

European Tourism Between Economic Prosperity and Green Pressures: Multidimensional Analysis of Resilience and Sustainability

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This paper analyses tourism influence on growth and environment in the EU27 for the period 2009-2024, integrating tourism-specific factors (seasonality, tourist revenues, tourist expenditures per trip, international arrivals, the share of tourism in total exports) along with macroeconomic and institutional variables (economic freedom, state investments in education, unemployment rate). We have approached tourism from two angles: economic (in terms of resilience) and ecological (in terms of environmental sustainability), applying multiple linear regression (MLR) and structural equation models (SEM), based on Pearson correlations. Tourism simultaneously and antagonistically influences the environment's resilience and sustainability. Tourist expenditure per trip, revenues from international tourism, the marginal effect of tourist flows, or tourist attractiveness, the market's freedom supports resilience, but not the share of tourism in total exports. Environmental sustainability is positively supported by market freedom and negatively endorsed by the tourist expenditure per trip. Seasonality appears as a reliable solution for both environmental sustainability and resilience. The results indicate no statistically significant effects of unemployment and education, and reveal that tourism dependency entails risks to resilient growth.

Nevertheless, tourism remains essential for European economic prosperity. Reducing green pressure involves a series of concessions on seasonality and directing tourism revenues toward technologies and practices that reduce the carbon footprint. The novelty lies in the integrated approach to resilience and sustainability, highlighting the ambivalent impact of tourism, and showing that seasonality is rather a structural policy tool than a constraint in the simultaneous achievement of environmental and resilience objectives, offering insights with direct implications for European tourism development policies.

Keywords: *Tourism Resilience; Environmental Sustainability; Seasonality; Tourist Expenditure; Economic Freedom.*

Introduction

Tourism is one of the most dynamic European sectors, contributing to growth, the labour market, and regional development, thereby underscoring the economic dependence of many European regions on tourist flows (De Siano & Canale, 2024; Roussel & Audi, 2024; Burcu, 2024; Solis & Gil, 2024). Economic expansion comes with a high ecological cost, as tourism activities put pressure on the environment. Tourism is responsible for 5–8 % of the global greenhouse gas emissions, and in areas overburdened with tourism, the pressure on natural resources has reached critical levels (EEA, 2023). European tourism was marked by the complication of its relationship with economic resilience and the environment, due to the fragile balance between income and increasing vulnerabilities. Despite consecutive global shock waves, the European tourism sector has demonstrated remarkable resilience, but with increasing social and ecological costs (World Bank, 2024). This dual reality – economic prosperity versus environmental degradation – requires a systemic analysis of how European tourism can evolve toward a more resilient, sustainable model. Ecological pressures are reaching critical levels (Nawarat *et*

al., 2024) mainly due to anthropogenic activities (Hunjra *et al.*, 2024). They affect the environment, the setting in which tourist experiences take place (Prayag *et al.*, 2019), but tourism sustains growth and resilience.

The resilience of a destination is the ability to cope with vulnerabilities regardless of their cause – economic crises, natural disasters, climate change, conflicts, or pandemics. Besides the economic component, resilience has other constituents. The environmental one stems from the fact that destinations are exposed to risks caused by climate change, such as rising water levels, the occurrence of extreme phenomena, and pollution, which affect seasonality and the infrastructure of destinations. The social component stems from the local community's ability to adapt through social cohesion, the management of large flows of tourists, even migratory ones, and the adaptation of the tourism workforce to market requirements. We also identify a social component independent of the circumstances of a particular destination, namely the unsafe, conflictive, uncertain global environment, in transport safety, especially air transport. All these components disrupt the economy, creating a complex framework for resilience and sustainability. Resilience

includes elements such as sustainability and socio-economic systems; it is dynamic, multi-dimensioned, and multi-scale (Prayag *et al.*, 2019). It reflects how tourism responds to shocks and the destination's ability to recover quickly. Tourism plays a key role in promoting resilience, environmental protection, cultural heritage preservation, and social inclusion (Khater & Faik, 2024; Pai *et al.*, 2025). However, excessive tourism, negative environmental impact, and excessive commercialization of culture hinder sustainable development, in other words, resilience (Khater and Faik, 2024), which is the upper octave of growth, and it is tested in unfavourable times.

The pandemic has shown that tourism-dependent regions are vulnerable, and their resilience is somewhat uncertain. The pandemic has been a stressor with long-term effects, causing tourist destinations to change their approach to resilience. There has been a shift from the concept of resilience expressed as maintaining balance and returning to the initial state (engineering resilience, technical resilience, or hard resilience) to a gradual and systemic adaptation approach (ecological resilience, or soft resilience) (Corradini & Matteo Rizzari, 2024). Engineering resilience focuses on static equilibrium or ideal state and on returning to the initial state; resilience is a process sparked by a triggering event, through which the entity returns to its previous state. Ecological or socio-ecological resilience emphasizes the constituent elements of resilience and their ability to maintain, resume, or change adaptively in the face of external challenges. It implies the existence of an area of flexible stability in which systems reorganize and recover, continuing their existence and functioning (Prayag, 2022; Sorakunnas *et al.*, 2024). In tourism, a socio-economic system, resilience is understood as the relationship between the system and its components (Prayag, 2022). Despite the pandemic's effects, tourism has not lost its resilience. On the contrary, it has proven to be the sector with the most remarkable capacity for recovery (Corbisiero and Monaco, 2021) when appropriate rehabilitation and vulnerability-reduction strategies are applied (Tegelberg & Griffin, 2024).

The events that followed the 2000s highlighted the need for economic resilience and environmental sustainability amid significant changes induced by technological progress, in the field of transport and production and consumption patterns. We are referring to the COVID-19 pandemic and to events that have affected global or regional tourism. For example, the 2008 financial crisis mainly affected tourism-dependent destinations and highlighted the need for greater resilience. Nature has subjected some destinations to risks, which highlights the need for sustainability. Wildfires affected the Mediterranean states – Greece, Portugal, Spain, Italy – in 2007, 2017, 2021, and Australia in 2019–2020. Hurricanes Katrina (2005), Irma, and Maria (2017) strongly affected islands in the Caribbean and the USA, tsunamis affected Thailand, Indonesia, Sri Lanka, and the Maldives in 2004, and repeated massive floods culminated with *acqua alta*, which affected Venice in 2019, a destination that also copes with the problem of overtourism. The earthquakes affected Nepal (2015, 2025), Italy (2009, 2016), Turkey (1999, 2020, 2023), Greece (2017, 2020), Chile (2010), Japan (2011), Haiti (2010), Mexico (2017). Even though anthropogenic, controllable activities do not cause them, they affect tourism, at least in the short term, thereby

requiring increased resilience. Conflicts and terrorist attacks represent another destabilizing factor in many destinations. They have occurred, since 2011, in Syria (2011–2012), Egypt (2011, Arab Spring, the attacks of 2013–2015), Turkey (the attacks and conflicts of 2015–2016), Tunisia (the attacks of 2015), Israel and Palestine (repeated conflicts such as those of 2014, 2021, 2023, 2025), Ukraine (the conflict began in 2014, broke out again after a period of calm in 2022 and is ongoing), Lebanon (2006 and the political-economic crisis of 2019–2021), Afghanistan (after 2021), Sri Lanka (1983–2009 civil conflict, the attacks of 2019). These aspects motivate the evaluation of the components of tourism with a simultaneous impact on the resilience and environmental sustainability, given that tourism has remained a growth-oriented activity and is responsible for the ecological and social limits of the planet (Higgins-Desbiolles, 2020). The literature demonstrates, in multiple ways, the need for resilience and sustainability and the role of tourism in this equation. The impact of tourism is captured as an individual effect, in relation to other determinants not analysed in this study, and across different geographical regions. We will fill this gap by examining tourism-specific factors alongside macroeconomic and institutional variables that contribute to the resilience and sustainability of the EU27. In the order given, we shall analyse the literature framework, develop empirical analyses using multiple linear regression (MLR) and structural equations modelling (SEM), discuss the results summarised in Chart 1, and, finally, propose a series of economic policy measures and conclude.

Literature Review

Tourism – Resilience Relationship

Numerous studies analyse the nexus among tourism, resilience, and sustainability from various perspectives, without exhausting the subject. The concept of tourism resilience has evolved significantly: if in 2020 discussions focused on financial survival, researchers are now proposing a holistic approach. Despite the manifestation of unfavourable economic conditions, tourists do not give up the intention to travel, in the short and medium term, which allows tourism to maintain its resilient character, even if it adapts and transforms (Corbisiero & Monaco, 2021), depending on the specifics of each destination (Brandano *et al.*, 2024). These characteristics, which intersect with elements such as gastronomy (Trung & Dao, 2024), influence tourist engagement and satisfaction (Trung and Mohanty, 2023). Resilience is not only about the ability to cope with shocks, but also about turning crises into opportunities for structural change (Ioannides *et al.*, 2024). One example is the integration of technological innovations into traditional tourism experiences. In Portugal, local agroecological practices are integrated into premium tourism experiences, generating higher revenues with a reduced ecological impact (Ribeiro *et al.*, 2024; Khater & Faik, 2024).

Tourism development produces positive externalities in a destination (De Siano & Canale, 2024). Tourism drives the expansion of economies with low tourism specialization and development, while growth, in turn, generates tourism development in highly specialized tourism countries

(Cardenas-Garcia *et al.*, 2024). The effects of tourism manifest gradually, influenced by how the authorities capitalize on the benefits generated by this sector. Growth is stimulated by the need to ensure adequate conditions for tourists, which in turn contributes to reducing poverty, improving the quality of life, access to education and health services, as well as strengthening security (Alcala-Ordóñez *et al.*, 2023) and resilience.

Developing countries dependent on tourism benefit from progress as social globalisation intensifies, since this process is directly correlated with growth and indirectly with the performance of international tourism (Haini *et al.*, 2023). In these states, the population is concerned with ensuring livelihoods and capitalizing on the financial opportunities offered by tourism, trying to overcome the challenges associated with this sector (Manner-Baldeon *et al.*, 2024). By contrast, in developed countries, tourism is perceived as a means of maintaining mental and physical balance. The differences in interest between these two categories of countries require economic policies that prioritize accessibility, sustainability, safety, and education to strengthen economic resilience (Arora, 2024). A balance between economic development and environmental protection responds to both residents' need to improve their material welfare and to tourists' desire to improve their well-being. Albaladejo *et al.* (2023) show that the nexus between tourism and growth is relevant only in low-income countries with limited specialization in tourism. This is contradicted by the reality of the world's most visited destinations and those of European countries dependent on tourism, most of which are highly specialized and high-income states. According to Fei *et al.* (2025), growth supports tourism, and Trung *et al.* (2025) show that tourism development affects the environment only in the short term, with no indication of direct or indirect effects.

Studies indicate that doubling the number of tourists, tourism revenues, and expenditure increases GDP, and doubling the GDP amplifies tourism attractiveness, tourism revenues, and expenditure, influenced by human capital and gross capital formation (Risso, 2018). It is postulated that progress is not only favoured by tourism revenues, but also by tourist flows, which have a significant impact on regional development and contribute to the growth of established destinations in economically and innovatively developed areas (Zhang, 2024; Gour *et al.*, 2023), by factors such as visitor expenditure, length of stay (Vaya *et al.*, 2023; Koksall and Karabulut, 2024; Martínez *et al.*, 2025), revenues (Nowak & Sahli, 2024; Santos, 2024; Mantecon, Milano & Huete, 2025), seasonality (Zvaigzne *et al.*, 2022; Berjozkina, 2022; Santos, 2024; Fernandez-Morales *et al.*, 2024) and by the characteristics of the country of origin (Elgin & Elveren, 2024). Tourists from developed countries tend to spend more while traveling than those from developing countries (Thrane & Farstad, 2012), and, in difficult times, declines in tourist flows accentuate economic vulnerability, affecting resilience (Gour *et al.*, 2023).

The relationship between tourism and growth does not appear, in all studies, to be only positive. For example, Ferran Portella-Carbo *et al.* (2023) demonstrated that tourism reduces its impact on growth not only during crises but also during economic expansion. In difficult times, short-term mechanisms, such as direct and multiplier effects,

contribute to stabilisation and growth, while in the long term, development adjustment mechanisms are activated. Policymakers need to consider both types of mechanisms, as prolonged specialization in tourism involves structural challenges (Ferran Portella-Carbo *et al.*, 2023). The pre-pandemic high-demand destinations were those that subsequently recovered the fastest (Boto-Garcia & Mayor, 2022), demonstrating that resilience entails the positive manifestation of tourism, as reflected in its significant economic contribution before a difficult period.

Some destinations tend to focus solely on tourism as a means to bolster economic resilience. However, Watson and Deller (2021) argue that reliance on tourism can actually diminish resilience. In the United States, where their research examined this relationship, they found that such dependence hinders or limits the capacity to navigate challenging economic and social times.

The pandemic has had a transformative effect on tourism on an unprecedented scale and has also given essential lessons for strengthening the resilience of destinations, according to the study conducted by Tegelberg and Griffin (2024). These lessons are about engaging regional tourism demand and destination leadership in supporting small and medium-sized enterprises and communities towards a sustainable, resilient, and environmentally-friendly future. Thus, destinations will be prepared for future changes that may manifest as shocks to tourist flows. This assertion results from the analysis of decarbonization scenarios and increased climate impact. It appears that resilience and sustainability are inseparable objectives for a destination, and they need to be clarified to identify the easiest and most effective ways to achieve them.

In this context, this study proposes to test the following research hypothesis: H1: increasing tourists' expenditure per trip, tourism flows (tourism attractiveness), and the share of tourism in exports influence *the resilience of the EU27*.

According to neoclassical theory, growth is linked to education. Howard *et al.* (2024) support this assumption by highlighting the positive effects of higher education investment. Similarly, Vicente *et al.* (2021) identify disparities between developed and less developed countries, noting that in the former, the manner in which the state allocates funds to the education sector is crucial. In contrast, in the latter, the per capita expenditure on education plays a significant role. We incorporate state investment in education into the analysis, recognizing it as a crucial factor influencing growth, and we seek to validate the following hypothesis, namely H2: *state investment in education impacts the resilience of the EU27*.

This study highlights various factors that link resilient growth to the capacity to manage challenging times. After some studies, a rapid recovery can occur in environments characterized by a high level of economic freedom (Candela & Geloso, 2021). Conversely, there are also more tentative views regarding the impact and value of economic liberty on both financial and environmental outcomes. Rapsikevicius *et al.* (2021) view this relationship as antagonistic; therefore, we aim to validate hypothesis H3, which posits that *economic freedom influences the resilience of the EU27*.

Additionally, in direct relation to tourism, we observe the theorized impact and role of seasonality. Fernandez-Morales *et al.* (2023) acknowledge the significance of

tourism for destination development; however, they emphasize that seasonality entails negative consequences, highlight the limited evidence on tourism's impact on resilience, and assert that vulnerabilities stemming from seasonal imbalances are tangible. The seasonal nature and susceptibility of a tourist destination adversely affect growth by leading to capital underutilization, income fluctuations, and sensitivity to external disturbances (Stojic *et al.*, 2023), which, in turn, impact resilience. Typically, it is associated with adverse effects in existing literature, which leads us to propose validating the following hypothesis: H4: *seasonality influences the resilience of the EU27.*

From the literature, we deduce that the relationship between tourism and the economy is complex, insufficiently theorised, leaving room for studies focused on tourism's impact on resilience from different perspectives.

Tourism – Environment Relationship

Tourism is closely linked to nature, and therefore, its impact on the environment is significant. Although initially considered harmless, the sector has become a major driver of pollution (Sorakunnas *et al.*, 2024). Since tourist activity is carried out, with predilection, in nature, tourism is strongly linked to the environment, where it causes loss of biodiversity, landscape degradation, and increased pollution. The relationship between tourism and the environment has been systematically studied since the 2000s, with a focus on the impact on destination attractiveness, seasonality, travel motivation, destination choice, and visitor satisfaction. Recent research, conducted between 2010 and 2023, focuses on governance, cost feasibility, and sustainability (Gossling & Scott, 2024). Tourism is negatively associated with the environment (Sorakunnas *et al.*, 2024; Banerjee *et al.*, 2025). Anthropogenic activities are damaging nature, a trend that has accelerated over the last 50 years. A 1 % increase in the economy, energy consumption, and tourist flow leads to short-term increases of 1.35 %, 1.06 %, and 0.57 % in emissions, and long-term increases of 0.72 %, 0.62 %, and 0.16 % (Raihan, 2024).

Brida and Cardenas-Garcia (2024) weigh the advantages and disadvantages of tourism development. It generates income, creates jobs, stimulates investment in infrastructure, encourages social inclusion, reduces poverty, and supports the preservation of cultural and natural heritage. These benefits place tourism among the key economic sectors and among the main instruments for growth. The tension between tourism and environment is maintained by tourist flows (Farooq *et al.*, 2023; Roussel & Audi, 2024) by growth and population (Nathaniel *et al.*, 2023), by excessive consumption (Saeporsdottir & Wendt, 2024) and requires policies and reforms aimed at depressurizing this relationship and reducing dependence on fossil energy as much as possible (Cevik, 2022). Still, the energy transition comes with economic and financial challenges (Lupu *et al.*, 2024). Numerous studies focus on renewable energy consumption as the solution to mitigate the tourism-environment imbalance. Such a study was developed by Trung *et al.* (2024), who, following the example of emerging Asian states, demonstrated that, in the short and long term, tourism development affects the environment. The authors proposed integrating renewable energy consumption into

tourism development policy to balance growth with environmental conservation.

Emissions generated by tourism are associated with alarming distributional inequalities, because the world's top 20 polluting states contribute three-quarters to the global carbon footprint (Sun *et al.*, 2024), and tourism will continue to pollute the environment (Lenzen *et al.*, 2018). Even if tourism contributes to the carbon footprint, the analysis of its relationship with growth and resilience indicates a dual nature of the sector that is not necessarily an amplifier of inequalities. Tourism affects the environment and economies of destinations by transferring income from developed to developing countries (Torres-Diaz *et al.*, 2024). There is an assertion that tourist flows and emissions have combined effects, both positive and negative (Ozturk *et al.*, 2023). These differences are attributed to national policies that prioritize environmentally friendly tourism practices and to the destination's socioeconomic characteristics (Karakus & Erkilic, 2024; Elgin & Elveren, 2024). The importance of resilient growth and sustainability requires a simultaneous approach, not prioritizing them in the destination's economic policy.

Considering the findings from the studies referenced above, we suggest validating the following research hypotheses: H5: *increasing tourist expenditure per trip, tourism flows (the tourism attractiveness), and the share of tourism in exports influence the environmental sustainability of the EU27.*

An example of minimizing the environmental impact of tourism is selecting destinations with eco-friendly options, choosing less popular yet attractive destinations, and choosing destinations with low demand during peak season (Karma *et al.*, 2024; Banerjee *et al.*, 2025), as seasonality negatively affects the environment (Santos, 2024). Santos' (2024) conclusion could be contradicted by the fact that the moderation of tourist activity in the off-season is favorable to the environment. To support this claim, we will examine the impact of seasonality on the environment in the case of the EU27 and, to this end, we seek to validate hypothesis H6: *seasonality influences the environmental sustainability of the EU27.*

The importance of tourism's relationship with the environment lies in the fact that the condition of the environment affects the entire tourism industry, including the image of a destination, the length of stay in a destination, the expenditure on tourism products, the tourism revenues, and implicitly the economic resilience (Qiang *et al.*, 2024). However, the impact of air pollution on tourism revenues, tourist flows, expenditure per capita, and length of stay is non-linear.

The success of sustainable tourism also depends on tourists' and residents' behaviour (Wilkinson & Coles, 2023; Chakraborty, 2024), not only on the destination's economic policy. A responsible attitude towards the environment involves modulating behaviour to promote sustainability through community participation of the inhabitants of a destination (Pourhossein *et al.*, 2023) and changing tourists' perception. However, their beliefs would encounter resistance (Saltik & Akova, 2024). The decarbonization of tourism is estimated at \$11 per trip (Scott *et al.*, 2015), and neglecting global and national emission mitigation efforts will turn tourism into one of the main contributors to climate change

(Gossling *et al.*, 2023). The manifestations of climate change have become more pronounced in recent decades and require, worldwide, the identification and implementation of appropriate solutions that, on the one hand, address environmental problems and, on the other hand, at least maintain the comfort provided by growth.

The overlap with tourism involves, according to Köhler (2024), several areas, such as radical innovation to achieve sustainability objectives, which will result in changes to the socio-technical system, economic policy, organizational and industrial aspects, geography, and the ethics of transitions. In green destinations, tourism becomes an engine of change because its association with nature creates an environment conducive to emphasizing sustainability.

Chakraborty (2024) drew a similar conclusion. The adoption of technological innovation and sustainable practices becomes imperative to ensure resilience and strengthen its capacity to respond to shocks as tourism moves through the post-pandemic period.

Resilient and sustainable tourism involves integrating advanced technologies, including artificial intelligence, the Internet of Things (IoT), and robotics. Technological and digital progress will revolutionize the sector, enhancing operational efficiency, travel experience, and resource optimization. The trend of amplifying tourism in nature raises critical issues that require reassessing topics related to social and environmental impacts, according to Salvatore (2024). At present, the changes are escalating, and their frequency is difficult to predict. This unsafe situation renders tourism an undesirable driver of development. The risk arises in two situations: one associated with overtourism and the other with a low number of visitors when destinations are not ready to manage their presence.

To address the sustainability issues associated with tourism, which emerged particularly after the pandemic, Wilkinson and Coles (2023) propose significant demand involvement, but they recognize that tourists desire a sustainable environment. Yet, there is little action in this direction. Chakraborty (2024) also refers to the demand's implications. In addition to the use of tools specific to current progress – technology, digitalisation, artificial intelligence, etc. - there is a need for increased awareness of the effects of tourism on the environment.

Magnusson *et al.* (2023) analysed the literature on sustainability transitions and identified three contemporary tendencies relevant to tourism: deep transitions, transitions in practice, and the geography of transitions, all of which suggest understanding the changes in tourism imposed by the environmental situation and the need for sustainability.

Another perspective on sustainable tourism is associated with a controversial concept in the literature: *tourism degrowth* (Kimunio *et al.*, 2024). The need for degrowth in tourism arose in the wake of the pandemic when tourism functions were reassessed, and travel patterns and attitudes towards tourism also changed. Degrowth is suggested as a path to tourism sustainability and equity in the post-pandemic world or in the *new normal* era, as Efthimiou (2025) also highlights. The concept of degrowth is understood differently and associated with a deliberate downward trend. A more relaxed solution mediates environmental problems from renewable energy, whose consumption reduces emissions, unlike globalisation and the

use of the internet (Horobet *et al.*, 2025). Although many EU countries have decoupled their post-pandemic increases in carbon emissions, carbon-intensive energy consumption patterns remain an obstacle (Simionescu, 2025). Increasing the consumption of renewable energy in destinations is a solution more easily accepted by tourists and travel agencies than degrowth, which is mainly understood as a deliberate tempering of activity in the sector.

Chiwariidzo and Masengu (2024) proposed other solutions for the post-pandemic recovery. They suggest adapting the green tourism chain by adopting green technologies and social media branding as channels for resilience and sustainability in tourism, especially in emerging economies. Digitalisation is a dynamic process that helps reduce energy consumption in tourist destinations, as sustainability is associated with renewable energy use (Kolisnichenko *et al.*, 2025). Gan *et al.* (2025) also refer to digitalisation. They believe that sustainable tourism is possible through green finance and the digital economy. This duo amplifies the positive environmental impact of tourism. Digital transformation, through innovations such as mobile apps, artificial intelligence, and innovative tourism platforms, is redefining tourist behavior and organizational management, according to Hunjra *et al.* (2024). The post-pandemic recovery has altered tourists' preferences, increased flexibility for booking policies, and improved safety and security protocols. These changes were possible through digital technologies and digitalisation. Yet, the resilience of tourism continues to be affected by climate change, labour shortages, overtourism, and geopolitical instability, thereby strengthening the motivation to analyse resilience and sustainability as associated economic policy priorities. Current research highlights the significance of integrating new technologies and embracing digitization. In the realm of sustainable tourism, it is essential to adopt the latest and most effective technologies while fostering the development of digital skills. Nevertheless, adaptation relies on education and a level of economic freedom sufficient to enable the widespread adoption of green technologies across all destinations. This objective leads to the development of subsequent hypotheses, which we aim to validate: H7: state investment in education influences environmental sustainability in the EU27, and H8: *economic freedom impacts environmental sustainability in the EU27*.

In the context of climate change and global risks, it becomes essential to adopt positive and regenerative approaches in resilience and sustainability analysis (Yadav & Yadav, 2024). These approaches aim to address negative aspects and promote active commitment to nature and human well-being, helping shape a balanced future (Neisig, 2025). In this regard, we seek to assess the components of the tourism sector that simultaneously influence economic resilience and environmental sustainability, given that we have not identified studies that address this relationship in an integrated way, but only separately.

We sought to identify how tourism contributes to resilience and sustainability and to formulate economic policy recommendations for European states to progress sustainably and better cope with economic, climate, and social shocks.

The study captures European resilience and sustainability in a multidimensional manner by combining economic, institutional, and social aspects, even though the latter is only partially represented, through analysis of the unemployment rate. This economic and social indicator reflects market stability as reflected in the labour market.

The work is anchored in the theory of sustainable development whose reference center is the Brundtland Report (Phillips, 2023; Vanderheiden, 2024), in triple bottom line frameworks which emphasize the link among the economy, society, and the environment (Castilla-Polo & Sanchez-Hernandez, 2025; Sahoo and Upadhyay, 2024) and in the resilience theory which defines resilience as the ability to overcome shocks easily (Hu *et al.*, 2024; Diab & Green, 2024). Even if, in the literature, there are fragmented and less holistic approaches to the tourism-resilience-sustainability relationship, the originality of our study derives from the macroeconomic relationships highlighted through the analysis of indicators, which give finesse and relevance to the analysis focused on the EU27 region with the help of correlation and relational models, applying multiple regression models validated with structural equation constructs.

Studies analysing simultaneously the determinants of European resilience and sustainability are insufficient, and the approaches differ from the one we proposed.

Moreover, the structural heterogeneity of the EU27 economies and the formulation of effective tourism policies require a differentiated, contextualised approach aimed at strengthening economic resilience and environmental sustainability. Tourism, as a sector with multiplicative effects, will contribute to the diversification of local economies, to the reduction of regional disparities, and to the protection of natural capital, provided that public policies are adapted to the economic and ecological specificities of each region. In advanced economies (Germany, France, the Netherlands), tourism policies should support the transition to circular tourism models, with a focus on energy efficiency, green mobility, and carbon footprint reduction (Li *et al.*, 2024). Investments in smart infrastructure and the digitalisation of tourism services can increase economic resilience by diversifying revenue sources and reducing vulnerability to external shocks (such as pandemics or energy crises). In these countries, integrating sustainability indicators into strategic planning is essential to maintain long-term competitiveness.

In emerging economies (such as Romania, Bulgaria, Croatia), policies should aim to strengthen the absorption capacity of European funds for the development of ecotourism infrastructure and for the restoration of natural and cultural heritage. Promoting rural tourism and ecotourism contributes to the diversification of the local economy and to the increase of the community's resilience by reducing dependence on volatile sectors. It is necessary to implement proper mechanisms to monitor environmental impact and educate local actors on sustainable practices (Carril-Caccia *et al.*, 2024). For peripheral and island economies (such as Malta, Cyprus, and Latvia), an integrated approach is needed to mitigate seasonality and reduce pressure on fragile ecosystems. Diversifying the tourism offer through health, educational, and creative tourism can increase economic resilience. Also, the adoption

of climate change adaptation policies (e.g., coastal risk management, biodiversity conservation) is crucial for long-term sustainability.

Beyond this general approach, there are important exceptions, which show that the analytical indicators proposed by this study provide a nuanced and in-depth picture of European economic policy approaches.

Advanced economies with environmental vulnerabilities or high seasonality (such as Austria or Greece), although developed, have characteristics that bring them closer to emerging or peripheral economies in terms of tourism. Austria, with its intense mountain tourism, faces pressures on alpine ecosystems and climate risks (e.g., reduction of snow cover). Greece has a structural dependence on seasonal and mass tourism, which affects economic resilience and environmental sustainability (Krabokoukis & Polyzos, 2024).

Emerging economies with high performance in sustainable tourism, such as Slovenia, are examples of states that have developed a green tourism model, with coherent policies for environmental protection and the integration of local communities. Despite its modest economic size, Slovenia stands out for its ability to implement advanced tourism strategies, with ecological resilience indicators above the EU average (Karma *et al.*, 2024).

Peripheral economies specialized in niche tourism (such as Estonia or Finland, in the context of the Nordic regions, can be considered geographically peripheral) have developed forms of niche tourism (e.g., digital tourism, wellness tourism in natural environments) which give them a distinct competitive position (Mildeberg & Vider, 2022). These models promote economic diversification and increase resilience to external shocks. The exceptions underline the need to use composite indicators in the comparative analysis of tourism policies. Rigid classifications need to be complemented with qualitative and contextual analyses to capture the real dynamics of tourism development in the EU27.

The lack of consolidated research on the relationship between tourism-resilience and sustainability from the perspective of tourism-specific factors together with macroeconomic and institutional variables, which contribute to the resilience and sustainability of the EU27, is compensated by validating the following research hypotheses outlined below:

H1: increasing tourists' expenditure per trip, tourism flows (tourism attractiveness), tourism revenues, and the share of tourism in exports influence the resilience of the EU27.

H2: state investment in education influences the resilience of the EU27.

H3: economic freedom influences the resilience of the EU27.

H4: seasonality influences the resilience of the EU27.

H5: increasing tourists' expenditure per trip, tourism flows (tourism attractiveness), tourism revenues, and the share of tourism in exports influence the environmental sustainability of the EU27.

H6: seasonality influences the environmental sustainability of the EU27

H7: state investment in education influences the environmental sustainability of the EU27.

H8: economic freedom influences the environmental sustainability of the EU27.

Methodological Framework

Data

In the context of literature, this study proposes a structured analysis on two dimensions: economic resilience, measured by GDP per capita (GDP), and environmental sustainability, measured by CO2 emissions. We selected the explanatory variables to highlight the impact of the tourism sector and the relevant economic and social factors on resilience and environmental sustainability. The economic dimension of tourism and the pressures exerted on environment and economy are captured by the analysis of residents' expenditure per trip to the reference country (EXP), the number of foreign tourist arrivals or tourist flows (ARR), income from international tourism (REC), the share of tourism in total exports (TEX), and seasonality or attractiveness in the peak season (SEA). We added variables specific to macroeconomic and social stability: government expenditure on education (GEE) - an indicator of the state's investments in human capital and the economy's capacity to adapt, the unemployment rate (UNE) - relevant for the labour market and the index of economic freedom (IEF) - applicable for the institutional context and the potential for resilient and sustainable development. Figure 1 illustrates the relationship among variables within the framework of research hypotheses and applied empirical models.

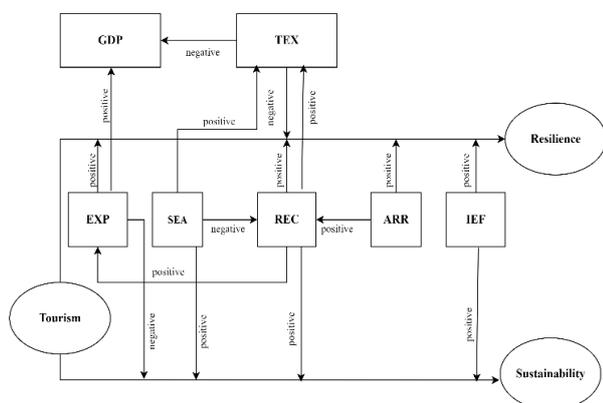


Figure 1. Workflow and Results Chart

We motivate the choice of these variables by the analysed dimension, the economic dimension of tourism (EXP, ARR, REC, TEX, SEA), the integration of macroeconomic and institutional factors (IEF, GEE, UNE), and their availability for the entire period.

The literature review suggests that resilience and sustainability are influenced by a diverse array of variables, including those included in our empirical models. The variables EXP, ARR, REC, TEX, and SEA characterize the tourism sector and influence its magnitude. Tourism adds significantly to GDP in specific destinations. The proportion of tourism in GDP correlates with its impact on growth, and sustained growth over time mitigates economic vulnerability by enhancing resilience. The advancement of tourism and its rising contribution to overall exports, while indicative of growth and resilience, leads to environmental degradation, thereby highlighting sustainability as a focal point of research.

Given that CO2 emissions have precipitated significant issues related to climate change and extreme weather phenomena, and in light of increasing global apprehension about their reduction, we assess sustainability through the lens of CO2 emissions from tourism. This is particularly relevant in recent decades, as advancements and international connectivity have reduced distances, made tourism more affordable, and amplified both the sector's development and its environmental consequences. We included the IEF in the analysis to elucidate the impact of openness on the two examined processes.

Furthermore, we incorporated two additional metrics, both proven to be effective, into the analysis. While neoclassical theory emphasizes the significance of education in fostering progress, contemporary research correlates education with both growth and resilience, thereby extending the theoretical framework. We aim to examine the role of education within the tourism sector through the lens of neoclassical theory. Moreover, education is intricately connected to the labour market. For sustainable growth, it is essential to maintain a balanced labour market, resulting in a natural rate of unemployment. Tourism is viewed as a sector with a significant capacity to engage vulnerable segments of the workforce. These considerations drive the choice of variables incorporated in our empirical analysis.

To ensure complete coverage of the period 2009–2024, we applied techniques of data extrapolation and interpolation using data from the World Bank, Our World Data, The Heritage Foundation, and the World Tourism Organization. The interpolation was made for some of the observations, and the extrapolation was only for the year 2024. Interpolation is the process of estimating values between known data points, whereas extrapolation is the process of making predictions beyond the analysed range. We employed interpolation to address only a limited number of gaps and, through extrapolation, projected data for a single year. Errors are directly proportional to data sparsity in interpolation and the size of the forecast horizon in extrapolation. Given that the methods are linear, the results are considered effective (***, 2025; Jiang *et al.*, 2024; Muckley *et al.*, 2023). To justify the extrapolation-which in this study involves a forecast for a single year (2024) and only for specific variables-we observe that the EU27 did not experience significant regime changes or structural shifts during the forecast period. While economic, social, political, or environmental shocks could undermine a short-term forecast, such conditions were not present. The empirical analysis was performed in two stages. Initially, we analysed the effects of tourism on European economic resilience (GDP) and on environmental sustainability (CO2). Subsequently, the analysis expands to include economic and social variables not specific to the tourism sector to assess tourism's impact on the resilience and sustainability of the environment under the influence of education (GEE), unemployment (UNE), and economic freedom (IEF).

The selection of the 2009–2024 interval allows the capture of the effects of the COVID-19 pandemic as a stress test for the resilience of tourism-specific macroeconomic indicators, the analysis of post-crisis recovery processes, and the examination of long-term tourism trends from a sustainability perspective.

Method

Following the application of interpolation and extrapolation to complete the EU27 data set for the period 2009-2024, we used Pearson correlations to assess bivariate relationships between variables (1).

$$r = \frac{Cov(x,y)}{\sigma_x \sigma_y} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}} \quad (1)$$

Where, x_i, y_i are the values of the observations, \bar{x} and \bar{y} are the means of the variables, r is the Pearson coefficient.

Pearson correlations indicate associations among variables, but not causality, which is why we carried out the regression analysis. The method predicts the outcome variable from a set of predictor variables (Field, 2009). Multiple linear regression (MLR) characterizes the relationship between a dependent variable and several independent variables (2), because the term multivariate regression describes a technique for more than one independent variable (Adkins & Hill, 2018). The model involves formulating assumptions and developing a linear regression model by adding independent variables and their regression coefficients to improve predictive power (2).

$$y_i = \beta_0 + \beta_1 * x_{1i} + \beta_2 * x_{2i} + \dots + \beta_k * x_{k,i} + \epsilon_i \quad (2)$$

Regression coefficients are generally estimated using the least squares method. The β estimates minimize the sum of squared differences between the observed variables and the predictor, or the sum of squared residuals, according to equation (3).

$$\sum_{i=1}^n [y_i - (\hat{\beta}_0 + \hat{\beta}_1 x_{1i} + \hat{\beta}_2 x_{2i} + \dots + \hat{\beta}_k x_{k,i})]^2 \quad (3)$$

Where: y_i represents the dependent variable, x_i represents the independent variables, β_i represents the regression coefficients, and ϵ_i represents the error term.

Collinearity is tested with the Variance Inflation Factor (VIF) (4) and Tolerance (5). The high VIF values and low Tolerance values demonstrate high collinearity.

$$CFI = 1 - \frac{X_{model}^2 - df_{model}}{X_{null}^2 - df_{null}} \quad (6)$$

$$RMSEA = \sqrt{\frac{X_{model}^2 - df_{model}}{df_{model}(N-1)}} \quad (8)$$

Where:

X_{null}^2 – Chi-squared value of the null model

df_{null} – Degrees of freedom of the null model

X_{model}^2 – Chi-squared value of the estimated model

df_{model} – Estimated degrees of freedom of the model

N – sample size

k – difference between observed and estimated values

We applied a two-tier empirical analysis to assess the components of the tourism sector that simultaneously affect environmental resilience and sustainability. Two models have been developed at each level. One of the models has resilience as its central point; the other has environmental sustainability. The first level involves analyzing the relationship between

$$VIF_{nx_k} = \frac{1}{1 - R_{(n-1)x_k}^2} \quad (4) \quad Tol = \frac{1}{VIF_j} = (1 - R_j^2) \quad (5)$$

Where $R_{(n-1)x_k}^2$ is the determining coefficient of regression.

The Structural Equation Model (SEM) is used to verify and consolidate results from multiple linear regression (MLR), serving as a test of the robustness of the identified relationships. Although a general mathematical definition of SEM is difficult to formulate, the model looks at the relationships among variables. Within SEM, variables are divided into two categories: exogenous (those that influence other variables) and endogenous (those that are influenced). The model explains the links between endogenous and exogenous variables by considering residual factors (errors).

The variables are grouped as follows:

- y_i^* – endogenous variables (results)
- z_i^* – exogenous variable (determinant)
- u_i – residuals (errors). Both y_i^* and z_i^* can be divided

into observable components (y_i, z_i) and unobservable (η_i, ζ_i), according to Florens et al. (2007). SEM estimates endogenous values from exogenous values and errors, and the relationships among variables are often represented visually by path diagrams, in which arrows indicate direct influences.

To assess the good fit of the model with the data, several indicators are used, such as:

- CFI (Comparative Fit Index): compare the proposed model with the reference model in which there are no relationships among variables (5).

- TLI (Tucker-Lewis Index): similar to CFI, but penalizes models that are too complex (7).

- RMSEA (Root Mean Square Error of Approximation): measures how well the model fits, taking into account the sample size (8); Lower values indicate a better fit.

- SRMR (Standardized Root Mean Square Residual): shows the difference between the observed and estimated correlations of the model (9); values below 0.08 are considered acceptable.

$$TLI = \frac{\frac{X_{null}^2}{df_{null}} - \frac{X_{model}^2}{df_{model}}}{\frac{X_{null}^2}{df_{null}} - 1} \quad (7)$$

$$SRMS = \sqrt{\frac{1}{k} * \sum_{i=1}^k (r_i - \hat{r}_i)^2} \quad (9)$$

tourism, on the one hand, and resilience and sustainability on the other. The second level introduces socio-economic variables to capture possible changes in results within the broader macroeconomic context.

Empirical Results

Pearson correlations, which measure statistical association, are used to identify bivariate associations among variables. They provide an initial picture of the direct relations among variables and information about collinearity. The values of the coefficients do not show major collinearity problems; only in a few situations is moderate collinearity observed (Figure 2.)

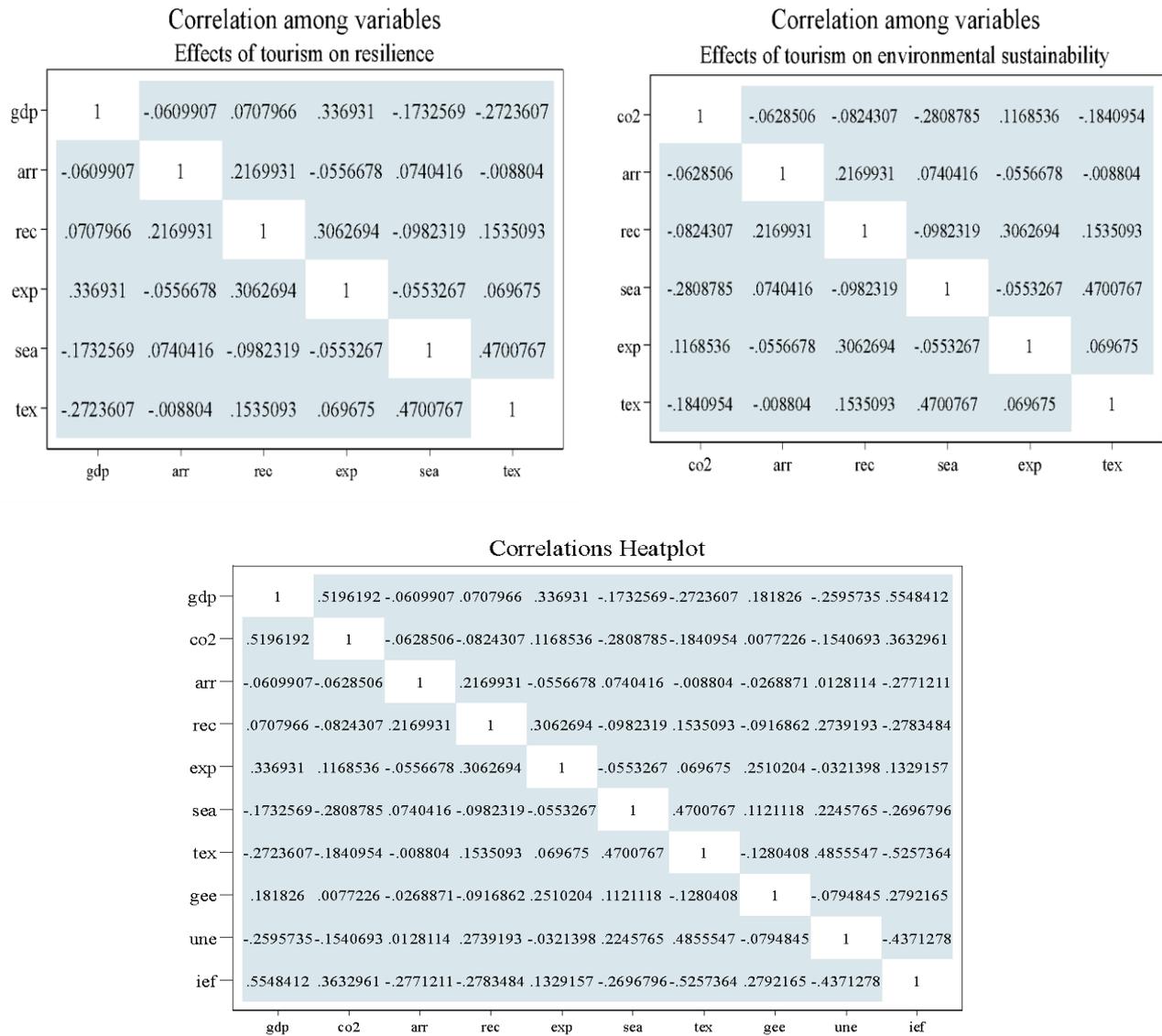


Figure 2: Correlation Among Variables

Source: Authors' contribution based on statistical data

Significant Pearson correlations, at the first level of the analysis, positively associate GDP and CO₂, on the one hand, and EXP, on the other, and negatively link GDP and CO₂, on the one hand, and SEA and TEX, on the other.

Significant Pearson correlations at the second level - analysis of tourism and socio-economic variables - identify significant positive relationships between resilience and environment, tourism through EXP, governance and economic freedom, and significant negative relationships between resilience and tourism through SEA and the labour market. With respect to the environment, the results identify substantial positive relationships between the emissions and tourism through EXP and economic freedom, and significant negative relationships between the emissions and tourism through SEA and the labour market (Figure 2).

There are associations among variables, but correlations do not inform about the mechanism of the relationships between them. We applied multiple linear

regression (MLR) and structural equation model (SEM) to validate the research hypotheses. The analysis conducted here is exploratory and identifies structural associations. We test research hypotheses without strictly determining causality. The data have undergone substantial changes over the interval analysed, especially during the pandemic, which has led to homoscedasticity problems and affected the results of regression analyses. This is a limitation of the analysis, especially since the post-pandemic period is too short to split the analysis into two distinct periods. We applied SEM to verify the MLR results, using Pearson correlations as the benchmark. We used the acronyms MLR1.1 for the analysis of tourism impact on European economic resilience, MLR1.2 for the analysis of tourism impact on environmental sustainability, MLR2.1 for the analysis of the effects of tourism and socio-economic indicators on European economic resilience, and MLR2.2 for the analysis of the effects of tourism and socio-economic indicators on environmental sustainability.

Table 1

Multiple Linear Regression (MLR) Results

Variable		MLR1.1	MLR1.2	MLR2.1	MLR2.2
ARR	Coef	-0.047	-0.003	0.077	0.081
	P-value	0.293	0.939	0.058	0.091
REC	Coef	0.019	-0.146	0.163	-0.079
	P-value	0.699	0.004	0.000	0.130
EXP	Coef	0.349	0.150	0.218	0.097
	P-value	0.000	0.002	0.000	0.054
SEA	Coef	-0.009	-0.264	0.017	-0.233
	P-value	0.846	0.000	0.712	0.000
TEX	Coef	-0.295	-0.047	0.011	0.106
	P-value	0.000	0.369	0.829	0.084
GEE	Coef			-0.024	-0.085
	P-value			0.558	0.077
UNE	Coef			-0.052	0.030
	P-value			0.247	0.572
IEF	Coef			0.587	0.380
	P-value			0.000	0.000
Cons	Coef	1.1e-09	2.2e-10	7.55e-10	-4.35e-10
	P-value	1.000	1.000	1.000	1.000
F		21.81	10.84	17.57	12.56
Prob>F		0.0000	0.0000	0.0000	0.0000
R-squared		0.2038	0.1128	22.48	0.1919

Source: Authors' calculations

Tourism contributes to European resilience (MLR1.1) through the EXP and TEX, which is positive in the first case, and negative in the second. Theoretically, SEA does not support resilience, but the result is not statistically significant. The introduction of the analysis of socio-economic determinants is not directly correlated with tourism (MLR2.1); it does not change the positive impact of the EXP on resilience, but instead activates the direct positive impact of the REC and the marginal positive impact of the ARR. The IEF is a direct factor of resilience. The introduction of socio-economic indicators into the analysis shows that, in the broader context, in which the effects of governance and economic freedom are assessed, tourism continues to positively influence resilience not only due to the increase in EXP, but also in REC and ARR.

Tourism is often considered a greener activity than other sectors, yet its effects remain questionable. EXP unbalances the environment, while SEA determines, despite contrary expectations, that an emission reduction is warranted. The TEX effect is not supported by the result's

lack of statistical significance (MLR1.2). The broadening of the analytical framework keeps the impact of EXP and SEA on environmental sustainability unchanged.

The MLR results demonstrate that EXP is a factor of economic resilience, not of environmental sustainability, while SEA exerts the opposite effects, being a factor of sustainability, not of resilience. Resilience is supported, in addition to tourism, by economic freedom, which, in turn, negatively affects environmental sustainability (Table 1). The results validate the research hypotheses, but also draw attention to the fact that tourism is not a panacea for environmental resilience and sustainability; instead, it shapes economic resilience and manifests in contradictory ways in the environment. The R-squared values (Table 1) show that tourism is one of the determinants with a moderate impact on environmental resilience and sustainability. The MLR models are statistically significant, and the VIF and Tolerance values confirm the Pearson correlations, indicating the absence of collinearity among the variables (Table 2).

Table 2

Collinearity Among Variables

	MLR1.1		MLR1.2		MLR2.1		MLR2.2	
	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance
ARR	1.09	0.918	1.19	0.841	1.09	0.918		
REC	1.25	0.799	1.42	0.702	1.25	0.799	1.42	0.702
EXP	1.12	0.890	1.32	0.759	1.12	0.890	1.32	0.758
SEA	1.36	0.735	1.43	0.698	1.36	0.735	1.43	0.698
TEX	1.37	0.730	1.98	0.504	1.37	0.730	1.98	0.504
GEE			1.23	0.814			1.23	0.814
UNE			1.48	0.674			1.48	0.674
IEF			1.87	0.535			1.87	0.535
Mean	1.24		1.49		1.24		1.49	

Source: Authors' calculations

A limitation of MLR consists of violating the homoscedasticity hypothesis. Even though the skewness values are normal (1.499 – MLR1.1, -0.412 – MLR1.2, 1.603 – MLR2.1, 1.439 – MLR2.2), they are statistically significant, and kurtosis (6.440 – MLR1.1, 2.298 – MLR1.2, 7.989 – MLR2.1, 7.530 – MLR2.2) are statistically significant and show platykurtic distributions in three of the models. The Breusch-Pagan and Cameron Trivedi tests, which are also statistically significant, contradict the

normality hypothesis. Heteroscedasticity occurs because there are substantial differences among the indicators' values in the cross-sectional data, and, in addition, the dependent variables change significantly from the beginning to the end of the period (Figure 3). The trend is explained by changes in macroeconomic indicators in response to the pandemic-induced crisis, the conflict in the EU's proximity, and the policy to reduce the negative environmental impact of economic activities.

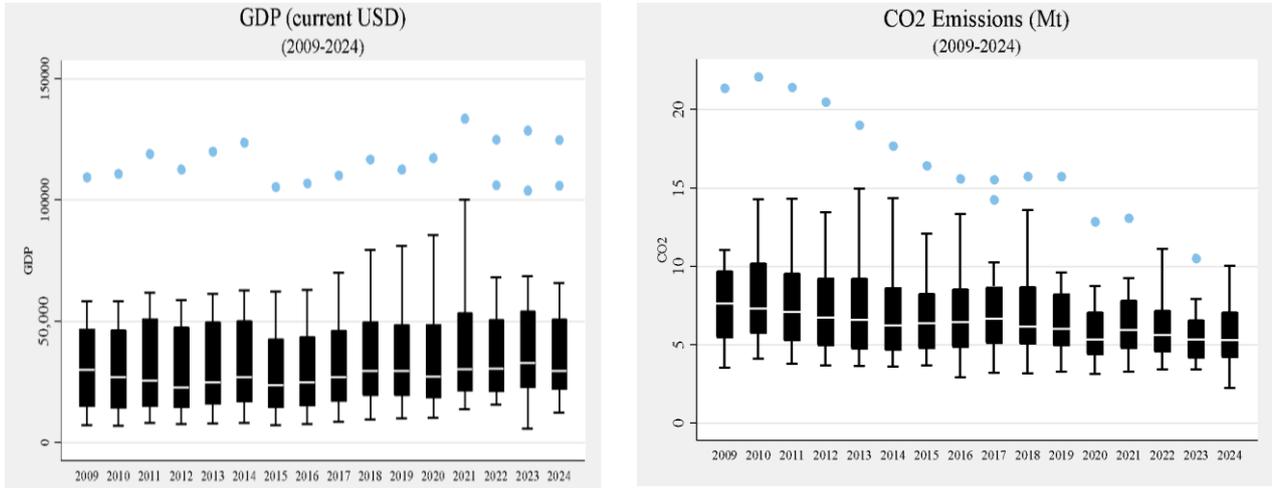


Figure 3. GDP per Capita and CO₂ Emissions

Pearson correlations are the starting point in the application of recursive SEM, which is the robustness analysis for MLR results, clarifying and supplementing the

conclusions on the effects of tourism on European economic resilience and environmental sustainability (Figure 4 and Table 3).

Effects of tourism on economic resilience

Effects of tourism on environmental sustainability

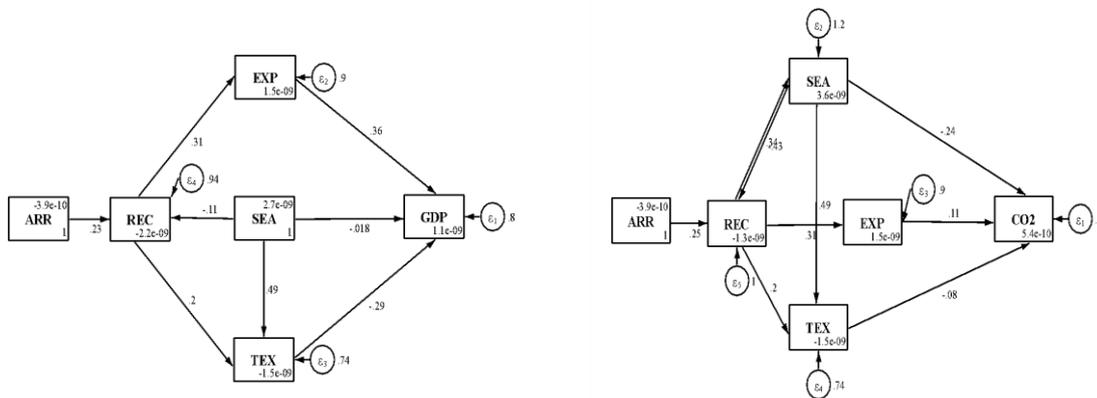


Figure 4. SEM Constructs

Table 3

SEM Results for the Total Effects of Tourism on Economic European Resilience and Environmental Sustainability

Effects of tourism on the environment									
Variable		Coef.	z	P> z	Variable	Coef.	z	P> z	
GDP	EXP	0.356	8.22	0.000	CO ₂	SEA	-0.237	-4.55	0.000
	TEX	-0.289	-5.89	0.000		TEX	-0.080	-1.54	0.124
	SEA	-0.017	-0.36	0.716		EXP	0.109	2.37	0.018
	_cons	1.09e-09	0.00	1.000		_cons	5.39e-10	0.00	1.000
EXP	REC	0.306	6.69	0.000	SEA	REC	0.341	1.41	0.157
	_cons	1.52e-09	0.00	1.000		_cons	3.64e-09	0.00	1.000
TEX	REC	0.202	4.85	0.000	TEX	SEA	0.489	11.79	0.000

Effects of tourism on the environment							
Variable	Coef.	z	P>/z/	Variable	Coef.	z	P>/z/
SEA	0.489	11.79	0.000	REC	0.202	4.85	0.000
_cons	-1.46e-09	0.00	1.000	_cons	-1.46e-09	0.00	1.000
REC				REC			
SEA	-0.114	-2.46	0.014	SEA	-0.425	-1.96	0.050
ARR	0.226	4.82	0.000	ARR	0.248	4.82	0.000
_cons	-2.21e-09	0.00	1.000	_cons	-1.35e-09	0.22	1.000

Source: Authors' calculations

EXP is a resilience factor, while TEX is not. Tourism, as the literature demonstrates, is vulnerable to crises, regardless of their cause – for example, economic, climate, pandemic, social – but also to competition from other destinations. TEX rather proves to be a determinant of growth in direct dependence on tourism revenues, even if the share of the sector in total exports increases. By contrast, the SEM results confirm EXP's favorable impact on resilience. REC, which depends on ARR positively and on SEA negatively, dictates the size of EXP and TEX.

The TEX impact on environmental sustainability is not statistically significant, and increasing SEA reduces the emissions, which is an advantage for the environment. SEA is important for TEX and REC, which has a positive influence in the first case and a negative one in the second. The REC increase is reflected in the EXP and confirms that this category of income depends positively on the ARR and negatively on the SEA (Table 4).

Table 4

Direct and Indirect Effects of Tourism on Resilience and Environmental Sustainability (Statistically Significant)

Effects of tourism on economic resilience				Effects of tourism on environmental sustainability			
Variable	Coef.	z	P>/z/	Variable	Coef.	z	P>/z/
Direct effects				Direct effects			
GDP				CO ₂			
EXP	0.356	8.22	0.000	SEA	-0.237	-4.55	0.000
TEX	-0.288	-5.89	0.000	EXP	0.109	2.37	0.018
TEX				TEX			
SEA	0.489	11.79	0.000	SEA	0.489	11.79	0.000
REC	0.202	4.85	0.000	REC	0.202	4.85	0.000
REC				REC			
SEA	-0.114	-2.46	0.014	SEA	-0.425	-1.96	0.050
ARR	0.226	4.82	0.000	ARR	0.248	4.82	0.000
EXP				EXP			
REC	0.306	6.69	0.000	REC	0.306	6.69	0.000
Indirect effects				Indirect effects			
TEX				TEX			
SEA	-0.023	-2.19	0.028	REC	0.120	2.16	0.031
ARR	0.045	3.42	0.001	ARR	0.080	3.06	0.002
EXP				EXP			
SEA	-0.035	-2.31	0.021	SEA	-0.113	-2.57	0.010
ARR	0.069	3.91	0.000	ARR	0.066	3.80	0.000
GDP							
REC	0.051	1.99	0.047				
SEA	-0.147	-5.63	0.000				

Source: Authors' calculations

We tested a good fit of the data with the SEM model (M1 – RMSEA = 0.056, pclose = 0.349; CFI = 0.973; TLI = 0.937; SRMR = 0.036. M2 – RMSEA = 0.078, pclose = 0.078; CFI = 0.937; TLI = 0.842; SRMR = 0.045).

Resilience depends directly on EXP and TEX and indirectly on SEA and REC. EXP reflects tourism demand and tourists' expenditure on accommodation, restaurants, transport, cultural services, and other specific services that generate income for the tourist destination. They support related activities and contribute to resilient growth because, if well-managed, they increase the capacity to adapt and recover from crises and other shocks. Good income management involves investing in infrastructure, supporting the balance of the labour market by creating employment opportunities, reducing the unemployment

rate, and promoting sustainable development. EXP, directly conditioned by REC, is an economic lubricant conducive to resilience. International tourism strengthens resilience because it is a form of export. TEX indicates the ability to attract tourism income and integrate it into the foreign market. Export value expansion stabilizes the balance of payments and reinforces resilience. The effects of seasonality, even if indirect, are notable for resilience. Although the accentuated seasonality confers advantages to a destination, especially ecological ones, from an economic perspective, it is associated with vulnerability. Seasonality impacts the labour market, the incomes of the population and tourism entrepreneurs, and, consequently, the state budget, the economy, and society. A balanced distribution of tourists throughout the year favours resilience

compared to seasonal tourism. The number of tourists indirectly impacts the economy through the expenses they incur, which serve as income for the tourist destination. Tourism revenues drive growth, yet, in the case of resilience, their distribution and reinvestment are decisive. For example, their focus on specific activities and sectors fuels economic dependency and vulnerability to shocks. Conversely, the correct distribution of revenues strengthens resilience by translating them into profitable investments with impact in areas such as tourism, education, the labour market, and infrastructure.

Resilience is influenced directly and indirectly by EXP, TEX, SEA, and REC, which, in turn, vary across contexts. SEA is associated with economic activity concentrated over a short period. Seasonality, in the short term, allows the increase of the REC, part of the TEX, feeding the balance of payment equilibrium, as they are direct receipts in foreign currency. REC, calculated as the product of ARR and EXP, is improving amid diversified, high-quality tourism offerings. The ability of destinations to attract tourists willing to spend more is directly correlated with REC and EXP. ARR has a significant indirect role because its concentration in the peak season affects the volume of tourist services. Growing ARR, especially during peak seasons, strengthens the REC and increases TEX by diversifying the offer and raising the prices of tourism products. The pronounced seasonality amplifies tourism's contribution to exports, but increases vulnerability by weakening resilience in the absence of export diversification.

Figure 5 provides a visual synthesis of the key findings and illustrates the relationships among the variables analyzed.

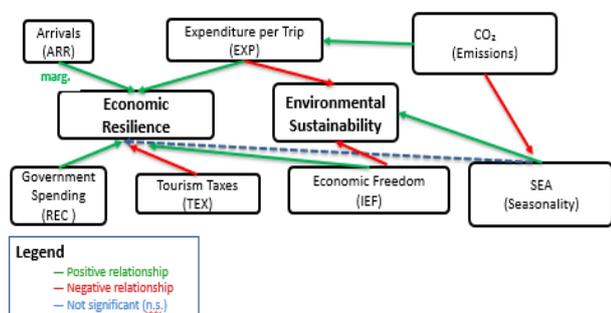


Figure 5. Structural Relationships Between Tourism, Economic Resilience, and Environmental Sustainability in the EU27 (2009–2024)

EU countries are divided, according to the economic position of tourism, into three categories: countries strongly dependent on tourism, the Mediterranean ones – Greece, Croatia, Cyprus, Spain, Malta, Portugal; diversified countries, whose tourism does not contribute significantly to their economy but are highly accessed destinations globally – Germany, France, the Netherlands, Poland, Sweden; and emerging countries, especially those from the old communist bloc – Romania, Bulgaria, the Baltic states (Ortega & Ribeiro, 2024). Countries dependent on tourism make tourism a pivot of their development policy, a pivot of the economic measures mix. They should manage seasonality, balance visitor flows with accommodation capacity, reinvest tourism

revenues in smart, more sustainable infrastructure, including the expansion and adaptation of transport infrastructure to reduce dependence on a few markets and promote themselves as attractive, sustainable destinations, open to tourism all year round. Their tourist output, for example, arrivals, revenues, the share of tourism in exports and gross domestic product, seasonality, weigh considerably in the economic and social evolution and guide their economic policy. Diversified economies are indirect beneficiaries of tourism development, with the sector being important but not dominant, and with a lower share in exports and gross domestic product than in tourism-dependent states. These countries can integrate tourism into their economic policy mix by using tourism revenues to invest in destinations that meet sustainability requirements, in education, and in other sectors that strengthen their resilience. Emerging European economies are vulnerable to shocks. Fragility is linked to the labour market and the institutional framework; hence, the need for effective educational policies and improvements to institutional quality, along with development policies that promote environmental sustainability, energy, growth, and tourism development by positioning them as safe, specific destinations. The economic situation of emerging European countries remains complex, especially in an unbalanced geopolitical environment. Among them and the other two groups, economic cleavages in the development of the tourism sector still exist, making them candidates for a diversified economy rather than one dependent on tourism. So, for these countries, tourism development policy is a crucial component of the economy, approached not as a priority but as a structural element with high potential, especially in their sustainable niches.

This paper demonstrates the dual effect of tourism on European economic resilience and environmental sustainability, but also that tourism is one of the determinants of resilience without being a panacea for economic, social, and environmental problems. Decision-makers must carefully manage tourism development.

The study also draws attention to the distinction between correlation and causality, which is essential in the analysis of public policies. The significant correlations identified among tourism, economic, and ecological variables inform about the relations' direction but do not explain the causal mechanisms that govern them. In the absence of a rigorous causal demonstration, policy formulation based solely on correlations can lead to ineffective or even counterproductive interventions. For example, the positive correlation between tourism expenditure (EXP) and resilience does not guarantee that boosting EXP will automatically generate sustainable growth. Therefore, policies need to be based on validated causal models, methodological triangulation, and longitudinal evaluations to inform strategic decisions that maximise the positive impact of tourism on sustainable development in the EU27.

Economic policy measures must be geared towards robust growth, as this strengthens resilience, while also prioritizing environmental protection by minimizing or even eliminating the adverse effects of tourism on the environment. The choice to stimulate environmentally friendly forms of tourism, such as ecotourism, rural

tourism, smart tourism, careful management of urban tourism, encouraging proximity travel, with means of transport less aggressive with the environment, the consumption of renewable energy, the use of digitalization and artificial intelligence for the development of smart destinations, educating consumers of tourism products to adopt an environmentally oriented behaviour are ways to ease the relationship between resilient economic growth and environmental sustainability induced by the development of the tourism sector. In the following, the empirical results are developed to extend their usefulness.

Discussions and Conclusions

This paper analyses the influence of the tourism sector on European economic resilience and environmental sustainability. Tourist expenditure per trip strengthens economic resilience.

In what follows, we offer an interpretation of the empirical results in relation to the research hypotheses and the analysed variables, highlighting both the statistically confirmed relationships and the contradictions or ambivalent effects that shape the scientific contribution of the study.

Regarding tourist expenditure per trip (included in hypotheses H1 and H5), the results confirm hypothesis H1, demonstrating that tourist expenditure per trip has a direct and significant impact on economic resilience, through GDP growth. However, hypothesis H5 shows that such expenditure harms environmental sustainability by increasing CO₂ emissions. This dual influence underscores the ambivalent nature of tourism: a driver of economic growth, but also a source of environmental pressure.

A 1-point increase in tourist expenditure per trip increases GDP by 0.349, as the MLR1.1 model shows. When we added the study variables that describe market stability, the effect of tourist expenditure per trip remains positive, but slightly lower (0.218), as the MLR1.2 model shows. The impact of tourism expenditure on resilience is confirmed by SEM, which highlights the direct effect of tourism on resilience through tourists' expenditure per trip, with a 0.356-point increase in GDP for a unit increase in tourists' expenditure per trip. Economic freedom is, by all appearances, a resilient factor because an increase of one unit determines the rise of GDP by 0.587 points. Economic freedom (addressed in hypotheses H3 and H6) has a positive effect on resilience by stimulating GDP (validating hypothesis H3), but reflects negatively on the environment through intensified emissions (hypothesis H6). This contradiction highlights the need for regulatory policies to accompany economic freedom to transform growth potential into a sustainable instrument.

The increase in the share of tourism in exports weakens resilience because, according to MLR1.1, it reduces GDP by 0.295, a tendency confirmed by SEM, which reveals a direct opposite relationship between the share of tourism in exports and GDP. The results also confirm hypothesis H4, showing that seasonality reduces resilience by diminishing tourist expenditure and revenues. Seasonality is also relevant to the validation of hypothesis H8, as it positively affects sustainability by tempering tourism activity and reducing environmental pressure. This

dual influence makes seasonality a critical determinant that must be managed differently depending on the destination's objectives (resilience vs. sustainability). Seasonality weakens resilience, having an adverse indirect effect on GDP. An increase of one point on seasonality diminishes growth with a value of 0.147. The result is confirmed by SEM, which also reveals that an increase in seasonality by 1 point reduces tourist expenditure per trip by 0.035 points and tourism revenues by 0.114 points. Tourist expenditure per trip is part of the revenue, and the increase in seasonality means more tourists in the peak season and fewer in the rest of the year. The disproportionate number of tourists between peak season and the rest of the year is reflected in tourist expenditures and the destination's revenues. Seasonality has a positive direct effect on the share of tourism in exports, highlighting that in the peak season, a destination is more prone to attract foreign visitors. Another finding from the empirical analysis is that tourism revenues have resilient effects. Tourism revenues positively impact both resilience and sustainability, confirming hypotheses H1 and H5. They stimulate tourist expenditure, exports, and GDP, contributing also to the reduction of environmental pressure through activity diversification. MLR2.1 shows that GDP is increasing its value by 0.163 points when the revenues from tourism rise by one unit. The result is supported by SEM, which also shows a direct positive effect of tourism revenues on tourists' expenditures (0.306), on the share of tourism in exports (0.202), and on GDP (0.051), but, in the last case, the effect is indirect. Tourist numbers or tourist flows are essential determinants of a destination's resilience. Tourist flows, although having a marginal impact on GDP, indirectly influence both resilience and sustainability through their effects on revenues and expenditure. The increase in tourist flows has a positive marginal impact on resilience, as manifested by a rise of 0.077 in the value of GDP at one point in the tourist flows, as MLR2.1 shows. To this conclusion, we add the SEM results, which indicate that tourist flows produce a direct increase in tourist revenues of 0.229 and an indirect increase in tourists' expenditure per trip and in the share of tourism in exports of 0.045 and 0.069, respectively. All these aspects validate hypotheses H1, H3, and H4. Hypothesis H2 lacks the statistical support. Theoretically, an increase in state investment in education negatively affects resilience because education shifts the labour force's orientation toward more sophisticated economic activities. Hypotheses H2 and H7 share the analysis of education's impact. Both hypotheses lacked statistical support, suggesting a more complex relationship among investments in education, resilience, and sustainability. Theoretically, education can redirect the labor force toward more sophisticated activities, with mixed effects on the economy and the environment. The absence of empirical confirmation underscores the need for further research that integrates social and human development indicators.

In contrast, some resilience factors have opposite effects on environmental sustainability. Tourist expenditure and economic freedom negatively affect the environment, whereas seasonality and tourism revenues positively impact it. Tourists' expenditures per trip increase CO₂ emissions by 0.150 units, and this pattern persists

when we add additional indicators to the analysis. MLR1.2 and MLR2.2 confirm the unsustainable nature of tourists' per-trip expenditures. SEM also demonstrates a direct action of tourists' expenditure per trip on the environment. MLR2.2 confirms the unsustainability of economic freedom because, when this indicator increases by one point, the CO₂ emissions also increase by 0.380 points. Unlike the effects of tourists' expenditures and economic freedom on the environment, tourism revenues and seasonality are sustainable, as revealed by MLR1.2, MLR 2.2, and SEM. All these aspects validate hypotheses H5, H6, and H8. Hypothesis H7 lacks statistical support. Theoretically, an increase in state investment in education negatively affects sustainability because education provides stability in the labour market, which boosts people's quality of life and encourages the consumption of goods and services produced in an unsustainable manner. Tourism revenues and tourist flows indirectly influence both dimensions. Although tourism is not an absolute determinant of resilience and environmental sustainability, the results underscore the antagonistic relationship between the two, highlighting the need for economic policies that balance environmental protection and tourism development.

In synthesis, the empirical analysis demonstrates that tourist expenditure per trip, economic freedom, and tourist flows significantly contribute to the economic resilience of the EU27, confirming hypotheses H1, H3, and H4. In contrast, seasonality and the share of tourism in exports adversely affect resilience, while hypothesis H2 concerning the role of education did not receive statistical support. On the sustainability dimension, the results confirm hypotheses H5, H6, and H8, highlighting the positive impacts of tourism revenues and seasonality, and the adverse effects of tourist expenditure and economic freedom on the environment. Hypothesis H7 was not empirically supported.

In this research, tourism was approached in two components: economic (resilience) and ecological (environmental sustainability), which brings novelty to the literature, especially in the EU context research. From an economic point of view, tourism is a factor in resilient growth, increasing visitor expenditure per trip associated with tourism revenues and the share of tourism in total exports, creating jobs, stimulating investment, including state investment in education, and intensifying economic freedom. From an ecological point of view, tourism exerts pressure on the environment through excessive resource consumption, especially during peak season, thereby affecting fragile ecosystems. These conclusions reflect the conflict between tourism's positive effect on resilience and its negative impact on the environment. We draw attention to the necessity of measures able to protect the environment through tourist policy and to change the behavior of both entrepreneurs and consumers of tourist products.

From the perspective of the structural and ecological diversity of the EU27 member states, tourism policies must not only be differentiated and adaptive, but also capable of integrating indicators of economic resilience and environmental sustainability, to respond to the systemic challenges of the 21st century. From this point of view,

tourist spending per trip (EXP) is positively associated with resilient growth and negatively associated with sustainability. For one, the decision on their destination is up to tourism entrepreneurs, and they do not always support environmentally friendly investments. On the other hand, tourism revenues (REC) are associated with favorable impacts on tourists' spending per trip, as well as with resilience and sustainability, because the decision on their destination rests with authorities, who implement measures for tourism development, sustainability, and increased energy efficiency. Our findings show that, unlike general perception, the importance of tourists' expenditure per trip is greater. A resilient and sustainable destination should not attract more tourist flows but should stimulate tourists' expenditures. This aspect implies, for a destination, developing and offering a complex tourist product for visitors while attending to environmental implications. Tourists' demands would be met through friendly environmental activities, such as outdoor activities, mobility in less remote areas to limit the use of polluting transport, and accommodation in less sophisticated or innovative units. Unlike tourists' expenditures per trip, tourism revenues have a broader scope, resulting from related activities, and their sustainability is essential.

The increase in tourist flows (ARR) has a marginally positive impact on tourism revenues. At the same time, seasonality (SEA) serves as a structural tool to achieve the sustainability objective by tempering tourism activity outside the peak season and contributing to increasing the share of tourism in total exports. This makes tourism an attractive sector to be supported through decision-making as a factor of progress, but as Europe's dependence on tourism increases, resilience will be affected. The analysis of all these indicators together brings novelty to tourist literature. The results contradict the literature and the logic about the effects of the share of tourism in exports because we draw attention to the risks arising from dependence on tourism. The EU27 must remain a region with a diverse economic structure, where tourism plays an important role. The sector, well managed, contributes to economic prosperity and to the reduction of green pressure. Diminishing the carbon footprint of European tourism is possible by focusing on seasonality and attracting higher tourism revenues, which can be invested in green technologies, processes, and initiatives that improve energy efficiency, protect natural resources and the ecosystem, and develop and promote green and smart destinations. The seasonality analysis represents another aspect of novelty. It is less studied in the literature, and our results highlight that a destination should encourage seasonal tourism if environmental sustainability is its primary goal. On the contrary, if its main goal is resilience, seasonal tourism should be discouraged because it reduces tourists' expenditures, tourism revenues, and the share of tourism in exports. The dual effect of seasonality on resilience and sustainability reiterates the need to design economic policy measures capable of developing tourism throughout the year without causing additional damage to the environment.

The research hypotheses are, the most of them, validated by empirical analysis and substantiate recommendations are made such as: improving the quality of the tourism offer so

that products with high economic value predominate, intensifying tourism in the peak season or not, depending on the destinations goals regarding resilience and sustainability, investing in education, diversifying exports, ecological regulations in tourism and related activities, stimulating the labour market by promoting green jobs, modifying the behaviour of the tourism product consumers and agents in the sector. In consequence, the results suggest that resilient and sustainable tourism requires structural adjustments and a broader perspective on the measures that decision-makers should implement. The structural changes need time to become favorable for the economy, society, and environment. Tourism will continue to contribute positively to resilience and to put pressure on the environment, but, conditioned on the goals and implications of the state, entrepreneurs and consumers, the sustainable effect of tourism would gradually improve, maintaining and even increasing its resilience.

The theoretical contribution of this study lies in the simultaneous integration of economic resilience and environmental sustainability, a perspective rarely addressed in the literature. The paper emphasizes the ambivalent role of seasonality-reducing resilience while supporting sustainability-and clarifies the impact of education and economic freedom on both dimensions. Furthermore, identifying the adverse environmental effects of tourist expenditure per trip represents an innovative contribution, challenging the predominantly economic perspective found in previous studies.

The empirical results provide a foundation for policy recommendations in EU27 member states: stimulating tourist expenditure through complex and environmentally friendly products, managing seasonality according to destination objectives (resilience or sustainability), investing in education to support the green transition, diversifying exports, and promoting green jobs. These measures can reduce the tension between tourism development and environmental protection while simultaneously strengthening economic resilience.

As in any other approach, limits are identified. The macro indicators exhibit fluctuating values, leading to homoscedasticity problems. As a result, we used robustness analysis. Using interpolation and extrapolation is another constraint. The missing values of the macro indicators could produce changes in the results, but they would be insignificant. Interpolation can lead to underestimation of variance and artificial relationships among variables, and extrapolation, which assumes that the observed trend remains outside the analysed period, can cause some structural changes and unexpected events to go unnoticed, and the coefficients could be distorted. Fortunately, interpolation was applied for a few observations, and extrapolation only for the year 2024. The application of the two methods, which are extremely limited, reduces the risk to the quality of the results. The analysis can be optimized by using other variables or empirical models, which opens up new research directions. Relevant variables such as those describing the level of human development, genuine progress index, biodiversity index, water consumption, or tourist-resident relations would add value to the results. The lack of values for the entire analysed period or the difficulty of quantification reserves them for future

research. Also, the social dimension is partially captured in the study. In addition to the unemployment rate, it could be presented more clearly by including other social indicators in the analysis, such as inequality, poverty levels, and well-being, aspects that can be addressed in future research. Further, there is the possibility of bidirectional relationships among tourism, resilience, and sustainability, which are not detected with the applied methodology but which can be identified in future research. The interest group is EU27, hence the risk of the impossibility of generalizing the results, which have a pronounced specific characteristic.

The study would have benefited from the analysis of synthetic indicators such as the Human Development Index, the Genuine Progress Indicator, or relevant sustainability indices like biodiversity or water consumption; however, due to data unavailability, these were not included. Additionally, the tourist-resident relationship, which is appropriate to the tourism-resilience-environment nexus, is challenging to quantify. These shortcomings constitute limitations of the analysis and can be addressed in future research. These aspects open future research directions, including the integration of social dimensions (inequality, poverty, well-being) and the exploration of bidirectional relationships among tourism, resilience, and sustainability.

This paper brings in a high degree of novelty by offering an integrated analysis of the simultaneous impact of tourism on economic resilience and environmental sustainability, which, in the literature, are generally treated separately. It also identifies the antagonistic role of tourism by highlighting the sector's contradictory effects on the economy and the environment, which runs counter to the predominantly positive or negative view of the tourism sector's impact we find in the literature. The analysis highlights the role of seasonality, generally considered a factor of tourist attractiveness, but the results emphasize the influence on the environment and the economy, which is less investigated. Identifying the harmful role of the expenditure per trip on the environment is another innovative approach in the context in which it is generally regarded as having an economic dimension only. One-sided explanations are countered by examining the roles of state investment in education, labour market imbalances, and economic freedom, which add complexity to the relationship among tourism, resilience, and the environment. The analysis is contextualized within an extensive set of economic, environmental, and tourism-specific indicators, within a coherent framework with a pronouncedly innovative character.

This work is part of an extensive research framework, having solid links with the literature. Previous studies have highlighted the role of tourism as a driver of growth, such as those developed by Risso (2018), Berjozkina (2022), Zvaigzne et al. (2022), Vayá et al. (2023), Arora (2024), Fernández-Morales et al. (2024), Zhang (2024) and the sustainability challenges it generates such as those conducted by Farooq et al. (2023), Nathaniel et al. (2023), Ozturk et al. (2023), Brida and Cárdenas-García (2024), Roussel and Audi (2024), Santos (2024), Karma et al. (2024), Banerjee et al. (2025), but none of the studies simultaneously analyse the effect of tourism on resilience and sustainability, which gives this work a novelty character.

The results achieved, in contrast to those reported in the literature, reflect the indirect influence of tourism revenues on resilience. These revenues are utilized not only within the tourism sector but also for the advancement of various other activities. The development of sustainable tourism, for instance, requires investments in green and smart technologies, education, and infrastructure, including the construction of accommodation units, roads, airports, and other facilities that support tourism, though not solely for that purpose. No destination should rely solely on tourism as its primary economic activity, nor should it prioritize increasing tourist flows as its primary goal for sustainable growth. While the literature indicates that increased tourist flows positively influence growth, our findings reveal that their impact is indirect, which is to be expected. The sheer volume of tourists alone does not enhance resilience; instead, it is the expenditure they make at a critical destination. This signifies a crucial element of tourism revenue that, when managed effectively, has the potential to be converted into instruments for resilience and sustainability. We have emphasized the environmental challenges associated with tourist spending; however, the nuances of each destination's economic policy are significant. With the proper measures, it is possible to convert an otherwise unsustainable facet of resilience into a sustainable one.

Another difference from the findings in the literature pertains to the influence of seasonality. The findings of our research indicate that seasonality diminishes resilience, aligning with economic reasoning. Seasonality refers to a period of heightened activity confined to a specific few months of the year. This contraction affects earnings, resulting in actual earnings falling short of potential gains that could be realized if tourism activity were to persist year-round. This restriction, while beneficial to the environment due to its sustainable contribution, undermines the resilience of a seasonal tourist destination. Thus, seasonality creates a divergence between environmental concerns and the enhancement of resilience. Every destination aims for resilience and sustainability, and one potential solution is to create a multifaceted tourism product that can attract visitors year-round. This aligns with the current trend encouraging destinations to adopt green and smart technologies in tourism, while also fostering sustainable practices among tourism entrepreneurs and consumers. The state's involvement is justified through essential investments in education, which are crucial for achieving the goals of enhancing resilience and sustainability. Anyway, the main destinations' goals could lead to a choice between resilience and sustainability, in the short and medium term, using seasonality as a valid instrument.

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The results indirectly align with the existing literature concerning the influence of attractiveness factors, including accessibility, sustainability, safety, and education. These are determinants of resilience that necessitate suitable economic policy interventions. A successful tourism development strategy should emphasize qualitative factors rather than relying solely on quantitative measures. The results obtained illustrate the significant positive impact of tourist spending, investment in education, and economic freedom on resilience, as well as the complex relationship between tourist flows and the expansion of the tourism sector's contribution to total exports. Furthermore, we acknowledge the existing tension between tourism and the environment, as highlighted in previous studies, and emphasize the necessity of incorporating measures to manage tourist flows into the tourism development strategy. This extends to the previously mentioned considerations regarding the construction sector and the development of transport infrastructure, which have been beneficial for tourism development but detrimental to the environment. In this study, we show that the tension between resilience and sustainability created by tourism development could be diluted if the tourists' expenditure, seasonality, and economic freedom are well-managed, firstly, and secondly, the tourism revenues and tourist flows.

The usefulness of research lies in providing empirically grounded practical recommendations, such as diversifying the tourist offer, extending the tourist season, stimulating green jobs, discouraging unsustainable tourism practices, encouraging investment in education and economic freedom, and changing the tourism consumer's behaviour. These directions are essential for harmonizing economic interests with environmental protection, an aspect increasingly debated in the literature. In addition, the methodology used and the identification of relevant indicators open up new possibilities of analysis, constituting the starting point for the development of more robust models for assessing the tourism impact. Through its innovative approach and contextualization on an extensive set of indicators, this paper aligns with recent research. It provides a solid basis for developing sustainable strategies in European tourism that can reduce the tension between resilience and the environment.

This study makes an original scientific contribution by providing an integrated analysis of tourism's impact on economic resilience and environmental sustainability in the EU27. The results highlight the antagonistic nature of tourism-as a driver of economic progress but also a source of environmental pressure-and underscore the need for differentiated and adaptive policies. The study offers a solid empirical basis for the development of sustainable European tourism strategies capable of reducing the tension between resilience and environmental protection.

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