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A note on the human capital and tourism growth nexus: A semi-parametric approach

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Abstract

We investigate the impact of human capital on tourism growth by using a semi-parametric fixed effects estimator developed in Baltagi and Li (2002). The results shed new light on the existing literature since they unveil strong non-linear effects of human capital on tourism growth. Furthermore, we uncover a non-monotonic "M-shaped" curve between human capital and growth when we impose the assumption of imperfect labor substitutability.

Keywords: Human capital; Tourism growth; Labour substitutability; Semi-parametric analysis
JEL Classification Codes: Z32, C14, O47

1. Introduction

The impact of human capital on economic growth constitutes ongoing research with many studies producing contradicting results. One strand of literature supports the evidence of insignificant impact (Delgado et al., 2014), while other studies argue that human capital has a strong positive effect on growth (Ketteni et al, 2007; Mamuneas et al, 2006; Kalaitzidakis et al, 2001).

Tourism activity as a stimulus of economic growth can be analyzed from different angles. Firstly, tourism receipts are expected to affect the economy, with changes in sales, employment, tax revenues, and income levels. Also, tourism's crucial role in raising capital, reducing poverty, and advancing social well-being has drawn the interest of a growing number of researchers. Moreover, due to tourism productivity and effectiveness, there is a better allocation of economic resources reducing costs, improving performance, and maintaining tourism competition at a high level.

Despite the plethora of studies focusing on the impact of tourism development on economic growth (see among others Nunkoo et al, 2020; De Vita and Kyaw, 2016; Wu et al, 2016), the effect of human capital on tourism growth is overlooked by the existing empirical works. This

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is the first study that attempts to investigate the related strand of literature by incorporating a qualitative measure allowing for imperfect labor substitutability and comparing it to other standard indicators (i.e., average years of schooling, human capital index with perfect labor substitutability).

Lee and Lee (2016) assert that growth studies assume that the different types of human capital are perfect substitutes. However, the majority of skilled workers cannot be substituted easily by unskilled ones. This happens since the productivity of unskilled workers will increase over time as a result of educational expansion leading to an increased scarcity of the unskilled. According to Ciccone and Peri (2005) and Jones (2014), such an assumption creates a bias that leads to an underestimation of the human capital. We contribute to this debate by relaxing the assumption of perfect substitutability between skilled and unskilled workers.

This study aims to investigate the impact of human capital on tourism growth by using a semi-parametric fixed effects estimator. The results shed new light on the existing literature since they unveil strong non-linear effects of human capital on tourism growth.

2. Data and methodology

The modified/augmented Solow growth model can be illustrated by the following reduced form equation:

$$\ln(TR_{it}) = g\left(\left(HC_{0,it}\right), \ln\left(POP_{it}\right), \ln\left(GDP_{0,it}\right), \ln\left(SI_{it}\right), \ln\left(TRA_{it}\right)\right) + e_{it} \quad (1)$$

where $\ln(TR)$ indicates the logged international tourism receipts as a proxy for tourism development for country i over time t (De Vita and Kyaw, 2016). HC_o denotes the human capital stock (proxied by three alternative indicators). POP measures the average annual population growth rate, GDP indicates the initial levels of income and e is the error term. Moreover, SI measures the share of gross capital formation at current purchasing power parities. Lastly, TRA denotes trade openness as a percentage of gross domestic product. Table 1 provides the descriptive statistics.

We employ five-year non-overlapping averages for 40 countries over the period 1970-2014 (see Appendix A). The majority of the variables have been extracted from different data sources (World Bank; Lee and Lee, 2016). Apart from the standard human capital index proxied by the average years of schooling and returns to education at initial levels, we use for the first time in the literature two alternative indicators allowing for perfect (HCP) and imperfect substitutability (HCA) between skilled and unskilled workers.

We utilize a flexible Semi Parametric Fixed Effects Model following the methodology described in Baltagi and Li (2002). Our model can thus be given by the following equation:

$$GR_{it} = a_i + x_{it}^T \beta + w_{it}\gamma + f(\psi_{it}) + e_{it} \quad (2)$$

where $f(\psi_{it})$ is an unknown function of ψ_{it}, entering the model in a non-parametric way (e.g., human capital indicators). X_{it} is the vector of exogenous linear regressors, while the *w*-vector includes the time dummies. Lastly, e_{it} denotes the error term.

Table 1. Summary statistics.

Variables	*Mean*	*Standard Dev.*	*Minimum*	*Maximum*
ln(TR)	0.0654	0.134	-0.416	0.573
HCS	2.112	0.720	1.009	3.703
HCP	2.006	0.659	1.032	3.760
HCA	4.024	1.355	1.301	6.407
ln(POP)	1.812	0.845	-2.638	3.255
ln(GDP)	11.42	1.814	8.068	16.54
ln(SI)	-1.711	0.547	-4.504	-0.696
ln(TRA)	3.941	0.499	2.268	5.330

3. Results and discussion

3.1. Preliminary testing

Before presenting the main results of this study, 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. In doing so, we have applied the Pesaran test of cross-sectional dependence (Pesaran 2003; 2004). The null hypothesis reveals that cross-sections of the panel data are weakly dependent on each other. The empirical results of the cross-sectional dependence test are reported in Table 2.

We find that cross-sectional dependence is significantly present between the variables in the model. As it is evident from Table 2, the relevant test strongly rejects the null hypothesis of cross-section independence (P-values = 0.000). In 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 for applying second-generation unit root tests to test the stationarity properties of the variables (Pesaran, 2015; Im et al., 2003).

For checking the order of integration of the variables, we have applied the cross-sectionally augmented Dickey-Fuller (PESCADF) unit root tests developed by Pesaran (2007). The relevant test is a second-generation unit root test assuming the cross-sectional dependence in a panel dataset. The null hypothesis is that all the variables in the panel are non-stationary, against the alternative hypothesis of only a section of the series is stationary. The empirical results of the PESCADF test are reported in Table 3. We find that nearly all the variables are stationary under the presence of cross-sectional dependence (i.e., integrated of order zero).

3.2. Empirical findings

We begin by estimating the parametric (baseline) model described in Equation 1 expressed in linear and nonlinear form. To effectively tackle endogeneity and reverse causality between human capital and tourism growth, we adopt the instrumental variable approach using the generalized method of moments (De Vita, and Kyaw, 2016).

Table 2. Cross-section dependence test.

Variables	Test statistic	p-value	Correlation	Absolute (correlation)
ln(TR)	6.85^{***}	0.000	0.053	0.304
HCS	124.17^{***}	0.000	0.968	0.968
HCP	118.79^{***}	0.000	0.926	0.929
HCA	110.99^{***}	0.000	0.865	0.891
ln(POP)	50.91^{***}	0.000	0.397	0.603
ln(GDP)	118.33^{***}	0.000	0.922	0.922
ln(SI)	7.20^{***}	0.000	0.056	0.381
ln(TRA)	49.24^{***}	0.000	0.384	0.473

Notes: Under the null hypothesis of cross-sectional independence the Pesaran (2004) test (“*CD test*”), follows a two-tailed standard normal distribution. The p-values are for a one-sided test based on the normal distribution. Correlation and Absolute (correlation) are the average (absolute) values of the off-diagonal elements of the cross-sectional correlation matrix of residuals. Under the null hypothesis, the residuals are weakly cross-sectional dependent. ***1% level of statistical significance.

Table 3. Second-generation panel unit root tests.

Variables	***PESCADF test***	
	Level	*First Difference*
ln(TR)	-1.898* (lags = 1) [0.11]	-
HCS	-2.501*** (lags =1) [0.000]	-
HCP	-1.777 (lags = 1) [0.304]	-1.681** (lags = 1) [0.046]
HCA	-2.468*** (lags = 1) [0.000]	-
ln(POP)	-1.758 (lags = 1) [0.346]	-0.434 (lags = 1) [0.332]
ln(GDP)	-1.991** (lags = 1) [0.038]	-
ln(SI)	-2.621*** (lags = 1) [0.000]	-
ln(TRA)	-3.471*** (lags = 1) [0.000]	-

Notes: The PESCADF performs the t-test for unit roots in heterogeneous panels with cross-section dependence, proposed by Pesaran (2003). The null hypothesis in both tests assumes that all series are non-stationary at least for one country. The constant term is included in the PESCADF test. The number in brackets denotes P-values. **5% level of statistical significance, ***1% level of statistical significance.

Regarding the linear specifications (see Columns 10-12 of Table 4), all the estimated coefficients are statistically significant and have the anticipated signs. The effect of human capital on tourism growth appears to be positive in all the cases exhibiting a stronger impact when the average years of schooling (HCS) are taken into account. On the contrary, human capital exhibits a nonlinear effect only when we assume imperfect labor substitutability (see Column 6). This finding contradicts the study of Delgado et al, (2014) supporting the insignificant impact on growth. However, the absence of nonlinear effects when perfect labor substitution is considered (see Column 5), is in alignment with the study of Jones (2014).

Next, we apply a specification test to assess if the nonparametric fit can be approximated by a parametric adjustment of order three. The test results suggest that all parametric specifications of Equation 1 are rejected with probability values of 0.000 in all cases. We thus proceed to estimate the semi-parametric model by allowing several variables (HCS, HCP, and HCA) to enter non-parametrically, while we also check for possible nonlinear effects of initial income on growth. As it is evident, nearly all of the variables are statistically significant and properly signed. Initial income levels (lnGDP) exhibit strong non-linear (cubed) effects on tourism growth while the share of gross capital formation (lnSI) and trade openness (TRA) are positively correlated with the level of growth.

Figures 1a-b plot estimates of the impact of human capital (horizontal axis) on growth (vertical axis) along with 95% confidence bands. Figure 1a indicates that human capital exhibits nonlinear effects of growth when standard measures are taken into account. As it is observed, there is

Table 4. Estimation results.

	Nonlinear estimates						Linear estimates					
Dependent variable: TR^{+}	**Semi-parametric**			**Parametric**			**Semi-parametric**			**Parametric**		
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HCS	-	-	-	0.132	-	-	-	-	-	0.312***	-	-
				(0.434)						(0.0585)		
HCS *(squared)*	-	-	-	0.131	-	-	-	-	-	-	-	-
				(0.194)								
HCS *(cubed)*	-	-	-	-0.0241	-	-	-	-	-	-	-	-
				(0.0283)								
HCP	-	-	-	-	-0.260	-	-	-	-	-	0.151***	-
					(0.512)						(0.0467)	
HCP *(squared)*	-	-	-	-	0.273	-	-	-	-	-	-	-
					(0.225)							
HCP *(cubed)*	-	-	-	-	-0.0489	-	-	-	-	-	-	-
					(0.0329)							
HCA	-	-	-	-	-	0.345*	-	-	-	-	-	0.0753***
						(0.192)						(0.0200)
HCA *(squared)*	-	-	-	-	-	-0.0759*	-	-	-	-	-	-
						(0.0493)						
HCA *(cubed)*	-	-	-	-	-	0.00670*	-	-	-	-	-	-
						(0.00408)						
ln(POP)	-0.0171	-0.0186	-0.0178	-0.00227	-0.00496	-0.0190	-0.0205	-0.0216	-0.0210	-0.00994	-0.0150	-0.0114
	(0.0196)	(0.0194)	(0.0194)	(0.0170)	(0.0166)	(0.0168)	(0.0197)	(0.0197)	(0.0197)	(0.0159)	(0.0162)	(0.0163)
ln(GDP)	-3.176**	-3.171**	-3.272**	0.742	0.564	-0.0269	-0.296***	-0.314***	-0.314***	-0.195***	-0.130***	-0.135***
	(1.448)	(1.433)	(1.444)	(0.549)	(0.568)	(0.550)	(0.0372)	(0.0385)	(0.0385)	(0.0282)	(0.0247)	(0.0237)
ln(GDP) *(squared)*	0.223*	0.219*	0.226*	-0.0813*	-0.0627	-0.0122	-	-	-	-	-	-
	(0.125)	(0.123)	(0.124)	(0.0478)	(0.0492)	(0.0469)						
Ln(GDP) *(cubed)*	-0.00556	-0.00538	-0.00555	0.00229*	0.00183	0.0004	-	-	-	-	-	-
	(0.00353)	(0.00350)	(0.00352)	(0.00137)	(0.00141)	(0.00132)						
ln(SI)	0.0636*	0.0662*	0.0688*	0.108***	0.106***	0.109***	0.0642*	0.0651*	0.0660*	0.109***	0.108***	0.101***
	(0.0360)	`(0.0358)	(0.0356)	(0.0224)	(0.0232)	(0.0229)	(0.0361)	(0.0360)	(0.0360)	(0.0220)	(0.0232)	(0.0224)
TRA^{+}	0.140***	0.137***	0.131***	0.0393	0.0649**	0.0829**	0.141***	0.139***	0.135***	0.0526*	0.0792**	0.0761**
	(0.0473)	(0.0469)	(0.0470)	(0.0323)	(0.0320)	(0.0326)	(0.0475)	(0.0473)	(0.0474)	(0.0307)	(0.0309)	(0.0307)
Observations	317	317	317	358	358	358	317	317	317	358	358	358
R-squared	0.212	0.223	0.224	0.177	0.141	0.139	0.190	0.198	0.197	0.165	0.119	0.129
F-test	-	-	-	7.40***	5.62***	5.55***	-	-	-	12.34***	8.46***	9.24***
				[0.000]	[0.000]	[0.000]				[0.000]	[0.000]	[0.000]

Notes: $^{+}$ The variables are defined as ln*(1+variable)*. Standard errors in parentheses *** statistical significance at 0.01, ** statistical significance at 0.05, * statistical significance at 0.1.

Figure 1a. Nonparametric estimates of human capital on tourism growth

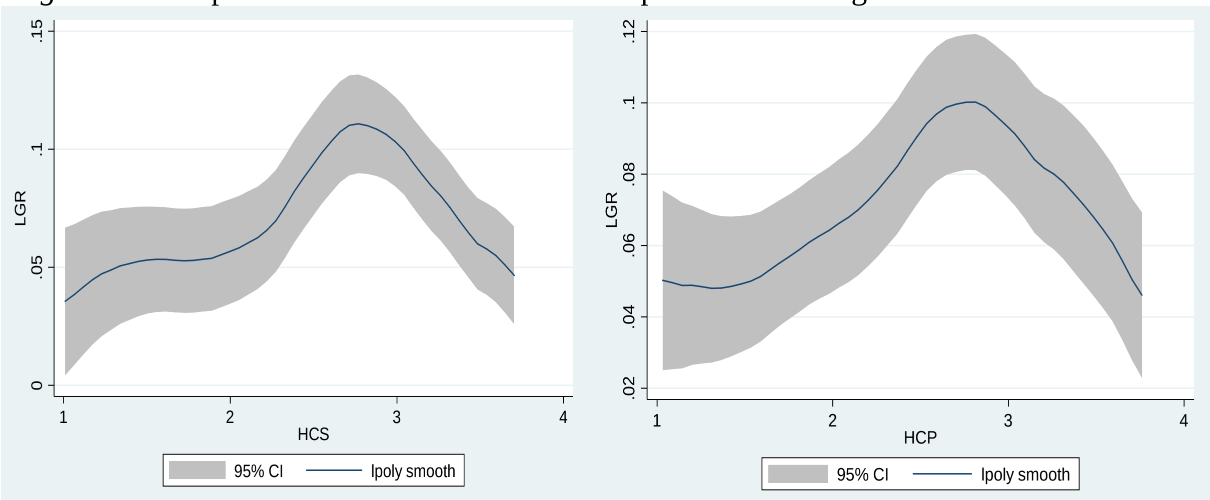
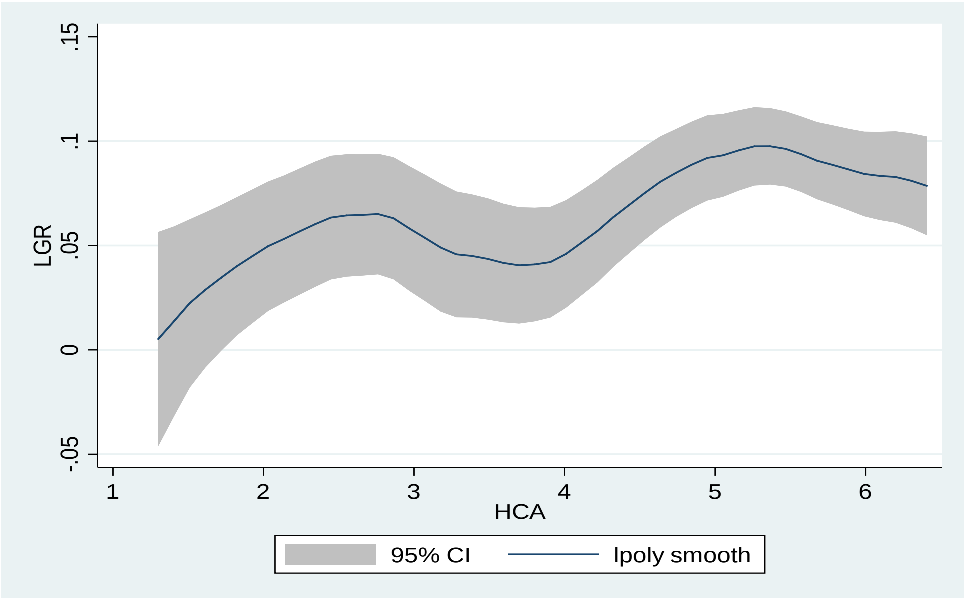


Figure 1b. Nonparametric estimates of human capital on tourism growth.



a "*hump-shaped*" relationship between human capital and tourism growth confirming earlier studies (Mamuneas, 2006; Ketteni et al, 2007). During the upward part of the curve, an increase in the quality of the human capital accelerates tourism growth up to a certain level (threshold). This optimal level reflects a "*turning*" point since a marginal increase or decrease in its value reverses the relationship between human capital and growth. However, when human capital crosses this level, the effect on growth turns negative (decreasing part) since specific parameters such as corruption, black market, and brain drain make human capital unproductive (Rogers, 2008).

On the contrary, when we assume imperfect labor substitutability, the nonlinear relationship between human capital and tourism growth can be modeled as a fourth-degree polynomial (see Figure 1). The nonlinear behavior appears quicker (in terms of distance between the first and the second turning point) for the case of imperfect labor substitutability compared to the case of perfect labor substitutability signifying that the nonlinear returns on growth rates are more frequent as the human capital accumulates. This further implies that there is a higher probability of the existence of '*threshold effects*' arguing that growth cannot occur without the existence of overqualified labor (Azariadis and Drazen, 1990).

Table 5. Multilevel mixed-effects parametric results.

Dependent variable: TR+	Linear estimates			Nonlinear estimates		
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
HCS	0.0408**	-	-	-0.149	-	-
	(0.0171)			(0.320)		
HCS *(squared)*	-	-	-	0.120	-	-
				(0.145)		
HCS *(cubed)*	-	-	-	-0.0217	-	-
				(0.0209)		
HCP	-	0.0268*	-	-	-0.135	-
		(0.0171)			(0.344)	
HCP *(squared)*	-	-	-	-	0.110	-
					(0.155)	
HCP *(cubed)*	-	-	-	-	-0.0206	-
					(0.0224)	
HCA	-	-	0.0170**	-	-	-0.0885
			(0.0085)			(0.142)
HCA *(squared)*	-	-	-	-	-	0.0311
						(0.0365)
HCA *(cubed)*	-	-	-	-	-	-0.00281
						(0.003)
ln(POP)	-0.0102	-0.0112	-0.0106	-0.00862	-0.00974	-0.0099
	(0.0141)	(0.0142)	(0.0141)	(0.0141)	(0.0141)	(0.0141)
ln(GDP)	-0.022***	-0.0182**	-0.0194***	-0.0185**	-0.0157**	-0.0179**
	(0.0073)	(0.00739)	(0.00709)	(0.00751)	(0.00755)	(0.00721)
ln(SI)	0.0395***	0.0424***	0.0407***	0.0330**	0.0373**	0.038***
	(0.0144)	(0.0144)	(0.0144)	(0.0149)	(0.0148)	(0.0147)
TRA+	-0.0218	-0.0165	-0.0236	-0.0278	-0.0257	-0.0226
	(0.0171)	(0.0172)	(0.0181)	(0.0173)	(0.0176)	(0.0181)
Constant	0.389	0.360***	0.385***	0.441*	0.417	0.466**
	(0.115)	(0.118)	(0.118)	(0.244)	(0.259)	(0.196)
Observations	541	541	541	549	549	549
Wald-test	66.74**	63.14**	64.82**	71.85***	68.34***	66.36**
	[0.0151]	[0.0307]	[0.022]	[0.0087]	[0.0179]	[0.0262]

Notes: +The variables are defined as ln*(1+variable)*. Standard errors in parentheses *** statistical significance at 0.01, ** statistical significance at 0.05, * statistical significance at 0.1. The number in brackets denotes P-values.

3.3. Robustness checks

Since the sample covered in the relevant study, suggests a mixture of developed and developing countries, the fixed effects model that we used in the analysis, may not capture the entire variability of the sample countries. For this reason, we rely on mixed-effects regression models to examine between and within-country effects to consider more than one factor causing random variability.

Mixed models consist of fixed effects and random effects. The fixed effects are specified as regression parameters (i.e., a dependent variable followed by a set of regressors). The random-effects portion of the model is specified by first considering the grouping structure of the data. Using a multilevel mixed-effects model encompasses how the random effects enter the model (i.e., random intercepts or random coefficients). In this way, we could check for the robustness of our (parametric) findings. As it is evident, from Table 5, the parametric estimates under the multilevel mixed-effects models are robust indicating that the effect of human capital on tourism growth remains positive though not statistically significant in the nonlinear specifications.

4. Conclusion

This study highlights the importance of imperfect labor substitutability in unpacking the puzzling relationship between human capital and tourism growth. The empirical findings incur significant policy implications since regulators and government officials need to know in which part of the curve the tourism industry operates to fine-tune their strategies. Specifically, a further increase in human capital may lead to adverse effects on tourism growth due to its non-linear nature (downward part). However, since the productivity of the unskilled workers in the tourism industry might increase over time, the policymakers should pursue highly specialized educational programs to boost the quality of the existing human capital and thus tourism development (upward part).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Azariadis, C., and Drazen, A. (1990) Threshold externalities in economic development, *Quarterly Journal of Economics*, 105: 501-526.

Baltagi, B. H., and Li, D. (2002) Series estimation of partially linear panel data models with fixed effects, *Annals of Economics and Finance*, 3(1): 103–116.

Ciccone, A., and Peri, G. (2005) Long-run substitutability between more and less educated workers: evidence from US states, 1950–1990, *Review of Economics and Statistics*, 87: 652–663.

Delgado, M. S., Henderson, D. J., and Parmeter, C. F. (2014) Does education matter for economic growth?, *Oxford Bulletin of Economics and Statistics*, 76: 334-359.

De Vita, G., and Kyaw, K. S. (2016) Tourism development and growth, *Annals of Tourism Research*, 60: 23-26.

Im, K. S., Pesaran, M. H., and Shin, Y. (2003) Testing for unit roots in heterogeneous panels, *Journal of Econometrics*, 115(1), 53-74.

Jones B. F. (2014). The human capital stock: a generalized approach, *American Economic Review*, 104: 3752-3777.

Kalaitzidakis, P., Mamuneas, T., Savvides, A., and Stengos, T. (2001) Measures of human capital and nonlinearities in economic growth, *Journal of Economic Growth*, 6: 229-254.

Ketteni, E., Mamuneas, T., Savvides, A., and Stengos, T. (2007) Is the Financial Development and Economic Growth Relationship Nonlinear?, *Economics Bulletin*, 15(14): 1-12.

Lee, J. W., and Lee, H. (2016) Human capital in the long run, *Journal of Development Economics*, 122: 147-169.

Mamuneas, T., Savvides, A., and Stengos, T. (2006) Economic development and the return to human capital: A smooth coefficient semiparametric approach, *Journal of Applied Econometrics*, 21, 111-132.

Nunkoo, R., Seetanah, B., Jaffur, Z. R. K., Moraghen P. G. W., and Sannassee, R. V. (2020) Tourism and Economic Growth: A Meta-regression Analysis, *Journal of Travel Research*, 59(3), 404-423.

Pesaran, M. H. (2015) Time Series and Panel Data Econometrics, OUP Catalogue, Oxford University Press.

Pesaran, M. H. (2007) A Simple Panel Unit Root Test in The Presence Of Cross-section Dependence, *Journal of Applied Econometrics*, 22: 265–312.

Pesaran, M. H. (2004) General diagnostic tests for cross-section dependence in panels, CESifo Working Paper No. 1229.
Pesaran, H. (2003) A Simple Panel Unit Root Test in the Presence of Cross Section Dependence, Cambridge Working Papers in Economics 0346, Faculty of Economics (DAE), University of Cambridge.
Rogers, M. L. (2008) Directly unproductive schooling: How country characteristics affect the impact of schooling on growth, *European Economic Review*. 52 (2), 356–385.
Wu, P. C., Liu, S. Y., Hsiao, J. M., and Huang, T. Y. (2016) Nonlinear and time-varying growth-tourism causality, *Annals of Tourism Research*, 59: 45-59.

Appendix A

Argentina, Austria, Bolivia, Chile, Cote d'Ivoire, Cameroon, Denmark, Dominican Republic, Algeria, Ecuador, Egypt, United Kingdom, Ghana, Guatemala, Honduras, India, Iceland, Jamaica, Japan, Kenya, Korea, Sri Lanka, Mexico, Mali, Malawi, Malaysia, Nigeria, Norway, Pakistan, Peru, Philippines, Paraguay, Sudan, Senegal, Sweden, Thailand, Tunisia, Turkey, Uruguay, United States.