THE NEXUS BETWEEN TOURISM AND REGIONAL REAL GROWTH: DYNAMIC PANEL THRESHOLD TESTING

Darko B. Vuković[1,2]*, Alexander M. Zobov[3], Ekaterina A. Degtereva[3]

[1]Geographical Institute "Jovan Cvijić" SASA, Belgrade, Serbia; e-mail: vdarko@hotmail.rs
[2]People's Friendship University of Russia (RUDN University), Faculty of Economics, International Laboratory for Finance and Financial Markets, Moscow, Russia
[3]People's Friendship University of Russia (RUDN University), Faculty of Economics, Department of Marketing, Moscow, Russia; e-mails: zobov-am@rudn.ru; degtereva-ea@rudn.ru

Abstract: This study analyzes the nexus between tourism and regional real growth for European regions at the Nomenclature of territorial units for statistics (NUTS), level 2, for the period 1995–2019. The study uses the dynamic panel threshold model to analyze complex relations between variables. As the dependent variable, we chose real growth rate of regional gross value added at basic prices by NUTS 2 regions. The independent variable is regional arrivals at tourist accommodation, while the control variables are health, household income, and employment at NUTS 2 regional level. The study found the threshold variable for 95% confidence interval. The marginal effects in the low inflation regime are higher compared to marginal effects in the high inflation regime. The study results support tourism-led growth hypothesis, indicating tourism as a one of the main drivers of regional growth. This research contributes to rare literature in application of dynamic panel threshold model in tourism. As an implication, this study can be used as a methodological approach to analyze the impact of different variables (not only tourism, but also innovations, technology, well-being, etc.) on regional growth, especially in countries with high regional differences, such as the Commonwealth of Independent States (CIS), Latin America, etc.

Keywords: tourism; regional real growth rate; dynamic threshold regression

1. Introduction

Tourism is one of most important industries and the driver of economic growth in Europe. According to the World Tourism Organization (UNWTO, 2021), European countries are ranked in the group of countries with the highest tourism direct gross domestic product in the world. The literature testifies numerous studies that have confirmed the impact of tourism on regional development growth (Harb & Bassil, 2021; Paci & Marrocu, 2014; Soukiazis & Proença, 2008; Vukovic et al., 2020; and many others), in which panel regression analysis was mostly used to study the dependence of regional economic growth on certain tourism variables. For example, in the study of Lv (2019), tourism is an effective tool in achieving balanced regional development. The author used a fully modified ordinary least squares model on the panel

---

*Corresponding author, e-mail: vdarko@hotmail.rs

sample of 113 countries worldwide to confirm a significant long-run equilibrium relationship for the tested variables. However, only a few years back, scholars began to use more complex threshold regression models in similar issue analyses (Chiu et al., 2021; Deng et al., 2014; Lv & Xu, 2021). One of the very recent threshold models is the dynamic panel threshold model, tested in only a few studies so far (for example, in the study of Chiu et al., 2021). This model has a very important advantage related to the endogeneity problem of variables—in the case of the threshold effect, endogenous variables are allowed. Second, the model includes inflation regimes, which are important for the analysis of the impact on real growth.

Due to the reason that endogeneity exists in tourism-led growth hypothesis (confirmed by Chiu et al., 2021; Cortés-Jiménez & Pulina, 2010; Kim et al., 2006; Massidda & Mattana, 2013; Seetanah, 2011), where tourism is one of main drivers of growth, the aim of our research is twofold:

- First, to test the dynamic panel threshold model and to contribute to rare-developing literature that deals with this issue (including its theoretical contribution to the tourism-led growth hypothesis) and
- Second, to empirically analyze the relationship between tourism and regional growth in European regions.

The study uses arrivals at tourist accommodation as independent tourism variable, which is literature-supported and previously used in several studies (Chiu et al., 2021; Soukiazis & Proença; 2008) where authors analyzed the impact of tourism through the accommodation capacity on the regional growth in per-capita income in Portugal. The implication of the study is to fill the previously mentioned gap in the existing literature and practically, to contribute to policy implication of tourism to regional growth rate. Even more, study results could contribute to model testing in other regions (such as the Commonwealth of Independent States [CIS], Russia and Kazakhstan—countries with regions with different regional development, Latin America, and many more).

The next importance of tourism, as one of the drivers of regional growth, is a positive spillover of influence on other sectors (such as on industry, technological sector, transportation, etc.) and on other regions (including neighboring countries). This positive influence has four key aspects. Firstly, the development of tourism ensures the development of the necessary transport and social infrastructure, which is an important prerequisite for the implementation of joint industrial and technological projects of the regions (even in neighboring countries, like in Russia and Kazakhstan). This is especially important for the less developed regions, where significant problems remain with the formation of such modern infrastructure (such as Central Asian regions, including airports, roads, hotels, etc.). Secondly, the development of tourism as a generator of regional growth leads to an increase in the mobility of people and increases the degree of openness of the region. This is an important element of "soft power", which makes regions more attractive for investments and economic cooperation. Thirdly, tourism acts as an obvious element of the national branding of countries, which has a positive impact on the promotion and branding of specific national and regional companies and their strategic alliances with other international stakeholders. Finally, these spillovers from tourism can contribute to macroeconomic stability and more effective policy making. No less important is the impact of tourism on agrarian sector (Petrović et al., 2017). This is especially true for the contribution to the economy, as well as a main support to the nutrition of the population, ecological issues, and more.

2. Materials and methods

2.1. Sample

The data were collected on 13/10/2021 from Eurostat for all European regions at the Nomenclature of territorial units for statistics (NUTS), level 2, for the period 1995–2019. NUTS 2 is the Nomenclature of territorial units for statistics—Eurostat classification of territories with between 800,000 and 3 million inhabitants (Eurostat, 2021). In our sample, we used real growth rate of regional gross value added (GVA) at basic prices by NUTS 2 regions (percentage change on previous year) as the dependent variable. The independent variable is arrivals at tourist accommodation (ATA) establishments by NUTS 2 regions and includes: hotels, holiday, and other short-stay accommodation, camping grounds, recreational vehicle parks, and trailer parks. As control variables, we used: health, household income, and employment (NUTS 2 regional level for all for control variables). The model, program language, and environment were created in R program.

2.2. The model

Our following experimental application introduces a dynamic panel threshold model, developed by Hansen (1999). The model considers endogenous regressors including lags of the dependent variable. Compared to a classic threshold autoregression model (including the advantage of drawing interpretations about the primary data generating procedure), in dynamic panel threshold regression the coefficients can take both a small and a robust number of different values. These coefficients depend on the value of exogenous stationary variable (Seo & Shin, 2016). The study uses a dynamic panel threshold model due to the relevance of the theory of economic growth (GVA as indicator), with inflation's distortional effects. Hansen's model considers Equation 1:

$$GVA_{it} = \mu_i + \beta'_1 \chi_{it} I(q_{it} \leq \gamma) + \beta'_2 \chi_{it} I(q_{it} > \gamma) + e_{it} \qquad (1)$$

where indicators of function are $I(q_{it} \leq \gamma)$ and $I(q_{it} > \gamma)$, GVA_{it} is a scalar stochastic dependent variable (GVA), q_{it} is scalar of threshold variable, the regressor is χ_{it}, and e_{it} is regression error for $i = 1,... n$; $t = 1, ...T$. When observations are divided in two regimes, conditional on whether the threshold variable q_{it} is larger or smaller compared to the threshold γ, the Equation 2 could also be presented as:

$$GVA_{it} = \begin{cases} \mu_i + \beta'_1 \chi_{it} + e_{it}, & q_{it} \leq y \\ \mu_i + \beta'_2 \chi_{it} + e_{it}, & q_{it} > y \end{cases} \qquad (2)$$

The last equation presents two slopes β_1 (Beta 1) and β_2 (Beta 2), differing two regimes. Followed by Hansen (1999), the regressor χ_{it} and the threshold variable q_{it} are not time invariant, which is important for the identification of slopes β_1 and β_2. The coefficients β_1 and β_2 indicate the marginal effect of inflation on GVA growth in the low (β_1—below the estimated threshold value) and in the high (β_2—above the estimated threshold value) inflation regimes.

3. Results and discussion

The estimated threshold value—arrivals at tourist accommodation as threshold variable find to be 699 at 95% confidence interval using the dynamic panel threshold model. Beta 1 and Beta 2 represent the effect of ATA on GVA for both regimes. Beta 1 denotes the marginal effect of ATA on GVA in the low inflation regime. Similarly, Beta 2 indicates the marginal effect of ATA on GVA in the high inflation regime. Both Beta 1 and Beta 2 regime dependent coefficients are statistically significant and have positive marginal effect in both low and high regimes. However, the marginal effects in the low inflation regime are higher—the percentage growth in ATA leads to higher increase in GVA. In the case of the high inflation regime (Beta 2), the variable regional arrivals at tourist accommodation have lower effect in GVA's increase (Table 1).

More information can be found for the threshold confidence interval from the plot of the concentrated likelihood ratio function (Figure 1). The threshold first-step estimate confidence interval in the point where GVA_{it} is near zero (from the beginning of left side of the plot). The 95% confidence intervals for $\beta'_1\chi_{it}$ and $\beta'_2\chi_{it}$ likelihood ratio lie under the red dotted line. In the case of control variables there are also supporting results. All control variables are statistically significant, where

Table 1. Dynamic panel threshold model

Dynamic threshold values	Model values
Estimated threshold value	698.9701
The effect of tourism	
Beta 1	0.51***
Beta 2	0.25***
Effect of control variable	
Initial	−0.005
Health	57.039***
Household income	28.277***
Employment	120.64***
Regime 1—Threshold variable less than 698.9701	21%
Regime 2—Threshold variable greater than 698.9701	79%

Note. Followed and motivated by Hansen (1999), each regime in dynamic panel regression contains at least 5% of all observations. Initial is considered as lagged endogenous variable.
***presents 1% significance.

employment and health have higher positive influence on GVA compared with household income. This means that growth in any of the control variables will affect growth in GVA. The regions with higher employment rate contribute more to their regional GVA.
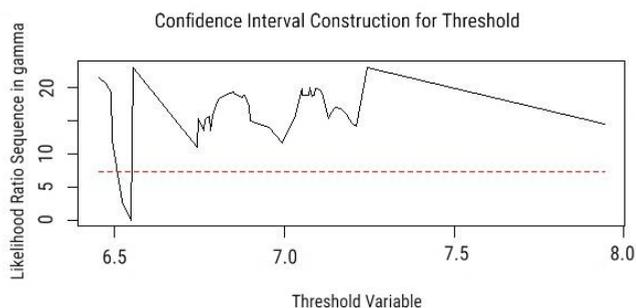

Figure 1. Threshold model estimator diagram.

Note. Likelihood Ratio Sequences in gamma LRn(gamma) is represented by a black line, and 90% Critical is represented by a red dashed line.

The study results show that tourism has positive and significant effect on regional GVA. In the low inflation regime, tourism generates more regional real GVA compared with high inflation regime. This situation is expected and logical due to the reason of inflation's influence on added values (as real added value with basic prices, considering the included inflation). After dynamic threshold analysis, the results point that regions with higher arrivals at tourist accommodation produce more real growth rate of regional gross value added at NUTS 2 level. Even more, the tourism-led growth hypothesis is valid for both regimes (with the first regime higher effect), which is partially in line with the study of Deng et al. (2014). The authors confirmed this only for tourism specialization for certain "threshold" levels. Our study results are related to Soukiazis and Proença's (2008) outcomes, proving that tourism is a relevant factor that significantly generates the regional standards of living (GVA could also be one of indicators of the standards of living). The study results are also in line with Harb and Bassil (2021), who found that tourism has strong and positive effects on regional growth of 27 European countries. We also confirmed, according to results, the existence of tourism-led growth hypothesis (Chiu et al., 2021; Cortés-Jiménez & Pulina, 2010; Kim et al., 2006; Massidda & Mattana, 2013; Seetanah, 2011).

4. Conclusion and implications

This study analyzes the impact of tourism on regional real growth with the implementation of the dynamic panel threshold model. In general, the study results support tourism-led growth hypothesis, where tourism positively affects regional growth. Our findings of dynamic threshold model are statistically significant for all the independent and control variables. For future studies, there are several suggestions that could be used in methodological and practical points. First, the model could be extended with heteroscedasticity and with lagged dependent and endogenous variables. Also, according to the suggestion of Hanses (1999), it will be desirable to include random effects. As practical implication, we suggest extending the sample area and testing in different regions worldwide. It will be very interesting to apply the dynamic panel threshold model for regions with high regional differences, like in Russia, Kazakhstan, Turkey, or some of the Latin American countries. Second, control variables could also be extended with other sectors in economy that affect innovations, regional competitiveness, regional brands, and others. The conducted study acts as part of the research of factors influencing regional economic growth. In this regard, this is a pilot stage of the study, within the framework of which methodological tools (for assessing the relationship of a particular economic sector with the regional macroeconomic situation) were developed.

Acknowledgements

References

Chiu, Y. B., Zhang, W., & Ding, K. (2021). Does Globalization Influence Inbound Tourism? Evidence from a Dynamic Panel Threshold Analysis. *Journal of Travel Research*, *60*(5), 1074–1084. https://doi.org/10.1177/0047287520919514

Cortés-Jiménez, I., & Pulina, M. (2010). Inbound tourism and long run economic growth. *Current Issues in Tourism, 13*(1), 61–74. https://doi.org/10.1080/13683500802684411

Deng, T., Ma, M., & Shao, S. (2014). Research note: Has International Tourism Promoted Economic Growth in China? A Panel Threshold Regression Approach. *Tourism Economics, 20*(4), 911–917. https://doi.org/10.5367/te.2013.0308

Eurostat. (2021). *NUTS - Nomenclature of Territorial Units for Statistics.* https://ec.europa.eu/eurostat/web/nuts/background

Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of Econometrics, 93*(2), 345–368. https://doi.org/10.1016/S0304-4076(99)00025-1

Harb, G., & Bassil, C. (2021). Harnessing cross-region disparities to assess the impact of tourism on regional growth in Europe. *Current Issues in Tourism, 24*(11), 1491–1504. https://doi.org/10.1080/13683500.2020.1829566

Kim, H. J., Chen, M-H., & Jang, S. C. S. (2006). Tourism expansion and economic development: The case of Taiwan. *Tourism Management, 27*(5), 925–933. https://doi.org/10.1016/j.tourman.2005.05.011

Lv, Z. (2019). Deepening or lessening? The effects of tourism on regional inequality. *Tourism Management, 72*, 23–26. https://doi.org/10.1016/j.tourman.2018.11.009

Lv, Z., & Xu, T. (2021). Tourism and environmental performance: New evidence using a threshold regression analysis. *Tourism Economics*. https://doi.org/10.1177/13548166211042450

Massidda, C., & Mattana, P. (2013). A SVECM analysis of the relationship between international tourism arrivals, GDP and trade in Italy. *Journal of Travel Research, 52*(1), 93–105. https://doi.org/10.1177/0047287512457262

Paci, R., & Marrocu, E. (2014). Tourism and regional growth in Europe. *Papers in Regional Science, 93*, S25–S50. https://doi.org/10.1111/pirs.12085

Petrović, D. M., Gelbman, A., Demirović, D., Gagić, S., & Vuković, D. (2017). The Examination of the Residents' Activities and Dedication to the Local Community—An Agritourism Access to The Subject. *Journal of the Geographical Institute "Jovan Cvijić" SASA, 67*(1), 37–52. https://doi.org/10.2298/IJGI1701037P

Seetanah, B. (2011). Assessing the dynamic economic impact of tourism for island economies. *Annals of Tourism Research, 38*(1), 291–308. https://doi.org/10.1016/j.annals.2010.08.009

Seo, M. H., & Shin, Y. (2016). Dynamic panels with threshold effect and endogeneity. *Journal of Econometrics, 195*(2), 169–186. https://doi.org/10.1016/j.jeconom.2016.03.005

Soukiazis, E., & Proença, S. (2008). Tourism as an alternative source of regional growth in Portugal: a panel data analysis at NUTS II and III levels. *Portuguese Economic Journal, 7*(1), 43–61. https://doi.org/10.1007/s10258-007-0022-0

Vukovic, D. B., Maiti, M., Vujko, A., & Shams, R. (2020). Residents' perceptions of wine tourism on the rural destinations development. *British Food Journal, 122*(8), 2739–2753. https://doi.org/10.1108/BFJ-04-2019-0291

World Tourism Organization. (2021). *The Economic Contribution of Tourism and the Impact of COVID-19, preliminary version*. World Tourism Organization. https://doi.org/10.18111/9789284423200