

Analysing the linkage between total factor productivity and tourism growth in Latin American countries

Total factor
productivity
and tourism
growth

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Abstract

Purpose – The study aims to investigate the nexus between total factor productivity and tourism growth in Latin American countries for time series data from 1995 to 2017.

Design/methodology/approach – Using the extension of the Granger noncausality test in the nonlinear time-varying of Ajmi *et al.* (2015), the study points out the interconnectedness between the variables during the period.

Findings – The study found nonlinear causality between the variables. Particularly, studying the conclusions for the time-varying Granger causality fashion, it can be noticed that the one-way causality from total factor productivity to tourism growth is obtained for Argentina, Bolivia, Brazil, Uruguay and Venezuela, while the vice versa is confirmed for Chile, Ecuador and Nicaragua. Lastly, the study dissected the plots of the curve causality.

Practical implications – In view of the results, some crucial policy implications could be suggested, such as, under certain circumstances and as an exceptional case, the use of policy instruments such as targeted investment, marketing and the support of tourism organizations focused on driving a tourism-led-based productivity and/or tourism programs and projects.

Originality/value – The current work is distinguished from the existing body of understanding in several substantial directions. This work explores, for the first time, the linkages between the total factor productivity index and tourism growth for Latin American countries. No single attempt has been known to investigate this interaction by using nonlinear causality, and this study determines the shape of the curve between the total factor productivity index and tourism growth for each country.

Keywords Total factor productivity, Tourism growth, Time-varying approach, Latin American countries

Paper type Research paper

1. Introduction

The importance of tourism growth (TOUR) in the generation of economic growth has been extensively recognized by academics and policymakers base the increase in their macroeconomic data on the expansion and development of these findings (Manrai *et al.*, 2018; Flores-Muñoz *et al.*, 2019; Nguyen *et al.*, 2020; Polemis *et al.*, 2021). Since the work by Balaguer and Cantavella-Jorda (2002), was the first one to formally refer to the tourism-led growth hypothesis (TLGH), a plethora of authors has investigated that discipline [1].

JEL Classification — O47, O54, Z31, Z32

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Remained on the same strand but searching this academic question from a different angle. This research studies the connection between the total factor productivity (TFP) index and TOUR in Latin American Countries (LACs). To do this, we employ a data set of 16 LACs during the period 1995–2017 evaluating the time-varying causality of [Ajmi *et al.* \(2015\)](#). Our underlying idea is that the TFP index can be a more effective variable in preference to economic growth to interpret the relationship between economic development and TOUR. Furthermore, a bulk of relevant literature used economic growth ([Du *et al.*, 2016](#); [Mérida and Golpe, 2016](#); [Tang and Abosedra, 2016](#); [Chiu and Yeh, 2017](#); [Li *et al.*, 2018](#)) with only two studies which used TFP ([Liu and Tsai, 2018](#); [Tzeremes, 2021](#)).

In particular, from the beginning of growth economics and the pioneering Solow model ([Solow, 1956](#)) TFP has been deemed an intriguing milestone to explicate long-run amelioration. TFP depicts a compound of labor and capital productivity, which explains the rise of technological development. Thus, TFP has classically been considered a vital tool of technological development ([Letta and Tol, 2018](#); [Vella, 2018](#); [Nguyen *et al.*, 2021a, b](#)). According to [Solow \(1956\)](#), endogenous growth and neoclassical framework can measure economic growth. Moreover, TFP accounts for the degree of technological development, as a result, it has a direct impact on economic growth but as an exogenous factor. Lastly, based on endogenous growth theories, TFP is a crucial element of economic growth via technological change which is a vital component of TFP ([Romer, 1986](#); [Lucas, 1988](#); [Tzeremes and Tzeremes, 2021](#)). Thus, either neoclassical or endogenous growth models state that the TFP index may increase economic growth in the long run period.

We choose to study LACs for many reasons. Initially, there is not much research on the tourism and growth nexus [2]. LACs are a tourist attraction in many aspects. Natural tourist resources encompass famous beaches, lush jungles and great biodiversity. Brazil is at the top of the biodiversity ranking (with more than 3,000 species). Mexico and Costa Rica are included in the top 10 best natural tourism destinations. Moreover, Argentina, Colombia and Peru belong to the top 50 cultural tourism destinations. Apart from natural and cultural tourism, LACs are medical tourism attractions. Brazil is known for plastic surgery and Cuba for cancer treatments. Religious tourism is one more motivation to visit LACs. For example, the Basilica of Our Lady of Guadalupe in Mexico and the National Sanctuary of Our Lady of Aparecida in Brazil are popular destinations with more than 10 million visitors every year. Lastly, LACs are famous for business–economic tourism, Brazil and Mexico are developing economies and Panama and Puerto Rico are enormously open to international trade ([Netto *et al.*, 2015](#)).

This research contributes in several ways. First, it sheds light on the relationship between TFP and TOUR for LACs analyzing the role played by the productivity of TOUR. In contrast to previous studies that only focus on the effect of economic growth on tourism development ([Du *et al.*, 2016](#); [Mérida and Golpe, 2016](#); [Tang and Abosedra, 2016](#) and [Chiu and Yeh, 2017](#), among others), we pay attention to TOUR, which may arise from increased productivity. Second, we applied the time-varying causality which captures time effects instead of the classical Granger causality ([Ajmi *et al.*, 2015](#)). Finally, for the first time, we illustrate the relationship between these two variables for LACs and we emerge the shape of the curve for each country.

The rest of the paper is organized as follows: [Section 2](#) reports the literature review and the method is described in [Section 3](#). Then, [Section 4](#) presents formally the results and lastly, in [Sections 5 and 6](#) the discussion and conclusions are exhibited.

2. Literature review

The tourism literature of LAC shows how the growth of the tourism sector can potentiate relationship economic growth as well as its advantages. Tourism led growth hypothesis is confirmed for most of the academic research. Specifically:

For Colombia, [Brida *et al.* \(2009\)](#) utilizing the Johansen cointegration test and a vector error correction (VEC) model proved the hypothesis that tourism led to growth. Again, for Colombia, and with the same econometric models but this time for the five most popular tourist destinations, [Brida and Monterubbianesi \(2010\)](#) verified the validity of TLGH. Likewise, findings for Chile, yet an extra Granger causality test (Toda–Yamamoto) is used by [Brida and Risso \(2009\)](#) to confirm the TLGH. Not surprisingly, outcomes for Brazil ([Brida *et al.*, 2011](#)) and Mexico ([Sánchez Carrera *et al.*, 2008](#)). [Croes and Vanegas \(2008\)](#) investigated the validity of TLGH for Nicaragua by implementing the Johansen cointegration test and the traditional Granger causality model. Also, the authors used an extra variable, poverty reduction, and they showed a long-run connection between the three variables. About Granger causality results, a unidirectional causality running from tourism to growth and poverty reduction is revealed, whilst a two-way causality between growth and poverty reduction is suggested. [Brida *et al.* \(2010\)](#) analyzed the connection between tourism–economic growths in Uruguay and divulged the hypothesis that tourism provokes economic growth. Moreover, they employed the tourism receipts from Argentina (exchange rate) since Argentinean tourists constitute most arrivals in Uruguay. The results demonstrated the validity of the hypothesis that export-led economic growth.

The panel data method was applied by [Fayissa *et al.* \(2011\)](#) to explore the impact of TOUR on economic growth. In particular, they built a multivariable framework implementing a fixed-random effect, a generalized method of moments estimator and a panel quantile fashion on a panel data of 18 LACs. The findings disclosed the general hypothesis which exists that TOUR induces a positive rise in economic growth. Finally, [Lionetti and González \(2012\)](#) documented the influence of TOUR on trade leveraging cointegration and vector autoregressive procedures for Argentina, Chile, the Dominican Republic, Mexico, Nicaragua and Venezuela. Neither Granger causality nor long-run linkage are depicted for the six LAC, yet when it comes to the short-run association is verified for Chile, Dominican Republic, Nicaragua and Venezuela. Nonetheless and interesting to observe is the mutual connection between these countries for the two variables.

However, all previous evidence shows that TOUR causes economic growth employing cointegration or traditional Granger causality models. Our study, first, implements TFP (economic development) rather than economic growth and second, we exhibit that previous studies have mostly relied on the standard Granger causality test to explore the dynamic link between the variables under examination.

3. Method

3.1 Data and variables

We used the annual data of 16 LACs comprising the period 1995–2018 [3]. The sample of LACs was confirmed by Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. The sample contained two variables, the TFP index and TOUR. The data set of TFP was taken from the Penn World Table-v9.1 ([Feenstra *et al.*, 2015](#)), while the data set from TOUR was received from World Development Indicator [4]. Table 1 shows the descriptive statistics of the variables.

3.2 Research model and analytical procedure

According to [Granger \(1969, 1988\)](#), a classical vector autoregressive (VAR) framework can be described only with two variables (φ , λ). The relationship between these two variables is renowned as the Granger causality test. Indisputably, a vast number of scientific works applied this model in many academic disciplines. The structure of the model is:

Table 1.
Descriptive statistics

Countries	TOUR			TFP				
	Min	Max	Std. Dev.	Mean	Min	Max	Std. Dev.	Mean
Argentina	1,716,000,000	6,058,000,000	1,346,502,504	4,088,913,043	0.628	0.823	0.052	0.742
Bolivia	92,000,000	919,000,000	265,418,418.3	369,130,434.8	0.378	0.500	0.037	0.435
Brazil	744,000,000	7,406,000,000	2,273,169,670	4,152,434,783	0.471	0.789	0.078	0.575
Chile	1,179,000,000	4,604,000,000	992,425,505.2	2,166,739,130	0.567	0.738	0.057	0.673
Colombia	887,000,000	5,801,000,000	1,642,017,363	2,759,739,130	0.461	0.609	0.049	0.539
Costa Rica	763,000,000	3,827,000,000	941,686,486.4	2,143,434,783	0.575	0.730	0.041	0.628
The Dominican Rep.	1,571,000,000	7,178,000,000	1,538,832,812	3,843,826,087	0.607	0.745	0.036	0.703
Ecuador	315,000,000	1,663,000,000	444,504,058.1	739,304,347.8	0.353	0.457	0.028	0.403
Guatemala	216,000,000	1,580,000,000	503,658,273.2	946,260,869.6	0.633	0.851	0.061	0.694
Honduras	85,000,000	722,000,000	216,683,507.1	456,395,652.2	0.342	0.588	0.062	0.415
Nicaragua	51,000,000	841,000,000	200,036,073.8	284,391,304.3	0.388	0.507	0.039	0.433
Panama	372,000,000	6,865,000,000	2,236,344,276	2,429,913,043	0.777	0.992	0.049	0.846
Paraguay	76,000,000	399,000,000	104,099,014.1	187,173,913	0.377	0.542	0.036	0.470
Peru	521,000,000	4,573,000,000	1,336,382,562	2,088,521,739	0.353	0.574	0.079	0.462
Uruguay	409,000,000	2,666,000,000	744,550,847.4	1,278,347,826	0.604	0.756	0.051	0.693
Venezuela	378,000,000	1,097,000,000	207,944,256.6	769,363,636.4	0.265	0.702	0.114	0.507

Source(s): Own elaboration

$$\varphi_t = \delta_0 + \sum_{i=1}^{\nu} \delta_i \varphi_{t-i} + \sum_{i=1}^{\nu} \psi_i \lambda_{t-i} + \omega_i, \quad (1)$$

and

$$\lambda_t = \xi_0 + \sum_{i=1}^{\nu} \xi_i \lambda_{t-i} + \sum_{i=1}^{\nu} \beta_i \varphi_{t-i} + \omega_i, \quad (2)$$

in our case φ and λ are the variables TOUR and TFP. In this model, [Dahlhaus et al. \(1999\)](#) developed a framework with a local stationarity process. Additionally, based on the same process, [Sato et al. \(2007\)](#) constructed a time-varying VAR model (dynamic VAR model) which involves a time smooth variation. This dynamic VAR fashion can be described as follows:

$$\theta_{t,T} = \rho(\tau/T) + \sum_{l=1}^{\zeta} \pi_l(\tau/T) \theta_{t-l,T} + \omega_{t,T}, \quad (3)$$

where $\theta_{t,T}$ and $\rho(\tau/T)$ stand for the variables TOUR and TFP, $\pi_l(\tau/T)$ denotes the autoregressive coefficients while $\omega_{t,T}$ shows the white noise error terms. Recently, a transformed model of [equation \(3\)](#) was established by [Ajmi et al. \(2015\)](#). The authors accomplished this transformation by applying the M- and B-splines functions [\[5\]](#). Especially, using this new calculation (M- and B-splines functions) via a multiple linear regression model, [Ajmi et al. \(2015\)](#) re-estimated the model of [equation \(3\)](#) and the computational model can be defined as follows:

$$\pi_t = \sum_{\nu=0}^{\psi} \delta_{\nu} \zeta_{\nu}(\tau) + \sum_{\lambda=1}^{\theta} \gamma_{\nu}^{\lambda} \zeta_{\nu}(\tau) \pi_{t-l} + \omega_t \quad (4)$$

where δ_{ν} denotes the vectors while γ_{ν}^{λ} shows the B-splines coefficients. Moreover, according to [Ajmi et al. \(2015\)](#), the Granger causality test can be applied through the Wald test and then by applying the Wald test to the coefficients we can get the time-varying causality. Specifically, if the coefficients of the B-splines are statistically significant then we can conclude that the outcomes of the Granger causality are time-varying otherwise the results are constant. Finally, because this model is bivariate, and it reduces the number of observations, we suppose the lag order is equal to one (for more details, see [Sato et al., 2007](#); [Ajmi et al., 2015](#)).

Lastly, as a robustness check, we can use welfare-relevant TFP levels at current PPPs instead of TFP levels at current PPPs. The welfare-relevant TFP level of a country's infinitely lived representative consumer is summarized, in first order, by TFP and by the capital stock per capita. To calculate this welfare-relevant TFP, a measure of real domestic absorption is needed which includes consumption as well as investment ([Feenstra et al., 2015](#)) [\[6\]](#).

4. Results

[Table 2](#) begins by considering the unit root tests and more precisely two stationarity tests, [Phillips and Perron \(1988\)](#) and the Augmented Dickey–Fuller generalized least squares (DF-GLS) test constructed by [Elliott et al. \(1996\)](#). Our results show that no country has a unit root at level whilst when it comes to the first difference both variables for all countries disclose stationarity at order (1).

Table 2.
Unit root tests results

Countries	DF-GLS test			Perron test				
	Level	1st diff.	Level	1st diff.	Level	1st diff.		
	TOUR	TFP	TOUR	TFP	TOUR	TFP		
Argentina	-1.13 [4]	0.23 [3]	-2.23 [3]**	-3.11 [3]***	-7.73 [2]	-10.43 [2]	-18.64 [2]**	-21.13 [2]**
Bolivia	-0.05 [4]	-0.66 [4]	-4.37 [2]***	-3.88 [3]***	-11.25 [2]	-5.19 [2]	-15.50 [2]*	-16.16 [2]*
Brazil	-2.91 [3]*	-0.42 [4]	-3.95 [3]***	-2.10 [3]**	-1.80 [2]	-6.71 [2]	-22.55 [2]***	-21.29 [2]**
Chile	-1.78 [3]	-3.49 [2]**	-2.11 [2]**	-2.50 [2]**	-12.52 [3]	-2.71 [3]	-31.36 [3]***	-17.72 [3]*
Colombia	-2.87 [2]	-1.12 [5]	-2.29 [3]**	-3.92 [2]***	-8.33 [3]	-2.64 [3]	-45.98 [3]***	-28.92 [3]***
Costa Rica	-1.39 [3]	-1.22 [4]	-3.00 [1]***	-2.80 [3]***	-15.49 [3]	-8.06 [3]	-33.71 [3]***	-21.92 [3]**
The Dominican Rep.	-1.59 [3]	-0.96 [4]	-2.10 [3]**	-2.42 [3]**	4.59 [3]	-5.46 [3]	-39.45 [3]***	-36.45 [3]***
Ecuador	-1.50 [3]	-0.93 [4]	-2.58 [3]**	-3.71 [2]***	-10.05 [3]	-5.35 [3]	-39.50 [3]***	-40.90 [3]***
Guatemala	-1.52 [3]	-3.01 [3]*	-2.20 [3]**	-2.94 [3]***	-5.95 [3]	-6.98 [3]	-54.77 [3]***	-24.14 [3]**
Honduras	0.61 [5]	-0.51 [5]	-2.71 [3]***	-2.56 [3]**	-4.9 [3]	-3.62 [3]	-19.56 [3]**	-18.81 [3]**
Nicaragua	-1.90 [3]	-1.30 [3]	-2.37 [3]**	-3.11 [3]***	-19.09 [3]	-4.51 [3]	-42.40 [3]***	-39.98 [3]***
Panama	-0.95 [4]	-0.93 [4]	-2.20 [3]**	-3.88 [2]***	-1.91 [3]	-6.59 [3]	-44.94 [3]***	-40.10 [3]***
Paraguay	-1.78 [3]	-1.96 [3]	-2.74 [3]***	-2.33 [3]**	-8.71 [3]	-8.65 [3]	-42.97 [3]***	-25.66 [3]***
Peru	-1.10 [4]	-1.43 [3]	-3.44 [2]***	-3.56 [1]***	-16.82 [3]	-10.01 [3]	-37.51 [3]***	-39.49 [3]***
Uruguay	-2.26 [3]	-0.88 [4]	-2.20 [3]**	-2.55 [3]**	-7.56 [3]	-3.41 [3]	-59.93 [3]***	-28.79 [3]***
Venezuela	-2.14 [3]	-1.47 [4]	-2.39 [3]**	-2.64 [2]***	-8.37 [3]	-13.70 [3]	-28.49 [3]***	-29.65 [3]***

Note(s): ***, **, * and * denote significant at 1%, 5% and 10% level. Numbers in square brackets are selected lags

Source(s): Own elaboration

Concerning the findings of the causalities, the results are reported in Table 3. We will start our analyses with the classical Granger causality test. Particularly, watching the relationship between TFP and TOUR, we can observe only one unidirectional causality running from the TFP and TOUR (for the Dominican Republic) and three countries (Chile, Uruguay and Venezuela) with the opposite linkage. Moreover, we can notice that most of the results indicate the neutrality hypothesis among the variables for Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Nicaragua, Panama, Paraguay and Peru whilst surprisingly we do not have a bidirectional relationship. Regarding the dynamic Granger causality, we can observe only one two-way causality (for Bolivia) and two cases of dynamic causalities running from the TOUR to TFP linkage (for Ecuador and Nicaragua), whilst the opposite causality is obtained for Brazil and Uruguay. In addition, as we mentioned in traditional Granger causality findings, most of the outcomes unveil the neutrality hypothesis among the covariates for Argentina, Chile, Colombia, Costa Rica, The Dominican Republic, Guatemala, Honduras, Panama, Paraguay, Peru and Venezuela. Lastly, observing the findings for the time-varying Granger causality framework, we can notice that the one-way causality from TFP to TOUR is obtained for Argentina, Bolivia, Brazil, Uruguay and Venezuela, while the reverse linkage is confirmed for Chile, Ecuador and Nicaragua. Furthermore, the neutrality hypothesis is divulged for Colombia, Costa Rica, the Dominican Republic, Guatemala, Honduras, Panama, Paraguay and Peru, while the two-way connection is not revealed. Although there is no study, to the best of our knowledge, which employed the TFP index (the majority used economic growth) to explore the linkage between TFP and TOUR, on one hand, these findings are in tandem with Brida and Risso (2009) for Chile and Croes and Vanegas (2008) for Nicaragua. On the other hand, our results are not in line with Brida *et al.* (2011) for Brazil, with Brida and Monterubbianesi (2010) and Brida *et al.* (2009) for Colombia, with Brida *et al.* (2010) for Uruguay and finally, with Lionetti and González (2012) for Argentina, Chile, the Dominican Republic, Nicaragua and Venezuela.

Countries	Traditional causality		Dynamic causality		Time-varying causality	
	H: TOUR to TFP	H: TFP to TOUR	H: TOUR to TFP	H: TFP to TOUR	H: TOUR to TFP	H: TFP to TOUR
Argentina	0.966	0.566	0.984	0.26	0.665	0.1*
Bolivia	0.445	0.826	0.067*	0.016**	0.114	0.035**
Brazil	0.272	0.99	0.737	0.079*	0.555	0.098*
Chile	0.01***	0.143	0.342	0.528	0.074*	0.245
Colombia	0.166	0.489	0.962	0.839	0.966	0.745
Costa Rica	0.282	0.499	0.837	0.99	0.775	0.935
The Dominican Rep.	0.824	0.069*	0.634	0.905	0.771	0.348
Ecuador	0.785	0.963	0.089*	0.269	0.1*	0.413
Guatemala	0.241	0.953	0.85	0.361	0.932	0.265
Honduras	0.253	0.711	0.125	0.644	0.168	0.791
Nicaragua	0.133	0.748	0.025**	0.56	0.012**	0.648
Panama	0.896	0.555	0.481	0.492	0.639	0.529
Paraguay	0.811	0.139	0.669	0.41	0.621	0.386
Peru	0.811	0.139	0.669	0.41	0.621	0.386
Uruguay	0.034**	0.782	0.345	0.001***	0.389	0.00***
Venezuela	0.014**	0.913	0.759	0.443	0.576	0.042**

Note(s): Values in the table are the *p*-values. ***, ** and * denote significant at 1%, 5% and 10% level. The number of lags used to implement the test is equal to one

Source(s): Own elaboration

Table 3.
Causality test results

5. Discussion

Since we get the statistically significant pairs of time-varying causality, we check the form of the curve for each country. As we stressed above, we used only the statistically significant pairs of time-varying causality between the two variables. Therefore, and according to [Table 3](#), we consider eight countries: Argentina, Bolivia, Brazil, Chile, Nicaragua, Uruguay and Venezuela. The findings are pictured in [Figure 1](#). Particularly, interesting to observe is that the validity of the U-shaped curve is confirmed solely for Argentina, inverted U-shaped curve for Uruguay while the rest of the countries depict N-shaped or inverted N-shaped curve.

5.1 Theoretical implications

The plot of U-shaped curve means that TOUR increased in Argentina since the TFP increased. Uruguay shows an inverted U-shaped curve, this sign implies when TFP increases

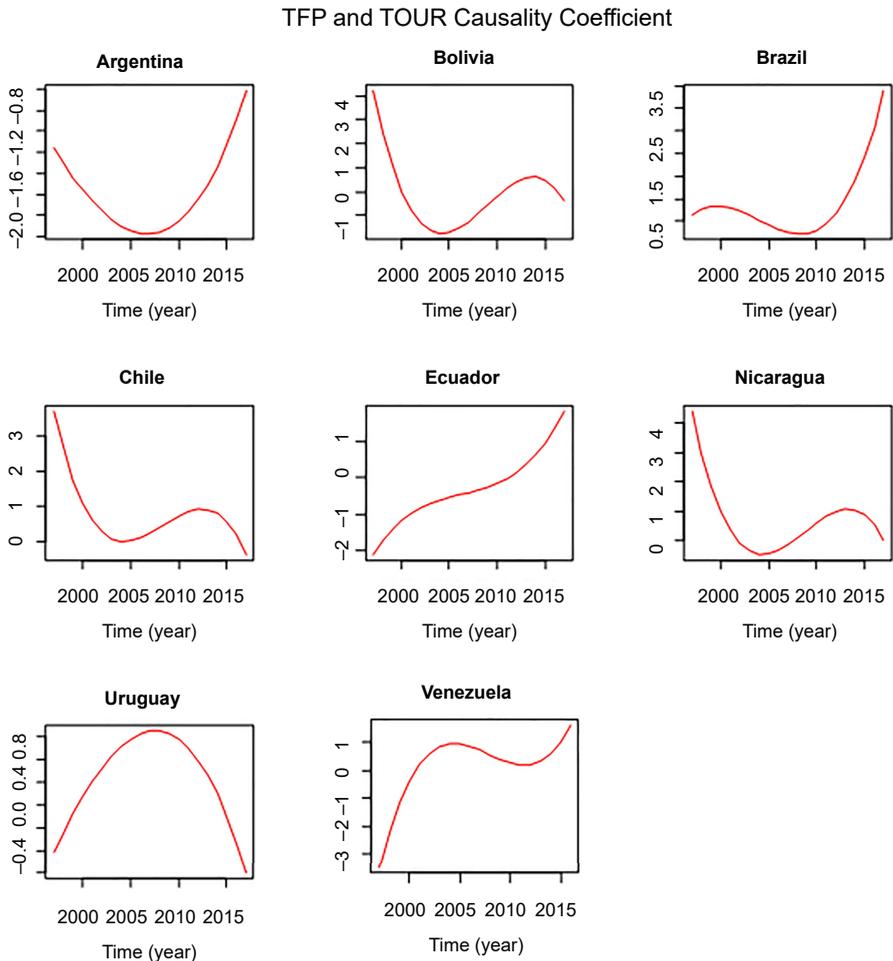


Figure 1.
Pseudo-curve causality

Source(s): Own elaboration

at the same time TOUR decrease up to a point in time the threshold stage of TFP is came and then tourism is decreasing. Concerning the N-shaped form for Brazil, Ecuador and Venezuela, this sign insinuates that when TFP grows, tourism initial move upward, afterward decrease when the left turning point and lastly increase since it reaches the right turning point. In addition, the N-shaped curve depicts the positive statistically significant effect of the TFP on TOUR in the long run. Lastly and regarding the inverted N-shaped curve indicated in Nicaragua, Chile and Bolivia, this sign implies that when the TFP grows, tourism initial move downward, afterward rises when the left turning point and lastly decreases since it reaches the right turning point. In addition, the N-shaped curve depicts the positive statistically significant effect of the TFP on tourism growth in the long-run.

5.2 Policy implications

In respect of the policy perspective, our study contains evidence with clear implications for LACs. TFP and tourism policies should be coordinated because they affect each other. TOUR seems to have effects on TFP while it is also affected by it. Therefore, the intensity of TFP long-run impacts is found powerful for most countries. It implies that policymakers should attach more importance to TFP in terms of TOUR policies. Additionally, the outcomes offer a convincing case, and under certain circumstances as an exceptional case, for the use of policy instruments such as targeted investment, marketing and the support of tourism organizations focused on driving a tourism-led-based productivity and/or tourism programs and projects. With respect to the labor and capital productivity angle, policymakers (countries) collaborating with tourist companies, can adopt pre-employment knowledge, supplying employees with tourism-linked skills and training. Hiring people with competent abilities and experience in tourist companies is useful for accumulating human capital and ameliorating the increase in tourist productivity. Moreover, the tourism-linked substructure is probably to be upgraded, assisting the accessibility of tourist locations. Hence, countries may determine a crucial key by directly investing in the substructure. Furthermore, given the actuality that growth in productivity might come from technological advancements and a competitive environment, countries could offer subsidies to the tourism industry and stipulate tourism-related environmental standards to support the espousal of advanced technology and to promote a regular tourism market.

5.3 Future research agenda

Finally, academics could improve our empirical contribution with additional research on the association between the TFP and TOUR nexus by applying different econometric tools (such as quantile causality or quantile regression) or/and encompassing extra variables (exchange rate, trade or globalization, among others).

6. Conclusions

There are many studies in the tourism literature examining the link between economic growth and TOUR with different methodologies and time periods. However, the focus is more on economic growth and not economic development. Our study, first, employed TFP (economic development) rather than economic growth and second, we show that previous studies have mostly relied on the standard Granger causality test to examine the dynamic link between the variables under examination. Although the standard form of Granger causality has the advantage of dependence on the stochastic behavior of series instead of the specific structural model, it is not able to capture the time-varying nature of causal nexus among the variables. Another challenging issue regarding the application of the standard Granger causality framework for examining the dynamic linkages of the variables is the assumption of the

parameter's stability. The test assumes that the parameters of the econometric model remain fixed over time. However, these issues could be moderated by a more stable Granger causality pattern. Hence, this research studies the connection between the TFP index and TOUR in LACs. To do this, we employ a data set of 16 LACs during the period 1995–2017 evaluating the time-varying causality of Ajmi *et al.* (2015). The nonlinear connection between these variables is confirmed for six countries. Precisely, studying the outcomes of the time-varying Granger causality, we can mention that the one-way causality from TFP to TOUR is obtained for Argentina, Bolivia, Brazil, Uruguay and Venezuela, while the opposite linkage is confirmed for Chile, Ecuador and Nicaragua. Finally, we investigated the graphs of the “curve causality”, and as it is demonstrated, our findings endorse the validity of the U-shaped curve for Argentina, inverted U-shaped curve for Uruguay, N-shaped curve for Brazil, Ecuador and Venezuela and inverted N-shaped curve for Bolivia, Chile and Nicaragua.

Notes

1. For an extensive literature review see, Pablo-Romero and Molina (2013) and Brida *et al.* (2016).
2. We discovered only two studies (Fayissa *et al.*, 2011; Lionetti and González, 2012) which proved the tourism and growth nexus.
3. The period for Venezuela is from 1995 to 2016 due to the availability of the dataset.
4. <http://datatopics.worldbank.org/world-development-indicators/>
5. M- and B-splines functions are nominated by Eilers and Marx (1996).
6. We implemented welfare relevant TFP level instead of TFP and the results are almost the same with slight differences. (These results are available upon request).

References

- Ajmi, A.N., Hammoudeh, S., Nguyen, D.K. and Sato, J.R. (2015), “On the relationships between CO₂ emissions, energy consumption and income: the importance of time variation”, *Energy Economics*, Vol. 49, pp. 629-638.
- Balaguer, J. and Cantavella-Jorda, M. (2002), “Tourism as a long-run economic growth factor: the Spanish case”, *Applied Economics*, Vol. 34 No. 7, pp. 877-884.
- Brida, J.G. and Monterubbianesi, D.P. (2010), “Causality between economic growth and tourism expansion: empirical evidence from some Colombian regions”, *Journal of Tourism Challenges and Trends*, Vol. 3 No. 1, pp. 153-164.
- Brida, J.G. and Risso, W.A. (2009), “Tourism as a factor of long-run economic growth: an empirical analysis for Chile”, *European Journal of Tourism Research*, Vol. 2 No. 2, pp. 178-185.
- Brida, J.G., Pereyra, S.J., Risso, W.A., Such-Devesa, M.J. and Zapata-Aguirre, S. (2009), “The tourism-led growth hypothesis: empirical evidence from Colombia”, *Tourismos: An International Multidisciplinary Journal of Tourism*, Vol. 4 No. 2, pp. 13-27.
- Brida, J.G., Lanzilotta, B., Lionetti, S. and Risso, W.A. (2010), “Research note: the tourism-led growth hypothesis for Uruguay”, *Tourism Economics*, Vol. 16 No. 3, pp. 765-771.
- Brida, J.G., Punzo, L.F. and Risso, W.A. (2011), “Research note: tourism as a factor of growth—the case of Brazil”, *Tourism Economics*, Vol. 17 No. 6, pp. 1375-1386.
- Brida, J.G., Cortes-Jimenez, I. and Pulina, M. (2016), “Has the tourism-led growth hypothesis been validated? A literature review”, *Current Issues in Tourism*, Vol. 19 No. 5, pp. 394-430.
- Chiu, Y.B. and Yeh, L.T. (2017), “The threshold effects of the tourism-led growth hypothesis: evidence from a cross-sectional model”, *Journal of Travel Research*, Vol. 56 No. 5, pp. 625-637.
- Croes, R. and Vanegas, Sr. M. (2008), “Cointegration and causality between tourism and poverty reduction”, *Journal of Travel Research*, Vol. 47 No. 1, pp. 94-103.

- Dahlhaus, R., Neumann, M.H. and von Sachs, R. (1999), "Nonlinear wavelet estimation of the time-varying autoregressive processes", *Bernoulli*, Vol. 5, pp. 873-906.
- Du, D., Lew, A.A. and Ng, P.T. (2016), "Tourism and economic growth", *Journal of Travel Research*, Vol. 55 No. 4, pp. 454-464.
- Eilers, P.H. and Marx, B.D. (1996), "Flexible smoothing with B-splines and penalties", *Statistical Science*, Vol. 11, pp. 89-102.
- Elliott, G., Rothenberg, T.J. and Stock, J.H. (1996), "Efficient tests for an autoregressive unit root", *Econometrica*, Vol. 64, pp. 813-836.
- Fayissa, B., Nsiah, C. and Tadesse, B. (2011), "Research note: tourism and economic growth in Latin American countries—further empirical evidence", *Tourism Economics*, Vol. 17 No. 6, pp. 1365-1373.
- Feenstra, R.C., Inklaar, R. and Timmer, M.P. (2015), "The next generation of the Penn world table", *American Economic Review*, Vol. 105, pp. 3150-3182, available at: www.ggd.net/pwt
- Flores-Muñoz, F., Báez-García, A.J. and Gutiérrez-Barroso, J. (2019), "Fractional differencing in stock market price and online presence of global tourist corporations", *Journal of Economics, Finance and Administrative Science*, Vol. 24 No. 48, pp. 194-204, doi: [10.1108/JEFAS-01-2018-0013](https://doi.org/10.1108/JEFAS-01-2018-0013).
- Granger, C.W. (1969), "Investigating causal relations by econometric models and cross-spectral methods", *Econometrica: Journal of the Econometric Society*, Vol. 37 No. 3, pp. 424-438.
- Granger, C.W. (1988), "Some recent development in a concept of causality", *Journal of Econometrics*, Vol. 39 Nos 1-2, pp. 199-211.
- Letta, M. and Tol, R.S. (2018), "Weather, climate and total factor productivity", *Environmental and Resource Economics*, Vol. 9, pp. 1-23.
- Li, K.X., Jin, M. and Shi, W. (2018), "Tourism as an important impetus to promoting economic growth: a critical review", *Tourism Management Perspectives*, Vol. 26, pp. 135-142.
- Lionetti, S. and González, O. (2012), "On the relationship between tourism and growth in Latin America", *Tourism and Hospitality Research*, Vol. 12 No. 1, pp. 15-24.
- Liu, H. and Tsai, H. (2018), "Total factor productivity growth and regional competitive analysis of China's star-rated hotels", *Tourism Economics*, Vol. 24 No. 6, pp. 625-644.
- Lucas, R.E. Jr (1988), "On the mechanics of economic development", *Journal of Monetary Economics*, Vol. 22 No. 1, pp. 3-42.
- Manrai, L.A., Manrai, A.K. and Friedeborn, S. (2018), "Environmental determinants of destination competitiveness and its Tourism Attractions-Basics-Context, ABC, indicators: a review, conceptual model and propositions", *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 50, pp. 425-449, doi: [10.1108/JEFAS-01-2018-0010](https://doi.org/10.1108/JEFAS-01-2018-0010).
- Mérida, A. and Golpe, A.A. (2016), "Tourism-led growth revisited for Spain: causality, business cycles and structural breaks", *International Journal of Tourism Research*, Vol. 18 No. 1, pp. 39-51.
- Netto, P., Trigo, A. and Gonzaga Godoi, L. (2015), *Tourism in Latin America*, Springer, Basel.
- Nguyen, C.P., Schinckus, C. and Su, T.D. (2020), "Economic policy uncertainty and demand for international tourism: an empirical study", *Tourism Economics*, Vol. 26 No. 8, pp. 1415-1430.
- Nguyen, C.P., Nhi, N.A., Schinckus, C. and Su, T.D. (2021a), "The influence of foreign direct investment on productivity: an institutional perspective", *Review of Development Finance*, Vol. 11 No. 1, pp. 35-45.
- Nguyen, C.P., Schinckus, C., Su, T.D. and Chong, F.H.L. (2021b), "The influence of tourism on income inequality", *Journal of Travel Research*, Vol. 60 No. 7, pp. 1426-1444.
- Pablo-Romero, M.D.P. and Molina, J.A. (2013), "Tourism and economic growth: a review of empirical literature", *Tourism Management Perspectives*, Vol. 8, pp. 28-41.
- Phillips, P.C. and Perron, P. (1988), "Testing for a unit root in time series regression", *Biometrika*, Vol. 75, pp. 335-346.

- Polemis, M.L., Tzeremes, P. and Tzeremes, N.G. (2021), "Hotels' occupancy rates and convergence: empirical evidence from the first pandemic wave", *Tourism Economics*, 13548166211049871, doi: [10.1177/13548166211049871](https://doi.org/10.1177/13548166211049871).
- Romer, P.M. (1986), "Increasing returns and long-run growth", *Journal of Political Economy*, Vol. 94 No. 5, pp. 1002-1037.
- Sánchez Carrera, E.J., Brida, J.G. and Risso, W.A. (2008), "Tourism's impact on long-run Mexican economic growth", *Economics Bulletin*, Vol. 23 No. 21, pp. 1-8.
- Sato, J.R., Morettin, P.A., Arantes, P.R. and Amaro, E. Jr (2007), "Wavelet based time-varying vector autoregressive modelling", *Computational Statistics and Data Analysis*, Vol. 51, pp. 5847-5866.
- Solow, R.M. (1956), "A contribution to the theory of economic growth", *The Quarterly Journal of Economics*, Vol. 70, pp. 65-94.
- Tang, C.F. and Abosedra, S. (2016), "Tourism and growth in Lebanon: new evidence from bootstrap simulation and rolling causality approaches", *Empirical Economics*, Vol. 50 No. 2, pp. 679-696.
- Tzeremes, P. (2021), "How do globalization indicators de jure–de facto and total factor productivity affect tourism development in European countries?", *Journal of Hospitality and Tourism Insights*, Vol. 4 No. 5, pp. 601-621, doi: [10.1108/JHTI-05-2020-0089](https://doi.org/10.1108/JHTI-05-2020-0089).
- Tzeremes, P. and Tzeremes, N.G. (2021), "Productivity in the hotel industry: an order- α malmquist productivity indicator", *Journal of Hospitality and Tourism Research*, Vol. 45 No. 1, pp. 133-150.
- Vella, M. (2018), "Employment and labour hoarding: a production function approach", *Journal of Economics, Finance and Administrative Science*, Vol. 23 No. 46, pp. 230-246, doi: [10.1108/JEFAS-07-2017-0079](https://doi.org/10.1108/JEFAS-07-2017-0079).

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