SPOUDAI Journal of Economics and Business, Vol. 73 (2023), Issue 1-2, pp. 42-63.

University of Piraeus

SPOUDAI
Journal of Economics and Business
Σπουδαί
http://spoudai.unipi.gr

The Tourism-Led Growth Hypothesis Revisited: A Managerial Perspective

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Abstract

The scope of this study is to provide fresh evidence on the Tourism-Led Growth Hypothesis (TLGH) using a panel of 142 countries spanning the period 1995-2018. The relevant work deviates from earlier studies by allowing the relationship between tourism and economic growth to take a non-specified and thus flexible functional form. The empirical results drawn from the Semi Parametric Fixed Effects Model (SPFEM) unveil a meaningful inverted-U-shaped relationship between tourism specialization and economic growth strongly supporting the TLGH. This signifies that a rise in tourism specialization proxied by tourism receipts fosters economic activity to a certain level, beyond which a further increase might result in an economic downturn. The empirical results survive robustness checks under the inclusion of two tourism specialization indicators and an alternative semi-parametric estimator. Lastly, significant policy implications are also discussed highlighting the role of competition in designing and implementing effective managerial strategies in the tourism industry.

JEL Classification: Z32, M10, C14, O47.

Keywords: Tourism; Economic growth; Competition; Strategy; Semi-Parametric Model

1. Introduction

During the last two decades, there has been a plethora of studies focusing on the uni-directional causality between tourism activity and economic growth (see Table 1). The first strand of literature investigates if there is a causal association between tourism and the development of economies by applying Granger causality tests (see for example Antonakakis et al, 2015; Belloumi, 2010). On the other hand, other researchers such as Dritsakis (2004), Kim, Chen, and Jang (2006), and Lee and Chien (2008) mention evidence for the justifiability of the existence of the growth hypothesis. Finally, Oh (2015), and Payne and Merval (2010), denote the existence of neutrality and conservation hypotheses concerning the tourism and growth relationship.

Shahbaz et al (2017), investigate the tourism-growth nexus in Malaysia using time series quarterly data over the period 1975–2013. The authors employ the augmented Solow production function, and the autoregressive distributed lag bounds procedure, they also incorporate trade openness and financial development and account for structural breaks in series. The results show evidence of cointegration between the variables. Assessing the long-run results using both indicators of tourism demand, it is noted that the elasticity coefficient of tourism is 0.13 and 0.10 when considering visitor arrivals and tourism receipts (in per capita terms), respectively. Notably, the impact of tourism demand is marginally higher with visitor arrivals. The elasticity of trade openness is 0.19, that of financial development is 0.09 and that of capital share is 0.15. In the short run, the coefficient of tourism is marginally negative, and for financial development and trade openness, it is 0.01 and 0.18, respectively. The Granger causality tests show bidirectional causation between tourism and output per capita, financial development, tourism, trade openness, and tourism demand, duly indicating the feedback or mutually reinforcing impact between the variables.

Table 1: Selected studies on the Tourism-Led Growth Hypothesis

Study	Period	Country / Region	Methodology	Key findings
Demiroz and Ongan (2005)	1980-2004	Turkey	Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Gunduz and Hatemi-J (2005)	1965-2002	Turkey	Cointegration and Granger Causality tests	Unidirectional Causal Relationship
Kaplan and Celik (2008)	1963-2006	Turkey	Cointegration and Granger Causality tests	Unidirectional Causal Relationship
Oh (2005)	1975-2001	South Korea	VAR, Cointegration and Granger Causality tests	Unidirectional Causal Relationship
Chen and Chiou-Wei (2009)	1975-2007	South Korea and Taiwan	Causal relationship test	Bidirectional Causal Relationship (South Korea), Unidirectional Causal Relationship (Taiwan)
Kreishan (2015)	1990-2014	Bahrain	ARDL	Unidirectional Causal Relationship
Mishra et al. (2011)	1978-2009	India	Cointegration and Granger Causality tests	Unidirectional Causal Relationship
Payne and Mervar (2010)	2000 to 2008	Croatia	Toda and Yomamoto causality test	Unidirectional Causal Relationship
Khalil et al. (2007)	1960 to 2015	Pakistan	VECM, Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Lee and Chien (2008)	1959-2003	Taiwan	Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Kim et al. (2006)	1971 - 2003 and 1956-2002	Taiwan	Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Cortes-Jimenez et al. (2009)	1954-2000, 1964-2000	Italy and Spain	Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Karticioglu, (2009)	1960-2006	Turkey	ARDL Bounds testing	No causal relationship
Arslanturk et al. (2011)	1963-2006	Turkey	Cointegration and Granger Causality tests	No causal relationship

Kasimati (2011)	1960-2010	Greece	VECM, Cointegration and Granger Causality tests	No causal relationship
Po and Huang (2008)	1995-2005	88 countries	Non linear relationship	TLGH
Chiu and Yeh (2016)	1995-2008	89 countries	Threshold regression model	TLGH
Lanza et al. (2003)	1977-1992	13 OECD countries	Cointegration and causality tests	TLGH
Sequiera and Nunes (2008)	1980-2002	90 countries	Panel regression	TLGH
Lee and Chang (2008)	1990-2002	23 OECD and 32 non-OECD countries	Cointegration and causality tests	TLGH for OECD. Bidirectional for non-OECD
Cardenas-Garcia et al., (2015)	1991-2010	144 countries	Panel regression	TLGH
Cortes-Jimenez et al. (2010)	1990-2004	Spain and Italy	Cointegration and multivariate Granger causality tests	TLGH
Nissan et al. (2011)	2000-2005	11 developed countries	OLS	TLGH
Seetanah (2011)	1990-2007	19 island economies	GMM, Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Seghir et al. (2015)	1988-2012	49 countries	Cointegration and Granger Causality tests	Bidirectional Causal Relationship
Tugcu (2014).	1988-2011	Mediterranean countries	Cointegration and Granger Causality tests	Bidirectional for European countries, TLGH for Asian, No relationship for African countries
Apergis and Payne (2012)	1995-2007	9 Caribbean countries	Panel Error Correction, Cointegration, and Granger Causality tests	Bidirectional Causal Relationship

The results of this line of research are sensitive to the sample period, model specification, variables selected, frequency of observations, the methodological approach applied, and country/countries involved, although most of the studies support the TLGH (see among others Brida, Sanchez, and Risso, 2008; Gunduz and Hatemi-J, 2005; Sahli and Nowak, 2007; Tugcu, 2014).

However, several studies (Oh, 2005; Payne and Mervar, 2010) have identified the reverse effect, that economic development boosts tourism expansion. This hypothesis called the growth-led tourism hypothesis, postulates that the sustained economic growth of a country facilitates the development of the tourism sector in that country. As resources become available for tourism infrastructure, the positive economic climate encourages the proliferation of tourism activities, and international tourists are also attracted by the country's economic vitality. In addition, several contributions show a reciprocal influence on economic growth and tourism development, thus suggesting a mutually reinforcing effect between tourism and economic growth (Chen and Chiou-Wei, 2009; Dritsakis, 2004; Kim, Chen, and Jang, 2006; Zaman, et al, 2016). Finally, some studies observed no evidence of a significant relationship between tourism activity and economic growth in different countries (Brida, et al, 2011; Katircioglu, 2009).

The results of these studies suggest directional, unidirectional, or bidirectional causal relationships. An earlier study was conducted by Balaguer and Cantavella-Jorda (2002) for Spain over the period 1975-1997. Conducting Granger causality and cointegration tests, the study verifies the existence of TLGH.

To this end, our study contributes to the existing literature by adopting for the first time to the best of our knowledge, a semi-parametric fixed effects model described in Baltagi and Li (2002) to properly account for the imposition of possible nonlinear effects of tourism specialization on economic growth. The model properly accounts for the existence of two-way fixed effects (e.g., country and time) to eliminate the bias arising from two related sources.

We supplement our analysis by using several robustness checks (i.e., inclusion of several tourism demand indicators, and estimation of an alternative semi-parametric model) to test and secure the validity of the empirical analysis. The reason for relying on a "*hybrid*" econometric model consisting of a parametric and a nonparametric part, stems from the fact that only in rare cases, does the economic theory imply a particular functional form for an empirical model specification (Lokshin, 2006). Besides an incorrect parameterization of the regression equation might result in inconsistent estimates (Tran and Tsionas, 2010). Moreover, relying on parametric (linear) specifications, one may specify the correct functional form when testing for moderation effects. The latter has increased the need for the application of non/semi-parametric regression models (see for example Assaf et al, 2020; Su and Ullah, 2011; Henderson et al, 2008).

The remainder of the paper unfolds as follows. Section 2 discusses the most related studies on the TLGH. Section 3 describes the data and the methodology applied alongside the necessary cross-section dependence, stationarity, and cointegration testing. Section 4 presents the empirical findings and the robustness checks. Finally, Section 5 concludes the paper by providing some useful policy implications.

2. Theoretical framework

The empirical model used in this study is based on the augmented Solow growth model as it has been modified by Barro (1991) and Barro and Sala-i Martin (2003). The theoretical model relies on a classical Cobb-Douglas three-factor production function characterized by constant scale returns given as follows:

$$Y(t) = K(t)^{a} H(t)^{\beta} (A(t)L(t))^{1-a-\beta} \tag{1}$$

where Y denotes the total output (GDP), K reports the physical capital, H denotes the human capital, A is the technological level, and L is the labor. The parameters α and β denote the elasticities related to physical and human respectively. If we use dynamics, Eq.1 becomes:

$$\dot{K}(t) = s_k Y(t) - \delta K(t) \tag{2}$$

$$\dot{L}(t) = nL(t) \tag{3}$$

$$\dot{A}(t) = gA(t) \tag{4}$$

$$\dot{H}(t) = s_h Y(t) - \delta H(t) \tag{5}$$

Where s_k denotes the shares of income invested in physical capital, s_h are the shares invested in human capital, n is the rate of labor growth, g is the technological progress, and δ is the depreciation rate.

Taking logarithms, Mankiw, et al, (1992), transform the above equations into the following (reduced-form) estimated model expressed in a steady-state equilibrium:

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln(A(0)) + gt - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta)\ln(s_k) + \frac{\beta}{1-\alpha-\beta}\ln(s_h) \quad (6)$$

3. Data and methodology

3.1 Sample selection and variables

In this study, we have used the annual data of 142 countries spanning the period 1995-2018 (see Table A1 in the Appendix).[1] We collected the annual data for per capita (initial) GDP (constant 2010 US$), GDP per capita growth rate (annual %), trade flows (% of GDP) as a proxy for trade openness, general government final consumption expenditure (in US$) and gross domestic savings (in US$) from the World Development Indicators database.

Data for international tourism receipts (in US$), tourism receipts for travel items (in US$), and number of arrivals are obtained from the World Tourism Organization, Yearbook of Tourism Statistics, and Compendium of Tourism Statistics. To proxy for human capital, we use life expectancy at birth (in years).[2] The total fertility rate (in births per woman) is employed in the empirical model to account for the population effect. The associated coefficient comes with a negative sign on the steady-state ratio of capital to the effective worker in the neoclassical growth model (Adamou and Clerides, 2009). The last two variables are also obtained from the World Development Indicators database. Moreover, we use lagged real per capita GDP (in logs) as a proxy for physical capital. Summary statistics for the sample variables are reported in Table 2.

Table 2: Summary statistics

Variable	Observations	Mean	Standard Deviation	Min	Max
Y	3,355	2.368	4.620	-62.38	121.8
log (TR)	3,346	20.68	2.317	13.59	26.75
log (TR)^2	3,346	9.151	0.688	6.810	10.80
log (TRTI)	3,330	20.51	2.361	11.51	26.61
log (TRTI)^2	3,330	9.099	0.707	5.971	10.77
log (TA)	3,215	14.15	1.993	8.556	19.84
log (TA)^2	3,215	6.989	0.751	4.608	8.927
log (GDP)	3,345	8.534	1.424	5.212	11.43

[1] Many studies on growth use five or even ten-year non overlapping averaged observations to isolate business cycle influences and to minimize the impact of measurement errors (see Adamou and Clerides, 2009). However, Bassanini et al., (2001) argue that the lack of synchronicity in country business cycles does not purge five-year averages from cyclical effects. Based on that and due to the limited time length of the sample, we use annual data like previous related studies (see for example Chiu and Yeh, 2016).

[2] The stock of human capital is typically proxied using measures of educational attainment (i.e., school enrolment) and health indicators such as life expectancy at birth (Adamou and Clerides, 2009).

log (FER)	3,363	0.947	0.487	-0.0233	2.044
log (TRD)	3,188	4.264	0.604	-1.787	6.081
log (CON)	3,044	2.690	0.388	-0.0930	4.129
log (LIFE)	3,364	4.232	0.141	3.613	4.433
log (DS)	2,839	23.01	2.651	10.65	29.46

Notes: Y denotes the GDP per capita growth rate (annual %), TR denotes international tourism receipts (in US$), TRTI denotes the international tourism receipts for travel items (in US$), TA denotes the international tourist arrivals (in numbers), GDP denotes the per capita GDP (constant 2010 US$), FER is the total fertility rate (in births per woman), TRD denotes the trade flows (% of GDP), CON denotes the general government final consumption expenditure (in US$), LIFE denotes the life expectancy at birth (in years) and finally DS is the gross domestic savings (in US$).

3.2 Stationarity and cointegration testing

Before applying unit root tests, we need to check for the applicability of the second-generation unit root tests. Specifically, one of the additional complications that arise when dealing with panel data compared to the pure time-series case is the possibility that the variables or the random disturbances are correlated across the panel dimension. The early literature on unit root and cointegration tests adopted the assumption of cross-sectional independence (Kyung et al., 2003; Pesaran, 2003; 2004; 2015).

In this pursuit, we must check the possibility of cross-sectional dependence in the data. This comes straightforward since the implementation of second-generation panel unit root tests is desirable only when it has been established that the panel is subject to a significant degree of residual cross-section dependence (Apergis et al, 2021). In doing so, we have applied Chudik and Pesaran (2015) weak cross-sectional dependence test. The null hypothesis reveals that cross-sections of the panel data are weakly dependent on each other. The empirical results of the Chudik and Pesaran (2015) cross-section test are reported in Table 3.

We find that cross-sectional dependence is significantly present between the variables in the model. As is evident from Table 2, the relevant test strongly rejects the null hypothesis of cross-section independence (P-values = 0.000). In the face of this evidence, we proceed to test for unit roots using tests that are robust to cross-section dependence (i.e., second-generation tests for unit roots in panel data). The presence of cross-sectional dependence leads us to apply second-generation unit root tests to test the stationarity properties of the variables.

Table 3: Cross-section dependence tests

	Pesaran (2004)		Chudik and Pesaran (2015)		
Variables	**Test statistic**	**p-value**	**Variables**	**Test statistic**	**p-value**
GR	72.52***	0.000	GR	72.480***	0.000
log (TR)	331.291***	0.000	log (TR)	268.578***	0.000
log $(TR)^2$	330.81***	0.000	log $(TR)^2$	266.519***	0.000
log (TRTI)	338.608***	0.000	log (TRTI)	273.667***	0.000
log $(TRTI)^2$	337.86***	0.000	log $(TRTI)^2$	271.280***	0.000
log (TA)	319.484***	0.000	log (TA)	220.679***	0.000
log $(TA)^2$	318.948***	0.000	log $(TA)^2$	218.384***	0.000
log (GDP)	312.745***	0.000	log (GDP)	310.396***	0.000
log (FER)	155.791***	0.000	log (FER)	155.866***	0.000
log (TRD)	60.514***	0.000	log (TRD)	56.049***	0.000
log (CON)	26.888***	0.000	log (CON)	26.529***	0.000
log (LIFE)	420.544***	0.000	log (LIFE)	411.832***	0.000
log (DS)	229.955***	0.000	log (DS)	188.270***	0.000

Notes: Under the null hypothesis of cross-sectional independence the Pesaran (2004) test ("*CD test*"), follows a two-tailed standard normal distribution. The Chudik and Pesaran (2015) test, checks the residuals for weak cross-sectional dependence in a panel data model. Under the null hypothesis, the residuals are weakly cross-sectional dependent. ***1% level of statistical significance.

For checking the order of integration of the variables, we have applied the cross-sectional Im-Pesaran-Shin (CIPS) and cross-sectionally augmented Dickey-Fuller (CADF) unit root tests developed by Pesaran (2007). These tests are second-generation unit root tests assuming the cross-sectional dependence in a panel dataset. The CIPS test is an extension of Im-Pesaran-Shin (IPS) (2003) with a single factor containing heterogeneous loading across the cross-sections. It is a cross-sectionally augmented IPS Dickey-Fuller type test considering the cross-sectional means of the level and lagged differences to IPS-type regression. In this case, the null hypothesis of homogeneous non-stationary is tested against the alternate hypothesis of heterogeneous alternatives. On the other hand, the PESCADF test is based on the mean of the augmented Dickey-Fuller (ADF) t-statistic of every panel member. The null hypothesis is that all the variables in the panel are non-stationary, whereas the alternative hypothesis of only a section of the series is stationary (see also Maddala and Wu, 1999). The empirical results of CIPS tests are reported in Table 4. We find that all the variables contain unit root in the presence of cross-sectional dependence. After the first difference, all the variables are stationary. This reveals that all the variables are integrated of order one (I-1).

Table 4: Second-generation panel unit root tests

Variables	*Fisher test*		*PESCADF test*	
	Level	*First Difference*	*Level*	*First Difference*
GR	270.33 [0.681]	392.43*** [0.000]	1.323 (lags = 2) [0.907]	-32.331*** (lags = 1) [0.000]
log (TR)	303.44 [0.161]	366.32*** [0.000]	0.353 (lags = 3) [0.638]	-8.349*** (lags = 2) [0.000]
log $(TR)^2$	262.0306 [0.798]	367.17*** [0.000]	0.257 (lags = 3) [0.601]	-8.576*** (lags = 2) [0.000]
log (TRTI)	247.31 [0.933]	370.80*** [0.000]	-0.825 (lags = 3) [0.205]	-8.479*** (lags = 2) [0.000]
log $(TRTI)^2$	202.77 [0.999]	367.94*** [0.000]	-1.138 (lags = 3) [0.127]	-8.522*** (lags = 2) [0.000]
log (TA)	136.42 [1.000]	803.89*** [0.000]	-0.785 (lags = 3) [0.215]	-8.165*** (lags = 1) [0.000]
log $(TA)^2$	142.77 [1.000]	812.18*** [0.000]	-1.158 (lags = 3) [0.129]	-8.107*** (lags = 1) [0.000]
log (GDP)	241.548 [0.9533]	698.913*** [0.000]	1.185 (lags = 2) [0.908]	-3.223*** (lags = 2) [0.001]
log (FER)	491.53*** [0.000]	345.14*** [0.000]	1.985 (lags = 1) [0.965]	3.514*** (lags = 1) [0.000]
log (TRD)	256.71 [0.739]	945.07*** [0.000]	1.851 (lags = 1) [0.968]	-14.420*** (lags = 1) [0.000]
log (CON)	227.92 [0.947]	863.54*** [0.000]	2.492 (lags = 1) [0.994]	-15.754*** (lags = 1) [0.000]
log (LIFE)	355.30*** [0.002]	469.027*** [0.000]	0.414 (lags = 3) [0.925]	-22.204*** (lags = 1) [0.000]
log (DS)	240.41 [0.481]	602.33*** [0.000]	0.256 (lags = 3) [0.968]	-18.625*** (lags = 2) [0.000]

Notes: The Fisher test combines the p-values from N-independent unit root tests, as developed by Maddala and Wu (1999). The relevant test assumes that all series are non-stationary under the null hypothesis against the alternative that at least one series in the panel is stationary (Kyung et al., 2003). The lag order (L) for the Fisher test is set at L = 6. The PESCADF performs the t-test for unit roots in heterogeneous panels with cross-section dependence, as proposed by Pesaran (2003). The null hypothesis assumes that all series are non-stationary at least for one country. The constant term is included in PESCADF test. The number in brackets denotes P-values. **5% level of statistical significance, ***1% level of statistical significance.

3.3 Methodology

We use the Baltagi and Li (2002) flexible semiparametric fixed-effects estimator, which has been widely used in empirical analysis. This approach considers a linear fixed-effects model allowing for a non-parametric specification for one particular regressor (e.g., tourism specialization).[3] In this way, our model, avoids any pre-determined assumption regarding the functional form (e.g., "*inverted U*" or "*N shape*") of the tourism-growth nexus, while, it allows the data to guide the empirical research in contrast to most of the tourism and hospitality literature (see Assaf et al, 2020).

The relevant estimator prevails with the originally developed estimator by Li and Stengos (1996), which works well only for finite samples (i.e., 50 and 100 observations, and a time span of up to three years). Moreover, it estimates the original unknown function of the model and not the function that arises after the first differencing (Kasioumi and Stengos, 2020).

Alternatively, one could also employ nonparametric regression models that can be used to estimate relationships between sample variables with minimal assumptions on the underlying functional forms. However, such an approach has several limitations including the estimation of many parameters (e.g., the curse of dimensionality), which in many cases leads to a computationally-intensive problem. Therefore, the estimation of a fully nonparametric equation is less practical in samples of moderate to large sizes, creating significant distortions (Avila, 2020). For the above reasons, we rely on a semiparametric method, namely the SPFEM, which combines the flexibility of nonparametric regressions with the structure of standard parametric models, reducing the curse of dimensionality and the computational cost of model selection and estimation (Kasioumi and Stengos, 2020; Baltagi and Li, 2002).

Let the model be given by the following equation:

$$y_{it} = a_i + x_{it}^T \beta + w_{it}\gamma + f(z_{it}) + \varepsilon_{it} \tag{7}$$

where $f(\cdot)$ is an unknown function of z_{it} (tourism specialization), entering the model in a non-parametric way. Y_{it} is the dependent variable namely the GDP growth. X_{it} is the vector of exogenous linear regressors including per capita GDP, fertility rate, trade openness, general government final consumption expenditure, life expectancy at birth, and gross domestic savings, while the w-vector includes the year dummy variables, and ε_{it} are zero mean i.i.d. innovations. Moreover, we assume that the error term is uncorrelated with the unknown function $f(\cdot)$.

Following Baltagi and Li (2002), we approximate $f(z_{it})$ by series differences $p^K(z_{it})$ where the latter is the first k terms of a sequence of functions $[p_1(z), p_2(z), \dots]$.

By taking the first differences to remove fixed effects, we end up with the following equation:

$$\Delta(y_i) = \Delta(x_i^T)\beta + \Delta(w_i)\gamma + \Delta\{p^k(z_\iota)\}\delta + \Delta(\varepsilon_\iota) \tag{8}$$

In the next step, we use the fitted fixed effects $\hat{a}_i$ to estimate the error component residual of Eq.2. Thus, we have:

$$\hat{u}_{it} = y_{it} - x_{it}^T\hat{\beta} - w_{it}\hat{\gamma} - \hat{a}_i = f(z_{it}) + \varepsilon_{it} \tag{9}$$

[3] We used the "*xtsemipar*" command in STATA ver. 15 developed in Libois and Verardi, (2013).

The non-parametric part (fz_{it}) is approximated by a spline interpolation, which yields similar results to the classical Epanechnikov-kernel-weighted local polynomial fit but is recommended to approximate complex non-linear shapes and does not suffer from Runge's phenomenon (Li and Racine, 2006; Newson, 2000).

Lastly, it is important to use both time and individual (country) fixed effects in our analysis to mitigate biases that stem from two potential sources (see also Kasioumi and Stengos, 2020). Our analysis controls for some unobserved factors that differ over time but are constant over space (e.g., countries) such as different tourism specialization (time effects) as well as for factors that vary across countries but are constant over time (individual effects).

4. Results and discussion

This section presents the empirical findings of the econometric analysis. We begin by estimating a parametric quadratic model that will be contrasted with the semi-parametric model. Then, the analysis focuses on sensitivity analysis and the necessary robustness checks to strengthen the validity of our findings. The latter accounts for the inclusion of two alternative tourism specialization indicators, namely the tourism receipts for travel items and the number of arrivals as well as the application of another semi-parametric model (partially linear regression model).

4.1 Parametric results

Following earlier works (see among others Adamou and Clerides, 2009; Chiu and Yeh, 2016), we estimate the following simple (semi-log) parametric regression model:

$$\begin{aligned} Y_{it} &= \theta_1 TR_{it} + \theta_2 TR_{it}^2 + \beta_1 \log(GDP_{it}) + \beta_2 \log(FER_{it}) + \beta_3 \log(TRD_{it}) + \beta_4 \log(CON_{it}) \\ &+ \beta_5 \log(LIFE_{it}) + \beta_6 \log(DS_{it}) + n_i + \mu_t + u_{it} \end{aligned} \tag{10}$$

Where Y denotes the GDP per capita growth rate (annual %), TR denotes the international tourism receipts a proxy for the degree of tourism specialization (in US$), GDP denotes the per capita GDP (constant 2010 US$), FER is the total fertility rate (in births per woman), TRD denotes the trade flows (% of GDP), CON denotes the general government final consumption expenditure (in US$), LIFE denotes the life expectancy at birth (in years) and finally, DS is the gross domestic savings (in US$). All explanatory variables are expressed in natural logarithms. To account for the unobserved heterogeneity, we control for country and time-fixed effects. n_i is the unit-specific residual that differs between countries but remains constant for any country (country dummies), while μ_t captures the time effect (time dummies) and therefore differs across years but is constant for all sample countries in a particular year. The parametric model was estimated using both fixed and random effects, but the random effects estimator was rejected based on the Hausman test. We thus report fixed effects estimates only.

Table 5 presents the results obtained by the parametric specification that will be contrasted with the SPFEM. Nearly all the variables are statistically significant when we control for individual country and time-fixed effects respectively (see columns 1 and 2). The magnitude and the sign of the estimates are on average in line with previous related works (see for example Adamou and Clerides, 2009; Shahdaz et al, 2017).

Table 5: Parametric fixed effects results

Dependent variable: *GDP growth*	**(1)**	**(2)**	**(3)**
Tourism receipts	-4.356** (1.781)	-2.729*** (0.972)	-0.571 (2.279)
Tourism receipts squared	13.22** (5.198)	8.973*** (3.216)	2.031 (6.542)
Lag of initial GDP	-0.731*** (0.240)	-0.882*** (0.164)	-0.597*** (0.227)
Fertility rate	-4.668*** (1.018)	-2.928*** (0.474)	-4.608*** (0.915)
Trade openness	2.268*** (0.705)	0.857*** (0.266)	1.693*** (0.599)
Government consumption	-1.990* (1.061)	-1.158** (0.454)	-1.133 (0.785)
Life expectancy at birth	-11.25*** (3.295)	-3.201** (1.590)	-3.671 (3.304)
Gross domestic savings	0.693** (0.291)	0.311** (0.122)	0.657** (0.291)
Observations	2,759	2,759	2,759
Country Fixed Effects	Yes	No	Yes
Time Fixed Effects	No	Yes	Yes
F-statistic (Wald)	-	394.18*** [0.000]	13.56*** [0.000]
Within R-squared	0.0628	0.193	0.201

Notes: Country and time-fixed effects are included but not reported for brevity. The number in parentheses reports robust standard errors. The numbers in brackets are the corresponding P-values. *10% level of statistical significance, **5% level of statistical significance, ***1% level of statistical significance.

The variable of interest (TR) seems to exhibit a non-linear U-shaped effect since the estimated coefficients alternate in signs starting from negative to positive. However, when we jointly control for country and time-fixed effects (see column 3), the nonlinearity pattern vanishes, since the relevant coefficients are no longer statistically significant. The rest of the estimated coefficients provide mixed results, with the government consumption (CON) and life expectancy at birth (LIFE) showing a negative though not statistically significant correlation with the level of economic growth.

Next, we apply the Härdle and Mammen (1993) specification test to assess if the nonparametric fit can be approximated by a parametric adjustment of a second-order polynomial as expressed in Eq. 10. The reason for setting the polynomial order to two instead of a higher order can be justified by the fact that previous studies unveil quadratic effects when examining the TLGH (Zuo and Huang, 2017). The null hypothesis of the test denotes that the parametric model could be justified and thus is preferable to the non-parametric specification. The test relies on 100 wild bootstrap replicates to get the p-values. Based on the test results, the parametric specification is rejected with a p-value equal to zero. Therefore, the null hypothesis is rejected, supporting the validity of the semi-parametric specification against the parametric (quadratic) model. In other words, we argue that the semi-parametric model employed in this study offers the best specification for our research design and we proceed to present the results from this model.

4.2 Semi-parametric results

Having rejected the parametric specification of the tourism-growth nexus we proceed to estimate the two-way fixed effects panel data model developed in Baltagi and Li (2002) by allowing the tourism specialization proxied by three variables, namely TR, TRTI, and TA to enter non-parametrically in the model.

Table 6 presents the regression results drawn from the (semi-log) SPFEM. In column 1, the tourism receipts (TR) are expressed nonparametrically, while column 2 reports the results when tourism receipts for travel items (TRTI) enter the model nonlinearly. Lastly, column 3 presents the estimated coefficients when the third tourism indicator denoted by TA (e.g., number of arrivals) is used as the unknown function.

We argue that most of the independent variables are statistically significant and have the appropriate signs in nearly all the specifications. The level of physical capital proxied by the lagged value of per capita GDP is negatively correlated with the level of economic growth as expected. The magnitude of the estimated coefficient is -0,631 on average, indicating that holding all other constant, a 10% increase in the physical capital downturns the economic activity by nearly 0,06 units. The impact is less pronounced when the number of arrivals enters the model in a nonparametric way (see column 3).

The effect of the population (logFER) on economic growth comes with a negative sign, revealing that for every 10% increase (decrease) in the fertility rate, the GDP growth rate decreases (increases) by about 0,069 units on average.

Table 6: Semi-parametric fixed effects results

Dependent variable: GDP growth (Y_t)	**(1)**	**(2)**	**(3)**
logged GDP per capita (lagged once): *log(GDP$_{t-1}$)*	-0.673^{***} (0.168)	-0.662^{***} (0.167)	-0.558^{***} (0.173)
Fertility rate: *log(FER$_t$)*	-7.099^{**} (2.892)	-7.034^{**} (2.889)	-6.677^{**} (2.957)
Trade openness: *log (TRD$_t$)*	0.484 (0.419)	0.505^{*} (0.418)	0.407 (0.422)
Government consumption: *log(CON$_t$)*	-1.706^{**} (0.729)	-1.723^{**} (0.729)	-1.907^{**} (0.758)
Life expectancy at birth: *log(LIFE$_t$)*	-5.795 (11.779)	-6.068 (11.77)	-7.130 (12.00)
Gross domestic savings: *log(DS$_t$)*	1.617^{***} (0.213)	1.609^{***} (0.212)	1.944^{***} (0.221)
Diagnostics and testing			
Observations	2,590	2,590	2,474
Country Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Within R-squared	0.221	0.222	0.233
Root MSE	3.415	3.412	3.415

Notes: Country and time-fixed effects are included but not reported for brevity. The number in parentheses reports the robust standard errors using the Huber/White/sandwich estimator. The number in brackets is the corresponding P-values.*10% level of statistical significance, **5% level of statistical significance, ***1% level of statistical significance.

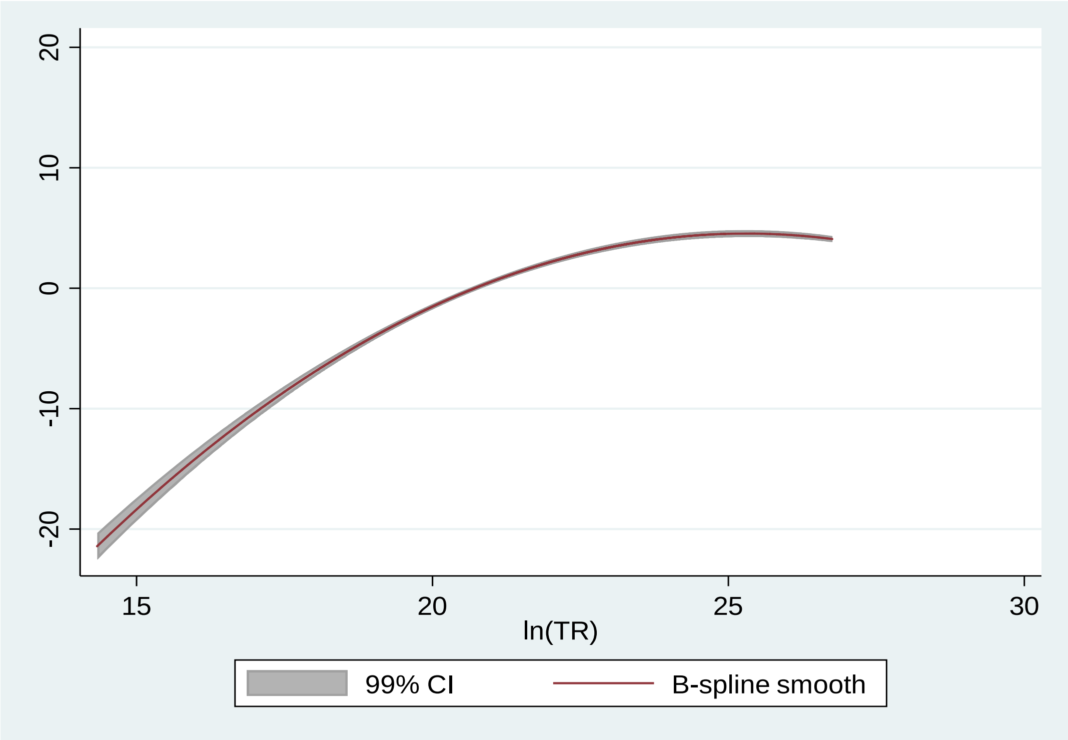
The level of trade openness exerts a positive though not statistically significant impact on long-run growth in two of the three specifications (see columns 1 and 3), while the extent of government intervention in the economy measured as the ratio of general government final consumption (logCON) has a negative and statistically significant effect. The impact of human capital on economic growth appears to be negative though not statistically significant, while the government size proxied by the gross domestic savings (logDS) is a long-run growth accelerator in all three models.

The graphical representation of the semi-parametric estimation of the unknown function $f(\cdot)$ along with the 99% confidence bands is shown in Figure 1. As it is evident, the relationship between tourism specialization proxied by tourism receipts (in logged terms) and GDP growth rate is nonlinear.[4] From a closer look at the relevant curvature, it is obvious that a "*hump*"

[4] We have also included in the nonparametric part of the Eq.7 the other two tourism specialization indicators (tourism receipts for travel items and number of arrivals) and the relevant curvatures exhibit a similar "*inverted-U*" shape. To preserve space the figures are available from the author upon request.

shaped relationship ("*inverted U-shaped*" curve) prevails between tourism specialization and economic growth. This means that at the early stages of economic development (increasing part of the curve), an increase in tourism specialization impacts positively the level of economic growth inducing an "*accelerator*" effect. The opposite holds when the economy is on the other side of the curve (e.g., the downward part).

Figure 1: Nonparametric estimates of tourism receipts (TR)



Notes: The vertical axis represents the growth rate of GDP (%), while the horizontal axis measures the tourism receipts expressed in logged terms. The maroon curve illustrates the semi-parametric estimation of logged tourism receipts (lnTR). The B-splines of power (degree) two were used to perform the nonparametric fit. The gray shaded area denotes the 99% confidence bands. The type of standard error reported is corrected using the Huber/White/sandwich estimator.

The study now focuses on possible explanations from the industry side justifying the (concave) nonlinear pattern of the curve. Specifically, when the economy starts to grow along with the rise in tourism demand, the government tries to support industrial growth by providing them with domestic credit. This industrial growth fueled by the flow of domestic credit is also catalyzed by the government size, which can be characterized by the government budget. In such a situation, when the economy opens, the native industries encounter stiff competition from their foreign competitors. Therefore, while helping the economy to grow, globalization also helps the native industries to become stronger, and the flow of domestic credit plays a crucial role in making these industries stronger. When these industries start to mature and self-sustain, they try to attract foreign direct investments, and thereby, their reliance on domestic credit goes down.

When the international tourism receipts rise, then the return on investment for the domestic industries will rise, and this inflow of international tourism receipts will help the industries to reduce their dependence on domestic credit. Based on the exchange rate differential, it will be easier for the domestic allied industries to repay the interest payment on domestic credit, and thereby, they will gradually move towards financial independence. Maintaining and uplifting the quality of service might bring them international collaborative opportunities, which will help them self-sustain. As a result, these industries will augment the tourism development in these nations, alongside strengthening the level of the industrial competitiveness of the industry.

It is worth mentioning that owing to tourism development, the nations can experience industrial development, which can strengthen their financial development by reducing the dependence on domestic credit and increasing the inflow of foreign currency into the economy. This explains the inverted U-shaped relationship between tourism specialization and economic growth.

4.3 Sensitivity analysis

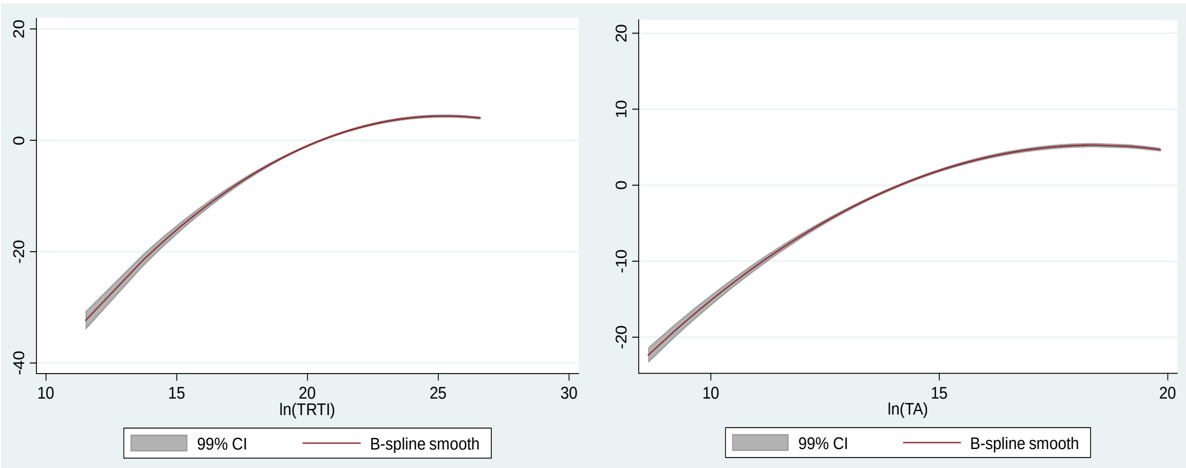
This section presents the necessary robustness checks to secure the validity of the empirical findings. The present study employs another semi-parametric methodology namely the Partially Linear Regression Model (PLRM) developed in Yatchew, (1998) to test and confirm the empirical findings obtained by the SPFEM. Moreover, we have used two other indicators accounting for tourism specialization, namely tourism receipts for travel items and the number of arrivals.

4.3.1 Robustness checks: Different indicators of tourism demand

We test the robustness of our findings by introducing two additional variables. The relevant variables are tourism receipts for travel items (TRTI) and the number of arrivals (TA). Both variables control for the impact of tourism demand on economic growth and are used widely by similar studies (see for example Zuo and Huang, 2017; Zaman et al, 2016 Chiu and Yeh, 2016).

It is evident from Figure 2 that both explanatory variables (expressed in natural logarithms) exhibit a non-linear relationship against the level of economic growth. If we closely look at the curvatures, we can see that an "*inverted-U*" shape correlation between tourism specialization proxied by the two relevant indicators and economic growth is evident.

Figure 2: Nonparametric estimates of alternative indicators (TRTI and TA)



Notes: The vertical axis represents the growth rate of GDP (%), while the horizontal axis measures the tourism receipts for travel items (left panel) and the number of tourist arrivals (right panel) both variables expressed in logged terms. The maroon curves illustrate the semi-parametric estimation of tourism receipts for travel items (left panel) expressed in logged terms (lnTRTI) and tourist arrivals (right panel) expressed in logged terms (lnTA). The B-splines of power (degree) two were used to perform the nonparametric fit. The gray shaded area denotes the 99% confidence bands. The type of standard error reported is corrected using the Huber/White/sandwich estimator.

The non-linear impact of tourism specialization on economic growth is more pronounced when international tourist arrivals (TA) enter the non-parametric part of the equation (see right panel of the Figure). The non-linear inverted U-shaped curvatures denote that beyond the "*turning point*" (i.e., global maximum) as tourism demand further increases, the economic growth rate exhibits a downturn. The relevant finding is also evident in Chiu and Yeh, (2016). In other words, if the size of the tourism demand exceeds the turning point, the social costs increase more quickly than the increase in benefits and thus eventually result in a decrease in economic development (Zuo and Huang, 2017). In this case, tourism cannot be sustainable, justifying the inverted U-shaped curve. We argue though that this finding is rather stable and robust.

4.3.2 Robustness checks: Partially linear regression model

The TGLH is tested within a simple Cobb–Douglas framework, employing a Partial Linear Regression Model of the following form:

$$\begin{aligned} Y_{it} &= f(Z) + \beta_1 l\,\text{og}(GDP_{it}) + \beta_2 l\,\text{og}(FER_{it}) + \beta_3 l\,\text{og}(TRD_{it}) + \beta_4 l\,\text{og}(CON_{it}) \\ &+ \beta_5 l\,\text{og}(LIFE_{it}) + \beta_6 l\,\text{og}(DS_{it}) + u_{it} \end{aligned} \tag{12}$$

where Z is the vector of the three tourism specialization variables (TR, TRTI, and TA). The vector Z denotes the nonparametric (non-functional) part of the model, while the rest of the variables (GDP, FER, TRD, CON, LIFE, and DS) are included in the parametric (functional) part of the equation as fully described in Section 4.1. The parametric effect, β, is estimated by first-order differencing using Yatchew's (1998) weights.

Table 7 presents the empirical results obtained by the PLRM. As it is evident, most of the explanatory variables are plausibly signed and statistically significant. The estimated coefficients do not deviate from the existing literature. Specifically, the lagged value of the initial per capita GDP (i.e., a proxy for physical capital) expressed in the natural logarithm, has the expected negative sign ranging from -0.44 to -0.58. The estimated negative sign indicates that an increase (decrease) in physical capital tends to decrease (increase) the level of growth in the economy. The magnitude of the relevant coefficient is higher than what other studies indicate (see for example Adamou and Clerides, 2009 and Barro and Sala-i Martin, 2003). This could be attributed to the different sample period used let alone the estimated econometric technique since the previous studies rely on panel data parametric methods (fixed effects, GMM, etc).

The fertility rate which enters the model in logarithmic form is negatively correlated with the level of economic growth. In other words, a higher (lower) fertility rate would be expected to reduce (increase) economic growth. The magnitude of the estimated coefficients is almost four times greater than the earlier work of Adamou and Clerides (2009), indicating a strong negative population effect on the level of economic growth. The degree of openness to international trade measured as the ratio of the sum of exports and imports to GDP is positively and statistically significant correlated with long-run economic growth. The estimated coefficients exhibit limited variability since they fall within a closed interval ranging from 1.3 to 2.2. The relevant findings are in alignment with the arguments imposed by the Ricardian trade models, where the absence of trade barriers to a country's growth may continue indefinitely.

Table 7: Partially linear regression model results

Dependent variable: GDP growth (Y_t)	**(1)**	**(2)**	**(3)**
logged GDP per capita (lagged once): *log(GDP$_{t-1}$)*	-0.5782*** (0.174)	-0.5811*** (0.173)	-0.439** (0.1813)
Fertility rate: *log(FER$_t$)*	-4.974*** (0.832)	-4.545*** (0.808)	-4.679*** (0.832)
Trade openness: *log (TRD$_t$)*	1.329*** (0.385)	1.704*** (0.377)	2.199*** (0.408)
Government consumption: *log(CON$_t$)*	-1.1121** (0.4781)	-1.1003** (0.4500)	-0.6895 (0.479)
Life expectancy at birth: *log(LIFE$_t$)*	-4.557* (2.761)	-6.375** (2.782)	-3.384 (2.883)
Gross domestic savings: *log(DS$_t$)*	0.698*** (0.148)	0.763*** (0.144)	0.792*** (0.157)
Diagnostics and testing			
Observations	2,758	2,758	2,641
Country Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
R-squared	0.378	0.388	0.377
F-test statistic	10.02*** [0.000]	10.431*** [0.000]	9.489*** [0.000]
Root MSE	2.971	2.934	2.949
Significance test on logged tourism receipts: *log (TR$_t$)*	2.010** [0.022]	-	-
Significance test on logged tourism receipts for travel items: *log (TRTI$_t$)*	-	3.394*** [0.000]	-
Significance test on logged tourism arrivals: *log (TA$_t$)*	-	-	2.962*** [0.002]

Notes: Country and time-fixed effects are included but not reported for brevity. The number in parentheses denotes the adjusted standard errors based on Yatchew (1998). The number in brackets is the corresponding P-value. The bandwidth for the nonparametric smoothing is set to 1.*10% level of statistical significance, **5% level of statistical significance, ***1% level of statistical significance.

On the contrary, the extent of government involvement in the economy as proxied by the government expenditure consumption (CON) is negatively and statistically correlated in two specifications (see columns 1 and 2). This variable portrays the effects of government-induced distortions and political corruption on economic development, revealing a negative impact on long-run growth as expected. The effect of physical capital proxied by life expectancy is surprisingly negative though not statistically significant in all the specifications. Moreover, the government-size effect expressed by the gross domestic savings is positive and statistically significant under the three alternative specifications.

The significance test of the variables of interest, that enter the specification nonlinearly (see Eq. 7) indicates that the log of tourism demand proxied by the three indicators (TR, TRTI, and TA), is highly statistically significant (p-values close to zero). This indicates that the impact of tourism specialization in each of the three cases, though statistically significant appears to be highly non-linear. It is worth mentioning that the estimation of the fully parametric model with a quadratic polynomial of the log of tourism demand, reveals that although the effect of exogenous variables is in some cases qualitatively similar between these two specifications, the magnitudes of some coefficients alongside the statistical significance are different. Moreover, the specification test of quadratic versus nonparametric scale effect described in Yatchew (2003), strongly rejects the null hypothesis denoting the superiority of the nonparametric specification.[5]

Finally, Figure 3 portrays the relevant curvature drawn from the estimation of the difference-based algorithm for fitting the alternative PLRM. As it is evident, from the relevant figure, the inverted-U-shaped curve between tourism receipts (logTR) and economic growth (Y) is well preserved though less pronounced, denoting that there is an optimum "*threshold*" where beyond this turning point the effect of tourism demand becomes negative. The relevant curvature confirms the SPFEM previous results regarding the existence of non-linear (concave) effects.

Figure 3: International tourism receipts (logged values) plotted against the GDP growth rate (%)

Notes: The vertical axis represents the growth rate of GDP (%), while the horizontal axis measures the tourism receipts expressed in logged terms. The maroon curve illustrates the semi-parametric estimation of tourism receipts expressed in logged terms (lnTR). The first-order differencing is used and the bandwidth for nonparametric smoothing is set to 0.8.

[5] The specification test is calculated as $V = \sqrt{n} * \frac{\left(s_{res}^2 - s_{diff}^2\right)}{s_{diff}^2} \sim N(0,1)$. When the tourism receipts (TR) enters the nonparametric part of the model, the test becomes $V = \sqrt{2{,}758} * \frac{(9.173-8.826)}{8.826} = 2.06$, which corresponds to a *p*-value close to zero.

5. Conclusions and policy implications

This study empirically tests the relationship between tourism specialization and economic growth (best known as the "*Tourism-Led Growth Hypothesis*") for 142 countries over the period 1995-2018 with different tourism characteristics by deploying a flexible SPFEM. This model allows the data to reveal which pattern (linear, or nonlinear) can best describe the structural correlation between the two key variables, assisting us to examine the validity of the TLGH. The rejection of the null hypothesis of the parametric (quadratic) specification against the semi-parametric model that we employ in this study, validates the superiority of the latter, declaring that it is the most adequate model to investigate the relationship between tourism specialization and economic growth. Therefore, a robust inverted U-shaped relationship between tourism specialization and economic growth is uncovered.

A rise in tourism specialization might give a boost to the economy by allowing several allied sectors to grow in tourist destinations and sustain the growth in those sectors. However, with the higher development of tourism, the allied industries will be transformed into a self-reliant structure, and thereby, the demand for domestic credit will reduce, and the possibilities of international collaborations might arise. That explains the possible reason behind the inverted U-shaped association between tourist specialization and economic growth.

This finding has important policy and managerial implications for countries and tourism stakeholders (i.e., hoteliers, travel agents, tour operators, etc) to develop their strategy. If policymakers and tourism managers had relied only on the parametric model estimates, then they would have concluded that tourism specialization does not exert a statistically significant impact on economic growth in several international tourism destinations, falsely rejecting the TLGH. The latter often causes bias since an improper estimation method is applied (see also Chiu and Yeh, 2016). Therefore, tourism managers may incorporate the non-linear relationship between tourism and growth in their effort to design and pursue the proper strategies focusing on the role of competition in the tourism industry such as cost leadership, price differentiation, and advertising

However, our empirical results with the flexible semi-parametric model unfold a different story. Controlling other well-established economic growth components, we argue that tourism specialization is a stimulus for economic growth, but it does so in a nonlinear way. This means that at high levels of tourism specialization the marginal impact of tourism on economic growth becomes minimal and tourism can even become burdensome to further economic development. After crossing this "*threshold*" tourism may still contribute to economic growth but at a diminishing rate.

Based on the above, it is argued that, when the economy is at the downward part of the curve, countries may be better off by pursuing policies aiming at developing other areas of economic activity besides tourism. This indicates that there are limits to the tourism-led growth hypothesis.

As a result, the countries should implement an alternative strategic growth plan in favor of developing new areas of economic activity since the potential benefits of tourism are exhausted (Adamou and Clerides, 2009). On the other hand, when economic activity is at the upward part of the curve, a country must devote its resources to the tourism sector since the impact of trade openness and the ongoing elimination of barriers to trade (i.e., tariff and non-tariff measures such as quotas and export subsidies) is positively correlated with economic growth. In other words, when the economy is at the earlier stages of development, tourism specialization may create significant gains for countries with a relatively high tourism "*profile*".

Acknowledgments

I would like to thank Associate Professor Michael Polemis for his valuable support in conducting the econometric analysis. Special thanks also go to the Editor-in-Chief Professor Michael Chletsos and an anonymous referee for valuable comments and suggestions that enhanced the merit of the paper.

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Appendix

Table A1. List of 142 sample countries

Aruba	Dominica	Jordan	Netherlands	Tanzania
Angola	Denmark	Japan	Norway	Uganda
Albania	Dominican Republic	Kazakhstan	Nepal	Ukraine
Argentina	Ecuador	Kenya	Pakistan	Uruguay
Armenia	Egypt, Arab Rep.	Kyrgyz Republic	Panama	United States
Antigua and Barbuda	Euro area	Cambodia	Peru	St. Vincent and the Grenadines
Australia	Eritrea	St. Kitts and Nevis	Philippines	Venezuela, RB
Azerbaijan	Spain	Korea, Rep.	Papua New Guinea	Vanuatu
Burundi	Estonia	Kuwait	Poland	Samoa
Benin	Ethiopia	Lao PDR	Portugal	South Africa
Bangladesh	Finland	Libya	Paraguay	
Bulgaria	Fiji	St. Lucia	West Bank and Gaza	
Bahrain	France	Sri Lanka	Romania	
Bahamas	Gabon	Lesotho	Russian Federation	
Belarus	United Kingdom	Lithuania	South Asia	
Belize	Ghana	Latvia	Sudan	
Bolivia	Guinea	Morocco	Senegal	
Brazil	The Gambia	Moldova	Singapore	
Barbados	Greece	Madagascar	Solomon Islands	
Botswana	Grenada	Maldives	Sierra Leone	
Canada	Guatemala	Mexico	El Salvador	
Switzerland	Guyana	Mali	Sub-Saharan Africa	
Chile	Honduras	Malta	Slovak Republic	
China	Croatia	Myanmar	Slovenia	
Cameroon	Haiti	Mauritania	Sweden	
Congo, Rep.	Hungary	Mauritius	Eswatini	
Colombia	Indonesia	Malawi	Seychelles	
Cabo Verde	India	Malaysia	The Syrian Arab Republic	
Costa Rica	Iran, Islamic Rep.	North America	Togo	
Cyprus	Iceland	Namibia	Thailand	
Czech Republic	Israel	Niger	Trinidad and Tobago	
Germany	Italy	Nigeria	Tunisia	
Djibouti	Jamaica	Nicaragua	Turkey	