This may yield structural changes from the data of GDP or tourism development variables, which therefore influence the result of the stationary test. Secondly, we use Johansen's [25] multivariate cointegrated method to test the cointegration relation between GDP and tourism development. Based on the multivariate cointegration model, we probe into the causality between GDP and tourism development with the weak exogeneity test. Finally, it is possible that structural breaks have occurred which might affect the result of the cointegration test. Using two kinds of Hansen [20] and Gregory and Hansen [18] structural change tests, which to our knowledge has not been previously applied in this area, we examine the cointegration relationship altogether and commented whether there is instability or not between GDP and tourism development.

The paper is organized as follows. Section 2 reviews recent literature in the area of economic effects of tourism development and describes the general framework. The empirical results are presented in Section 3. Concluding remarks close the article in Section 4.

## **2. Literature review and general frameworks**

### ***2.1 Literature review***

In the analysis of tourism, economists emphasize the economic effects of tourism on the economy. The speedy growth of tourism causes an increase of household incomes and government revenues through multiplier effects, improvements in the balance of

payments, and growth in the number of tourism-promoted government policies. As such, the development of tourism has usually been considered a positive contribution to economic growth (e.g. [27,34,35,51]). Given the aforementioned reasons, a steady stream of empirical tourism economics literature has been done in recent years, especially focusing on the issue of tourism demand.

Tourism demand has been extensively analyzed in empirical literature.<sup>2</sup> Lim [35] reviews a large number of empirical studies on modeling international tourism demand and integrates those results according to the important explanatory variables used (income, transportation costs, and tourism prices), the proportion of significant findings, and the effect sizes of these major explanatory variables. Some studies demonstrate significant results in a direction opposite to the overall conclusion. In a review of 70 articles applying meta-analysis, such outcomes occur in 2.8%, 6.2%, and 8.3% of all cases for the models used for the income, transportation cost, and tourism price variables, respectively.

Applying time series analysis is the most frequent econometric approach in the tourism demand literature. According to the review of Narayan [45], it is essentially divided into two categories. One is for pre-1995 and the other is post-1995. It was found that pre-1995 and some post-1995 research studies may have the so-called “spurious regression” problem for ignoring the unit root test and cointegration. Most post-1995 literature has applied modern econometric techniques including the unit root test, cointegration, or the error correction model.<sup>3</sup>

Lim and McAleer [38] predict tourism demand by past behavior of tourist variables, which is a simple and straightforward method, rather than relating them to other variables in a model.<sup>4</sup> However, this univariate time series forecasts cannot detect the hypothesis of tourism-led economic growth. Only a few empirical researchers have investigated tourism-led economic growth. Tourism-led growth occurs when tourism manifests a motivating influence across the entire economy in the form of spillovers and other externalities [41,51]. Balaguer and Cantavella-Jorda [6] examine the role of

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<sup>2</sup> Most of these research studies have considered tourism prices, income of origin country, transportation costs, and exchange rates as the more relevant variables in tourism demand [10,11].

<sup>3</sup> For instance, this has been studied by the following: Lee et al. [32], Seddighi and Shearing [57], Kulendran and King [29], Akis [2], Icoz et al. [24], Song and Witt [58], Vanegas and Cores [61], Kulendran and Witt [30], Lim and McAleer [39], Narayan [44,46,47], Dritsakis [10], etc.

<sup>4</sup> Other studies include Choy [7], Turner et al. [60], Lim and McAleer [38], etc.

tourism's long-run economic development in Spain. The hypothesis of tourism-led economic growth was confirmed by applying cointegration and causality tests. Durbarry [12] also supports the hypothesis of tourism-led economic growth by using the cointegration and causality tests to study the case of Mauritius.

Some research studies did not arrive at the same conclusion. Table 2 presents previous empirical results between tourism and economic growth, but we still cannot see an explicit result. Nevertheless, different empirical evidence shows different policy implications, which can not only contribute to distinguishing the innate characters of the tourism industry, but can also be used as the basis for how a government can resolve the symbiosis policies of tourism businesses and economic development [62]. In many countries much hope for economic development is laid on tourism due to its capacity in generating employment. The development of tourism as such mostly requires investment, principally in hospitality, transportation, basic health, and recreation in order to motivate the accommodation and the stay of visitors. Finally, governments have to be active in laying out legislation and ordaining the development of tourism, so that the environment might be preserved and the future of tourism activities might be insured over time (WTTC [65]).

Eugenio-Martin et al. [16] investigate the relationship between tourism and economic growth for Latin American countries from 1985 through 1998, being based on a panel data approach and the Arellano-Bond [3] estimator for dynamic panels. The empirical results show that tourism development can contribute to the economic growth of medium or low-income countries, while such a role is unclear for developed countries. In South Korea, the tourism-led economic growth hypothesis did not hold according to the research of Oh [51], which studies the causal relations between tourism growth and economic expansion. This research obtains the one-way causal relationship of economic-driven tourism growth. Kim et al. [28] examines the causal relationship between tourism development and economic growth in Taiwan. Although Taiwan and South Korea have similar experiences of economic development, their empirical results are different from Oh's [51]. They find a reciprocal relationship between tourism development and economic growth in Taiwan.

The factor of owing to structural breaks is a common problem in macroeconomic series as they are usually affected by exogenous shocks or regime changes in economic

events. Therefore, this relationship is likely to be subject to variation as a result of changes in the structure of the economy like changes in tourism development policy or economic development regimes, reforms in tourism regulation, or institutional developments. Using different unit root tests, Narayan [48,49] investigates whether military coups in 1987 and 2000 have had a transitory or a permanent effect on tourist expenditures in Fiji. Narayan [48] uses the Vogelsang [63] test, but Narayan [49] uses two different unit root tests – the Zivot and Andrews [67] and the Lumsdaine and Papell [40] tests. However, these two studies yield the same conclusions, which coup of 1987 had only a transitory effect on tourist expenditures in Fiji.

Unfortunately, most of these above studies in the literature did not test structural breaks for exogenous shocks or regime change in critical tourism or economic events. If the estimation periods cover the somewhat volatile time of tourism development and economic innovation, then it is important to check the cointegration relationship for structural breaks. Narayan [48,49] has studied the structural break of tourist expenditure but has not examined the stability of the relationship between tourism development and economic growth.

The instability of the economic system may in fact be reflected to the parameters of the estimated models that, when used for inference or forecasting, can induce misleading results. For these reasons, this paper examines the stability of the relationship between tourism development and GDP.

## **2.2. Model Specification**

According to the total of 70 studies under review by Lim [36], 65 studies and 48 studies include the income and tourism price variables, respectively. Following Balaguer and Cantavella-Jorda [6] and Lee and Chang [33], the model includes real GDP, a tourism development variable, and real exchange rate, which can be written as:

$$LY_t = \beta_0 + \beta_1 LTOUR_t + \beta_2 LRQ_t + u_t. \quad (1)$$

All the variables are expressed in natural logarithms so that elasticities can also be interpreted. Here,  $LY$  represents real GDP.  $LTOUR$  represents tourism development.  $LRQ$  is real exchange rate (a proxy variable of external competitiveness, Dritsakis [10]). Term  $u$  is the error term.

All the data used are annual observations of the variables, and the estimation period

is 1959-2003. Naturally, compared with monthly or quarterly data,<sup>5</sup> annual data can even react to seasonal adjustment phenomena. The nominal GDP series is transformed into real gross product in 2001 prices, using the consumer price index (CPI). The start of the sample period is 1959 which is determined by the availability of data for CPI. Terms LY and LRQ used in this study are taken from the AREMOS economic-statistic data banks, created jointly by the Ministry of Education in Taiwan. Furthermore, we use two different types of tourism development variables - LTOUR1 (Balaguer and Cantavella-Jorda [6]; Lee and Chang [33]) which is international tourism earnings in real terms and LTOUR2 (Eugenio-Martin et al. [16]; Lee and Chang [33]) which is the number of tourists. We collect all tourism variables from the Annual Report on Tourism by Taiwan.

### 3. Empirical investigation

#### 3.1. Unit-Root Tests

We apply the unit root tests of the augmented Dickey-Fuller (ADF, Dickey and Fuller, [9]), Phillips-Perron (PP; Phillips and Perron, [53]), DF-GLS (Elliot, et al., [13]), and  $MZ_{\alpha}^{GLS}$  (Ng and Perron, [50]). The lag order of models is selected based on the modified Akaike information criteria (MAIC). In order to take into account this possible shift in regime in the unit root test, Zivot and Andrews ([67]; hereafter ZA) and Perron [52] develop a new category of tests that allows an endogenous structural break. Two tests are allowed for a unit root against the alternative of a trend stationarity process with a structural break. We adopt the Akaike information criteria (AIC) to select the model and the lag lengths for the ZA and Perron tests.

Figure 1 plots the actual values of these series, indicating that the entire series exhibit trends. Consequently, all unit root test regressions are run with a constant and trend terms. We find the results of unit root tests without structural change which indicate that different tests may yield contradictory results.<sup>6</sup> Except for the PP test in LTOUR2, all other statistics are not able to significantly reject the null of the unit root. Furthermore, the DF-GLS and  $MZ_{\alpha}^{GLS}$  indicate that all difference variables do not

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<sup>5</sup> Hakkio and Rush [19] pointed out that when using monthly or quarterly data in an empirical analysis, increasing the number of observations does not add any robustness to the results.

<sup>6</sup> We do not report the details of all of the unit root tests we use here in order to conserve space, but all results are available upon request.



reject the null hypothesis of I(2), apart from LRQ that are integrated with order one. However, the two tests by the ZA and Perron approaches point out unanimously that all variables are I(1). Also noteworthy is that the ZA test results indicate that the breakpoint occurs in 1992 for real GDP, in 1965 and 1966 for tourism development variables, and in 1987 for the real exchange rate. We find critical economic and tourism incidents for Taiwan that can match with the structural breaks of these series.

First, what caused the breakpoint of real GDP in 1992? Due to the collapse of Taiwan's bubble economy in 1990, the asset markets went bust, the stock price index sank from around 12,000 to under 3,000 in half a year, and the real estate market became sluggish if not outright collapsed.

Second, why did tourism development variables have a structural break in 1965 and 1966? With the end of the U.S. aid program in Taiwan at 1965, the Military Assistance Advisory Group (MAAG), with members of about 10,000 who had stayed in Taiwan, was withdrawn and this event struck the tourism development of Taiwan. Fortunately, Japan relaxed its ban on overseas travel in 1964, and the movement of Japanese tourists to Taiwan picked up the pace. Japan has displaced the U.S. to become the dominant country generating travel to Taiwan from 1967 until the present.

There was a breakpoint of the real exchange rate in 1987, in which the government released foreign exchange controls and substituted the floating foreign exchange rate system for a managed foreign exchange rate system. Under this new system, the foreign exchange rate was determined by market forces (Yu [66]).

### ***3.2. Cointegration and Causality***

We follow an alternative route consisting of three steps: (i) test of a cointegration relationship using the full systems model; (ii) reduction of the model from the systems formulation to single equations using weak exogeneity tests to examine long-run causality; (iii) test for cointegration between the variables allowing for structural change or parameter instability (Pradhan and Subramanian [55]).

As a consequence of the presence of non-stationary series, eq. (1) is estimated using the Johansen [26] procedure for cointegration. Both  $\lambda$  max and Trace tests suggest the presence of one cointegrating vector for each type of tourism development variables, indicating the existence of a long-run relationship between tourism, real income, and the

real exchange rate in Taiwan.<sup>7</sup> The normalized cointegrating coefficients are shown as the following.

$$LY_t = 3.497 * LTOUR1_t + 0.805 * LRQ_t \quad (2)$$

$$LY_t = 4.669 * LTOUR2_t + 0.429 * LRQ_t . \quad (3)$$

The above indicates that tourism and the real exchange rate positively affects Taiwan's economic growth over time. The signs of the variables conform to the theory in the literature. This shows that tourism development contributes to economic growth, as in Durbarry [12]. At the same time, a rising real effective exchange rate can be harmful to tourism development (Coshall [8]). However, the long-run tourism-elasticities are estimated to be 3.50 to 4.67. The long-run real exchange rate-elasticities are estimated to be 0.43 to 0.81. According to these estimations, income has a positive relationship with tourism and a positive link with the exchange rate. Furthermore, the likelihood ratio test on the statistical significance of the parameters rejects the null hypothesis in all cases for the tourism variables, but does not reject the null hypothesis on the real exchange rate. In other words, comparing the effects on Taiwan's real GDP variables (LY) between the tourism variables (LTOUR1 and LTOUR2) and the real exchange rate (LRQ), the former is more significantly effective.

In order to examine the long-run causal relationship, we test for weak exogeneity among the cointegrating relationship (Johansen and Juselius [26]; Ericsson and Irons [15]). Hall and Milne [21] and Arestis et al. [4] interpret weak exogeneity in a cointegrated system as a notion of long-run causality. Weak exogeneity is rejected for LY, TOUR1, and TOUR2 at 5%, which indicates that bi-directional causal linkages between GDP and tourism development is identified.

These empirical findings have important implications for Taiwan. The bi-directional causality between tourism and GDP, which indicates the level of economic activity and tourism development, mutually influences each other in that a high level of economic growth leads to a high level of tourism development and vice versa. This suggests that tourism and GDP are endogenous and therefore any single equation forecast of one or the other could be misleading (Song and Witt [59]). This is different from the empirical results of previous related literature in studying the causal relationship between tourism and economic development, such as Balaguer and Cantavella-Jorda [6], Durbarry [12],

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<sup>7</sup> We do not report the details of all of the cointegration tests we use here in order to conserve space, but all results are available upon request.

Eugenio-Martin et al. [16], and Oh [51] - all of who obtain the one-way causal relationship of economic-driven tourism growth.<sup>8</sup>

It is now extensively accepted that the relationship between economic and financial time series are mainly non-linear.<sup>9</sup> Non-linear dependence may exist if tourism, real income, and the real exchange rate are generated by non-linear processes - this hypothesis is theoretically plausible and empirically substantiated. Several studies investigate the tests of non-linear causality relations, such as Baek and Brock [5] and Hiemstra and Jones [22]. Baek and Brock [5] show that the linear Granger causality tests have low power against the non-linear alternatives. However, any test based on the assumption of linearity fails to find any non-linear dependence. Savit [56] indicates that the difference between the linear and non-linear adjustments to any deviation from the equilibrium lies in whether or not the size of adjustment is proportional to the deviation. A proportional adjustment means a linear relationship, but this kind of adjustment cannot cause the randomness observed in financial and commodity markets.

### ***3.3. Parameter Stability and Structural Change***

The estimation periods for this study cover the somewhat volatile time of the tourism development and economic innovation in Taiwan. Consequently, it is important to check the cointegration relationship for structural breaks.<sup>10</sup> In this context, Hansen [20] proposes three tests ( $L_c$ ,  $MeanF$ , and  $SupF$ ) for parameter instability based on the full modified statistics. When the constant term is included in the specification, the data do not support the parameter stability. These tests show signs of instability.<sup>11</sup>

Furthermore, Gregory and Hansen ([26], henceforth GH) provide an alternative approach with tests that are based on the notion of regime change and are a generalization of the usual residual-based cointegration test. GH consider three alternative models - a level shift (model C), a level shift with trend (model C/T), and a

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<sup>8</sup> The differences in the results of this paper and those from previous studies might be attributable to the choice of the sample period and countries, the different combinations of the variables or the differences in the econometric methods.

<sup>9</sup> Recent works show the existence of a non-linear structure in the process generating returns of financial and commodity markets (Abhyankar [1]; Moosa and Silvapulle [43]).

<sup>10</sup> We do not report the details of all of the parameter stability and structural change tests we use here in order to conserve space, but all results are available upon request.

<sup>11</sup> The conclusion derived from the analysis of the figure of Hansen [20] confirms the test results: the stability of the relationship between tourism development and GDP deteriorated sizably in 1975 and from 1997 onward.

regime shift that allows the slope vector to shift as well (model C/S). GH have developed versions of the cointegration ADF tests of Engle and Granger [14], as well as the  $Z_t$  and  $Z_\alpha$  tests of Phillips-Quliaris [54], whereby all of them are modified according to the alternative considered. Taking into account that the date of the change is unknown, they compute the values of  $ADF^* = \inf_{\lambda \in J} ADF$ ,  $Z_t^* = \inf_{\lambda \in J} Z_t$ , and  $Z_\alpha^* = \inf_{\lambda \in J} Z_\alpha$ .

GH test provides clear evidence of not finding cointegration even when we allow for a structural break in the relationship between LY, LTOUR1, and LRQ. However, the relationship between LY, LTOUR2, and LRQ reveals a structural break in  $ADF^*$  and  $Z^*$  at the 10% level. According to the ADF statistic criterion, the structural break years estimated on the basis of the three models are mainly in 1980 and 1983. The structural break years of 1980 and 1983 were caused by the following: First, the oil price shock of 1979, which preceded economic recessions and decreased tourism activities. Second, another shock was the change in international political relationships. As with the descriptions of the last section, in 1979 the United States changed its diplomatic recognition from Taiwan, and this policy resulting in Taiwan facing difficult international and cross-strait political relationships. This severe international political situation prompted a prolonged slowdown in Taiwan's tourism growth. Finally, the adjustments of tourism policies also created some effects. In 1980, the Statute for the Development of Tourism was amended to encourage the construction of international tourist hotels. Moreover, the first management offices of the national scenic area administration were set up in 1982.

The structural break years are different between tests of Hansen [20] and GH [18]. The former is from 1975 to 1997, which were caused by many factors, including the changes of international and cross-strait political relationships, world economic crises, and relaxing tourism policies. The latter is 1980 and 1983 for the oil price shock of 1979 and the change of diplomatic recognition between Taiwan and the United States also in 1979. The structural break timing of the two tests is different, but both tests show the same phenomenon that international political change, economic shocks, and relaxing of some tourism controls and policies causing the structural breaks.

The GDP-tourism development specification, enveloping the changing economic

incidents, does raise some important questions on the long-run relationships between these series. These tests suggest that structural change in the cointegration vector is important and needs to be taken care of in the specification of GDP-tourism for Taiwan. This finding is reassuring since the endogenous estimation procedure produces structural breaks that correspond to recognizable tourism and economic events. It implies that, within the context of tourism development, households and the government may respond differently when the economy is in a different regime. Hence, the specification of GDP-tourism, enveloping the changing of tourism and economic events, does raise some important questions on the long-run relationships between GDP, tourism, and the real exchange rate.

Taiwan's 921 earthquake in 1999 and the SARS epidemic in 2003 did not bring about an unstable relationship between tourism development and GDP in the long run as either the results of the Hansen [20] test or the GH [18] test show. Reviewing the investigation of past empirical literature (Huang and Min [23]; Min [42]), the above disasters indeed struck Taiwan's international tourism industry in the short run, but in the long run these disasters did not generate structural breaks as our empirical results present. After the 921 earthquake in 1999, the Tourism Bureau of Taiwan implemented a series of measures to help the island's tourism industry recover. The Tourism Bureau assisted in reconstructing public facilities under relief loans for tourist industries. More international promotions were carried out to attract foreign tourists (Huang and Min [23]). After facing the detrimental effects of SARS, Taiwan's government launched a US\$75 million promotional campaign to recover from the devastating impact of SARS on the tourism industry (Min [42]). In the long run, the prompt and effective efforts of Taiwan's government have helped the tourism industry to recover and have concurrently improved Taiwan's awareness around the globe. These efforts avoided sapping Taiwan's tourist development in the long run.<sup>12</sup>

#### **4. Concluding remarks**

All studies in the previous literature have not examined parameter constancy across

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<sup>12</sup> After the 921 earthquake in 1999, the Tourism Bureau of Taiwan implemented a series of measures to help the island's tourism recover. The Tourism Bureau assisted in reconstructing public facilities under relief loans for tourist industries. More international promotions were carried out to attract foreign tourists. After facing the detrimental effects of SARS, Taiwan's government launched a US\$75 million promotional campaign to recover from the devastating impact of SARS on the tourism industry.

policy changes, even though the countries they investigated have been under substantial structural changes due to a number of altering tourism and economic policies. This paper has studied the issue of whether regime changes have broken down the stability of the relationship between tourism development and economic growth in Taiwan from 1959 to 2003. We empirically re-examine the long-run co-movement and causal relationship between real GDP and tourism development in a multivariate model.

By following the procedure of Pradhan and Subramanian [55], we apply a three-step testing procedure to inquire into the stability of the relationship between tourism development and economic growth in Taiwan. The empirical evidence was based on an elaborate methodology, by first identifying the full systems model. Then, it was reduced to the single equation framework. Finally, testing was done for the structural break with unknown timing.

This paper demonstrates the following empirical results. First, it indicates that all variables have the phenomena of a breakpoint. The breakpoint in 1992 was for real GDP, because of Taiwan's collapsing bubble economy in 1990. With the end of the U.S. aid program in Taiwan in 1965 plus Japan relaxing its ban on overseas travel in 1964, there was a breakpoint of tourism development variables in 1965 and 1966. The breakpoint of the exchange rate in 1987 was due to the government of Taiwan releasing foreign exchange controls and altering its foreign exchange rate system.

Next, tourism development looks to act as an engine of economic growth for Taiwan. Continuous economic growth will also generate a continuous rise on tourism development. However, the bi-directional causality between tourism and GDP, which indicates the level of economic activity and tourism development, mutually influences each other in that a high level of economic growth leads to a high level of tourism development and vice versa.

Third, the Hansen [20] test shows that the relationship between tourism development and GDP may indeed be unstable. At the same time, the GH [18] test does suggest that a structural change in the cointegration vector is important and needs to be taken care of in the specification of tourism development and GDP. We find that the breakpoints in various GDP-tourism match compatibly with critical economic, political or tourist incidents of Taiwan.

Finally, our empirical results also show that the development of Taiwan's tourist

industry has coped with the economic development and political relationship between Mainland China and Taiwan. Moreover, international and cross-strait political change, economic shocks, and relaxing of some tourism control and policies would break down the stability of the relationship between tourism development and economic growth.

And a final observation worth noting, past empirical literature have showed that natural and human disasters, like Taiwan's 921 Taiwan earthquake in 1999 and the SARS epidemic in 2003, indeed struck Taiwan's international tourism industry in the short run. Nevertheless, in the long run these disasters did not generate a structural break as our empirical results show. Furthermore, economic variables may exhibit non-linear dependencies, and in future research we suggest that researchers should consider the non-linear factor in the dynamic GDP-tourism relation.

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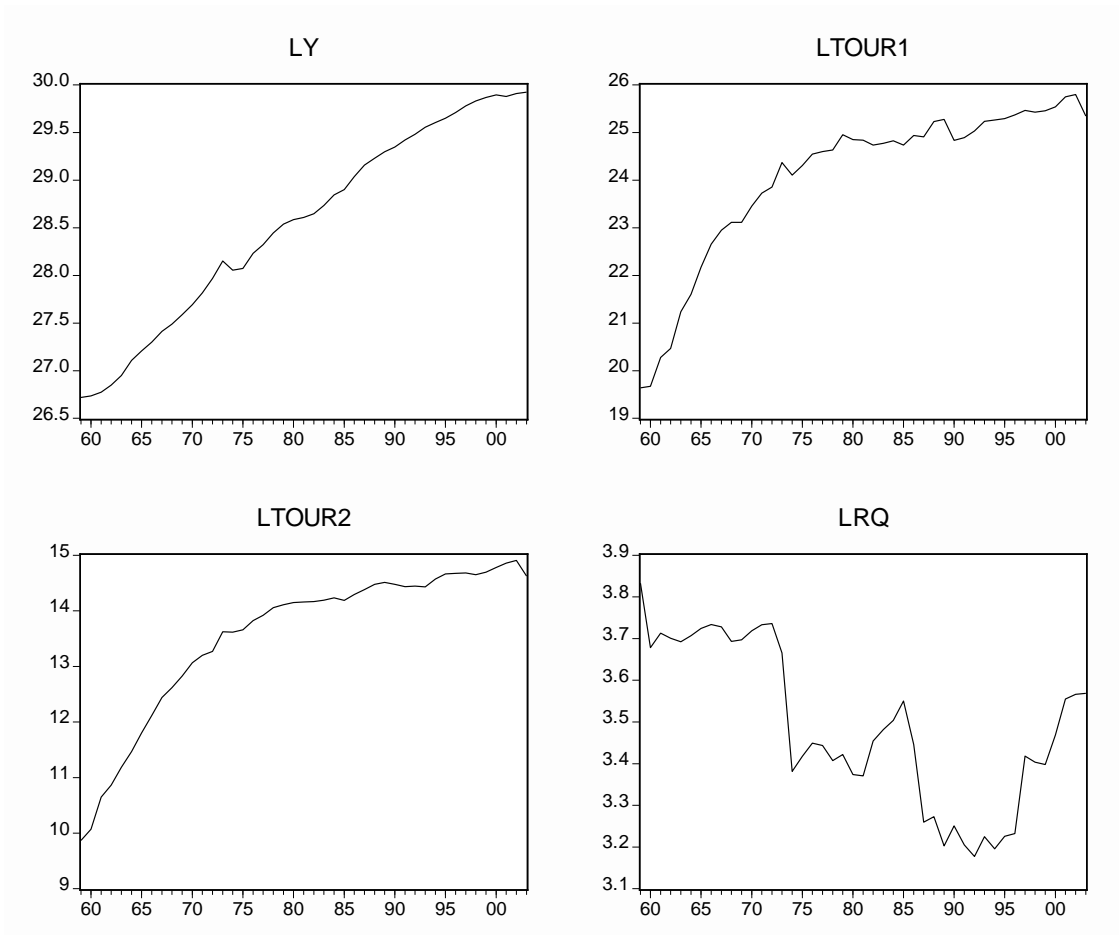


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**Figure 1. Plots of Real GDP, Tourism, and the Real Exchange Rate, Taiwan 1959-2003 (in Logs)**

**Table 1. International Tourism Revenue and Number of Tourists for Taiwan**

Year	International Tourism Revenue (US\$1,000)	Number of Tourists
1960	1,477	23,636
1970	81,720	472,452
1980	988,000	1,393,254
1990	1,740,000	1,934,084
2000	3,738,000	2,624,037

**Table 2. Comparison of Empirical Results between Tourism Development and Economic Growth**

<b>Samples</b>	<b>Authors</b>	<b>Empirical Method</b>	<b>Period</b>	<b>Country</b>	<b>Causal Relationship</b>
One country	Ghali [17]	OLS	1953–1970	Hawaii	tourism $\Rightarrow$ growth
	Balaguer and Cantavella-Jorda [6]	Error correction model	1975-1997	Spain	tourism $\Rightarrow$ growth
	Dritsakis [10]	Error correction model	1960–2000	Greece	tourism $\Leftrightarrow$ growth
	Durbarry [12]	Error correction model	1952-1999	Mauritius	tourism $\Leftrightarrow$ growth
	Narayan [44]	Error correction model	1970-2000	Fiji	growth $\Rightarrow$ tourism
	Oh [51]	Granger causality test	1975-2001	South Korea	growth $\Rightarrow$ tourism
	Kim et al. [28]	Granger causality test	1956-2002	Taiwan	tourism $\Leftrightarrow$ growth
Cross-section	Lanza et al. [31]	Almost ideal demand system (AIDS)	1977-1992	13 OECD countries	tourism $\Rightarrow$ growth
	Eugenio-Martín et al. [16]	Panel GLS	1980-1997	Latin American countries	tourism $\Rightarrow$ growth
	Lee and Chang [33]	Panel error correction model	1990-2002	OECD and non-OECD countries	OECD: tourism $\Rightarrow$ growth Non-OECD: tourism $\Leftrightarrow$ growth

Notes: “tourism  $\Rightarrow$  growth” denotes the causality running from tourism to economic growth. “tourism  $\Leftrightarrow$  growth” denotes the bidirectional causality between tourism and economic growth.