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Article

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Economies

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Suggested Citation: Vašaničová, Petra; Bartók, Katarína (2024) : Exploring the nexus between employment and economic contribution: A study of the travel and tourism industry in the context of COVID-19, *Economies*, ISSN 2227-7099, MDPI, Basel, Vol. 12, Iss. 6, pp. 1-20, <https://doi.org/10.3390/economies12060136>

This Version is available at:

<https://hdl.handle.net/10419/329062>

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Article

Exploring the Nexus between Employment and Economic Contribution: A Study of the Travel and Tourism Industry in the Context of COVID-19

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Abstract: The travel and tourism industry plays a crucial role in economies around the world. The impact of the COVID-19 pandemic on the tourism industry has been very pronounced. This paper aims to study the relationship between the country's T&T industry Share of Employment (TEMPL) and the country's T&T industry Share of Gross Domestic Product (TTGDP). This study is specific because we do not focus on the development of indicators over time; instead, we propose the models for 117 countries using the quantile regression (QR) while comparing models in the context of COVID-19 (between 2019 and 2021). The results of the QR determined that individual percentiles of the TTGDP are more affected by the TEMPL than other percentiles of the TTGDP, which is then reflected in the changes in regression coefficients. In addition, we compare analyzed indicators among countries according to region and income group. The study reveals that the tourism downturn caused by COVID-19 has adverse effects on the TEMPL and the TTGDP. In addition, the results show that the impact of COVID-19 on the tourism industry appears to be varied among countries, regions, and income groups.

Keywords: employment; GDP; travel and tourism; industry; COVID-19



Citation: Vašaničová, Petra, and Katarína Bartók. 2024. Exploring the Nexus between Employment and Economic Contribution: A Study of the Travel and Tourism Industry in the Context of COVID-19. *Economies* 12: 136. <https://doi.org/10.3390/economies12060136>

Academic Editor: Angeliki N. Menegaki

Received: 30 April 2024

Revised: 23 May 2024

Accepted: 27 May 2024

Published: 30 May 2024



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1. Introduction

The travel and tourism industry serves as a primary contributor to employment, government income, and foreign currency earnings for the economy. Tourism activities are significantly dependent on external factors, rendering the industry exceptionally susceptible to impacts such as terrorist attacks, climate change, natural disasters, economic downturns, and pandemics (Duro et al. 2021; Monterrubio 2022). The COVID-19 pandemic served as a crucial instance of a crisis capable of overturning entire socioeconomic systems worldwide (Jencova et al. 2021; Yopez and Leimgruber 2024).

Since the beginning of the COVID-19 crisis, the impact of the pandemic on the tourism industry has been very pronounced. The tourism sector experienced one of the first, and probably most severe, shocks to be caused by the international spread of COVID-19 (Mariolis et al. 2021). During the health crisis and economic downturn caused by COVID-19, the tourism and hospitality sectors have been severely affected, primarily due to various interconnected factors such as travel restrictions, nationwide lockdowns, business shut-downs, and the consequent effects on lives and livelihoods (Peterson and DiPietro 2021; Šenková et al. 2021). Measures to contain the virus in terms of lockdowns, travel restrictions, border closures, and mobility constraints have significantly affected the economic structure of many countries, especially those which have tourist-dependent economies (Tandrayen-Ragoobur et al. 2022). Countries whose tourism sectors contribute a high share of GDP are facing considerable economic impact, as the tourism sector plays a vital role in driving economic progress (Henseler et al. 2022). The occasions connected with the crisis

led to significant declines in both revenue and employment opportunities on a global scale (Seabra and Bhatt 2022).

Therefore, it is crucial to assess the economic influence of tourism and its contribution to the GDP. Consequently, policy briefs, industry reports, and scientific articles frequently commence by presenting statistics regarding the travel and tourism share of GDP (Figini and Patuelli 2022). Moreover, in addition to its significant role in enhancing the overall welfare of contemporary societies, employment stands as a crucial phenomenon and a topic that cannot be overlooked in macroeconomic scrutiny.

The existence of the relationship between employment and GDP has been verified in many studies (Burggraeve et al. 2015; Klinger and Weber 2020). The relationship between these indicators is frequently investigated using time series data (Ghosh 2009; Klinger and Weber 2020; Scarlett 2021). However, the connection between these specific indicators within the field of tourism is rarely explored. This paper innovatively contributes to the extant literature on the nexus of economic growth (GDP) and employment in the tourism industry by employing a quantile regression (QR) model for 117 countries while comparing models in the context of COVID-19. Specifically, this paper aims to study the relationship between the country's T&T industry Share of Employment (TTEMPL) and the country's T&T industry Share of GDP (TTGDP). Only a few studies use both indicators (Bulin 2014; Radovanov et al. 2020); thus, we aim to fill this research gap.

2. Literature Review

Studies on the tourism–growth nexus provide insights into the existence of a long-term and/or short-term relationship between tourism and economic growth. They also examine the adjustment mechanisms that restore equilibrium following a disruption in tourism and analyze how these relationships behave after shocks or regime changes (Ahmad et al. 2020). Ahmad et al. (2020) performed a systematic literature review of the tourism–growth nexus and focused mainly on the causality nexus. The studies analyzed utilized time series data. From an economic perspective, the focus was on the country's overall economic indicators, e.g., real GDP (Dogan et al. 2017; Dogru and Bulut 2018), GDP per capita (Paramati et al. 2017), and industrial production (Antonakakis et al. 2015). From a tourism perspective, studies usually dealt with international tourist arrivals (Antonakakis et al. 2015; Dogan et al. 2017), international tourism receipts (Dogru and Bulut 2018), and international tourism receipts per capita (Tang and Tan 2015; Paramati et al. 2017). The studies analyzed by Ahmad et al. (2020) have not yet included events related to the COVID-19 pandemic. Our study differs in three respects. First, it analyzes cross-sectional data instead of time series. Second, we analyze cross-sectional data for 2019 (before COVID-19) and 2021 (during COVID-19). Third, we consider the economic indicators directly related to tourism—TTGDP and TEMPL.

It is now clear that the pandemic has had an unprecedented impact on the tourism industry worldwide. The discussion about the impacts of the spread of the disease on national economies continues. As stated by Škare et al. (2021), at their time of writing, several empirical studies had evaluated the impact of the pandemic outbreak on the tourism industry. Nowadays, there are already significantly more studies on this topic. Existing studies usually deal with impacts in a particular country, e.g., Greece (Mariolis et al. 2021), Spain (Moreno-Luna et al. 2021), Portugal (de Fátima Brilhante and Rocha 2023), Australia (Pham et al. 2021; Munawar et al. 2021; Solarin et al. 2024), Ethiopia (Bogale et al. 2020), Tanzania (Henseler et al. 2022), Mauritius (Tandrayen-Ragoobur et al. 2022), Sri Lanka (Wickramasinghe and Naranpanawa 2023), Guangdong Province, China (Wu et al. 2022), Macao (Lim and To 2022); or in a particular region, e.g., Latin America and the Caribbean (Mulder 2020), Indonesia (Sun et al. 2021; Pham and Nugroho 2022), Germany and Spain (Rodousakis and Soklis 2022), Spanish provinces (Duro et al. 2021), Andalusia (Cardenete et al. 2022), Europe (Pasioka et al. 2022), European regions (Curtale et al. 2023), the Central and Eastern European region (Nagaj and Žuromskaitė 2021), Europe, the USA, and China (Islam and Fatema 2020), the Chengdu-Chongqing region in China (Ding et al. 2024).

The tourism industry serves as a significant generator of foreign exchange revenues, playing a pivotal role in driving economic growth through various channels, as evidenced by numerous studies (Ramlall 2024). Before the pandemic, tourism development was utilized to generate significant advantages for the macro-level economy, such as enhancing foreign receipts, stimulating service exports, and playing a crucial part in driving growth in the domestic economy through tourism-led initiatives (Sun et al. 2022; Brida et al. 2016). The tourism industry constitutes a vital source of income and employment (Kavya Lekshmi and Mallick 2022; Navarro-Chávez et al. 2023; Sánchez López 2024). Furthermore, tourism has a positive impact on currency circulation, employment rates, balance of payment, and investment in the development of necessary infrastructure, all of which facilitate the execution of tourism-related activities. Additionally, it contributes to bolstering the state budget by increasing government expenditure via public services and government revenue through the collection of both direct and indirect taxes (Tabash et al. 2023).

Tourism, being reliant on labor, offers numerous opportunities for both skilled and unskilled workers (Sun et al. 2022). Expanding employment opportunities is the most important effect of economic growth (Kozić and Sever 2022). In tourism, employment demand depends on the number of tourist arrivals, assuming that there is a positive relationship (Walmsley 2017). Tourism is seen as a significant driver of economic development in many developing countries, particularly for tackling poverty. It stands out as a major sector in these countries, as it is capable of fostering economic growth and enhancing social well-being at a regional level (Kavya Lekshmi and Mallick 2022; Monterrubio 2022). Moreover, given tourism's intersectoral connections, it can be seen as a potential catalyst for development in regions conducive to tourism activities (Sánchez López 2024).

Economic vulnerability and job instability in tourism have led to the inevitable onset of economic troubles (Sun et al. 2022). Islam (2021) noted that employment was expected to correspond with the economy's output level, meaning that as output decreases due to the pandemic, there is a potential for decreased employment and an increase in the unemployment rate. Sun et al. (2022) evaluate how reduced international tourism consumption affects tourism employment.

The impact of tourism on economic activity fluctuates based on the income levels and institutional characteristics of the host countries (Tang and Tan 2017; Borrego-Domínguez et al. 2022). Unfortunately, typically, standard economic impact analyses present findings through aggregate data, often lacking essential details to identify the countries that are most susceptible to economic vulnerability.

3. Methodology

We study the relationship between the country's TEMPL and the country's TTGDP. Both indicators express the economic importance of tourism in a specific region or country. The TEMPL shows how many people are employed in industries related to tourism. A higher TEMPL means that tourism provides a significant number of jobs. The TTGDP shows how much tourism contributes to overall economic activity. A higher TTGDP means that tourism is a significant source of income and has a large economic impact. The link between these two indicators arises because industries that contribute to GDP through tourism also create jobs. For example, hotels, restaurants, and travel agencies need employees to provide services to tourists. Therefore, the economic contribution (GDP) and employment in tourism interact and often show similar trends. A high TTGDP often correlates with a high TEMPL, as a greater economic contribution usually means more job opportunities are created.

Considering the aim of the paper, this study is specific because we do not focus on the development of indicators over time (time series), but we propose models for 117 countries considering conditional quantiles of the dependent variable. Therefore, we use QR. For comparison, we present results obtained by the ordinary least square (OLS) method.

A linear regression model determines parameters that minimize the sum of squared errors. When the residuals are normally distributed, the OLS estimator is the best linear unbiased estimate. Inference is made on the conditional mean and is used to determine whether to accept or reject the null hypothesis, which states that there is no relationship between the predictor x and the outcome variable y . In QR, parameters are identified for each quantile by minimizing the sum of absolute residuals. This method does not assume a specific distribution for the error terms, giving it nonparametric characteristics and making it robust to outliers. Unlike the linear regression model, which has a single set of parameters, the QR model produces a different set of parameters for each quantile. It allows for inferences at various quantiles, and statistical tests at each quantile can determine whether to accept or reject the null hypothesis (Li 2015).

We also visually compare linear regression lines concerning regions or income groups of analyzed countries. To enrich the study, this paper also compares the TEMPL and the TTGDP among regions and income groups and examines differences in these indicators before and during COVID-19. The investigation, together with geographic and economic aspects, will allow for a better understanding of this complex relationship.

3.1. Data

The data were collected via a database of the Travel and Tourism Development Index 2021, which was published by the World Economic Forum in May 2022 (Uppink Calderwood and Soshkin 2022). Specifically, the Tourism Satellite Account Research of the World Travel & Tourism Council is the source of both analyzed indicators the TEMPL (% of total employment) and the TTGDP (% of total GDP). We compare data and results for 2019 (before COVID-19) and 2021 (during COVID-19). We chose this period because we drew the data from the Travel and Tourism Development Index 2021 database, in which available data are only for these two years.

Data are available for 117 countries, which are further divided into two categories, namely region (Asia-Pacific, Europe and Eurasia, Middle East and North Africa, Sub-Saharan Africa, the Americas) and income group (high, upper-middle, lower-middle, and low-income economies). These categories are also derived from the database known as the Travel and Tourism Development Index. The countries are listed according to region and income group in Appendix A (Tables A1 and A2).

Tables 1 and 2 present descriptive statistics of the TEMPL according to region and income group. Figures 1 and 2 visualize boxplots of the TEMPL according to region and income group.

Table 1. Descriptive statistics of the TEMPL according to region.

	Asia-Pacific (20)		Europe and Eurasia (43)		Middle East and North Africa (12)		Sub-Saharan Africa (21)		The Americas (21)	
	2019	2021	2019	2021	2019	2021	2019	2021	2019	2021
Mean	4.80	4.22	4.63	4.17	4.96	3.51	3.91	2.31	3.96	2.74
S.D.	3.02	3.17	2.84	2.31	2.14	1.21	3.37	2.00	2.00	1.37
Min	1.12	0.73	0.82	1.05	1.14	1.45	0.93	0.69	1.04	0.93
Q1	3.13	1.74	2.37	2.34	3.90	2.74	1.91	1.27	2.55	1.87
Median	4.57	3.18	3.61	3.76	5.41	3.97	3.09	1.82	3.52	2.62
Q3	5.24	5.27	6.45	6.16	6.80	4.40	4.21	2.66	4.58	3.06
Max	14.63	11.45	12.72	9.29	7.44	4.89	16.42	9.09	9.06	6.39

Source: own processing using R.

Table 2. Descriptive statistics of the TEMPL according to income group.

	High (45)		Low (6)		Lower-Middle (33)		Upper-Middle (33)	
	2019	2021	2019	2021	2019	2021	2019	2021
Mean	4.96	4.24	3.46	1.88	4.49	2.98	3.87	3.38
S.D.	2.67	2.06	2.28	0.86	3.34	2.48	2.25	2.40
Min	1.12	1.05	1.14	0.83	0.93	0.70	0.82	0.69
Q1	3.25	2.60	1.76	1.33	2.86	1.55	2.25	1.85
Median	4.60	4.07	2.83	1.69	3.55	2.24	3.21	2.74
Q3	5.90	5.62	5.02	2.48	5.07	3.33	5.19	4.14
Max	12.72	9.29	6.80	3.09	16.42	11.45	8.58	10.75

Source: own processing using R.

We see (in Figure 1 and Table 1) the highest median of the TEMPL in the Middle East and North Africa region in both periods (5.41% in 2019 and 3.97% in 2021). The lowest median of the TEMPL is in the Sub-Saharan Africa region (3.09% in 2019 and 1.82% in 2021). Moreover, we see some outliers. In 2019, they correspond to Cambodia (14.46%) and New Zealand (9.30%) in the Asia–Pacific region; Greece (12.72%) in the Europe and Eurasia region; Cape Verde (16.42%) in the Sub-Saharan Africa region; Uruguay (9.06%) and Mexico (8.57%) in The Americas region. In 2021, the outliers are the Philippines (11.45%) and Thailand (10.75%) in the Asia–Pacific region, Cape Verde (9.09%) and Mauritius (6.20%) in the Sub-Saharan Africa region, and Uruguay (6.39%) and Mexico (5.45%) in the Americas region.

According to the income group, we see (in Figure 2 and Table 2) the highest median of the TEMPL in the high-income economies (4.60% in 2019 and 4.07% in 2021) and the lowest median in the low-income economies (2.83% in 2019 and 1.69% in 2021). Considering outliers, in 2019, the outliers are Greece (12.72%), Malta (11.35%), and Croatia (10.04%) in the high-income countries; Cape Verde (16.42%) and Cambodia (14.63%) in lower-middle-income countries. In 2021, the outliers are the Philippines (11.45%), Cape Verde (9.09%), Cambodia (8.44%), and Mauritius (6.20%) in lower-middle-income countries, and Thailand (10.75%), Georgia (8.58%), and Malaysia (7.78%) in upper-middle-income countries.

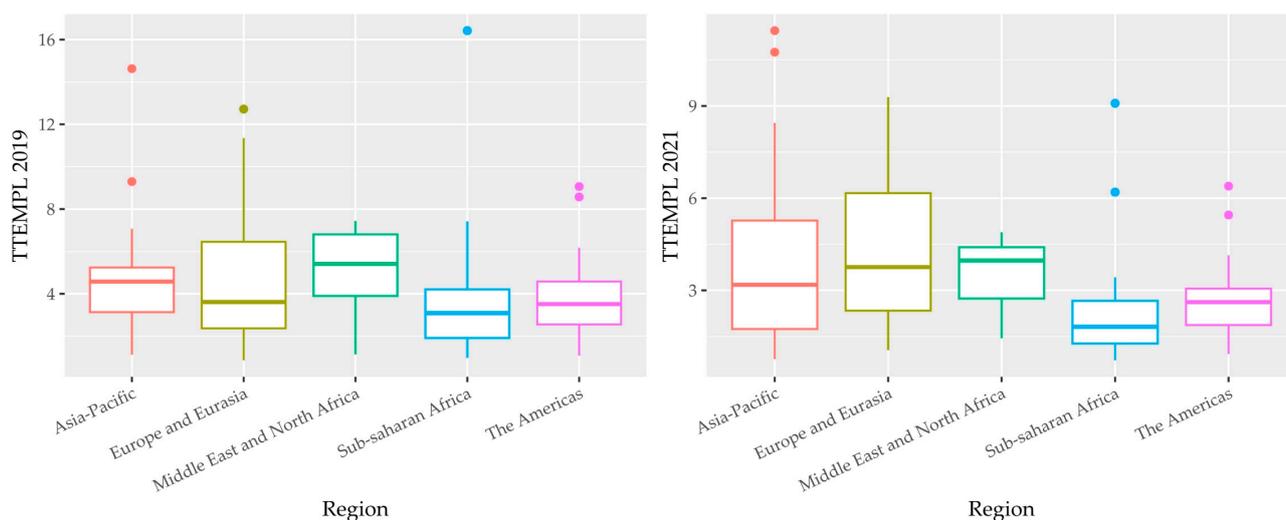


Figure 1. Boxplots of the TEMPL according to region. Source: own processing using R.

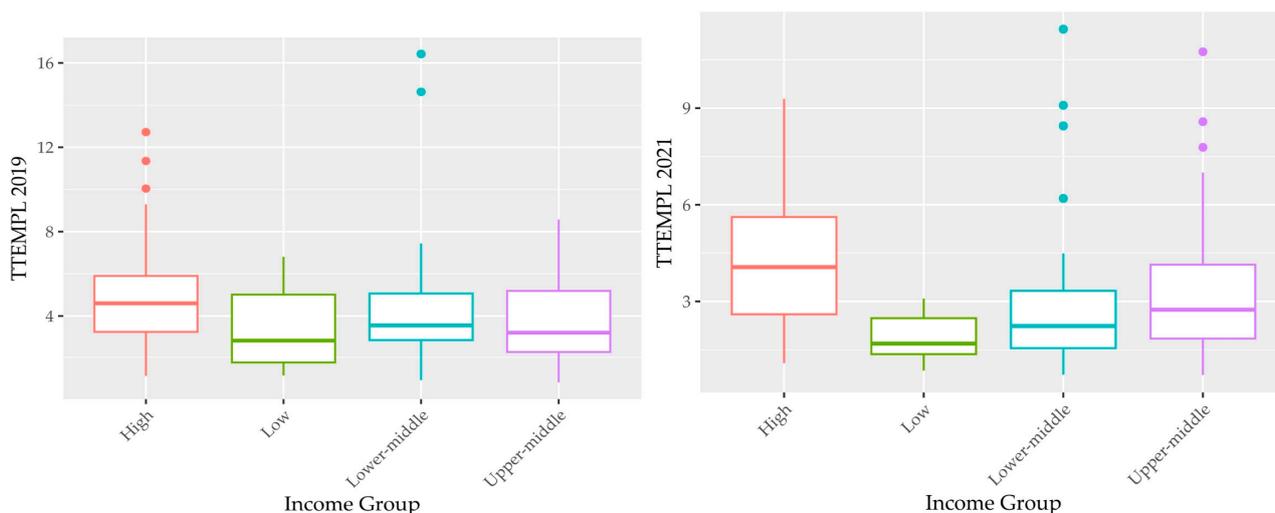


Figure 2. Boxplots of the TEMPL according to income group. Source: own processing using R.

Tables 3 and 4 present descriptive statistics of the TTGDP according to region and income group. Figures 3 and 4 visualize boxplots of the TTGDP according to region and income group.

Table 3. Descriptive statistics of the TTGDP according to region.

	Asia–Pacific (20)		Europe and Eurasia (43)		Middle East and North Africa (12)		Sub-Saharan Africa (21)		The Americas (21)	
	2019	2021	2019	2021	2019	2021	2019	2021	2019	2021
Mean	4.90	2.04	4.18	1.90	4.96	1.99	4.35	1.74	4.04	1.92
S.D.	3.49	1.81	2.71	1.01	2.27	0.79	3.66	1.18	1.97	1.09
Min	0.92	0.59	0.96	0.39	1.64	0.68	1.28	0.57	1.34	0.76
Q1	2.82	1.04	2.29	1.20	3.09	1.35	2.34	0.98	2.74	1.09
Median	3.76	1.52	3.44	1.68	5.36	2.13	3.35	1.39	3.71	1.85
Q3	5.78	2.55	5.52	2.45	6.41	2.57	4.73	1.90	5.29	2.26
Max	14.46	8.22	10.93	4.54	8.33	3.21	18.39	5.00	9.13	5.02

Source: own processing using R.

Table 4. Descriptive statistics of the TTGDP according to income group.

	High (45)		Low (6)		Lower-Middle (33)		Upper-Middle (33)	
	2019	2021	2019	2021	2019	2021	2019	2021
Mean	4.06	1.96	4.11	1.64	5.04	2.08	4.24	1.71
S.D.	2.32	1.00	2.23	0.92	3.76	1.57	2.62	1.05
Min	0.92	0.39	1.94	0.66	1.28	0.59	0.96	0.57
Q1	2.43	1.29	2.38	1.08	3.02	1.18	2.71	1.00
Median	3.30	1.68	3.42	1.49	3.73	1.63	3.68	1.34
Q3	5.48	2.55	5.94	1.87	5.74	2.52	5.24	1.95
Max	10.93	5.02	7.08	3.26	18.39	8.22	10.38	4.54

Source: own processing using R.

We see (in Figure 3 and Table 3) the highest median of the TTGDP in the Middle East and North Africa region in both periods (5.36% in 2019 and 2.13% in 2021). The lowest median of the TTGDP is in the Sub-Saharan Africa region (3.35% in 2019 and 1.39% in 2021). Moreover, we see some outliers. In the Asia–Pacific region, they correspond to Cambodia (14.46%) and the Philippines (12.38%) in 2019 and the Philippines (8.22%) in 2021. In the Europe and Eurasia region, the outliers are Croatia (10.93%), Montenegro (10.38%) in 2019,

Albania (4.54%), and Croatia (4.46%) in 2021. In the Sub-Saharan Africa region, the highest TTGDP was in Cape Verde (18.39%) in 2019 and Cape Verde (5.00%), Mauritius (3.96%), and Namibia (3.33%) in 2021. In the Americas region, the outliers are Uruguay (9.12%) in 2019 and Uruguay (5.02%), and Mexico (4.51%) in 2021.

According to the income group, we see (in Figure 4 and Table 4) that the median of the TTGDP is variable in time. In terms of outliers, in high-income economies, they correspond to Croatia (10.93%) in 2019, Uruguay (5.02%), and Croatia (4.46%) in 2021. In low-income economies, we see only one outlier in 2021, in Lesotho (3.26%). In lower-middle-income economies, outliers correspond to Cape Verde (18.39%), Cambodia (14.46%), and the Philippines (12.38%) in 2019, and the Philippines (8.22%), Cape Verde (5.00%), and Cambodia (4.62%) in 2021. In upper-middle-income economies, the outliers are Montenegro (10.38%), Georgia (10.09%), and Thailand (6.62%) in 2019, and Albania (4.54%), Mexico (4.54%), and Thailand (3.70%) in 2021.

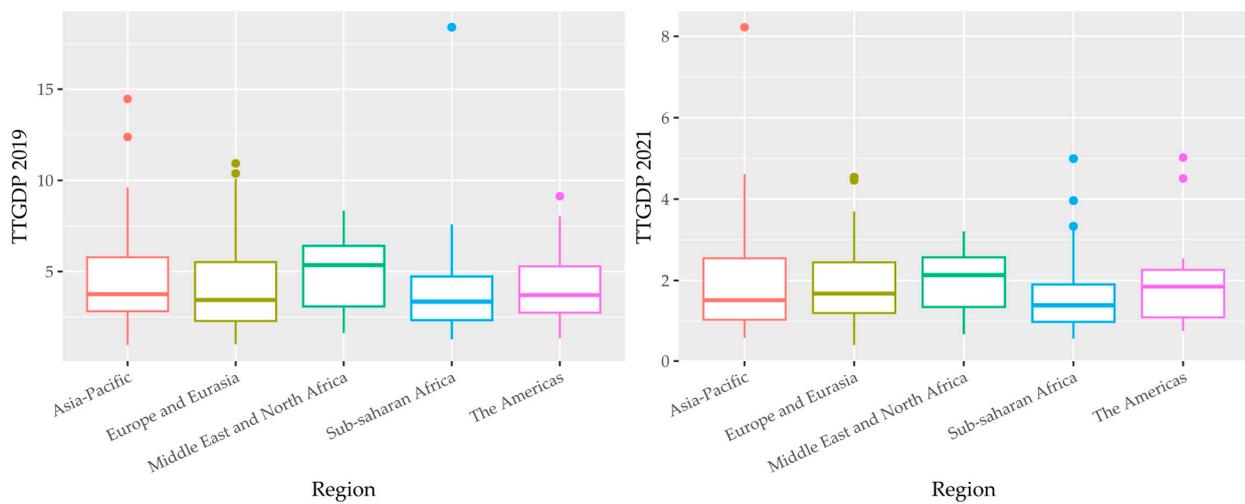


Figure 3. Boxplots of the TTGDP according to region. Source: own processing using R.

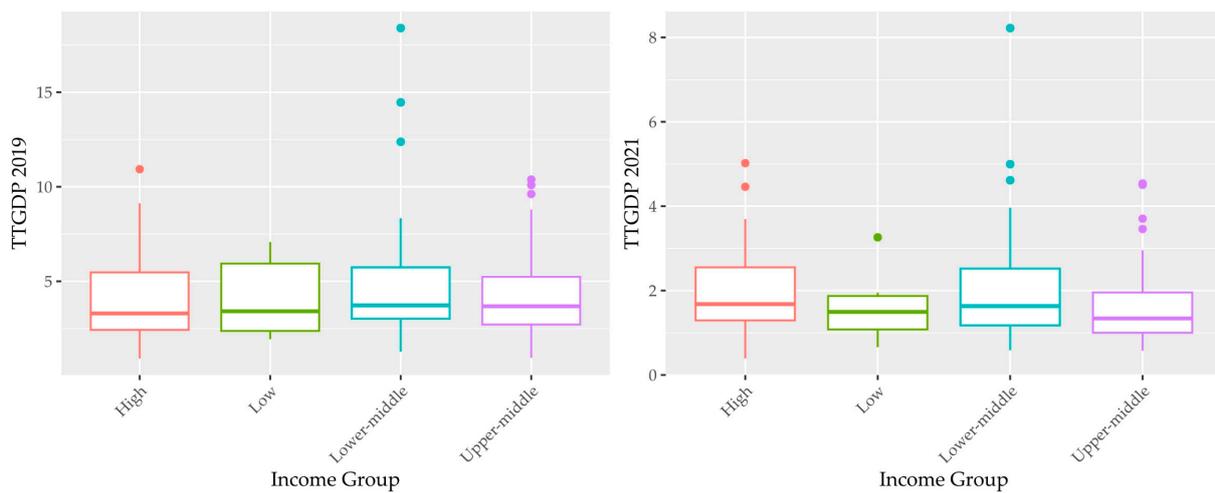


Figure 4. Boxplots of the TTGDP according to income group. Source: own processing using R.

3.2. Quantile Regression

To meet the research aim, we use QR. The description is based on that provided by Kalina and Vidnerová (2019, p. 25), Vašaničová and Jenčová (2022, p. 387), and Vašaničová and Miškuřová (2023, p. 416). In the standard linear regression model

$$Y_i = \beta_0 + \beta_1 X_{i1} + \dots + \beta_p X_{ip} + \varepsilon_i, \quad i = 1, \dots, n, \tag{1}$$

the regression τ -quantile for $\tau \in (0, 1)$ is defined as a (regression) line with parameters obtained as

$$\operatorname{argmin}_{b \in \mathbb{R}^p} \sum_{i=1}^n \rho_{\tau}(Y_i - X_i^T b), \quad (2)$$

where $X_i = (X_{i1}, \dots, X_{ip})^T$ denotes the i -th observation and ρ_{τ} (defined in [Koenker \(2005\)](#) as loss function) is considered in the form

$$\rho_{\tau}(x) = x(\tau - 1[x < 0]), \quad x \in \mathbb{R}, \quad (3)$$

with indicator function denoted by 1. Alternatively, ρ_{τ} may be formulated as

$$\rho_{\tau}(x) = \begin{cases} \tau x & \text{if } x \geq 0, \\ (\tau - 1)x & \text{if } x < 0. \end{cases} \quad (4)$$

If we assume that the quantile τ of the conditional distribution of the dependent variable Y_i is a linear function of the vector of independent variables (X_i), then we can write the quantile conditional regression as ([Kováč 2013](#)):

$$Y_i = \beta_0 + \beta_{\tau} X_i + \varepsilon_{i\tau}, \quad i = 1, \dots, n, \quad (5)$$

A specific feature of QR is that the estimated coefficients of the independent variables, β_{τ} , can be significantly different in various quantiles, which may indicate a heterogeneous conditional distribution of the dependent variable ([Cupák et al. 2016](#)). The advantage of QR is that it is the most suitable tool for modeling heteroscedastic data ([Kalina and Vidnerová 2019](#), p. 25; [Koenker 2005](#)).

To meet the aim of this paper, the model for the OLS is as follows:

$$TTGDP_i = \beta_0 + \beta_1 TEMPL_i + \varepsilon_i, \quad i = 1, \dots, n \quad (6)$$

while for QR, we consider the model according to (5) and the sequence of estimated coefficients is from $\tau = 0.05$ to $\tau = 0.95$ by 0.05. We test the presence of heteroscedasticity by the Breusch–Pagan test. If the residuals are heteroskedastic in the regression model, we use a paired bootstrap to compute p -values. To estimate the regression parameters of the QR model, we use the RStudio and the quantreg package, which was created as described by [Koenker \(2005\)](#) and [Koenker et al. \(2017\)](#). To test whether the slope coefficients of the models are identical, we use ANOVA and the anova.rq package.

4. Results

Figures 5 and 6 depict scatterplots that point to the relationship between the TTGDP and the TEMPL in 2019 and 2021. Countries (dots) are color-coded by region (Figure 5) and income group (Figure 6). Our aim is not to point out the coefficients of the individual regression lines, but only to show that the regression lines (with 95% confidence intervals marked by region or income group) differ across groups. In all cases, the relationship is positive. Countries with low levels of the TEMPL also have low levels of the TTGDP and vice versa. We see that the slopes of the regression lines vary across the years analyzed.

Table 5 presents the estimates of QR and OLS models for 2019 and 2021. The results of the ANOVA test detected that QR estimates significantly differ across quantiles. The regression model parameter estimates obtained using OLS were statistically significant, and the model explained up to 76.43% (in 2019) and 62.21% (in 2021) of the variability of the TTGDP. However, we indicated the presence of heteroskedasticity, which we confirmed through the Breuch–Pagan test (in 2019, BP = 23.670, $p = 0.0000$; in 2021, BP = 32.508, $p = 0.0000$). Therefore, the use of quantile regression is justified. The results of QR show that the TEMPL is statistically significant at each quantile level. Moreover, the coefficients differ between the models for 2019 and 2021. However, in both cases, as the quantile grows, the coefficient grows.

Figure 7 presents the sequence of estimated coefficients from $\tau = 0.05$ to $\tau = 0.95$ by 0.05. Each panel represents a covariate in the model; the horizontal axes display the quantiles, while the estimated effects are reported on the vertical axes (Costanzo and Desimoni 2017; Vašaničová and Jenčová 2022). The horizontal black solid line parallel to the x -axis denotes zero value; the red solid line corresponds to the OLS coefficient along with the 95% confidence interval (red dashed lines). Each black dot is the slope coefficient for the quantile indicated on the x -axis with 95% confidence bands marked by a gray color (Vasanicova et al. 2021; Vašaničová and Miškufová 2023). As stated by Costanzo and Desimoni (2017, p. 14), a joint inspection of the QR coefficients and the corresponding confidence bands, along with the OLS confidence intervals, permit an understanding of whether the effect of predictors is significantly different across the conditional distribution of the TTGDP values compared to the OLS estimate.

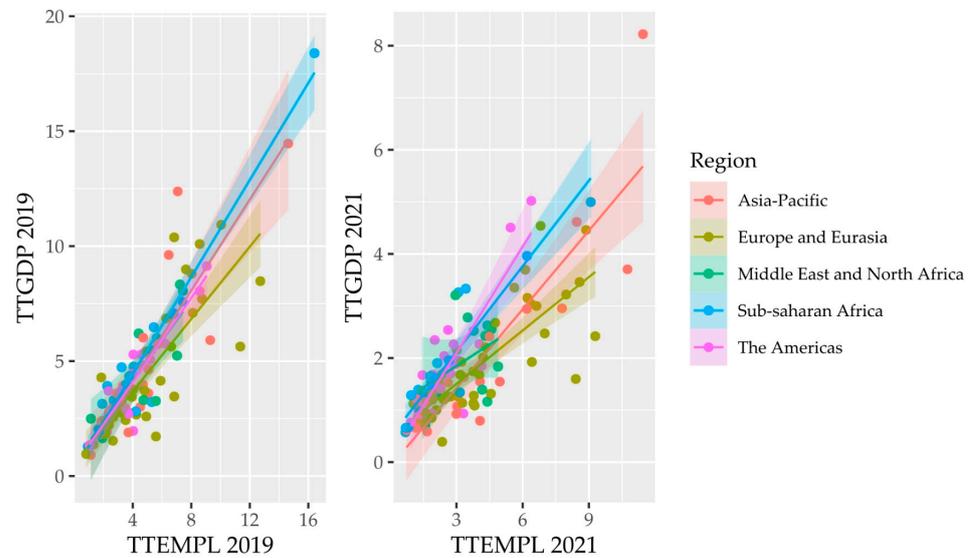


Figure 5. Relationship between the TTGDP and the TEMPL according to region. Source: own processing using R.

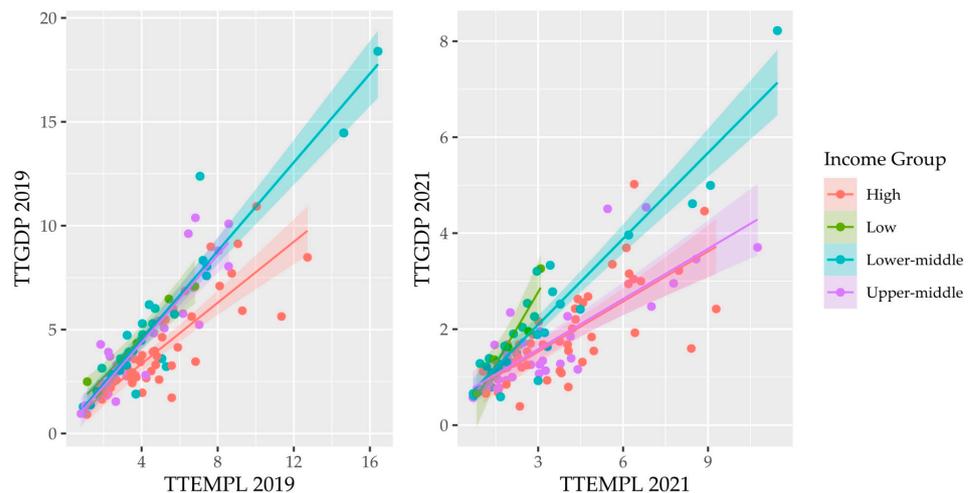


Figure 6. Relationship between the TTGDP and the TEMPL according to income group. Source: own processing using R.

Table 5. Estimates of model parameters (in 2019 and 2021).

Dependent Variable: TTGDP								
Model 2019					Model 2021			
Quantile	Intercept	<i>p</i> -Value	TTEMPL	<i>p</i> -Value	Intercept	<i>p</i> -Value	TTEMPL	<i>p</i> -Value
0.05	0.41825	0.3468	0.44487	0.0039	0.47871	0.0234	0.13748	0.0043
0.10	0.77640	0.0063	0.45132	0.0000	0.44007	0.0000	0.19163	0.0000
0.15	0.59295	0.0490	0.57188	0.0000	0.41625	0.0000	0.22744	0.0000
0.20	0.56324	0.2985	0.60670	0.0000	0.44572	0.0000	0.23046	0.0000
0.25	0.59518	0.0009	0.64714	0.0000	0.38971	0.0000	0.29746	0.0000
0.30	0.37305	0.0022	0.77284	0.0000	0.41880	0.0007	0.30563	0.0000
0.35	0.26166	0.1225	0.85194	0.0000	0.37555	0.0022	0.35562	0.0000
0.40	0.28223	0.1287	0.88888	0.0000	0.42767	0.0003	0.35339	0.0000
0.45	0.24104	0.1143	0.94441	0.0000	0.47022	0.0001	0.38179	0.0000
0.50	0.24071	0.1462	0.97230	0.0000	0.46292	0.0002	0.40312	0.0000
0.55	0.33519	0.0363	0.97051	0.0000	0.49380	0.0002	0.42848	0.0000
0.60	0.31753	0.0177	0.99668	0.0000	0.49527	0.0003	0.44671	0.0000
0.65	0.26577	0.0357	1.03754	0.0000	0.58753	0.0000	0.43632	0.0000
0.70	0.23992	0.0662	1.06249	0.0000	0.49178	0.0001	0.48800	0.0000
0.75	0.30017	0.2694	1.05847	0.0000	0.61232	0.0000	0.48243	0.0000
0.80	0.24037	0.3604	1.10539	0.0000	0.63203	0.0001	0.49985	0.0000
0.85	0.34532	0.4089	1.10518	0.0000	0.66393	0.0034	0.53225	0.0000
0.90	1.01647	0.1241	1.05813	0.0000	0.46011	0.1166	0.67775	0.0000
0.95	1.19484	0.2247	1.13764	0.0004	0.81636	0.0047	0.65768	0.0000
ANOVA <i>p</i> -value = 0.0000				ANOVA <i>p</i> -value = 0.0000				
OLS	0.36165	0.1430	0.90659	0.0000	0.47897	0.0002	0.40655	0.0000
BP = 23.670 (<i>p</i> -value = 0.0000); $R^2 = 0.7643$				BP = 32.508 (<i>p</i> -value = 0.0000); $R^2 = 0.6221$				

Source: own processing using R. Note: The *p*-values marked bold indicate the statistical significance at the significance level of 0.05.

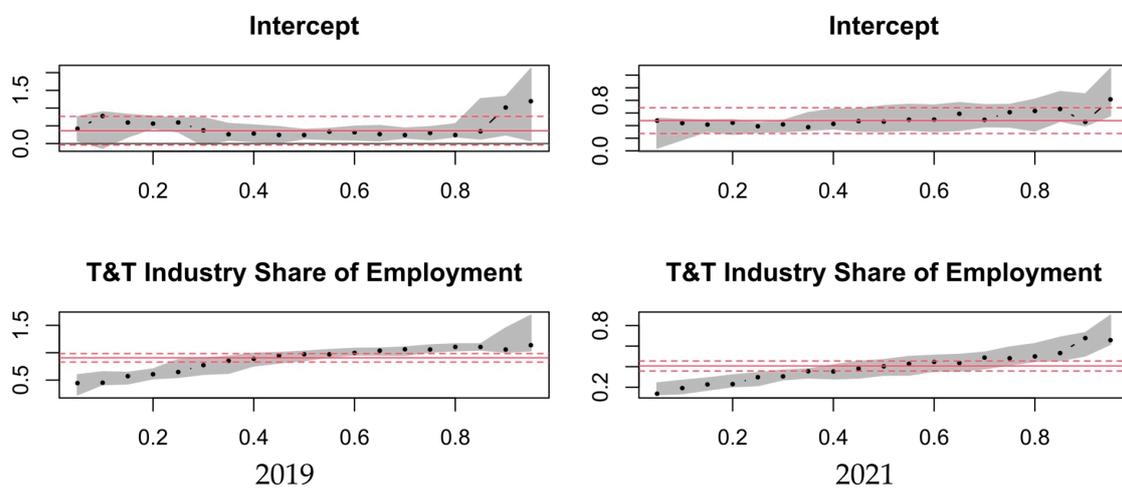


Figure 7. Estimates of model parameters by quantile level (in 2019 and 2021). Source: own processing using R.

Figure 8 shows the scatterplots, OLS and QR fits for different taus for 2019 and 2021. Superimposed on the plot are the $\tau = 0.05$, $\tau = 0.10$, $\tau = 0.25$, $\tau = 0.75$, $\tau = 0.90$, $\tau = 0.95$ quantile regression lines in gray, the median fit in solid blue, and the least squares estimate of the conditional mean function is represented by the solid red line.

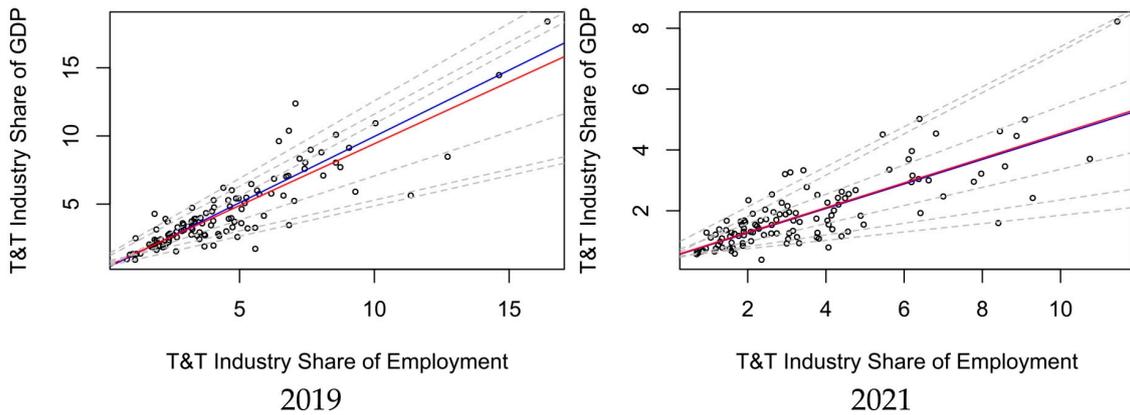


Figure 8. OLS and QR fit for different taus (in 2019 and 2021). Source: own processing using R.

Through QR, we found out which percentiles of the TTGDP may be more affected by the TEMPL (we see high coefficients for high quantile levels). In general (in both models), as the quantile grows, the coefficients grow. First, we interpret the results for the first model (2019) (see Table 5). For example, for the median ($\tau = 0.50$), we see that the 1% increase in the TEMPL is associated with the growth of the TTGDP by 0.97230%; for the third quartile ($\tau = 0.75$), we see that the 1% increase in the TEMPL is associated with the growth of the TTGDP by 1.05847%. On the other hand, although in the second model (2021), the coefficients also increase with quartile growth, the values are significantly lower. In this case, for the median ($\tau = 0.50$), we see that the 1% increase in the TEMPL is associated with the growth of the TTGDP by 0.40312%; for the third quartile ($\tau = 0.75$), we see that the 1% increase in the TEMPL is associated with the growth of the TTGDP by 0.48243%. Therefore, we examine whether the QR coefficients (for given τ) statistically significantly differ between 2019 and 2021. Wilcoxon’s signed rank test shows that differences exist. The results are shown in Table 6.

Table 6. Differences in quantile regression coefficients between 2019 and 2021—Wilcoxon’s signed-rank test.

Variables	n	W+	W−	z	p-Value
QR coefficients 2019					
QR coefficients 2021	19	190	0	3.8029	0.0001

Source: own processing using R.

Finally, we report which countries experienced the highest declines in the examined indicators as a result of the COVID-19 pandemic. Summary results of differences between 2021 and 2019 within the TEMPL and the TTGDP for each of the 117 countries are in Table A3 in Appendix B. The highest decrease in the TEMPL caused by COVID-19 was recorded in Cape Verde (−7.34%, Sub-Saharan Africa, lower-middle-income group), Greece (−6.35%, Europe and Eurasia, high-income group), Cambodia (−6.18%, Asia-Pacific, lower-middle-income group). The highest decrease in the TTGDP occurred in Cape Verde (−13.40%, Sub-Saharan Africa, lower-middle-income group), Cambodia (−9.85%, Asia-Pacific, lower-middle-income group), and Montenegro (−7.91%, Europe and Eurasia, upper-middle-income group).

Surprisingly, in some countries, despite the pandemic, the indicators have increased. We see the highest increase of the TEMPL in the Philippines (4.38%, Asia-Pacific, lower-middle-income group), Thailand (4.29%, Asia-Pacific, upper-middle-income group), and Netherlands (4.38%, Europe and Eurasia, high-income group). There was an increase in another 18 countries. The Philippine government has implemented several initiatives to encourage job creation and retention, including wage subsidies and the cash-for-work program (Furio et al. 2023). The paradox of Thailand’s success in controlling COVID-19

was described by [Tangkitvanich \(2021\)](#). Thailand prioritized soft loans to ease the cash constraints of small and medium enterprises, with earmarked allocations for travel and tourism companies ([ILO Brief 2021](#)). The Netherlands managed to maintain relatively stable employment levels during the COVID-19 pandemic because the Dutch government took measures to prevent employers from releasing employees ([Bussink et al. 2022](#)).

Considering the TTGDP, increases occurred in four countries, i.e., the Netherlands (0.70%, Europe and Eurasia, high-income group), Kyrgyz Republic (0.55%, Europe and Eurasia, lower-middle-income group), Moldova (0.18%, Europe and Eurasia, upper-middle-income group), and Namibia (0.11%, Sub-Saharan Africa, lower-middle-income group). The effective strategies employed by the Dutch government were also reflected in GDP performance ([Bussink et al. 2022](#)). The Kyrgyz government provided financial assistance and relief measures to tourism businesses to help them survive during the pandemic-induced downturn. This support aimed to prevent widespread closures and job losses in the tourism industry, thereby safeguarding tourism GDP ([Grant 2024](#)). The implementation of a fiscal stimulus aimed to cushion the impact of the pandemic in Namibia was examined by [Julius et al. \(2022\)](#).

5. Discussion

The term “crisis” has become increasingly common lately, owing to the adverse events that have affected various industries and societies worldwide ([Lim and To 2022](#)).

The study reveals that the tourism downturn caused by COVID-19 has adverse effects on direct employment in tourism. These outcomes highlight the depth and complexity of tourism. Although resources freed up from the tourism industry could potentially be absorbed by other industries, it is improbable that these resources could be extensively utilized by non-tourism industries given the current circumstances. The findings of this study concerning the macroeconomic effects of reduced tourism GDP and employment can help formulate specific policies to stimulate the industry. According to [Sun et al. \(2022\)](#), the observation of global tourism job losses reflects the social issue of inequality. Understanding potential mediators and moderators that may influence the relationship under investigation, e.g., government response effectiveness, health infrastructure, and dependency on tourism flows, can provide valuable insights for policymakers in designing effective strategies to support tourism employment and promote sustainable economic growth in tourism-dependent economies. Effective government responses can play a crucial role in maintaining both tourism GDP and employment levels. For instance, during economic downturns or crises like the COVID-19 pandemic, government interventions such as financial aid, wage subsidies, and job retention schemes can directly influence the stability of tourism employment, which in turn supports tourism GDP ([Barišić and Kovač 2022](#)). Good health infrastructure can manage health crises effectively, reducing the impact on tourism activities ([Xiong and Tang 2023](#)) and thus stabilizing the TEMPL and the TTGDP. Dependency on tourism flows could be also considered an important factor. For instance, in highly tourism-dependent economies, a drop in tourist arrivals directly leads to job losses, while tourism growth can rapidly boost employment. In more diversified economies, other sectors can buffer the impact of fluctuations in tourism GDP on employment, thus moderating this relationship ([Schubert 2021](#)).

Our results show the impact of COVID-19 on the tourism industry appears to be varied among countries. It corresponds to the results of [Lim and To \(2022\)](#). However, their research focused on tourism during the pandemic from a different perspective. They studied the effects of the COVID-19 pandemic on the gambling sector, focusing on Macao, the world’s largest destination-dependent gambling center. Moreover, we have shown that COVID-19 had a devastating impact on the GDP and employment. It corresponds to the research by [Seabra and Bhatt \(2022\)](#), who provided a literature review connected with the negative and positive effects of COVID-19 on the global tourism industry. The devastating impact of COVID-19 on global GDP and employment has revealed that external factors can significantly curtail one of the key industries of the national and global economy.

Even though variables related to GDP (e.g., per capita) and employment (e.g., employment rate or total employment) have been considered in many existing studies (e.g., [Dogru and Sirakaya-Turk 2017](#); [Manzoor et al. 2019](#); [Henseler et al. 2022](#); [Solarin et al. 2024](#)), we are not aware of any research that examines the relationship between the country's TEMPL and the country's TTGDP. One of the contributions of this paper is exploring this in relation to the COVID-19 pandemic.

From the existing research, these indicators were used by [Radovanov et al. \(2020\)](#) when investigating factors affecting the relative tourism efficiency using Tobit regression and an output-oriented data envelopment analysis. [Radovanov et al. \(2020\)](#) showed that the degree of sustainable tourism development significantly and positively impacts the efficiency of tourism. The coefficient for the TTGDP remains significant and positive in terms of overall efficiency, indicating that countries that prioritize the tourism sector tend to be more efficient. On the other hand, they excluded the TEMPL indicator from their model. [Bulin \(2014\)](#) used the TEMPL and the TTGDP when calculating the tourism multipliers and efficiency in European Union countries and used cluster analysis to categorize the countries into groups. His research is distinct because it did not address the analysis of relationships between indicators.

Other authors used only one of the two indicators. The TTGDP was used by [Lee \(2015\)](#) when modeling travel and tourism competitiveness. The TTGDP was regarded as one of the statistically significant variables influencing travel and tourism competitiveness. Results indicated that countries with a larger, more viable tourism industry and those that are wealthier tend to be more competitive in the global tourism market. [Figini and Patuelli \(2022\)](#) used the TEMPL when comparing European Union countries. Their research focused only on the TEMPL values achieved by the analyzed countries and did not explore any relationships.

Most tourism studies report these indicators at a global level when assessing the importance of tourism to the economy, i.e., how tourism contributes to the world's GDP or employment ([Vernekar 2015](#)). At present, it is often connected with the level related to COVID-19 (e.g., [Bogale et al. 2020](#); [Islam and Fatema 2020](#); [Duro et al. 2021](#); [Cardenete et al. 2022](#); [Pham and Nugroho 2022](#); [Akamavi et al. 2023](#); [de Fátima Brilhante and Rocha 2023](#)). If the studies are focused on a specific country or region, these indicators are also mentioned (e.g., [Sultana 2016](#); [Manzoor et al. 2019](#); [Mariolis et al. 2021](#); [Moreno-Luna et al. 2021](#); [Peterson and DiPietro 2021](#); [Sun et al. 2021](#); [Škare et al. 2021](#); [Tandrayen-Ragoobur et al. 2022](#); [Ramlall 2024](#)). However, only their values in the given period are presented and are not used in the research part of the publications.

In summary, our study addresses a notable research gap by integrating indicators of TEMPL and TTGDP within the context of COVID-19. We confirm the existence of the relationship between the country's TEMPL and the country's TTGDP. The results emphasize differences in indicators across regions and income groups within the countries under analysis. The findings from the QR showed that specific percentiles of the TTGDP are influenced to a greater extent by the TEMPL compared to other percentiles of the TTGDP, leading to alterations in regression coefficients. By adopting this approach, we contribute to a more nuanced understanding of the interplay between tourism, economic activity, and workforce dynamics. This endeavor not only enhances the depth of scholarly inquiry but also offers practical implications for policymakers and industry stakeholders in navigating the challenges and opportunities within the tourism sector.

Fiscal (targeted financial support, investment in infrastructure, promotion, and marketing, diversification support, workforce training, and development) and monetary (exchange rate management, credit facilities, financial incentives, collaboration with financial institutions) policies could support highly tourism-dependent economies, drawing from successful strategies observed in countries that have demonstrated resilience or quick recovery ([Sengel et al. 2023](#)). Successful examples of these policies can be observed in various countries. Japan introduced a domestic travel subsidy program called "Go-To Travel" to stimulate the domestic tourism demand during the COVID-19 pandemic. The

program provided subsidies covering a portion of travel expenses to encourage domestic travel and boost spending in the tourism sector (Miyawaki et al. 2021). New Zealand implemented a targeted financial support package for tourism businesses during the COVID-19 pandemic, including wage subsidies and grants (Hyslop et al. 2023). Spain launched extensive marketing campaigns to promote tourism recovery, including the “Spain for Sure” campaign to reassure travelers and rebuild confidence in the country as a safe destination (Martín-Critikián et al. 2021). Portugal provided financial incentives for tourism businesses to invest in sustainability measures, such as energy efficiency and waste reduction, to enhance long-term resilience and competitiveness (Turismo de Portugal 2023). Greece introduced targeted financial incentives and tax relief measures for tourism businesses, such as reduced VAT rates for accommodation and catering services, to stimulate demand and support the recovery of the tourism sector following the global financial crisis (European Commission 2023).

6. Conclusions

The COVID-19 pandemic exemplified a global crisis capable of disrupting entire socioeconomic systems worldwide. The tourism industry was no exception. During the initial phases of the pandemic, the tourism industry experienced near-complete halts. Currently, tourism is gradually adapting to new conditions.

We examined the relationship between the country’s TEMPL and the country’s TTGDP. By focusing on these two indicators, the research underscores the intertwined nature of economic contribution and employment within the tourism sector. Our paper is specific because we did not focus on the development of indicators over time, but we proposed models for the 117 countries using QR. The paper highlighted differences in indicators among regions and income groups of analyzed countries. Importantly, we assessed and compared different results caused by COVID-19. This comparative analysis enhances our understanding of how tourism contributes to economic activity and employment differently in various contexts, thus providing a more comprehensive framework for future research. Moreover, the paper illustrated differences between 2021 and 2019 within the TEMPL and the TTGDP for each of the 117 countries.

Our results contribute to the existing literature on the nexus between tourism employment and tourism GDP in the context of COVID-19. Our findings show the importance of understanding the intricate dynamics between economic growth and employment within the tourism industry, an area that has received limited attention in the existing literature. Our findings underscore the critical role of external shocks in disrupting the tourism sector and highlight the intricate dynamics between economic growth and employment within this industry. The methodological contribution using QR enriches the theoretical toolkit available for examining economic indicators within the tourism industry, suggesting that traditional linear models may not fully capture the complexity of these relationships. Moreover, this approach reveals varying impacts across the distribution, offering deeper insights into how tourism employment and GDP interact under different economic conditions.

From a practical perspective, the insights from this study have several implications for policymakers or industry stakeholders. We emphasize the necessity for effective crisis management strategies (e.g., rapid response mechanisms, financial support packages, and job retention schemes, wage subsidies) to mitigate the adverse effects of external shocks on tourism employment and GDP. Recognizing the variations in tourism’s economic impact across different regions and income groups, policymakers should tailor their strategies to the unique characteristics of each area. Strengthening health infrastructure is also crucial for managing health crises effectively. Our results can help businesses forecast and manage potential disruptions, ensuring better resilience. Finally, utilizing advanced analytical methods like QR can provide more detailed insights into regional economic dynamics, aiding in the development of more effective regional development plans.

Regarding the circumstances stemming from the COVID-19 pandemic, research by Kožić and Sever (2022) indicates that the heavily affected employment in the tourism

sector should begin to rebound once the health risks and travel impediments diminish. To efficiently address and alleviate the social repercussions of COVID-19, robust and credible evidence is essential to inform policy interventions.

In light of these findings, it is evident that further research could provide more comprehensive insights into the evolving dynamics of the travel and tourism industry. Examining the impact of other variables can further enhance our understanding of the tourism sector's dynamics. Expanding the scope of research to include more diverse geographical and economic contexts will also contribute to a more comprehensive understanding of tourism's economic impact. If this study is repeated after some time when more data are available, the study will yield more detailed results.

While this study provides valuable insights into the relationship between the TEMPL and the TTGDP, several limitations should be acknowledged. The study relies on data from 117 countries, but the data quality may vary significantly across different regions. Some countries may lack comprehensive or up-to-date information, which can affect the accuracy of the analysis. While the study examines the impact of COVID-19, it does not deeply explore the long-term effects of the pandemic on the tourism industry. Future research could extend the analysis to cover post-pandemic recovery phases. The impact of global events (e.g., international travel restrictions) versus local factors (e.g., domestic tourism policies) is not distinctly analyzed. A more detailed examination of these influences could offer better policy recommendations. By acknowledging these limitations, future research can address these gaps, leading to a more comprehensive understanding of the dynamics between the TEMPL and the TTGDP.

Author Contributions: Conceptualization, P.V. and K.B.; methodology, P.V.; software, P.V.; validation, P.V.; formal analysis, P.V. and K.B.; investigation, P.V.; resources, P.V.; data curation, P.V.; writing—original draft preparation, P.V.; writing—review and editing, P.V. and K.B.; visualization, P.V.; supervision, P.V.; project administration, P.V.; funding acquisition, K.B. and P.V. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Cultural and Educational Grant Agency of the Ministry of Education, Science, Research, and Sport of the Slovak Republic, grant No. 001PU-4/2022-KEGA.

Informed Consent Statement: Not applicable.

Data Availability Statement: For requests concerning the data, please contact the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Countries according to region.

Asia-Pacific		Europe and Eurasia				Middle East and North Africa		Sub-Saharan Africa		The Americas	
AUS	LKA	ALB	ESP	ISL	NLD	ARE	AGO	MWI	ARG	MEX	
BGD	MNG	ARM	EST	ITA	POL	BHR	BEN	NAM	BOL	NIC	
HKG	MYS	AUT	FIN	KAZ	PRT	EGY	BWA	NGA	BRA	PAN	
CHN	NPL	AZE	FRA	KGZ	ROU	ISR	CIV	RWA	CAN	PER	
IDN	NZL	BEL	GBR	LTU	SRB	JOR	CMR	SEN	COL	PRY	
IND	PAK	BGR	GEO	LUX	SVK	KWT	CPV	SLE	CRI	SLV	
JPN	PHL	BIH	GRC	LVA	SVN	LBN	GHA	TCD	DOM	TTO	
KHM	SGP	CYP	HRV	MDA	SWE	MAR	KEN	TZA	ECU	URY	
KOR	THA	CZE	HUN	MKD	TJK	QAT	LSO	ZAF	GTM	USA	
LAO	VNM	DEU	CHE	MLT	TUR	SAU	MLI	ZMB	HND	VEN	
		DNK	IRL	MNE		TUN	MUS		CHL		
						YEM					

Source: own processing. Note: countries' codes are according to Alpha-3.

Table A2. Countries according to income group.

High			Low		Lower-Middle			Upper-Middle		
ARE	FIN	ISR	POL	GHA	BEN	KGZ	NPL	AGO	DOM	MLI
AUS	FRA	ITA	PRT	LSO	BGD	KHM	PAK	ALB	ECU	MNE
AUT	GBR	JPN	QAT	RWA	BOL	LAO	PHL	ARG	GEO	MYS
BEL	GRC	KOR	SAU	SEN	BWA	LKA	SLV	ARM	GTM	PAN
BHR	HKG	KWT	SGP	SLE	CIV	MAR	TCD	AZE	CHN	PER
CAN	HRV	LTU	SVK	YEM	CPV	MNG	TJK	BGR	JOR	PRY
CYP	HUN	LUX	SVN		EGY	MUS	TUN	BIH	KAZ	ROU
CZE	CHE	LVA	SWE		HND	MWI	TZA	BRA	LBN	SRB
DEU	CHL	MLT	TTO		IDN	NAM	VEN	CMR	MDA	THA
DNK	IRL	NLD	URY		IND	NGA	VNM	COL	MEX	TUR
ESP	ISL	NZL	USA		KEN	NIC	ZMB	CRI	MKD	ZAF
EST										

Source: own processing. Note: countries' codes are according to Alpha-3.

Appendix B

Table A3. Differences in the TEMPL and the TTGDP (2021–2019).

Country	Δ TEMPL	Δ TTGDP									
CPV	-7.34	-13.40	MWI	-1.34	-2.21	LTU	-0.80	-0.68	PRY	-0.11	-0.58
GRC	-6.35	-5.43	SWE	-1.32	-0.89	BRA	-0.75	-1.28	ZMB	-0.10	-1.49
KHM	-6.18	-9.85	ARG	-1.30	-1.37	CAN	-0.72	-1.03	SVK	-0.07	-1.31
TUN	-4.48	-4.84	AZE	-1.25	-2.68	IDN	-0.70	-0.97	DNK	-0.05	-0.69
MAR	-3.72	-5.55	PAK	-1.24	-1.62	ECU	-0.68	-1.82	FIN	-0.02	-0.75
LSO	-3.71	-3.82	TTO	-1.23	-1.52	CHN	-0.65	-1.71	ITA	0.00	-2.63
LKA	-3.49	-4.24	ALB	-1.22	-4.26	ESP	-0.64	-3.21	GEO	0.00	-6.63
MEX	-3.12	-3.54	MUS	-1.22	-3.63	COL	-0.62	-1.15	KOR	0.03	-0.26
NZL	-3.11	-2.97	QAT	-1.17	-0.64	EGY	-0.62	-3.68	BEL	0.05	-1.01
MLT	-2.94	-4.03	NIC	-1.17	-3.02	GHA	-0.62	-1.35	MKD	0.11	-0.76
JOR	-2.86	-3.84	HRV	-1.17	-6.47	VEN	-0.60	-1.19	BGR	0.12	-1.84
RWA	-2.78	-4.52	BGD	-1.16	-1.59	SRB	-0.49	-1.47	LVA	0.15	-1.85
URY	-2.67	-4.11	GTM	-1.13	-1.85	AGO	-0.48	-0.78	SAU	0.15	-1.47
AUT	-2.62	-4.01	ROU	-1.10	-0.77	BIH	-0.47	-1.50	MNE	0.17	-7.91
TZA	-2.61	-2.70	HUN	-1.10	-1.51	AUS	-0.44	-1.46	SGP	0.27	-2.43
CYP	-2.51	-5.73	BHR	-1.07	-3.45	CHL	-0.43	-1.29	YEM	0.30	-1.13
LBN	-2.33	-5.86	ZAF	-1.05	-1.47	DEU	-0.42	-1.53	IRL	0.31	-1.55
HND	-2.13	-3.25	BOL	-1.01	-1.65	FRA	-0.40	-1.92	ARM	0.42	-2.65
CRI	-2.13	-3.12	HKG	-1.01	-3.84	MLI	-0.35	-2.50	TUR	0.62	-2.57
PAN	-2.03	-3.92	SLV	-1.01	-2.58	ISR	-0.33	-0.96	JPN	0.76	-0.85
BWA	-1.97	-3.34	EST	-1.01	-1.61	KWT	-0.32	-1.25	SVN	0.82	-0.76
CIV	-1.92	-2.85	USA	-0.99	-1.01	BEN	-0.30	-1.25	KGZ	1.91	0.55
NAM	-1.87	0.11	KAZ	-0.97	-1.08	LUX	-0.28	-0.79	MDA	2.44	0.18
SEN	-1.82	-2.71	TJK	-0.97	-1.71	CHE	-0.26	-1.01	MYS	3.14	-1.87
IND	-1.74	-1.97	ARE	-0.94	-3.05	GBR	-0.25	-2.39	NLD	3.71	0.70
LAO	-1.56	-2.74	SLE	-0.88	-1.28	TCD	-0.23	-0.63	THA	4.29	-5.91
MNG	-1.54	-2.69	PER	-0.87	-2.04	VNM	-0.22	-3.60	PHL	4.38	-4.16
KEN	-1.43	-2.11	NGA	-0.87	-1.17	CZE	-0.21	-0.99			
ISL	-1.42	-5.83	CMR	-0.85	-1.76	POL	-0.15	-1.06			
NPL	-1.34	-2.44	DOM	-0.83	-3.15	PRT	-0.13	-3.88			

Source: own processing. Note: a higher drop is indicated by a deeper red color.

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