

Impact of digital transition on the tourism sector

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Abstract: *Global tourism is one of the first sectors to be digitized. The era of digitization attracts new prospects for improving tourism services, both from the perspective of promoting tourist destinations and facilitating commercial exchanges between participants. The analysis is carried out for the European Union, in this paper I want to present the evaluation of the impact of online activities on tourist activities, through a panel econometric analysis, the data being reported on the percentage of people aged between 16-74 years who used the Internet in the last three months. Following the analysis, the methods used show the existence of a connection, of an appreciable intensity, between the two aspects studied, a fact that leads to more elaborate research in the future, given the dynamics of the two phenomena.*

Keywords: *digitalization, tourism sector, digital economy, digital tourism, panel modelling*
JEL classification: *L86, Z30, Z32, E20, C01, C10.*

1. Introduction

In an era where digitalization is changing the face of all economic sectors, it is crucial to understand how it is influencing tourism, a key sector for many economies. The study provides valuable insight into the concrete effects of internet use in tourism activities.

Tourism was among the first sectors to digitize business processes on a global scale, through online booking of airline flights and hotels, but also by collecting information about the areas of interest targeted by tourism consumers. As technology has advanced to become a global phenomenon, tourism has been one of the economic sectors that have adopted new technologies and platforms. Also, digitalization has a positive impact on the environment based on innovations in the tourism activity, as well as the efficient use of resources contributing to a stronger development of tourism (Sigala & Chalkiti, 2014).

Society is going through a period where it is strongly influenced by technological advances. This new, digital approach is greatly changing the structure of all economic branches due to the spread of technologies, artificial intelligence, big data, cloud computing and others. Tourism stands out as a relevant economic activity with accelerated growth, a job generator responsible for the development of regions and the improvement of the economy of these spaces. Tourism as an economic activity is adapting more and more to the new digitization trends based on the companies' effort to be more competitive.

Online travel planning services, both for accommodation and transport bookings, have increased year on year, on average by 60%, according to Eurostat estimates, both on domestic routes and for trips abroad (2023).

According to a study conducted in 2015 on the level of internet use by individuals and households, almost 40% of the population segment aged between 16-74 uses digital technology to study the offers of a new trip (Bănescu et al., 2021). Many Europeans use digital services to purchase products and services online, a fact that is also evident from the large number of accesses and holiday reservations, on digital tourism platforms, among foreign tourists, but also domestic tourists (Booking, 2023).

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Through econometric analysis, the study can help guide strategic decisions of tourism industry actors, including travel agents, hoteliers and tourism policy makers, to optimize the use of digital technologies.

Understanding the link between digitalization and tourism can improve the way tourist destinations are promoted online, helping to attract more tourists and increase revenues.

This paper presents the link between digitalization and tourism, through the number of arrivals and overnight stays in accommodation units in Europe. The econometric analysis is carried out on panel data, for 27 European countries, for the period 2002-2022, the influencing factors being the country's degree of development, cybersecurity and the tourism sector.

2. Literature review

The technological advance of the last decade led to the development of the Internet and encouraged industries such as tourism to update their business models to innovative and interesting models through new marketing strategies (Bennett et al., 2017). As a result of this evolution, marketing strategies have targeted the digital ecosystem in perspective, which has facilitated accessing and obtaining goods and services, whenever and wherever the consumer is (Sutherland et al., 2018).

Also, traditional marketing has undergone adaptations regarding the area of promotion in the online environment, generating significant changes in percentages, related to the number of accesses and consumers who used digital devices worldwide (Palos-Sanchez et al., 2019).

In 2016, a study was conducted on the determining factors influencing the percentage of people who use digital techniques and methods to access and book tourism services, which demonstrates their high purchasing power, level of education and degree of digitalization of consumers (Dumičić, et al., 2016).

Technological advancement has led consumers to change their behavior and habits in terms of the amount of time they spend surfing the Internet (Yousaf & Xiucheng, 2018), which represents an opportunity for retailers and businesses that can operate and develop in the digital environment because specialists in the field have shown that users invest an average of 6 hours a day in front of digital devices (Fang et al., 2016).

Thus, among the industries that have gained momentum are those in the tourism sector, opting for business models based on the technological environment, which has led to a revolutionary development of the sector, therefore the role of digitalization is to reduce the boundaries between sectors (Hojeghan and Esfangareh, 2011). This fact led to the modification of the marketing strategies of the companies in the field and the adoption of the Digital Tourism Business (DTB) model, thus demonstrating the direct link of tourism with the promotion and sale of services and goods in the online environment (Hojeghan & Esfangareh, 2011).

The digitalization of tourism in rural areas contributes to local development, but this is quite difficult to manage due to limited access to technology, a fact found mainly in developing countries (Dredge et al., 2019).

The tourism industry is based on the promotion of services and their transaction with the help of the Internet, an example being the purchase of plane tickets or personalized travel packages (Nezakati et al., 2015; Palos-Sanchez & Saura, 2018).

In the contemporary world, digitization is the process by which digital technologies and application systems built on them are used to innovate and drive new trends in business functions and processes (Saura et al. 2020). Thus, digitalization is considered by specialists in the field as the engine of transformations, which led to significant changes in the tourism industry. An example would be China, which revived the Silk Road, which has a special historical importance from an economic, cultural point of view and political (Üzümcü & Alyakut, 2022).

Another aspect of the digitalization of tourism is the high degree of competitiveness, by reducing the operational and transaction costs of tourism services (Bojnec & Kribel, 2004; Buhalis and O'Connor, 2005; Buhalis and Kaldis, 2008). There are also theories that attest that there cannot be a direct correlation

between the degree of digitalization of a country and the competitiveness of the tourism industry (Dos Santos, Peffers and Mauer, 1993; Byrd and Marshall, 1997; Mihalič, 2007).

3. Data and methodology

For the empirical analysis of the link between tourism and activities in the field of digital economy, we used, as a proxy for tourism activities, two variables: nights spent in tourist accommodation units (millions of nights) and arrivals at tourist accommodation (number of arrivals). For the activities in the field of digital economy, we use, as a proxy, the percentage of people aged 16-74 who used the internet in the last 3 months to search for information about goods and services (as a percentage of the total population in that age group). The data series cover the interval from 2002 to 2022, refer to the countries of the European Union (EU-27 structure, from 2020):

- ✓ Nights spent in tourist accommodation units (Hotels; holiday accommodation and other short-stay accommodation; camping grounds, recreational vehicle parks and caravan parks. Source: Eurostat, table code: tour_occ_ninat².
- ✓ Arrivals at tourist accommodation (Hotels; holiday and other short-stay accommodation; campsites, RV parks and caravan parks [I551-I553]). Source: Eurostat, table code: tour_occ_arnat³.
- ✓ Percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services, European Commission, DESI Digital Decade Visualizer. Source: Eurostat, table isoc_ci_ac_i: Internet activities – individuals (Activities on the Internet – number of persons)⁴.

In our opinion, the variables "Nights spent in tourist accommodation units" and "Arrivals at tourist accommodation" as endogenous (in separate models) and "Percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services" as the explanatory variable are significant for the analysis of the relationship between tourism and digital transition. This is because the endogenous variables are good proxies for tourism intensity and reflect the attractiveness of a country as a tourist destination. "Arrivals at tourist accommodation" directly measures tourism demand, reflecting the number of tourists visiting a country, while "Nights spent in tourist accommodation units" focuses on the length of stay, highlighting the volume of tourism activity. These variables can help analyse factors that attract tourists (e.g., digital engagement, marketing effectiveness, infrastructure) rather than just their behaviour during their stay. Moreover, high tourism activity often correlates with better digital infrastructure and services, such as online booking systems, digital payment facilities, and e-tourism platforms. The "percentage of people aged 16-74 who used the Internet to search for information about goods and services" reflects digital engagement and behaviour. Specifically, this variable highlights the role of digital tools in consumer decision-making processes, including travel planning and accommodation booking. We expected that a higher percentage suggests greater reliance on digital platforms for tourism-related activities, directly linking tourism behaviour with digital literacy and adoption.

Panel data models were used. A panel data model enables capturing heterogeneity across countries (EU-27) while analysing changes over time and allows control for unobserved heterogeneity (Jula & Jula, 2024).

² Available online at:

https://ec.europa.eu/eurostat/databrowser/product/view/tour_occ_ninat?category=tour.tour_inda.tour_occ.tour_occ_n (accessed Apr. 21 2024)

³ Available online at:

[https://ec.europa.eu/eurostat/databrowser/view/tour_occ_arnat\\$defaultview/default/table?lang=ro](https://ec.europa.eu/eurostat/databrowser/view/tour_occ_arnat$defaultview/default/table?lang=ro) (accessed Apr 15 2024)

⁴ Available online at: <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/key-indicators/indicators> (accessed 15 Apr. 2024)

For the correct specification of the econometric models, we tested, in the first stage, the nature of the time series. According to standard panel unit root tests for the individual fixed effects model, the series "nights spent in tourist accommodation" and "percentage of people aged 16-74 who used the Internet in the last 3 months for searching information on goods and services" are stationary, and the series "arrivals at tourist accommodation units" and "percentage of people aged 16 to 74 who order goods or services online" are stationary only in the model with both individual fixed effects and linear trend (Appendix 1).

4. Research results and comments

We built panel econometric models to evaluate the impact of online activities approximated by "the percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services" on tourism activities (assessed by "number of nights spent at tourist accommodation units" and "arrivals at tourist accommodation units").

We built a panel econometric model similar to the previous one, for the 27 countries of the European Union. The forecast period is wider, 2002 – 2022 and was likewise restricted by data availability. The model specification is as follows:

$$(\text{Night})_{i,t} = a_0 + a_1 \cdot (\text{Night})_{i,t-1} + a_2 \cdot (\text{Findgs})_{i,t} + b_i \cdot (D_{2020}) + c_i + e_{i,t}, \quad (1)$$

where:

- i – cross-section index (for EU-27 countries)
- t – time index (year: 2002 – 2022)
- $(\text{Night})_{i,t}$ – the number of nights spent in tourist accommodation units in country I , year t
- d_{2020} – is a dummy variable, which takes the value 1 for the year 2020 and 0 for the rest.
- a_0 – is a constant coefficient (proportionality parameter)
- a_1 – evaluates the inertial component of tourists' behaviour
- a_2 – measures the impact of online commerce on tourism
- b_i – estimates the effects of the COVID-19 crisis on the tourist activity; the effects are highlighted in relation to the specifics of each country.
- c_i – are the individual specific effects (the particularities of each country)
- $e_{i,t}$ – the idiosyncratic error
- $(\text{Findgs})_{i,t}$ – denotes the percentage of people aged 16 to 74 in country i , year t , who used the Internet in the last 3 months to search for information about goods and services.

We included in the model a dummy variable for the year 2020. This is because 2020 represented a year of major decline in the tourism industry, without a similar evolution in the recent period. The respective variable was considered as an individual specific effect since the effect of the COVID-19 crisis manifested itself with different intensities in the EU-27 countries (Jula & Jula, 2023). The model estimate is as follows:

$$\text{Night}_{i,t} = 18.94522 + 0.65374 \cdot \text{Night}_{i,t-1} + 0.17683 \cdot \text{Findgs}_{i,t} + \hat{b}_i \cdot D_{2020} + \hat{c}_i + u_{i,t} \quad (2)$$

(8.2314) (0.0566) (0.1095)

(u_{it} are the residuals and, under the estimators, in parentheses, is the standard error). The model estimation results are detailed in Appendix 1b. Technically, the parameter attached to the FINDGS impact variable is significant at 5% (for the one-sided Student t -test), and the coefficient attached to the impact of COVID-19 on tourism is not statistically significant only for Luxembourg. All other coefficients are significant at the 0.001 threshold and the model as a whole is statistically significant (the probability attached to the F-statistic test is less than 10^{-6}). The fixed effects (estimated by the c_i coefficients) are not redundant (the probability attached to the null hypothesis is $< 10^{-4}$).

At the European level (EU-27), the estimated equation for 2002 – 2022 reveals a positive inertial impact ($\hat{a}_1 = 0.654$) in the dimensioning of tourist activities and a positive effect of the development of online activities ($\hat{a}_2 = 0.177$). The COVID-19 crisis prevented the development of tourism activities except Luxembourg (with non-significant coefficient), all the other estimators for coefficients of dummy 2020 variables are negative (and the mean of b_i estimators is negative). The greatest effects of the COVID-19 crisis were recorded in the countries that traditionally attract the largest share of international tourism flows:

Spain (-312.7 mil. nights spent in tourist accommodation units), Italy (-221 mil.), France (-178 mil.), Germany (-156 mil.), Greece (-93 mil.). The effect for Romania was -12.97 mil. nights spent in tourist accommodation units.

Specific individual fixed effects are positive for European countries recognized high touristic activity: compared to the European average ($\hat{a}_0 = 18.94$), Spain registers an increase of 116.46, Italy (+114.11), France (+113.02), Germany (+96.10), Greece (+3.27), Austria (+6.87). And those countries were the most affected by the COVID-19 crisis (estimates are detailed in Appendix 2). As a regional particularity, Romania is below the European average (the specific effect is -20.29). The regression equation for Romania, in the European context, is:

$$\begin{aligned} \text{Night}_{RO,t} &= (18.945 - 20.295) + 0.654 \cdot \text{Night}_{RO,t-1} + 0.177 \cdot \text{Findgs}_{RO,t} - 12.972 \cdot D_{2020} + u_{i,t} \\ &= -1.350 + 0.654 \cdot \text{Night}_{RO,t-1} + 0.177 \cdot \text{Findgs}_{RO,t} - 12.972 \cdot D_{2020} + u_{i,t} \end{aligned} \quad (3)$$

To compare the size of the estimators, we calculated the elasticity at means (by scaling the regression coefficients with the mean of the variables). The results are presented in Table 1:

Table 1. Relationship between nights spent in tourist accommodation units and people used the Internet to search for information about goods and services

<i>Endogenous variable: the number of nights spent in tourist accommodation units (Night_{i,t})</i>	Symbol	Coefficient of regression	Elasticity at Means
Constant	a_0	18.945220	0.225
Inertial effects	$\text{Night}_{i,t-1}$	0.653745	0.642
Percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services	$\text{Uings}_{i,t}$	0.176832	0.165
Mean effects of the COVID-19 crisis on tourism	$(\sum b_i)/21$	-2.653728	-0.031
The mean of the fixed individual specific effect	$(\sum c_i)/27$	-0.074246	-0.001

Source: calculations based on data from Appendix 2.

The econometric model, built at the European level, associates the development of online activities with a 0.165 increase in tourist services: the increase by 1 point (compared to the average) of the percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services is associated with the increase (as well, compared to the average) by 0.165 mil. nights spent in tourist accommodation units.

"Arrivals at tourist accommodation" directly measures tourism demand, reflecting the number of tourists visiting a country, while "Nights spent in tourist accommodation units" focuses on the length of stay, highlighting the volume of tourism activity. For this reason, we have developed an alternative panel data model, of the relationship between the number of "arrivals at tourist accommodation" (symbol: Arrival) and the "percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services" (symbol: Uings). The model specification is as follows:

$$(\text{Arrival})_{i,t} = \alpha_0 + \alpha_1 \cdot (\text{Arrival})_{i,t-1} + \alpha_2 \cdot (\text{Uings})_{i,t} + \delta_i \cdot (d2020) + \mu_i + \epsilon_{i,t}, \quad (4)$$

where symbols have the meaning shown for previous models. The model estimate is as follows:

$$\text{Arrival}_{i,t} = \underset{(2.4614)}{3.97030} + \underset{(0.0637)}{0.77042} \cdot \text{Arrival}_{i,t-1} + \underset{(0.0273)}{0.04994} \cdot \text{Uings}_{i,t} + \hat{\delta}_i \cdot d_{2020} + \hat{\mu}_i + u_{i,t} \quad (5)$$

(u_{it} are the residuals and, under the estimators, in parentheses, is the standard error). The model estimation results are detailed in Appendix 3. Technically, the parameter attached to the UINGS impact variable is significant at 3% (for the one-sided Student t-test), the intercept at 5%, and, similarly to the previous model, only the coefficient attached to the impact of COVID-19 on tourism in Luxembourg is not statistically

significant. All other coefficients are significant at the 0.001 threshold and the model as a whole is statistically significant: the probability attached to the F-test is $p(F_{stat}=666.4) < 10^{-6}$. The fixed effects (estimated by the μ_i coefficients) are not redundant (the probability attached to the null hypothesis is < 0.0001).

At the European level (EU-27), the estimated equation for 2002 – 2022 reveals a positive inertial impact ($\hat{\alpha}_1 = 0.77$) in the dimensioning of tourist activities and a positive effect of the development of online activities ($\hat{\alpha}_2 = 0.0499$). The COVID-19 crisis prevented the development of tourism activities (the mean of b_i estimators is negative).

Compared to the European average ($\hat{\alpha}_0 = 18.94$), specific individual fixed effects are higher for European countries recognized for tourism activity (Spain, Italy, France, Germany, Austria), and those countries were the most affected by the COVID-19 crisis (the estimates are detailed in Appendix 3). As a regional particularity, Romania is below the European average (the specific effect is -20.29). The regression equation for Romania, in the European context, is:

$$\begin{aligned} Arrival_{RO,t} &= (3.970 - 4.106) + 0.770 \cdot Arrival_{RO,t-1} + 0.050 \cdot Uings_{RO,t} - 6.378 \cdot \\ d_{2020} + u_{i,t} & \hspace{15em} (6) \\ &= -0,136 + 0.770 \cdot Arrival_{RO,t-1} + 0.050 \cdot Uings_{RO,t} - 6.378 \cdot d_{2020} + u_{RO,t} \end{aligned}$$

To compare the size of the estimators, we calculated the elasticity at mean (by scaling the regression coefficients with the mean of the variables). The results are presented in Table 2.

Table 2. Relationship between the arrivals at tourist accommodation and people used the internet to search for information about goods and services

Endogenous variable: number of arrivals at tourist accommodation ($Arrival_{i,t}$)	Symbol	Coefficient of regression	Elasticity at Mean
Intercept	a_0	3.970296	0.144
Inertial effects	$Arrival_{i,t-1}$	0.770422	0.752
Percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services	$Uings_{i,t}$	0.049938	0.142
Mean effects of the COVID-19 crisis on tourism	$(\sum \delta_i)/21$	-1.013787	-0.036
Mean specific individual fixed effects	$(\sum \mu_i)/27$	-0.045971	-0.002

Source: calculations based on data from Appendix 3.

The econometric model, built at the European level, associates the development of online activities with a 0.142 increase in tourist services: the increase by 1 point (compared to the average) of the percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services is associated with the increase (as well, compared to the average) by 0.165 mil. arrivals at tourist accommodation.

5. Conclusions

Tourism stands out as a relevant economic activity with accelerated growth, a job generator responsible for the development of regions and the improvement of the economy of these spaces. Tourism as an economic activity is adapting more and more to the new digitization trends based on the companies' effort to be more competitive. Tourism embraces digitization in several ways, such as online bookings, with the help of mobile applications, virtual reality, and the automation of internal processes. Tourism may drive investments in digital tools and services (e.g., online tourism platforms, digital marketing, and smart tourism technologies), enhancing DESI scores of the countries. Increased digital adoption, could further promote tourism by making a country more accessible and attractive to international and domestic tourists.

This paper analyses the relationship between digital transition and tourism activities across the European Union during 2002-2022. The analysis, utilizing panel econometric models, reveals several

findings that contribute to understanding of how digital adoption influences tourism development and resilience.

First, the study demonstrates a positive correlation between digital engagement and tourism activities across EU member states. The econometric models confirm that increased internet usage for searching goods and services correlates with higher tourism activity, both in terms of overnight stays and tourist arrivals. Specifically, a one-point increase in the percentage of people using the internet for information searches corresponds to an increase of 0.165 million nights in tourist accommodations. This relationship is further supported by the alternative model examining tourist arrivals, which shows a similar positive elasticity of 0.142.

The research also reveals strong inertial effects in tourism activities, with coefficients of 0.65 for overnight stays and 0.77 for arrivals. This indicates that tourism destinations tend to maintain their attractiveness over time, suggesting that established tourism markets benefit from substantial momentum effects. This finding highlights the importance of building and maintaining a strong tourism foundation, as successful tourism destinations are likely to continue attracting visitors.

A particularly noteworthy finding emerges from the analysis of country-specific effects. Traditional tourism powerhouses within the EU – Spain, Italy, France, and Germany – demonstrate significantly positive fixed effects compared to the European average. For instance, Spain shows an increase of 116.5 million of overnight stays above the European average (18.9), followed by Italy (+114.1), France (+113.0), and Germany (+96.1). These countries' strong performance above the baseline underscores their established position as premier tourism destinations within the EU.

However, the COVID-19 crisis of 2020 revealed the vulnerability of even the strongest tourism markets. The research quantifies the devastating impact of the pandemic through dummy variables, showing that countries with the highest tourism flows experienced the most severe declines. The magnitude of impact is striking: Spain: -312.7 million nights, Italy: -221, France: -178, Germany: -156, Greece: -93 million nights and so on.

This pattern suggests that while digital advancement supports tourism growth, it cannot fully insulate the sector from major external shocks. The uniform negative impact across almost all EU countries demonstrates the pandemic's unprecedented nature and scope.

Regional disparities within the EU are also evident from the analysis. Countries like Romania, showing a specific effect of -20.29 million of overnight stays below the European average, highlight the continuing challenges faced by emerging tourism markets in the EU. This suggests that while digital transition positively influences tourism development, other factors such as infrastructure, historical tourism reputation, and overall economic development continue to play crucial roles in determining a country's tourism performance.

The research discussed in the paper has several implications for tourism policymakers and stakeholders:

- ✓ Digital transformation should be prioritized as a key driver of tourism development, given the positive relationship between internet usage and tourism activities.
- ✓ While established tourism destinations benefit from strong inertial effects, they should not rely solely on historical success. The COVID-19 crisis demonstrated that even the strongest markets need robust crisis management strategies.
- ✓ Countries with below-average tourism performance, like Romania, might benefit from targeted policies that combine digital advancement with traditional tourism infrastructure development.
- ✓ The varying impact of the COVID-19 crisis suggests the need for differentiated crisis response strategies based on a country's tourism profile and international exposure.

Future research could explore additional dimensions of digital transition beyond internet usage for information searches, such as the impact of social media, mobile applications, and digital payment systems on tourism activities. Furthermore, investigating the role of digital readiness in tourism recovery post-COVID-19 could provide valuable insights for future crisis preparation and management.

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Appendix 1: Unit root tests

Panel unit root test: Summary

Sample: 1990 2022

Cross-section: 27

Exogenous variables: *Individual effects*

Newey-West automatic bandwidth selection and Bartlett kernel

Exogenous variables	<i>Individual effects</i>						<i>Individual linear trend</i>	
	<i>Night</i>		<i>Uings</i>		<i>Arrival</i>			
Series	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Null: Unit root (assumes common unit root process)								
Levin, Lin & Chu t	-6.219	0.0000	-7.572	0.0000	-3.213	0.0007	-13.090	0.0000
Null: Unit root (assumes individual unit root process)								
Im, Pesaran, Shin W-stat	-3.430	0.0003	-7.269	0.0000	0.811	0.7914	-12.305	0.0000
ADF - Fisher Chi-square	103.159	0.0000	172.678	0.0000	54.319	0.4622	245.296	0.0000

Exogenous variables	<i>Individual effects</i>				<i>Individual linear trend</i>			
	<i>Night</i>		<i>Uings</i>		<i>Arrival</i>			
Series	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
PP - Fisher Chi-square	94.780	0.0005	281.908	0.0000	58.997	0.2979	146.468	0.0000

Legend: Night – Nights spent in tourist accommodation units
 Arrival – Arrivals at tourist accommodation units
 Uings – Percentage of people aged 16-74 who used the internet in the last 3 months to search for information about goods and services

Source: Calculations in EViews based on the data described in §3. Data and Methodology

Conclusions: The time series *Night* (nights spent in tourist accommodation units) and *Uings* (percentage of people aged 16-74 who used the internet in the last 3 months to search for information about goods and services) are stationary in the model with individual effects as exogenous variables, while *Arrival* (arrivals at tourist accommodation units) is stationary only in the model with Individual effects and individual linear trends as exogenous.

Appendix 2: Panel model of the link between the "nights spent in tourist accommodation units" and "percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services"

Dependent Variable: Night

Method: Pooled Least Squares

Sample (adjusted): 2002 2022

Included observations: 21 after adjustments. Cross-sections included: 27

Total pool (unbalanced) observations: 522

White period (cross-section cluster) standard errors & covariance (d.f. corrected)

Standard error and t-statistic probabilities adjusted for clustering

Variable	Coefficient	Std. Error	Prob.
C	18.94522	8.231385	0.0296
Night (-1)	0.653745	0.056594	0.0000
Uings	0.176832	0.109545	0.1185
2020:AT	-43.89946	1.384733	0.0000
2020: BE	-20.50471	0.675567	0.0000
2020: BG	-15.67274	1.096234	0.0000
2020: CY	-13.97069	0.412794	0.0000
2020: CZ	-23.74451	1.003012	0.0000
2020: DE	-156.2098	5.520070	0.0000
2020: DK	-10.90245	0.717587	0.0000
2020: EE	-4.679709	1.048552	0.0001
2020: EL	-93.33413	3.453412	0.0000
2020: ES	-312.7154	5.548248	0.0000
2020: FI	-7.923668	0.259971	0.0000
2020: FR	-178.3482	5.401948	0.0000

Variable	Coefficient	Std. Error	Prob.
2020: HR	-47.06772	1.843732	0.0000
2020: HU	-17.72331	0.817467	0.0000
2020: IE	-16.25960	0.199205	0.0000
2020: IT	-221.0933	4.019982	0.0000
2020: LT	-5.072987	1.223317	0.0003
2020: LU	0.838978	1.330388	0.5338
2020: LV	-3.276159	0.671562	0.0000
2020: MT	-7.901931	0.724353	0.0000
2020: NL	-33.12111	1.795673	0.0000
2020: PL	-36.73735	1.715225	0.0000
2020: PT	-42.88064	1.492771	0.0000
2020: RO	-12.97218	0.698869	0.0000
2020: SE	-21.52338	0.814941	0.0000
2020: SI	-5.882357	0.593858	0.0000
2020: SK	-8.784118	1.507532	0.0000

Fixed Effects (Cross)

Variable	Coefficient
c: AT	6.867367
c: BE	-20.37894
c: BG	-21.66794
c: CY	-27.98795
c: CZ	-16.56533
c: DE	96.10056
c: DK	-22.94303
c: EE	-31.20426
c: EL	3.274776

Variable	Coefficient
c: ES	116.4570
c: FI	-27.23220
c: FR	113.0156
c: HR	-6.730760
c: HU	-24.23708
c: IE	-21.77923
c: IT	114.1068
c: LT	-30.40892
c: LU	-32.40197
c: LV	-30.47691

Variable	Coefficient
c: MT	-30.29083
c: NL	2.219132
c: PL	-5.189670
c: PT	-12.02681
c: RO	-20.29485
c: SE	-15.03423
c: SI	-29.84048
c: SK	-27.35450

Root MSE	12.93273	R-squared	0.949068
Akaike info criterion	8.171960	Adjusted R-squared	0.927778
Schwarz criterion	8.628721	S.E. of regression	13.68777
Hannan-Quinn criter.	8.350861	F-statistic	766.5829
Durbin-Watson stat	1.810671	Prob(F-statistic)	0.000000

Note: EU-27 country symbols are the standard ones from Eurostat statistics.

Source: Calculations in EViews based on the data described in §3. Data and methodology.

Appendix 3. Panel model of the link between the indicator "arrivals in tourist accommodation units" and "percentage of people aged 16-74 who used the Internet in the last 3 months to search for information about goods and services"

Dependent Variable: Arrival

Method: Pooled Least Squares

Sample (adjusted): 2002 2022

Included observations: 21 after adjustments. Cross-sections included: 27

Total pool (unbalanced) observations: 519

Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	Prob.
C	3.970296	2.461431	0.1074
Arrival (-1)	0.770422	0.063712	0.0000
Uings	0.049938	0.027288	0.0679
2020:AT	-18.61312	3.462418	0.0000
2020: BE	-10.50345	1.580125	0.0000

Variable	Coefficient	Std. Error	Prob.
2020: BG	-4.495833	0.595502	0.0000
2020: CY	-2.283711	0.370568	0.0000
2020: CZ	-10.79713	1.871937	0.0000
2020: DE	-85.37694	14.50891	0.0000
2020: DK	-3.468494	0.662358	0.0000
2020: EE	-2.227777	0.488609	0.0000

Variable	Coefficient	Std. Error	Prob.
2020: EL	-23.03901	3.788213	0.0000
2020: ES	-88.32215	12.47904	0.0000
2020: FI	-4.905161	0.542606	0.0000
2020: FR	-81.84588	13.37930	0.0000
2020: HR	-12.63077	1.794189	0.0000
2020: HU	-7.753928	1.114586	0.0000
2020: IE	-6.922202	1.657448	0.0000
2020: IT	-74.61644	9.268160	0.0000
2020: LT	-2.284134	0.618609	0.0002
2020: LU	0.097838	0.549174	0.8587
2020: LV	-1.586217	0.484755	0.0011
2020: MT	-1.631251	0.349428	0.0000
2020: NL	-17.75463	3.523859	0.0000
2020: PL	-17.07364	2.923543	0.0000
2020: PT	-16.05656	3.185782	0.0000
2020: RO	-6.378402	1.397321	0.0000
2020: SE	-12.88922	2.162384	0.0000
2020: SI	-3.130651	0.603418	0.0000
2020: SK	-3.584042	0.763043	0.0000

Fixed Effects (Cross)

Variable	Coefficient
μ: AT	0.635267
μ: BE	-4.047414
μ: BG	-5.320233
μ: CY	-7.387189
μ: CZ	-3.652850
μ: DE	29.29466
μ: DK	-6.399962
μ: EE	-7.225148
μ: EL	-1.615090
μ: ES	21.76070
μ: FI	-5.655936
μ: FR	31.74581
μ: HR	-3.930003
μ: HU	-5.443929
μ: IE	-5.341506
μ: IT	22.03026
μ: LT	-7.081267
μ: LU	-7.775465
μ: LV	-7.099964
μ: MT	-7.629341
μ: NL	1.002223
μ: PL	-0.263520
μ: PT	-2.756453
μ: RO	-4.105882
μ: SE	-1.521069
μ: SI	-6.998003
μ: SK	-6.459929

Akaike info criterion	6.127548	R-squared	0.987528
Schwarz criterion	6.586328	Adjusted R-squared	0.986046
Hannan-Quinn criter.	6.307285	F-statistic	666.5432
Durbin-Watson stat	1.942935	Prob(F-statistic)	0.000000

Note: EU-27 country symbols are the standard ones from Eurostat statistics.

Source: Calculations in EViews based on the data described in §3. Data and methodology.