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The effect of tourism growth on economic growth: A quantile regression analysis

Tzu Kuang
Department of International Business, Chung Hua University

Yi-Fan Tsai PhD
Institute of Technology Management, Taiwan

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Tzu-Kuang Assistant Professor

Department of International Business

Chung Hua University

Taiwan.

Yi-Fan Tsai Ph.D.

Institute of Technology Management

Taiwan.

ABSTRACT

This paper employs a quantile regression approach to test the effects of tourism growth on economic growth at the different conditional economic growth distribution from 1965 to 2005 in Taiwan. The key finding of this study is that tourism growth has a positive effect on economic growth at the top end of distribution (0.3 to 0.9 quantiles) of economic growth in Taiwan. However, tourism growth has no significant effect on economic growth at the low end of distribution (0.1 to 0.2 quantiles) of economic growth. The contribution of this study lies in providing empirical evidence to demonstrate that whether tourism growth will affect economic growth depends on the conditional distribution of economic growth.

INTRODUCTION

Tourism growth generates significant amount of foreign exchange earning that also contributes to the economic growth of numerous developed or developing countries. In the tourism research area, many empirical results indicated that tourism development and economic growth exists causal relationship in several nations (Balaguer and Cantavella-Jorda, 2002; Dristakis, 2004; Gunduz and Hatemi-J, 2005; Oh, 2005; Kim, Chen and Jang, 2006; Lee and Chang, 2008; Po and Huang, 2008). In particular, Kim et al. (2006) indicate that there exists a long-run equilibrium relationship and bi-directional causality between these two factors in Taiwan. Their research results showed that a 5% increase in tourism arrivals leads to a 0.5% increase in real gross domestic product (RGDP) in Taiwan. However, the above studies use traditional approach such as Ordinary Least Square (OLS) regression which estimates the effect of the independent variable on the mean of the conditional dependent variable distribution. Only estimating how on average the tourism growth affects economic growth will miss some important implication and not give a completed policy direction. For example, increasing in tourism development, on average, affects economic growth, but not affects low economic growth. In other words, it is important to examine that relationship between tourism growth and economic growth at different points of the conditional function of economic growth. A quantile regression allows us to investigate the impacts of tourism arrival on economic growth across different conditional economic growth

distribution.

The United States is Taiwan's third largest trading partner, taking 15% of Taiwanese exports and supplying 10.9% of its imports. China has recently become Taiwan's largest import and export partner. Foreign trade has been the engine of Taiwan's rapid growth during the past 40 years. In view of Taiwan economic growth, the average real GDP growth rate at 8.2%, which is attributed to the significant contributions of the manufacturing sector, in Taiwan from 1950 to 2000. However, Taiwan economic growth is on average only 3.04% over the period 2001-2005. In other words, Taiwan has a low level of economic growth rate right now. Although studies of the impact of tourism to national economy have grown significantly in Taiwan, researchers have not paid much attention to identify if the growth of tourism always has a positive impact on economic growth at the different conditional distributions of economic growth.

This study intends to find out if tourism growth brings about positive economic growth under some certain conditions. The remainder of this paper is simply organized as follows. Section 2 reviews the related literature. Section 3 describes research methodology, data collection and results from empirical analysis. Finally, we present the concluding remarks.

LITERATURE REVIEW

Tourism growth and economic growth

There have been largely literatures in analyzing the relationship between tourism growth and economic growth. Balaguer and Cantavella-Jorda (2002) showed that there is a long run equilibrium relationship between tourism growth and economic growth. They conducted a standard Granger causality test and showed that there is one-way causal relationship between tourism development and economic growth with Spanish data. Their empirical results support the tourism-led growth hypothesis. However, using data of South Korea, Oh (2005) found that economic growth led tourism expansion rather than tourism expansion causing economic growth. By using the co-integration analysis, he indicated no long-run relationship between tourism receipts and economic growth in South Korea over the period from 1975 to 2001. Dristakis (2004) and Kim et al. (2006) found a bi-directional relationship between tourism expansion and economic development. In particular, Kim et al. (2006) research results showed that a 5% increase in tourism arrivals leads to a 0.5% increase in gross domestic product (GDP) in Taiwan. Furthermore, using the panel data, Lee and Chang (2008) indicated that there are causal relationships between national tourism development and economic growth for OECD countries and for non-OECD countries, including those in Asia, Latin America and Sub-Sahara African countries for the period from 1990 to 2002. Po and Huang (2008) applying the threshold regression and the data for the 88 countries showed that tourism growth has a significantly positive relationship with economic growth in both high income countries and low income countries. They also found that in large and high income countries, capital stock also played an important role in promoting economic growth; while in the small and low income countries, tourism growth was the only source of economic growth. The results from previous empirical studies showed that it is possible that the increase in tourism development may or may not promote the economic growth.

Quantile regression

A quantile regression is a statistical technique intended to estimate, and conduct inference about conditional quantile function. The quantile regression approach proposed by Koenker and Bassett (1978) as an alternative to least squares regression in a wide range of applications. This approach takes into consideration the skewness of the distribution and gives a more complete picture of the way performance is affected by the various independent variables. This technique was further developed by Koenker and Hallock (2001) and Koenker (2005). Recently, the quantile regression has been receiving much attention for theoretical as well as empirical work, on a wide range of issues in economics. For example, Hartog, Pereira and Vieira (2001) examined the evolution of the returns to education in Portugal during the 1980s and early 1990s by using OLS and quantile regression estimators. Mello and Roberto (2003) used quantile regression methods to consider the issue of income convergence and the effects of policy variables on the conditional distribution of real GDP growth rates. Sakellariou (2004) used it for estimating gender wage differentials in Philippines. Patrinos and Sakellariou (2006) used it for estimating economic volatility and returns to education in Venezuela. Choi and Jeong (2007) used it for an analysis of the wage premium associated with technological change. Ram (2008) used a quantile regression analysis for the parametric differences across high-growth and low-growth countries. From above various studies, we found that applying quantile regression may point out that there exists the different effects on an dependent variable under the conditional distribution of the independent variable. However, there are rarely studies investigating the relationship between tourism growth and economic development by using quantile regression. Therefore, it is crucial to identify under which conditions the growth of tourism has an impact on economic growth.

METHODS AND RESULTS

The method of quantile regression

A quantile regression which was introduced by Koenker and Bassett (1978) offered a mechanism for estimating models for the conditional median function, and the full range of other conditional quantile functions. Whereas the method of ordinary least-squares regression results in estimates that approximate the conditional mean of the response variable, given certain values of the predictor variables, quantile regression results in estimates approximating either the median or other quantiles of the response variable. By supplementing the estimation of conditional mean functions with techniques for estimating an entire family of conditional quantile functions, quantile regression is capable of providing a more complete statistical analysis of the stochastic relationships among random variables.

According to Koenker (2005), a quantile regression is used when an estimate of the various quantile of a population is desired. One advantage of using quantile regression to estimate the median, rather than ordinary least squares regression to estimate mean, is that quantile regression will be more robust in response to large outliers. Like the least absolute deviations, the quantile regression objective function is a weighted sum of absolute deviations, which gives a robust measure of location, so that the estimated coefficient vector is not sensitive to outlier observations on the dependent variable. In addition, it also provides a more efficient approach than the least square method when the

error term is non-normal.

Another advantage to quantile regression is can be seen as a natural analogue in regression analysis to the practice of using different measures of central tendency and statistical dispersion to obtain a more comprehensive and robust analysis and the fact that any quantile can be estimated.

According to Koenker and Bassett (1978) method, we let $\{y_t, t = 1,2...,T\}$ be a random sample on the regression process $y_t = u_t + x_t\beta$, having conditional distribution function $F_{Y/X}(y) = F(Y_t \leq y) = F(y_t - x_t\beta)$, where $\{x_t, t = 1,2...,T\}$ denote a sequence of (row) k-vectors of a known design matrix. The θth regression quantile, $Q_{Y/X}(\theta), 0 < \theta < 1$ is defined as any solution to the minimization problem

$$\min_{\beta}\left[\theta\sum_{\{t:Y_t \geq X_t\beta\}}|y_t - x_t\beta| + (1-\theta)\sum_{\{t:Y_t < X_t\beta\}}|y_t - x_t\beta| \right] \tag{1}$$

The resulting solution to (1) is denoted as β_θ, from which we obtain the θth conditional quantile $Q_{Y/X}(\theta) = x\beta_\theta$.

Data collection

The real GDP (RGDP) data is obtained from the financial database of Taiwan Economic Journal (TEJ) and the total tourist arrivals (TOUR) were taken from the annual report on tourism from 1965 to 2005, published by Taiwan Tourism Bureau. The quarterly series of RGDP were available from January 1965 to December 2005. The quarterly TOUR was calculated using the monthly TOUR. Then, TOUR and RGDP data were transformed by the use of natural logarithms to calculate percentage changes in these variables. The growth rate of RGDP (RGDPGW) is calculated as $\log(RGDP_t) - \log(RGDP_{t-4})$, and the growth rate of TOUR (TOURGW) is calculated as $\log(TOUR_t) - \log(TOUR_{t-4})$. Examining the behavior of the response variable RGDPGW for different quantiles with respect to the independent variable TOURGW may result in very different conclusions relative to examining only the average of RGDPGW. There are 9 quantile regression results by using software STATA to analyze the effects of tourism growth on economic growth form the 10th to the 90th quantiles of economic growth.

Results

Table 1 displays results of the quantile regression with quarterly data. From 0.3 to 0.9 quantile of economic growth, tourism growth has a positive effect on economic growth at 5% significance level. However, at lower quantiles 0.1 and 0.2, tourism growth has positive but no significant effects on economic growth at 5% significance level. According to Kim's (2006) study, there exists a long-run equilibrium relationship between the two factors. However, by using quantile regressions, we find that whether tourism growth which is measured as tourism arrivals has a positive impact on economic growth will depend on the conditional distribution of economic growth.

Table 1. Regression results for tourism growth to economic growth from 1965-2005

Quantile	β_θ	Quantile	B_θ
0.1	0.0812 (0.547)	**0.9**	0.1784 (0.000)**
0.2	0.1348 (0.160)	**0.8**	0.2841 (0.000)**
0.3	0.1528 (0.020)**	**0.7**	0.2911 (0.000)**
0.4	0.1 390 (0.002)**	**0.6**	0.2531 (0.000)**
0.5	0.1978 (0.000)**	**OLS**	0.1700 (0.000)**

**Under 5% significance level

"( )" presents p-value

Figure 1 presents the variation 95% confidence interval for regression quantile estimates with RGDPGW as the dependent variable over the conditional RGDP quantiles and allows us to acknowledge the heterogeneity and consider the possibility that estimated slope parameters vary at different quantiles of the conditional growth rate distribution.
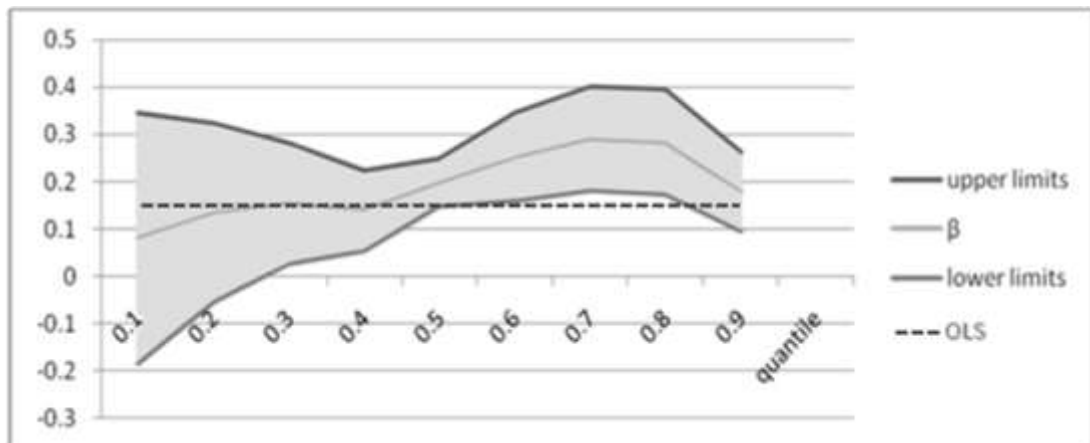
Figure 1   95% confidence interval for regression quantile estimates with RGDPGW as the dependent variable.

CONCLUDING REMARKS

Many literatures have examined the long-run equilibrium relationship between tourism development and economic growth. As an alternative to least squares regression in a wide range of applications, the methodology of a quantile regression has allowed to obtain the full characterization of the conditional distribution of the dependent variable (RGDPGW in our study), rather than its conditional mean only. The main objective of this study is to investigate the contribution of tourism development to the economic growth in Taiwan by using quantile regression method. We attempt to provide a comprehensive picture of the tourism growth to economic growth in Taiwan over the period of 1965-2005. The quarterly data of RGDP and total tourist arrivals over the period of 1965:Q1 to 2005:Q4 are collected for this study. In this study, the dependent variable (RGDP) is not normally distributed across RTOUR. The distribution is highly skewed and thus departs from normality. Therefore, the application of ordinary least square estimation will not produce the best linear unbiased estimator (BLUE) as our error term will be affected by the skewness of the dependent variable distribution. A quantile regression is a flexible approach, allowing a different grade of curvature for each conditional quantile, thereby providing the possibility of capturing certain non-linear effects that are predicted by economic theory. Our results confirm the usefulness of the quantile regression approach. It provides the best fit for the extreme conditional quantiles. Two points are to be emphasized. First, for a complete understanding of the core issue in the empirical research, it is useful not only to identify the tourism growth leads to economic growth, but also to judge whether the roles of tourism growth may differ in higher economic growth and lower economic growth. The focus of OLS has been incomplete in this study since it limits itself to mean while largely overlooking either the median or other quantiles of the response variable. Second, the method of quantile regression provides a useful supplement to the standard constant-parameter regression estimate (only one β) for studying all possible parameters (for all quantiles) vary across high economic growth and low economic growth, and should lead to a more complete understanding of what might really lie behind the stories of great effect or non-effect for tourism growth in Taiwan.

The contribution of our work to the empirical literature is that we provide evidence of the extent to which the tourism growth can spur economic growth while considering conditional distribution of economic growth. Our empirical results show that growth of international tourist arrivals positively impacts the economic growth of Taiwan between 0.3 to 0.9 quanitles, but no significant effects at 0.1 and 0.2 quantiles. Our findings imply that economic growth of Taiwan could not always be spurred by strengthening their tourism industries.

Taiwan's economy remains export-oriented, so it depends on an open world trade regime and remains vulnerable to downturns in the world economy. The total value of trade increased more than fivefold in the 1960s, nearly 10-fold in the 1970s, and doubled again in the 1980s. The 1990s saw a more modest, slightly less than twofold, growth. Export composition changed from predominantly agricultural commodities to industrial goods (now 98%). The electronics sector is Taiwan's most important industrial export sector and is the largest recipient of U.S. investment. Taiwan now faces the low level of economic growth, government might allocate resource in export-related industries at first

priority instead of tourism industry for recovering export economy and tourism will being stimulated by economy recovery. Therefore, the arguments in favor of allocating more resources to the tourist sector with the aim of obtaining increasing levels of income might base on this empirical analysis.

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Contact information:

Yi-Fan Tsai

Institute of Technology Management

Chung Hua University

707, Section 2, WuFu Road, HsinChu, 300 Taiwan.

Phone: +886 960 007707

Email:yvonnetsai0130@gmail.com