Geopolitical risks, GDP and tourism: an ARDL-ECM cointegration study on Ukraine

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Abstract

Tourism is a sector of the economy that is significantly affected by fluctuations in economic and political activity and the influence of external factors. Political tensions with Russia and the Crimean issue have affected tourism revenues as well as Ukraine's economic growth. Therefore, the situation in the Ukrainian tourism sector requires the development of science-based approaches and practical advice to improve tourism in Ukraine, taking into account the impact of environmental risks. In the study, the long-term effect of Ukraine's GDP and GPR Index on Ukrainian tourism was investigated for the period 1995-2019. The ARDL Boundary Test is used in the analysis to explore the long-term impact of Ukraine's GDP and GPR on Ukrainian tourism. ADF by Dickey and Fuller, and Phillips Perron unit root tests are used to assess the degree of integration of the series. Empirical findings suggest that geopolitical risk has a negative impact on tourism revenues. Results of research support the initial hypothesis that there is a nexus among indicators of economic growth, tourism, and the GPR index. This gives grounds for the assertion that reducing the level of risk to a minimum will increase the attractiveness of Ukraine as a tourist destination, thereby creating new opportunities for economic growth and social development.

Keywords: geopolitical risk, GPR Index, economic growth, tourism, ARDL cointegration, Ukrainian tourism

Introduction

Tourism as a type of economic activity has developed quite rapidly in recent years. The number of international tourist arrivals worldwide reached 1.4 billion in 2018 (Travel and Tourism Competitiveness Report, 2019) and still continues to increase. This proves the significant role of tourism in the global economy.

Tourism as an industry contributes to the GDP. This contribution is significant in many countries. A number of countries and regions are identifying tourism as a strategic priority for their

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development. This is not only true for developing countries, but also for developed countries. To a certain extent, tourism can stimulate the economic growth both directly, by generating revenues for the budget and stimulating employment in the tourism sector, and indirectly, by initiating the development of tourism-related industries, which confirms the multiplier effect of tourism.

However, tourism is a sector that is highly vulnerable to various risks. Tourism reacts very quickly and painfully to global risks; therefore, it is necessary to timely determine the degree of tourism's dependence on external risks in order to develop preventive measures.

For transition economies, tourism can be a major source of economic growth as it generates foreign exchange earnings and has a short payback period for investments. Ukraine has the potential to develop the tourism industry, such as a favourable territorial location, natural and recreational resources.

But, despite the abundant natural resources, Ukraine occupies only 78 out of 140 places in the competitiveness rating in tourism and travel, with a share of tourism in GDP of 1.4% (Travel and Tourism Competitiveness Report, 2019).

In addition, Ukraine's tourism industry has suffered significant losses as a result of the annexation of Crimea. Also, factors such as the military conflict in the East of the country caused by the intervention of the Russian Federation, the uncertain status of the occupied territories, significant migration, and a large number of internally displaced persons have had a negative impact on tourism in Ukraine.

Development of tourism in middle-income countries (like Ukraine) will not only increase budget revenues but also improve the country's image and, accordingly, its attractiveness to investors. Thus, it is very important to determine how tourism and economic growth are linked, as well as how strongly the level of geopolitical risk affects them.

We reasonably believe that the development of recommendations for assessing the level of risk for tourism and analysing its impact on the economy is an actual task. We also think that the relationship between indicators of geopolitical risk, economic growth, and tourism is significant. In this context, the aim of the study is to investigate the relationship between economic growth, geopolitical risk, and tourism, using Ukraine as a case study. In this context, it seems appropriate to assess the long-term impact of Ukraine's GDP and GPR index on Ukrainian tourism.

This paper is organized as follows; section two reviews the literature. Section three presents estimation technique used in the analysis. Section four mentions about results and discussion while section five is conclusions and policy recommendations.

1. Literature review

The importance of tourism to the global economy cannot be overlooked. Therefore, in recent years, many researchers have paid close attention to tourism and assessed its contribution to economic growth. A sufficient number of studies support the fact that tourism contributes to economic growth, as in the case of Turkey (Gunduz and Hatemi, 2005), Colombia (Brida *et al*., 2017), Spain (Balaguer and Cantavella-Jordá, 2002), Latin America, and the Caribbean (Brida *et al*., 2021).

Tourism is important for the economy because it can stimulate economic growth. There is plenty of research to back this up. Some of them are global in scope and cover all countries and territories. Ntibanyurwa (2006) found that tourism contributes significantly to economic growth. Nissan *et al*. (2010) confirmed this result and noted that tourism creates income and boosts economic growth.

In recent years, researchers have focused on identifying the interdependence between tourism and economic growth. Some studies confirm the positive contribution of tourism to growth. For example, Ekanayake and Long (2012) identified the causal relationship for 140 developing countries in 1995-2009. Cárdenas-García *et al*. (2013) found a link between economic development and the expansion of tourism activities for 144 countries in recent decades. This relationship was found to be more pronounced in developed countries. The results of Çağlayan *et al*. (2012) for 135 countries from 1995 to 2008 are mixed. A one-way causal relationship between GDP and tourism was found for the countries as a whole, as well as for the Americas and the Caribbean. The opposite is true for some countries in Asia and Oceania. In contrast, no such relationship was found in other regions. The results of Çağlayan *et al*.'s (2012) study for 135 countries from 1995 to 2008 are mixed. A one-way causal relationship was found across the countries as a whole, as well as in the Americas and the Caribbean, between GDP and tourism. The opposite is true for some countries in Asia and Oceania. At the same time, no such link has been found in other regions.

Scholars highlight cross-country differences and compare features of the mutual influence of tourism and growth in different countries across the region using the Granger causality test. Lean *et al*.'s study (2014) for the period 1980–2009 showed that Malaysia supports the long-term economic growth hypothesis for tourism, while Singapore supports the tourism-driven economic growth hypothesis. Similar scientific research for Morocco and Tunisia from 1980 to 2010 revealed a one-way causal relationship between tourism income and GDP growth in the short term (Bouzahzah and Menyari, 2013). Holik (2016) also analyzed the impact of foreign tourists on growth in ASEAN using a quantitative method on data from 1995 to 2012. Du *et al*. (2016) developed a tourism-growth model and evaluated the model based on data from 109 countries. The model results showed that, in addition to investment in tourism, other factors affect economic growth. Tabash (2017) concluded that there is a long-run relationship between GDP and international tourism receipts in Palestine for the period 1995–2014. Moreover, the Granger test confirms a causal relationship from international tourism income to economic growth.

Govdeli and Direkci (2017) confirmed the positive impact of tourism income on economic growth for 34 OECD countries during 1997–2012. Based on the spillover index, Antonakakis *et al*. (2015) found that the dynamic link between tourism and growth is unstable in both degree and direction overtime for 10 European countries in the 1995–2012 range. Moreover, this relationship is strongly influenced by several different negative events.

Hysa and Gjergji (2018) assessed the contribution of tourism to the Western Balkans economy from 2000 to 2014. The results of the study, using the Panel Johansen Co-integration approach, suggest that there is no long-run relationship. The research by Wang and Liu (2020) indicates that tourism competitiveness and growth are not balanced due to the lag of growth in 56 developing countries in 2008–2017. As a consequence, the spatial distribution of growth and tourism competition varies across countries. Based on panel data analysis via E-Views 8 statistical software, Öztürk *et al*. (2019) concluded that there is a statistically significant relationship between tourism and GDP in ASEAN Member Countries. Chirilă *et al*. (2020) determined, based on data for the years 2000–2019, that the link between economic growth and international tourism in Central and Eastern Europe is not constant in time and direction. Moreover, this relationship is affected by economic, financial, and debt crises.

Various factors influence the link between growth and tourism. Some researchers have focused on examining the features of this impact in the context of different countries. For example, Granger's causality test has shown that the relationship between tourism income and real growth is unidirectional and goes from growth to tourism income for the national economy in Malaysia from 1994 to 2004 (Kadir *et al*., 2010). Archer's (1984) econometric analysis showed that a share of 40% of per capita income growth in Barbados was derived from tourism revenues. Ozturk and Acaravci (2009) found no equilibrium long-run relationship between real GDP and tourism in Turkey from 1987 to 2007.

Findings of a study using the Granger causality test for 1980–2009 by Lashkarizadeh *et al*. (2012) revealed that the causal relationship between development and tourism in Iran is mutual in the long run. The outcomes of Bayer and Hank and the ARDL approaches by Shakouri *et al*. (2017) for 1980-2014 proved that growth and tourism in Iran are interrelated, both in the short and long term.

Phiri (2016) examined the causality between growth and tourism in South Africa from 1995 to 2014 using linear and non-linear cointegration approaches. Both approaches showed a significant relationship. Based on Bayer and Hunk's and ARDL's cointegration approaches, Ohlan (2017) found that indicators of economic growth, financial development, and tourism are interrelated. The data analysis for 1960–2014 in India showed that tourism income has a positive influence on growth. Using a vector autoregression model and Granger test on 2004–2016 data, Fadilah *et al*. (2018) revealed for a sample of Indonesia that tourist arrivals cause growth and not vice versa. Suhel and Bashir (2018) concluded that growth in South Sumatra depends upon the number of tourists, value-added, and expenditures in the tourism industry. Using the Granger test and the simultaneous equation model, they set up that there is a one-way link between tourist arrivals and growth and a two-way link between growth and tourism expenditure.

Manzoor *et al*. (2019) analyzed the impact of tourism on employment and economic growth between 1990 and 2015 in Pakistan. Using the regression method and the Johansen cointegration approach, the researchers concluded that the increased flow of tourists brings positive economic results in terms of employment opportunities and GDP growth. Based on data analysis for the period 1980–2016, Maden *et al*. (2019) revealed a statistically significant and positive relationship between GDP and tourism income in Turkey, irrespective of the duration of the analysis period.

Mazaraki *et al*. (2018) confirmed the hypothesis of the NTS's influence on growth in Ukraine by allowing its worldwide importance and dynamic development based on data from 2000 to 2017.

Amaluddin (2019) considered the dependence of growth on tourism for the period from 2010 to 2017 in Eastern Indonesia. The study's findings revealed that the direction and essence of the cause vary over time. This dependence is bidirectional in the long term and unidirectional from growth to tourism in the short term. Using a vector autoregression model and Granger's test, Jamel (2020) illustrated a bi-directional positive correlation between growth and tourism in Saudi Arabia over the period 1990–2018. In their study, Prakash *et al*. (2020) concluded that earnings from foreign tourists affect GDP significantly in India, while tourist arrivals affect GDP insignificantly. Khan *et al*. (2020) studied the role of tourism in development, using Pakistan as an example, and the impact of tourism on the development of developing countries.

We believe that the ambiguity in the results of country studies in the context of determining the direction of the nexus between economic growth and tourism can be explained by various factors, including the share of tourism revenues in the structure of GDP, the strategic orientation of the economy, the national accounting system, and others. As seen from the above, despite the discrepancies in the results obtained, most researchers concluded that the relationship between tourism and economic growth exists, and that it is positive.

The activities of the tourism sector are particularly susceptible to changes in politics and economic growth, as well as to various types of risks. Military unrest, strikes, and high crime rates have a negative impact on tourist flows. A high level of security in the country has a positive influence on the dynamics of tourist flows. Consequently, it is important to assess the impact of safety and risk on tourism.

It is well known that a tourist product is not a product for basic needs, so tourism demand is secondary. In this regard, the decision to travel is determined by many factors, one of which is safety. A high level of risk in a country negatively affects economic activity and is not conducive to tourism development. Therefore, it is important to assess the impact of risk on economic activity in general and on the tourism industry in particular.

It should be noted that global changes, both in the economy and in politics, are important for the tourism sector. Webster and Ivanov (2015) examined the most important global political and economic trends and their probable impacts on tourism and hospitality. In addition, contemporary studies include global security and its impact on tourism. For example, Bianchi (2006) analysed how the parameters of mobility and the international tourism environment are changing under the influence of security geopolitics and neoliberal international market expansion. Madankan and Ezzati (2015) investigated the effects of global political influences on tourism in 15 Middle Eastern countries. Scholars found that indicators of tourism attractiveness and geopolitical factors are directly related.

Recently, academics have used the Geopolitical Risk (GPR) Index to assess global risks. Caldara and Iacoviello (2018) developed this GPR indicator based on a count of newspaper articles highlighting tensions in the geopolitical sphere since 1985. This index reflects the risk of events that disrupt normal, peaceful, and democratic relations between populations and states. High geopolitical risk is often the cause of reduced business activity and leads to a shift in capital flows from less developed economies to more developed economies.

Researchers explore the impact of PGR on the tourism sector. Neacșu *et al*. (2018) consider tourism as an expression of freedom and examine the impact of geopolitical risks on contemporary tourism activities. More specifically, Demiralay and Kilincarslan (2019) estimated the sensitivity of tourism and leisure stock indices to the impact of GPR using conventional and quantile regression methods. Soybilgen *et al*. (2019) determined for 18 developing countries in 1986–2016 that geopolitical risks negatively and significantly affect growth rates. Demir *et al*. (2019) uncovered that the GPR Index had a negative impact on inbound tourism in 18 countries from 1995 to 2016. Based on correlation analysis, Tkachuk (2019) identified that geopolitical risks negatively affect international tourism development. Lee C-C. *et al*. (2020) also confirm the negative influence of GPR on tourism demand for 16 countries in 2005–2017, and the pandemic only exacerbates this. In general, most researchers note that the impact of geopolitical risks on tourism is negative.

Studies that focus on identifying the dependence of tourism activities on geopolitical risks in the context of individual countries and territories are noteworthy. Neacşu *et al*. (2018) identified the areas in which the influence of GPR on tourism is manifested, namely: tourist heritage, geographic reconfiguration of tourist flows, and the emergence of dark tourism, which uses war artifacts. Balli *et al*. (2019) investigated how geopolitical risk affects tourism in developing countries. In general, GPR responds differently to tourism in different countries. GPR has little impact on tourist arrivals in attractive destinations. The impact of GPR on tourism flows is minimal for some Asian countries and significant for Mexico, South Korea, and South Africa. Demir *et al*. (2020) assessed the influence of geopolitical risks on tourist arrivals in Turkey over the period 1990–2018. The researchers found that an increase in the GPR Index reduces tourist arrivals in Turkey, while a decrease in the GPR Index has no effect at all in the short term. Thus, the empirical study confirms the dependence of tourism on geopolitical risk.

Akadiri *et al*. (2020) investigated the direction of causality between the GPR Index, economic growth, and tourism using the Granger causality approach in Turkey for the period from 1985 to 2017. The study shows that geopolitical risks have a negative impact on economic growth and tourism in Turkey. Tiwari *et al*. (2019), using India as an example, found that the number of tourist arrivals in developing countries depends on economic policies and the level of geopolitical risk.

The main areas of research on the relationship between tourism, economic growth, and risks for developed and developing countries can be identified through a bibliographic study of works from the Scopus database. Using the VOSviewer program, the authors of the paper identified the relationships between the research keywords for this topic. The results of the bibliographic analysis are presented in Annex 1 (Fig. A1-A5).

Based on the analysis, the following conclusions can be drawn: The research directions of the link between economic growth and tourism in key areas do not differ significantly depending on whether developed countries or developing countries are being studied. Current research directions on the link between economic growth, tourism, and risks have mainly focused on sustainable development, climate change, human factors, and ecosystems. It should be noted that at this stage, there are not so many studies aimed at analyzing the causality between tourism, growth, and GPR.

This is due to the fact that the methodology for calculating the GPR Index was proposed recently, in 2018.

Studies of tourism in Ukraine, according to the bibliographic analysis of publications in Scopus, mainly focus on tourism management and the organization of various types of tourism. At the same time, most studies of economic growth in Ukraine do not link it to the development of the tourism sector.

It's important to stress that we have not yet found the results of studies aimed at determining the relationship and interdependence of economic growth, tourism, and the GPR Index in Ukraine. The scarcity of research on the link between growth, tourism, and GPR Index reinforces the importance and timeliness of this study. As a result, the situation in the Ukrainian tourism sector necessitates the implementation of scientifically validated methods and realistic recommendations for tourism development in Ukraine, taking into account geopolitical risks.

2. Model and data set

Tourism is one of the significant foreign exchange-inflowing sources for a country, followed by export activities. However, geopolitical risks are an important factor in determining the holiday reservation preferences of tourists. In this study, the impact of the GPR, which is the geopolitical risk indicator of Ukraine, and the Gross Domestic Product (GDP) of the country on tourism revenues has been examined. The model is created as follows:

$$lnTOURt = \beta_0 + \beta 1lnGPRt + \beta 2lnGDPt + \varepsilon_t \tag{1}$$

In Model (1), the impact of the GPR variable on tourism is expected to be negative. Therefore, the negative sign is used in the model. The study used annual time series data from 1995 to 2019. The reason for starting data from 1995 is that the tourism data of Ukraine has been published since this date. The logarithms of the series are taken to facilitate the analysis between variables and to give the elasticities of the independent variables to the coefficients to be estimated. β_0 is the constant term, β1 and β2 are the coefficients of elasticity to be obtained from the model as a result of estimation. Summary information about the variables is presented in Table 1 below:

Table 1. Description of the Logarithmic Variables

Variable	Symbols	Description	Data Source	Expected Sign
Tourism receipt (in US Dollar)	lnTOUR	International tourism revenues represent the expenditures of international visitors calculated by the current exchange rate of US dollar.	World Bank Database	
Gross Domestic Product (GDP) (in US Dollar)	lnGDP	It represents GDP according to market prices. **Data are in constant 2010 US dollars.** The GDP in US dollar is derived from the GDP in local currency translated.	World Bank Database	+
Geopolitical Risk Index[25]	lnGPR	Caldara and Iacoviello (2018), which offers a more comprehensive geopolitical risk measurement by taking into account risk factors such as war, terrorist activities and tension.	Federal Reserve Board	-

Source: Authors' Compilation

Descriptive statistics of the logarithmic variables are shown in Table 2.

Table 2. Descriptive Statistics

	lnTOUR	lnGPR	lnGDP
Mean	21.29849	4.667123	25.49804
Median	21.48313	4.525481	25.56720
Maximum	22.62865	5.554666	25.75807
Minimum	19.06778	3.844289	25.15908
Std. Dev.	1.033377	0.450060	0.197936
Skewness	-0.436393	0.451776	-0.571629
Kurtosis	2.028767	2.459363	1.871385
Jarque-Bera	1.705050	1.154889	2.688345
Probability	0.426337	0.561331	0.260755
Sum	511.1639	116.6781	637.4510
Sum Sq. Dev.	24.56094	4.861302	0.940284
Observations	24	25	25

Source: Researchers' computation using E-views 10.0

[25] The GPR index was created by calculating the number of articles about geopolitical events and dangers that appeared in leading 11 English-language newspapers. The articles in question are divided into six groups based on the words they contain. The index is calculated by dividing the total number of articles by the number of articles containing these word groups, then normalizing to a value of 100. As a result, values greater than 100 indicate that the risk has increased (Caldara and Iacoviello, 2018).

The logarithms of the series are taken to facilitate the analysis between variables and to give the elasticities of the independent variables to the coefficients to be estimated. Although the skewness coefficients for both variables in Table 2 are the same, the fact that they are negative for LTOUR and LGDP and positive for LGPR means that these variables have a left and right skew distribution, respectively. A kurtosis value of less than 3 for all variables indicates that the distribution is skewed. After applying the Jarque-Bera test to the variables, it can be seen that the probability values of the test statistic are greater than 0.05. Therefore, it can be said that all three variables show normal distribution.

3. Methodology and findings

The ARDL Boundary Test is used in the analysis to explore the long-term impact of Ukraine's GDP and GPR on Ukrainian tourism. ADF by Dickey and Fuller (1981), and Phillips Perron (PP) unit root tests by Phillips Perron (1988) are used to assess the degree of integration of the series. The existence of a long-run nexus among the series if the variables are equally stable I (1) or some of them are I (0), is investigated with the ARDL boundary test model by Pesaran *et al*. (2001). If the variables in the process have a long-run link, the error correction model is estimated in the following steps. This assessment helps to examine whether the short-term imbalance improves in the long-run and to determine long-run coefficients.

3.1. ARDL Cointegration Test

As the analysis method, the ARDL Limit Test Approach is preferred in the study. The existence of possible long-run relationships among series is determined by cointegration tests. However, as a constraint, most of the cointegration tests, such as Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990), require series to be combined in the same order. However, in the ARDL model, the series do not have to be integrated in the same order. In the ARDL method, it is sufficient that series are not combined of second order or more. In this context, determining the lag length to a high degree makes it difficult to explain the determination of a long-run link among series. According to the tests mentioned, the ARDL method has many advantages.

These advantages (Pesaran *et al*., 2001):

- It allows the series to have different lag lengths.

- It will provide some privileges such as the ability to estimate short- and long-term parameters simultaneously.
- It is an effective estimator even if the selected sample is small or some independent variables are endogenous.
- Unlike the Johansen and Juselius (1990) cointegration method, the ARDL approach does not include pre-testing of variables used in the unit root test model.

The ARDL limit test is a three-step test. First, the existence of cointegration between variables is investigated. In the case of a cointegration between variables, the given conditions are supported for the second step. Then, long-run coefficients between the variables are determined. Finally, the short-run coefficients between variables are estimated, and the error correction model is computed using the optimal lag lengths measured (Narayan and Smyth, 2006). The three-variable model used in the first step of the ARDL limit test is adapted to our study below:

$$\Delta lnTOUR_t = \beta_0 + \sum_{i=1}^{v} \beta_i \Delta lnTOUR_{t-i} - \sum_{i=0}^{y} \alpha_i \Delta lnGPR_{t-i} + \sum_{i=0}^{z} \Omega_i \Delta lnGDP_{t-i} + \delta_0 lnTOUR_{t-1} - \delta_1 lnGPR_{t-1} + \delta_2 lnGDP_{t-1} + \varepsilon_t \quad (2)$$

The terms “lnTOUR, lnGPR and lnGDP” in model (2) have already been described in Table 1. Also:
δ_0 ,δ_1 ve δ_2 are the coefficients for long-run relationships among series,
β_i , α_i ve Ω_i are the coefficients for short-run relationships among series,
Δ is the first-order difference symbol, indicating the terms which are in first differences,
β_0 is the constant term of the model,
ε_t is the white noise error term
v,y,z are the appropriate number of lags

First, Model (2) was estimated in order to evaluate the short- and long-run relationships among series using the ARDL estimator. Then, the hypotheses are formed to test possible cointegration in Model (2):

H_0: $\delta_0 = \delta_1 = \delta_2 = 0$ *(There is no cointegration between variables.)*

H_1: $\delta_0 \neq 0$, $\delta_1 \neq 0$ $\delta_2 \neq 0$ *(There is cointegration between variables.)*

In model (2), we investigated the existence of cointegration by the help of F statistics. The lower and upper limit values estimated by Pesaran *et al*. (2001) are compared with the F statistic value in the table. Pesaran *et al*. (2001)'s critical values table was formed with 20.000 and 40.000 replications for 500 and 1000 observations, respectively (Narayan, 2005). Narayan (2005) created a new table of lower and upper critical values for smaller samples, among 30-80 observations. Since the number of observations in this study is close to 30, the cointegration relationship between variables will be tested according to the critical values calculated by Narayan (2005). If the F statistic value is determined higher than the upper limit, H_1; If it is smaller than the lower limit, the H_0 hypothesis is accepted. In addition, no decision is made if the F statistic value is among the lower and upper limit. Finally, the error correction model is estimated by using the most appropriate lag lengths determined. In our study, results are shown at Table 8.

In this context, the error correction equation for the model we have established is as follows:

$$\Delta \ln TOUR_t = \beta_0 + \sum_{i=1}^{v} \beta_i \Delta \ln TOUR_{t-i} - \sum_{i=0}^{y} \alpha_i \Delta \ln GPR_{t-i} + \sum_{i=0}^{z} \Omega_i \Delta \ln GDP_{t-i} + \Theta ECM_{t-1} + \varepsilon_t \quad (3)$$

The terms β_i, α_i and Ω_i in model (3) represent the dynamic coefficients that bring the model into balance; the ECM term shows error correction term; the term Θ indicates the adjustment time that the model returns to its long-run equilibrium after a short-run shock. In this case, while the coefficient Θ should be negative, it should be considered that the coefficient should have a statistically significant probability value.

3.2. Empirical Findings

When dealing with non-stationary time series, Granger and Newbold (1974) discovered a spurious regression problem. Since there is no issue with the results obtained from stationary series, the use of non-stationary series can result in inaccurate and economically difficult-to-interpret results. As a result, before examining the presence of a nexus among variables in a regression analysis based on time series, it is important to investigate the time series properties of the variables used in the analysis. Dickey and Fuller (1979), Extended Dickey and Fuller (ADF) (1981), and Phillips-Perron (PP) (1988) tests are the most commonly used methods to test the stationary properties of series in practice. The ADF and PP unit root tests are used in this analysis to decide if the series is stationary or not, and the results are shown in Table 3.

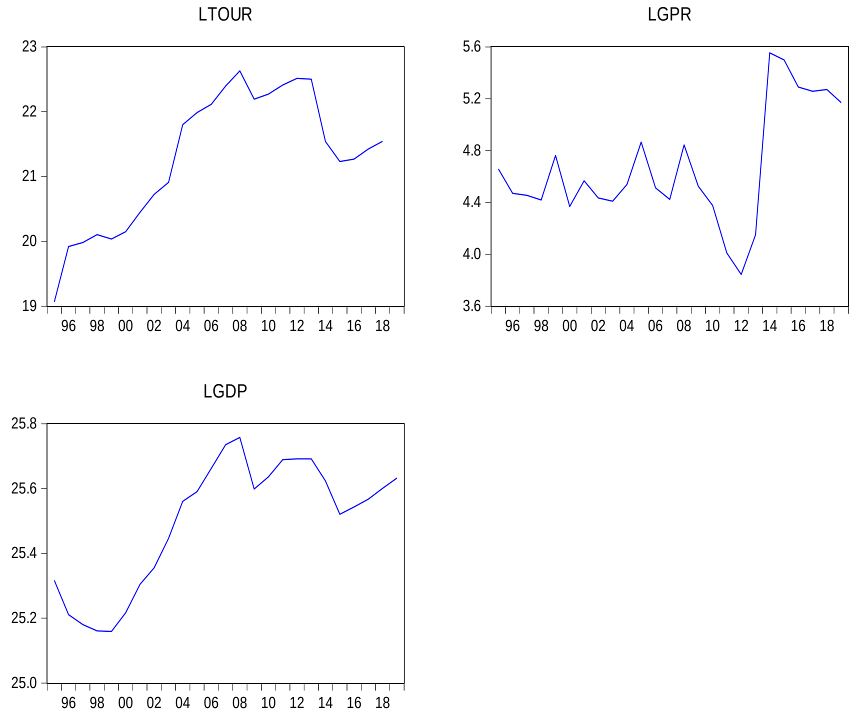
Table 3. ADF and PP Unit Root Test Results

	ADF		PP	
Variables	With Constant	With Constant and Trend	With Constant	With Constant and Trend
lnGDP	-0.9213	-11.003	-10.746	-14.380
lnGPR	-19.426	-24.573	-19.426	-25.684
lnTOUR	-14.614	-11.760	-23.749	-11.760
ΔlnGDP	-34.981**	-35.438*	-34.745**	-35.065*
ΔlnGPR	-46.021***	-44.992***	-47.493***	-46.282***
ΔlnTOUR	-39.414***	-40.163**	-39.414***	-40.389**

Source: Researchers' computation using E-views 10.0
Notes: MacKinnon (1996) one-sided p-values. (*****)Significant at 10%; (******)Significant at 5%; (*******) Significant at 1%.

If the ADF and PP test statistics among the unit root tests are absolutely greater than the critical values, the H_0 hypothesis is rejected and it is decided that the series is stationary. In other words, it does not have a unit root. In the study, it is seen that lnGDP, lnGPR, and lnTOUR variables have unit roots at both fixed and trended level values. In their first difference, they are stationary at the significance levels of 1%, 5%, and 10% in both fixed and trend models. ADF and PP unit root tests don't take into account structural breaks. It is possible that many structural changes will occur in the economy between 1995 and 2019, which are discussed in the study. Therefore, a possible structural break may affect the ADF and PP test results. In order to have information about these structural breaks, the graphical representation of the variables used is shown below:

Figure 1. Time paths of the variables (Logarithmic variables)



Source: Researchers' computation using E-views 10.0

Because of the economic developments that may cause the structural break seen in the graphs of the variables above, the Zivot and Andrews unit root test is applied to all variables. Because the Zivot and Andrews (1992) test takes structural break into account, the result of this test is also taken into account, along with the ADF and PP tests. For the Zivot and Andrews tests, the null hypothesis states the existence of a unit root, that is, series are not stationary, and the alternative hypothesis states that there is no unit root, that is, series are stationary. If H_0 cannot be rejected as a result of the tests, the series is defined to be non-stationary, and the unit root analysis is continued by taking the difference between the series. Table 4 shows the test results:

Table 4. Zivot-Andrews Unit Root Test

	Constant		**1st Difference**	
Variables	With constant	Break point	With constant	Break point
LGDP	-3.045249	2003	-5.009110***	2008
LGPR	-5.562168***	2013	-7.726387***	2014
LTOUR	-2.890882	2002	-5.032267***	2014

Source: Researchers' computation using E-views 10.0
Notes: MacKinnon (1996) one-sided p-values (*)Significant at 10%; (**)Significant at 5%; (***) Significant at 1%

When Zivot and Andrews (1992) are examined with regard to the level values of series with the structural break, it is seen that the t-statistics value of the lnGDP and lnTOUR, except for the lnGPR, is less than the critical values. This situation leads to the acceptance of the zero-hypothesis indicating that a series contains a unit root, against the alternative hypothesis that series are stationary. This result does not change the conclusion that these series include unit roots, except for lnGPR, although there are structural breaks. Therefore, the lnGPR variable is stationary at the level I (0), while the other variables are stationary when their first differences are taken at I (1). When the first differences between all variables are taken, variables are found to be stationary as a result of the Zivot and Andrews (1992) test. Where the outcomes of the standard unit root tests and Zivot and Andrews (1992) unit root tests are compared, only the stationarity of the lnGPR variable is altered, while other variables are shown to be stationary at different levels. As a result, the fact that variables are stationary at different levels causes the ARDL limit test approach to be applied in our study to test whether there is cointegration between the variables.

In this analysis, the maximum lag length is 2 for the margin test, and the acceptable lag length is 2 based on AIC criteria. No autocorrelation problems are found in the selected lag length. After determining the number of lags, the cointegration relationship among series is examined using boundary checking. Table 5 shows the impact of the bounds testing performed to assess the long-term nexus between variables in the context of the model (4).

Table 5. Bounds Testing Upper and Lower Critical Values

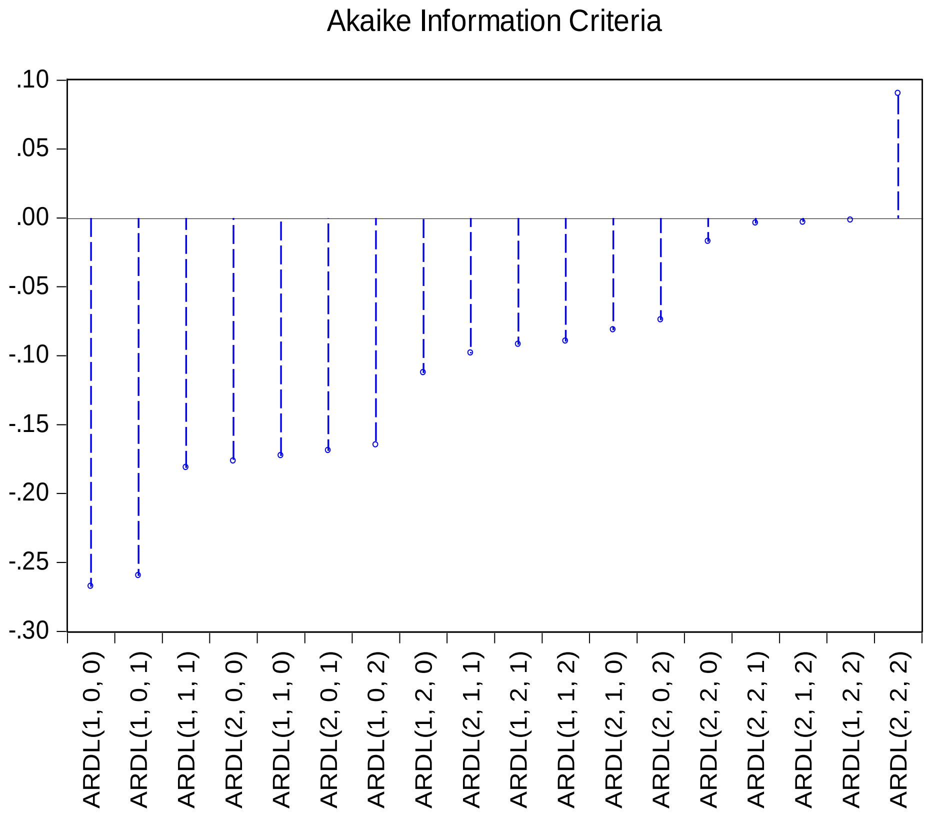
	10% Significance Level		5% Significance Level		1% Significance Level	
K:2	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
N: 25	3.437	4.470	4.267	5.473	6.183	7.873

Note: k is the number of independent variables in the model; N indicates the number of observations. Critical values in unrestricted intercept and no trend model are taken from Narayan (2005).
Source: Researchers' computation using E-views 10.0

ARDL Bounds Testing finds an F-statistic of 8.116720. At the 1%, 5%, and 10% levels of significance, testing based on model (4) is found to be greater than the upper critical value shown in Table (6). Based on this finding, we should conclude that there is a cointegration link among variables.

When considering the series for analysis using the ARDL process, the first step is to choose a suitable model in the sense of appropriate lag lengths. The maximum lag length for the model (2) developed in the first phase of the ARDL bounds testing method should be determined. Given the study's small number of observations and annual results, the maximum lag length is observed to be 2.

Figure 2. The Best 18 Models for Model (2), according to Akaike Information Criteria (AIC)



Source: Researchers' computation using E-views 10.0

The most appropriate lag length for Model (2) is determined using Akaike Information Criteria (AIC). The situation in which the AIC values calculated for each lag order are the smallest and there is no autocorrelation in Figure 2 gives the appropriate lag length. When Figure 2 is investigated, the optimum model with the smallest lag value among the estimated models is found to be ARDL (1,0,0). In this context, Model (2) is adapted to the following Model (4) after determining the lags. Finally, this model is used as a basis in the analyses performed.

$$\Delta \ln TOUR_t = \beta_0 + \sum_{i=1}^{1} \beta_i \Delta \ln TOUR_{t-i} - \sum_{i=0}^{0} \alpha_i \Delta \ln GPR_{t-i} + \sum_{i=0}^{0} \Omega_i \Delta \ln GDP_{t-i} + \delta_0 \ln TOUR_{t-1} - \delta_1 \ln GPR_{t-1} + \delta_2 \ln GDP_{t-1} + \varepsilon_t \quad (4)$$

Table 6. Model (4) Descriptive Statistics

R^2	0.729448
Adjusted R^2	0.684356
Autocorrelation (LM)	2.988054 (0.0790)
Heteroscedasticity (White)	10.65835 (0.2999)
Ramsey RESET Test	1.595856 (0.1289)
Normality (Jarque-Bera)	2.720863 (0.256550)

Note: Probability values of test results are showed in parenthesis.
Source: Researchers' computation using E-views 10.0

When the model's diagnostic test results are tested, it is observed that there is no autocorrelation in the model based on the Breusch-Godfrey LM test results. The error term is usually distributed based on the Jarque-Bera test results. Based on the White test results, there is no variance issue, and the model is defined in the correct parameters based on the Ramsey Reset Test results. Therefore, these results support the notion that the estimation results obtained are reliable.

Table 5 shows that there is a cointegration nexus between variables. The ARDL model, which was formed to determine the long-term nexus among variables, has been adapted to the study in the following ways:

$$\Delta \ln TOUR_t = \beta_0 + \sum_{i=1}^{1} \beta_i \Delta \ln TOUR_{t-i} - \sum_{i=0}^{0} \alpha_i \Delta \ln GPR_{t-i} + \sum_{i=0}^{0} \Omega_i \Delta \ln GDP_{t-i} + \varepsilon_t \quad (5)$$

Table 7 presents the long-run coefficients as well as the diagnostic test results:

Table 7. Long-term Coefficients and the Model

Dependent Variable: ΔlnTOUR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔlnTOUR (-1)	0.150169	0.113822	1.319326	0.2036
ΔlnGPR	-0.292691	0.110190	-2.656236	0.0161
ΔlnGDP	3.569320	0.664887	5.368309	0.0000
C	0.005045	0.043235	0.116687	0.9084

R-squared	0.729448	Mean dependent var	0.073741
Adjusted R-squared	0.684356	S.D. dependent var	0.336821
S.E. of regression	0.189233	Akaike info criterion	-0.328708
Sum squared resid	0.644565	Schwarz criterion	-0.130337
Log likelihood	7.615788	Hannan-Quinn criter.	-0.281978
F-statistic	16.17691	Durbin-Watson stat	2.527042
Prob(F-statistic)	0.000024		

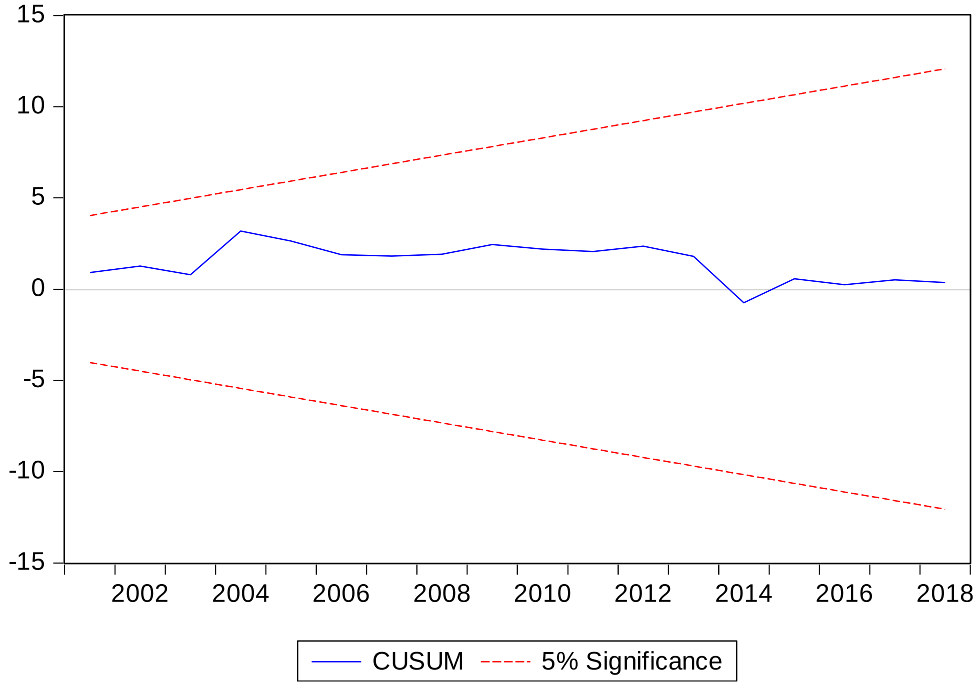
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔlnGPR	-0.344411	0.144613	-2.381604	0.0285
ΔlnGDP	4.200033	0.852240	4.928229	0.0001
C	0.005936	0.050719	0.117047	0.9081

Source: Researchers' computation using E-views 10.0

According to the outcomes in Table 7, the coefficients of the lnGDP and lnTOUR variables are statistically relevant in the long term. In other words, a 1% increase in LnGRP reduces tourism by 0.34%, whereas a 1% increase in LnGDP increases tourism by 4.2%. According the results of the analysis, we can say that geopolitical risks have a crucial impact on tourism for Ukraine. Economic growth is also very important for attracting investments to the tourism sector.

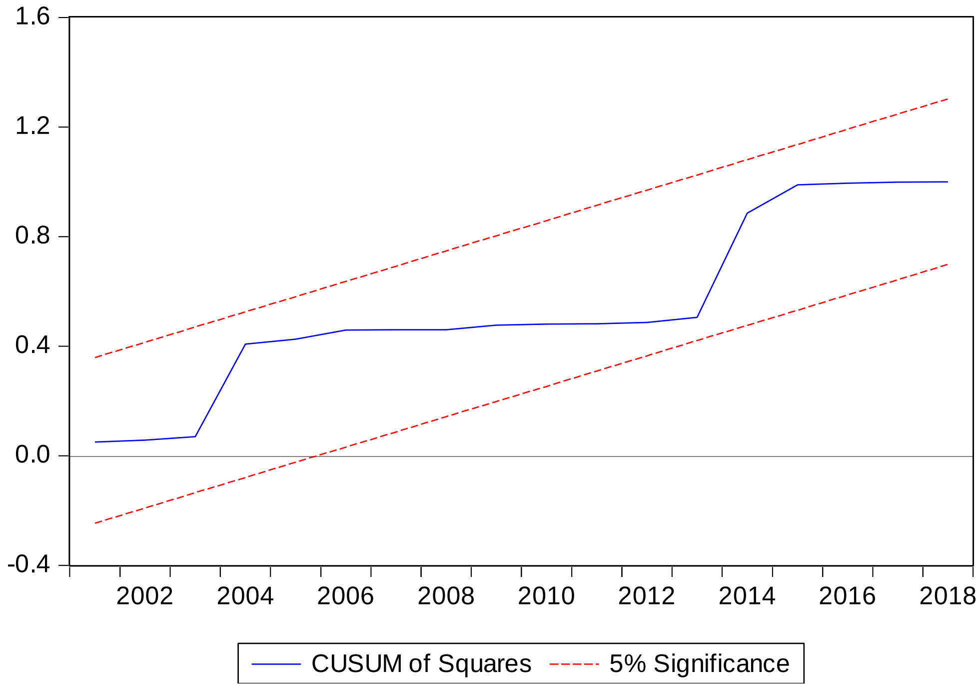
Finally, CUSUM and CUSUM square graphics revealed by Brown *et al.* (1975) are seen in Figure 3 to measure the stability of the long-term coefficients of ARDL and to decide if the error terms in the model are stable over the relevant period.

Figure 3. Cusum Test



Source: Researchers' computation using E-views 10.0

Figure 4. Cusum Square Test



Source: Researchers' computation using E-views 10.0

The fact that CUSUM and CUSUM2 test statistics are within the 5% critical value range indicates that, in the long term, the coefficients are stable and there is no break in the model.

Model (3) is adapted to Model (6) by adding lags for error correction model based on ARDL approach in order to investigate short-term nexus among variables:

$$\Delta \ln TOUR_t = \beta_0 + \sum_{i=1}^{1} \beta_i \Delta \ln TOUR_{t-i} - \sum_{i=0}^{0} \alpha_i \Delta \ln GPR_{t-i} + \sum_{i=0}^{0} \Omega_i \Delta \ln GDP_{t-i} + \Theta ECM_{t-1} + \varepsilon_t \quad \ldots (6)$$

The ECM_{t-1} variable in the model (6) is a lag one period of the error term series obtained from the long-term nexus. The coefficient of this variable shows how much of the deviations from short-run equilibrium will be corrected in the long run. This coefficient is expected to be statistically significant and have a negative sign. In this study, what is achieved in the long-term analysis is replicated in the short-term. First of all, the lag length is determined as 2, and no autocorrelation problem is encountered at this selected lag length. The ARDL (1, 0, 0) model is the model to be investigated in the study of the short-run relationship as part of the selected lag length.

Table 8 displays the estimation results of this model:

Table 8. ARDL-ECM Cointegration Test Results

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ΔlnGPR)	-0.292691	0.110190	-2.656236	0.0161
D(ΔlnGDP)	3.569320	0.664887	5.368309	0.0000
CointEq(-1)	-0.849831	0.113822	-7.466306	0.0000
Cointeq = ΔlnTOUR - (-0.3444*ΔlnGPR + 4.2000* ΔlnGDP + 0.0059)				

Source: Researchers' computation using E-views 10.0

The signs of the variables give the expected results to endorse the long-run coefficient signs, according to the results in Table 8. Furthermore, the coefficient of error correction term (ECMt-1) is found to be -0,849831. The sign of the error correction word is statistically significant and negative, as predicted. As a result, in the following period, 84 percent of the short-term deviation is corrected. In other words, the long-term balance is quickly restored. This result can be interpreted as the effect of geopolitical risk and economic growth on the tourism sector in Ukraine disappears in the short term, and this effect continues in the long term. In this case, we can say that it supports the long-term analysis results in Table 7.

Conclusion and discussion

In the study, the long-term effect of Ukraine's GDP and geopolitical risk index on Ukrainian tourism was investigated using the ARDL Boundary Test for the period of 1995–2019. Our findings support the initial hypothesis that there is a nexus among indicators of economic growth, tourism, and the GPR index. This gives grounds for the assertion that reducing the level of risk to a minimum will increase the attractiveness of Ukraine as a tourist destination, thereby creating new opportunities for economic growth and social development.

The tourism sector is closely related to many factors, such as technological development, economic structure, and political conditions. In this study, we examined the political and economic interaction of tourism in Ukraine. Empirical findings suggest that geopolitical risk has a negative impact on tourism revenues. Ukraine is situated geographically between Russia and the European Union. This increases the geographical risk of the country. In particular, the annexation of Crimea by Russia has increased the tension between the two countries. Therefore, Ukraine should develop foreign policies that will increase its security. Establishing new economic cooperation between countries can reduce Ukraine's geopolitical risks. The most important limitation of the study is that it considers only geopolitical risks, which is one of the political risk factors in the study. For this reason, the effects of risk factors such as government stability, corruption, bribery, and ethnic and religious tension on tourism should be addressed in future studies.

According to the other findings of the study, we found that incentives in the tourism sector have the potential to support the economic growth of Ukraine. Therefore, policymakers should adopt a tourism promotion law to reflect the conditions of the day. It is also necessary to follow policies that will support the tourism sector in global competition. Ukraine has a large tourism potential with its coastal destinations near the Black Sea, historical places, and dark tourism areas such as Chernobyl. Thus, tourism revenues could be a crucial part of the Ukrainian GDP in the future.

Although the analysis carried out in the work confirms the existence of the link between the indicators of economic growth, tourism, and the GPR index, the problem of assessing the influence of other factors on the analyzed indicators has not been solved. For example, not too much research has been conducted on the effect of the global pandemic on tourism flows and economic activity in the tourism economics field. The pandemic has undeniably affected many industries. But the degree of this influence is different. And if tourism has suffered significant losses, then some industries, such as online streaming services, electronic payments, online communications, electricity, food, security, and household chemicals, were unaffected and even expanded. And pharmaceuticals and the production of hygiene products and medical equipment received super-profits amid the pandemic. Therefore, it is important not only to take the risk into account but also to look for new opportunities even in difficult conditions.

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Appendix 1

Figure. A1. Terminological map of publications by keywords*: tourism; economic growth; developing countries,* 493 articles

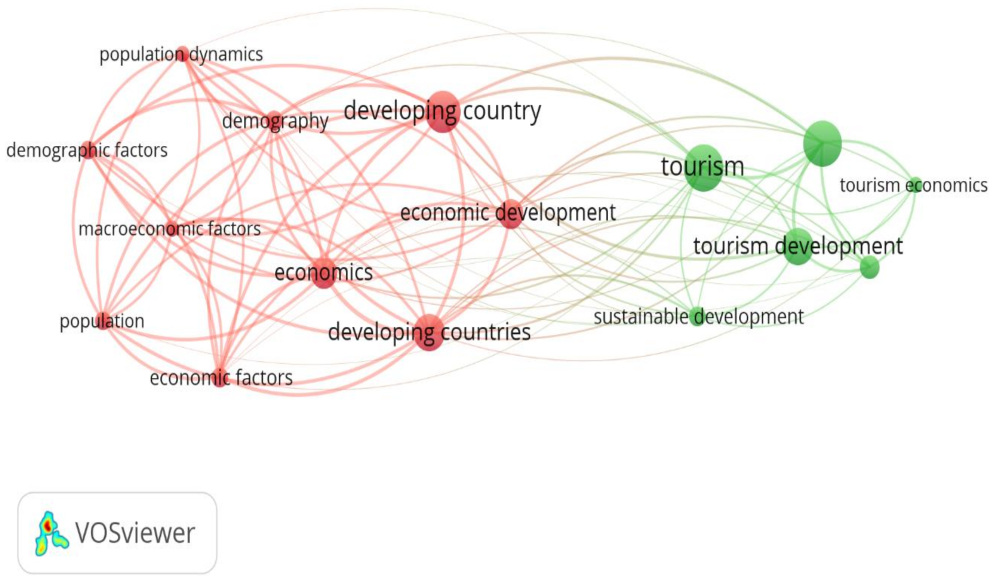

Figure. A2. Terminological map of publications by keywords*: tourism; economic growth; developed countries,* 280 articles

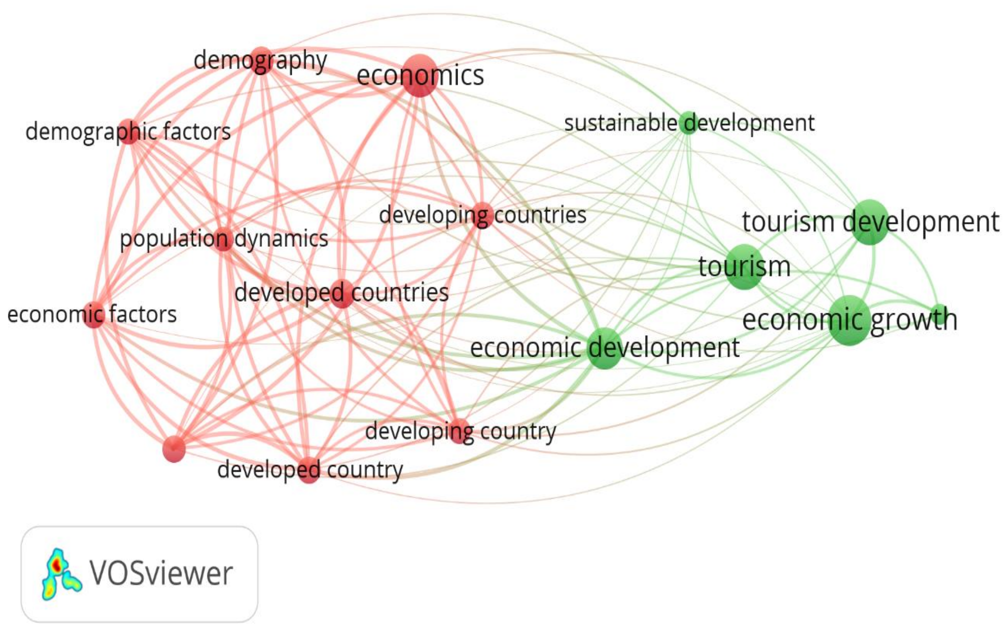

Figure. A3. Terminological map of publications by keywords: *tourism; economic growth; risks,* 241 articles

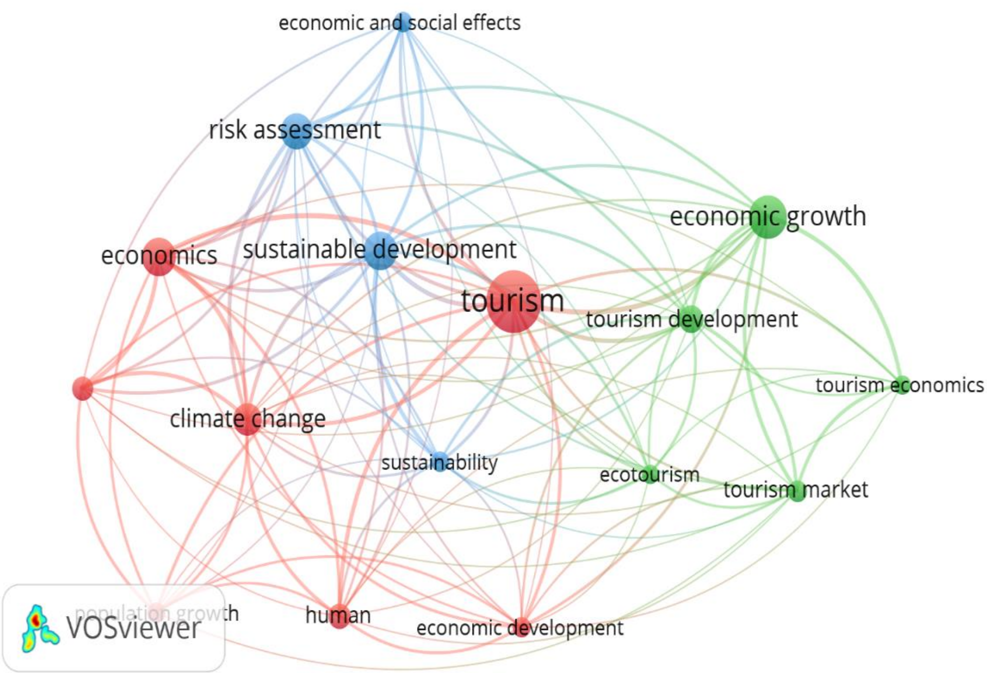

Figure. A4. Terminological map of publications by keywords: Ukraine; *tourism,* 203 articles

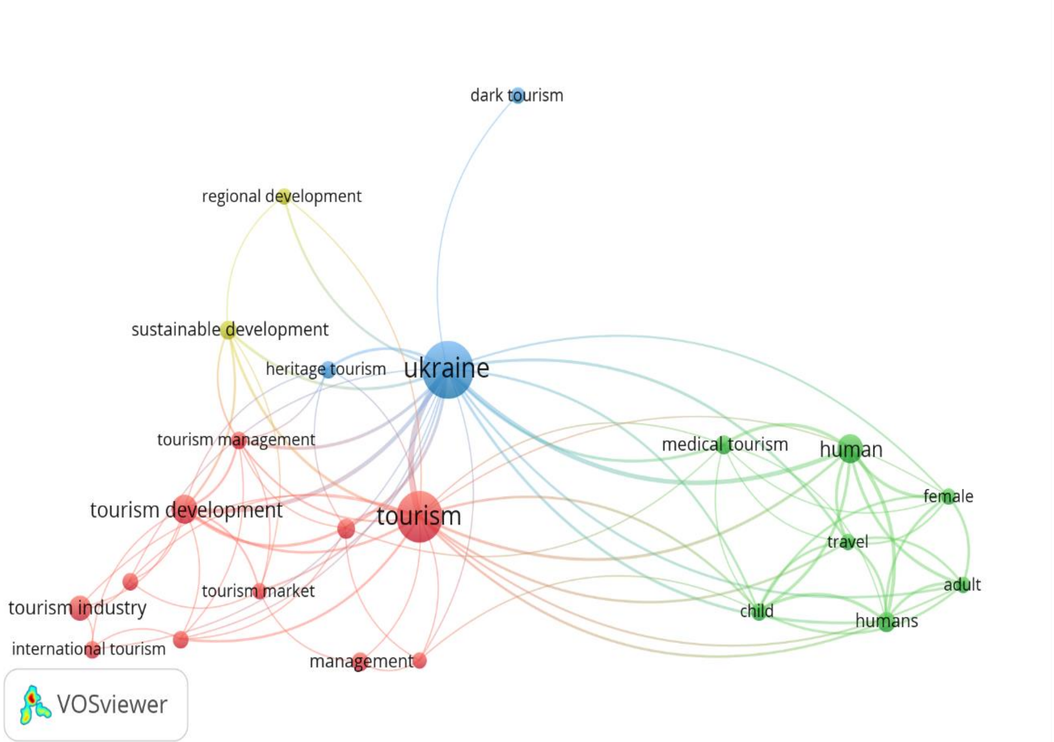

Figure. A5. Terminological map of publications by keywords: Ukraine; *economic growth*, 652 articles