E C O N O M I C S   B U L L E T I N

Tourism's Impact on Long-Run Mexican Economic Growth

Juan Gabriel Brida
Free University of Bolzano, Italy.

Edgar J Sanchez Carrera
University of Siena

W. Adrian Risso
University of Siena

Abstract

Tourism is one of the most important factors in the productivity of Mexican economy with significant multiplier effects on economic activity. This paper investigates possible causal relationships among tourism expenditure, real exchange rate and economic growth by using quarterly data. Johansen cointegration analysis shows the existence of one cointegrated vector among real GDP, tourism expenditure and real exchange rate where the corresponding elasticities are positive. The tourism-led growth hypothesis is confirmed through cointegration and causality testing. Tourism expenditure and Real Exchange Rate (RER) are weakly exogenous to real GDP. A modified version of the Granger Causality test shows that causality goes unidirectionally from tourism expenditure and RER to real GDP. Impulse response analysis shows that a shock in tourism expenditure produces a short fall and then a positive effect on growth.

Comments by anonymous referees were particularly useful in improving the paper and they are gratefully acknowledged with the usual caveats. Our research was supported by the Free University of Bolzano, project: "Market imperfections and tourism policy". An earlier draft of this paper was presented at the ATLAS International Conference 2007 Polytechnic Institute, Viana do Castelo-Portugal, 5 - 7 September 2007.
Citation: Brida, Juan Gabriel, Edgar J Sanchez Carrera, and W. Adrian Risso, (2008) "Tourism's Impact on Long-Run Mexican Economic Growth." *Economics Bulletin*, Vol. 3, No. 21 pp. 1-8
Submitted: December 4, 2007. **Accepted:** April 14, 2008.
URL: http://economicsbulletin.vanderbilt.edu/2008/volume3/EB-07C20155A.pdf

1. Introduction

The tourism-led growth hypothesis (TLGH) postulates that international tourism is considered as a potential strategic factor for economic growth. There are several empirical papers using time series techniques, analyzing the tourism industry's contribution to a country's economic growth. Some of the most remarkable works on this topic are Balaguer and Cantavella (2002) for Spain (suggesting the validity of TLGH), Dritsakis (2004) for Greece (showing the impact of tourism on long-run economic growth), Gunduz and Hatemi-J (2005) for Turkey (supporting the TLGH), Louca (2006), Noriko and Motosugu (2007), and Gani (1998) for small islands. Oh (2005) for Korea, Kim et al. (2006) for Taiwan. Similarly, Proença and Soukiazis (2005) examine the impact of tourism for Portuguese regions and Shan and Wilson (2001) study the causality between tourism and trade.

The purpose of this paper is to investigate possible causal relationships among tourism expenditure (*TourExp*), real exchange rate (*RER*) and economic growth measured by real *GDP*. We shall provide a plausible answer to the question: ***"Does the tourism sector cause economic growth and/or can it be a key factor for the Mexican economy?"***

The hypotheses are tested empirically by using the cointegration test by Johansen (1988), Johansen and Joselius (1990) and Johansen (1995). In addition, a modified version of the Granger Causality test (see Granger (1988)) is applied by using methodology suggested by Toda and Yamamoto (1995).

2. Specification of the model and data set

We specify a Vector Auto Regressive (VAR) model in order to test the causality among the variables:

$$U = (GDP, TourExp, RER) . \tag{1}$$

We search for a long-run relationship among the three variables, but a Vector Error Correction (VEC) model is applied to model the short-run dynamics. The model is represented in a first-differenced error correction form:

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{i=k-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t , \tag{2}$$

where *Y = (real GDP, TourExp, RER)* is a vector containing the variables and μ is a vector of constant terms. The matrix Π conveys information about the long-run relationship between the *Y* variables. The rank of Π is the number of linearly independent and stationary linear combinations of the variables.

Firstly, unit root tests are applied to study the stationarity of the series. In the case of non-stationarity, we apply the Johansen cointegration test in order to detect long-run relationships in the data. Then, weak exogeneity is tested in the model. Finally, a modified version of the Granger causality test is applied in order to analyze causality between the variables.

We use quarterly data from 1980 to second term 2007. Data of real GDP and real exchange rate (*RER*) are obtained from the Central Bank of Mexico. Tourism expenditure (*TourExp*) is a generated variable with the amount of foreign currency of international tourism, the nominal dollar-peso exchange rate and the consumer price index. The data source is the Central Bank of Mexico.

3. Methodology and Results

We have a spurious regression when trending or unit root time series produce non-stationary residuals, significant OLS parameter estimates, and a high R-square. Non-stationary residuals violate the standard assumption to apply OLS methodology. In this case, Phillips (1986) pointed out that cointegration techniques must be applied. A first step in cointegration analysis is to study the stationarity of the series by using unit root tests, such as the Augmented Dickey-Fuller (ADF) and the KPSS. The null hypothesis of the KPSS test is stationarity, complementing the ADF test. Remember that the ADF test has low power against stationary near unit root processes.
Tables I and II show unit root tests for the variables in levels and in differences. Variables are expressed in logarithms form.

Table I: Unit Root Test results: Levels

Variable	real GDP		TourExp		RER	
Unit Root Test	ADF	KPSS	ADF	KPSS	ADF	KPSS
Trend, Constant	-3.42	0.31*	-3.07	0.13	-2.03	0.19*
Constant	0.89	2.25*	-1.81	1.71*	-1.40	2.00*
Without Trend, Const.	2.34		1.41		0.18	

* Null Hypothesis Rejection at 5%

Table II: Unit Root Test results: First Difference

Variable	Δ(real GDP)		Δ(TourExp)		Δ(RER)	
Unit Root Test	ADF	KPSS	ADF	KPSS	ADF	KPSS
Trend, Constant	-4.17*	0.02	-5.10*	0.03	-3.55*	0.05
Constant	-3.85*	0.06	-5.08*	0.03	-3.48*	0.08
Without Trend, Const.	-2.51*		-4.68*		-3.29*	

* Null Hypothesis Rejection at 5%

According to the tests, time series are integrated processes of first order, *I(1)*. Hence, we have to study the existence of a cointegrating relationship. The two-step procedure by Engle and Granger (1987) assumes the existence of only one cointegrating relationship. The general procedure proposed by Johansen (1988) has the advantage of testing all the possible cointegrating relationships. Banerjee et al. (1993) highlight that searching for a cointegration relation is equivalent to searching for a statistical equilibrium between variables tending to grow over time. The discrepancy of this equilibrium can be modeled by a Vector Error Correction (VEC) model (equation (2)). The VEC shows how the variables come back to the equilibrium after suffering a shock.
In order to obtain the optimal VEC model we applied the minimum AIC-criterion, suggesting

a lag length of four.
To determine the number of cointegrating equations, the Johansen maximum likelihood method provides both trace and maximum eigenvalue statistics. Note in Table III that both tests detect the existence of one cointegrating vector.

Table III: Unrestricted Cointegration Rank Test

Trend assumption:	No deterministic trend			
Series:	real GDP, TourExp and RER			
		Trace		
Hypothesized No. of CE	Eigenvalue	Trace Stat.	Critical Value	Prob.
None*	0.298	54.965	35.193	0.00
At most 1	0.097	17.853	20.262	0.10
At most 2	0.066	7.142	9.164	0.12
		Maximum Eigenvalue		
Hypothesized No. of CE	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.
None*	0.298	37.112	22.299	0.00
At most 1	0.097	10.710	15.892	0.27
At most 2	0.066	7.142	9.164	0.12
Trace and Max.Eigen. test indicates 1 cointegrating eqn(s) at the 0.05 level				

* Denotes rejection of the hypothesis at the 0.05 level

Table IV shows that, in the long-run, real GDP is positively related with tourism expenditure and RER.

Table IV: Cointegrating Vector

real GDP	TourExp	RER	const.
1	-0.754	-0.005	-7.048
	[-2.301]	[-0.917]	[-2.079]

t-statistics in [].

McCallum (1984) asserts that incorrect signs can be produced if exogeneity is not studied. To apply inference techniques we must test weak exogeneity. When we consider separately the weak exogeneity of the variables we obtain that tourism expenditure is exogenous producing a test statistic of 0.05 and a p-value of 0.82, and that RER is exogenous with test statistic of 0.02 and p-value of 0.88. Table V presents the joint hypothesis of exogeneity for TourExp and RER (α_2=α_3=0). The test indicates a test statistic of 0.131 and the hypothesis cannot be rejected at 5% level (note a high p-value = 0.936).

Table V: Weakly exogeneity test

Cointegrating Restrictions:			
H_0: A(2,1)=0, A(3,1)=0			
Restrictions identifying all cointegrating vectors			
LR test for biding restrictions (rank=1)			
Chi-square(2):	0.131		
P-value:	0.936		
Cointegrating Vector after exogeneity			
real GDP	TourExp	RER	const.
1	-0.696	-0.006	-7.645
	[-2.137]	[-1.099]	[-2.270]

t-statistics in []. A(2,1) and A(3,1) are the adjustment coefficients in the TourExpend and RER equations of the VEC, respectively.

Cointegration by itself does not indicate the direction of the causal relationship. Granger (1988) proposes a test to study causality. Such causality can be captured from the VAR model. However, since the variables are integrated, application of the standard Granger causality test is invalid. Toda and Yamamoto (1995) suggest an alternative procedure. When the variables are integrated, they propose to estimate a VAR model with (k+d_{max}) lags, where k is the standard optimal number of lags and d_{max} is the maximal order of integration that we suspect might occur in the process. Once the VAR is estimated, we test Granger causality only using the first k lags. For instance, if we consider the following equation from a VAR model:

$$GDP_t = \gamma_0 + \gamma_1 TourExp_{t-1} + ... + \gamma_5 TourExp_{t-5} + \gamma_6 RER_{t-1} + ... + \gamma_{10} RER_{t-5} + \gamma_{11} GDP_{t-1} + ... + \gamma_{15} TourExp_{t-5} + \varepsilon_t$$

where k = 4 and d_{max} = 1, the null hypothesis of non-causality from TourExp to GDP should be:

$$H_0: \gamma_1=\gamma_2=\gamma_3=\gamma_4=0$$

This means,

H_0: *TourExpend does not Granger-cause real GDP.*

The hypothesis is tested using the Wald test. However, Toda and Yamamoto (1995) assert that Wald and LR tests are asymptotically equivalent in the present situation. Table VI shows the results for all the variables.

Table VI: Granger Causality Test (by Toda & Yamamoto)

Null Hypothesis	Wald-statistic	P-value
TourExp does not Granger Cause real GDP	24.54	0.000*
real GDP does not Granger Cause TourExp	8.936	0.063
RER does not Granger Cause real GDP	24.80	0.000*
real GDP does not Granger Cause RER	3.152	0.533
RER does not Granger Cause TourExp	8.487	0.075
TourExp does not Granger Cause RER	1.684	0.793

* Indicates rejection of the null hypothesis at 5%. We used a VAR with $k+d_{max}$ = 4+1. P-values correspond to the Chi-square distribution with 4 degree of freedom.

Equation (3) shows the long-run equilibrium after testing weak exogeneity of tourism expenditure and RER:

$$(\text{real}\, GDP)_t = 7.645 + 0.696(\text{TourExp})_t + 0.006(RER)_t \tag{3}$$

Summarizing, tourism expenditure and RER are weakly exogenous and in the long-run they Granger-cause real GDP. The elasticity of real GDP with respect to tourism expenditure is *0.696*. This means that increasing tourism expenditure by 100% produces an increment of almost 70% of the Mexican real product.

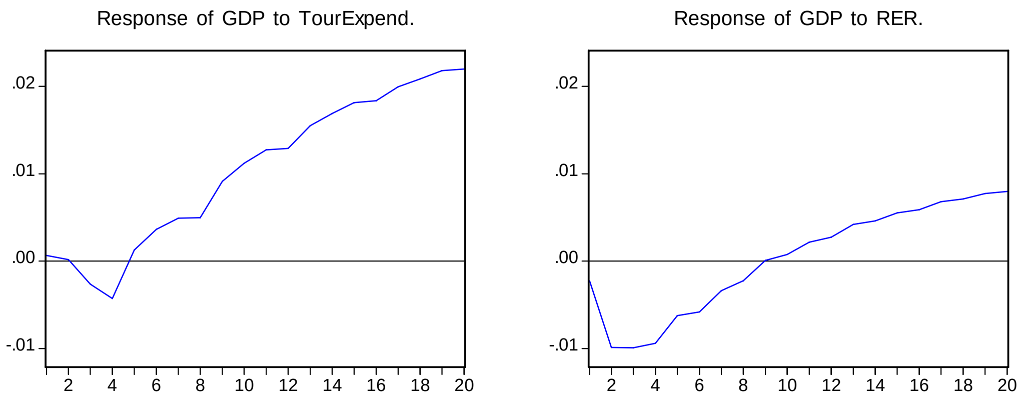

Figure 1: Impulse Response Functions of GDP

Furthermore, we study the impulse response functions. Figure 1 shows that after a shock in tourism expenditure, there is a fall as initial response of real GDP but then it presents a sustained positive response. Moreover, a shock in RER first produces a negative response but

then presents a positive reaction on the real GDP.
Note that a positive shock in the tourism expenditure positively affects the long-run real GDP. A positive shock in RER (real devaluation) first produces a negative effect for 9 quarters and then a high positive effect. This is the well-known J-curve[1] introduced by Magee (1973) and empirically modeled by Bahmani-Oskooee (1985).

4. Comparing results

In this section, we compare our results with two similar papers: i) Dritsakis (2004) for the Greece case and, ii) Balaguer and Cantavella (2002) for the Spanish case.
Dritsakis found bidirectional causality, whereas we obtained just one direction going from tourism to GDP. Moreover, we obtained a "Granger causal" relationship between tourism and economic growth. We, as Dritsakis, obtained the existence of a cointegration relationship among the three variables with similar signs and significance.
Balaguer and Cantavella found a cointegration relationship indicating that tourism positively affects economic growth over time. We obtained similar results. They also found that the corresponding elasticity of tourism expenditure has a significant effect on economic growth. As in our case, tourism expenditure affects economic growth in a unidirectional way. This provides the necessary arguments to support the TLGH for Mexico.

5. Conclusion

International tourism expenditure positively impacts Mexican economic growth. The elasticity of real GDP to tourism expenditure (0.69) shows that an increment of 100% in tourism expenditure produces an increment of almost 70% of the real product. However, note that the real exchange rate produces an insignificant effect with elasticity 0.006.
Then the tourism-led growth hypothesis applies to the Mexican economy suggesting that tourism is an important determinant of overall long-run economic growth.
A policy implication which may be drawn from this study is that Mexico can improve its economic growth performance by strategically harnessing the contribution of the tourism industry and improving their governance performance. Since tourism is an important engine of local development, it is necessary to increase domestic tourism in order to have more decentralization of local development caused by such activity.

References

Balaguer, J. and Cantavella-Jordà, M. (2002) Tourism as a long-run economic growth factor: the Spanish case, *Applied Economics*, vol 34, pp. 877-884.

Bahmani-Oskooee, M. (1985) Devaluation and the J-curve: some evidence from LDCs, *Review of Economics and Statistics*, vol. 67, pp. 500-504.

Banerjee, A., Dolado, J., Galbraith, J. and Hendry, D. (1993) *Co-integration, Error-Correction, and the Econometric Analysis of the Non-Stationary Data*, Oxford University Press.

[1] The J-curve shows that a trade balance must get worse after devaluation before it can get better. The effect on a nation's trade caused by devaluation of its currency can be plotted in this curve, because the trade picture worsens before showing improvement.

Cortez-Jimenez and Paulina, M. (2006) A further step into the ELGH and TLGH for Spain and Italy, in *Fondazione Eni Enrico Mattei Working Paper Series*, pp. 118-2006.

Dritsakis, N. (2004) Tourism as a long-run economic growth factor: an empirical investigation for Greece using causality analysis, *Tourism Economics,* vol. 10(3), pp.305-316.

Engle, R. and Granger, C. (1987) Co-integration and error correction: representation, estimation and testing, *Econometrica*, vol. 55, pp. 251-276.

Granger, C. (1988) Some recent developments in a concept of causality, *Journal of Econometrics*, vol 39, pp. 199-211.

Gani, A. (1998) Macroeconomic determinants of growth in the South Pacific island economies, *Applied Economics Letters*, vol. 5, pp.747-749.

Gunduz, L. and Hatemi-J, A. (2005) Is the tourism-led growth hypothesis valid for Turkey?, *Applied Economics Letters*, vol. 12, pp. 499-504.

Johansen, S. (1988) Statistical Analysis of cointegration vectors, *Journal of Economic Dynamics and Control*, vol. 12, pp. 231-254.

Johansen, S. and Juselius, K. (1990) Maximum likelihood estimation and inference on cointegration with applications to the demand for money", *Oxford Bulletin of Economics and Statistics*, vol. 52, pp. 169-210.

Johansen, S. (1995) *Likelihood-based inference in cointegrated vector autorregressive models*, Oxford University Press, Oxford.

Kim, H. J., Chen, M. and Jan, S. (2006) Tourism expansion and economic development: The case of Taiwan, *Tourism Management*, vol. 27, pp. 925-33.

Louca, C. (2006) Income and expenditure in the tourism industry: time series evidence from Cyprus, *Tourism Economics*, vol. 12(4), pp. 603--617.

Magee, Stephen P. (1973) Currency contracts, pass-through, and devaluation, *Booking Papers on Economic Activity*, no.1, pp. 303-323.

McCallum, B. (1984) On low-frequency estimates of long-run relationships in macroeconomics, *Journal of Monetary Economics*, vol. 14, pp. 3-14.

Noriko, I and Mototsugu, F (2007) Impacts of tourism and fiscal expenditure to remote islands: the case of the Amami islands in Japan, *Applied Economics Letter*, vol. 14, pp.661-666.

Oh, C. (2005) The contribution of tourism development to economic growth in the Korean economy, *Tourism Management*, vol. 26 (1), pp. 39-44.

Phillips, P. (1986) Understanding spurious regressions in econometrics, *Journal of Econometrics*, vol. 33, pp. 311-340.

Proença, Sara and Soukiazis Elias (2005) Tourism as an alternative source of regional growth in Portugal: a panel data analysis at NUTS II and III levels, *Portuguese Economic Journal*, vol. 6(2).

Shan, J. and Wilson K. (2001) Causality between trade and tourism: empirical evidence from China, *Applied Economics Letters*, vol. 8, pp. 279-283.

Toda, H., and Yamamoto, T., (1995) Statistical inference in vector autorregressions with possibly integrated processes, *Journal of Econometrics*, vol. 66, pp. 225-250.

Tosun, C., (1999) An analysis of contributions international inbound tourism to the Turkish economy, *Tourism Economics*, vol. 5, pp. 217-250.