http://www.diva-portal.org

This is the published version of a paper published in *Tourism Recreation Resarch*.

Citation for the original published paper (version of record):

Falk, M., Hagsten, E., Lin, X. (2022)
Importance of land characteristics for resilience of domestic tourism demand
Tourism Recreation Resarch
https://doi.org/10.1080/02508281.2022.2116541

Access to the published version may require subscription.

N.B. When citing this work, cite the original published paper.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:sh:diva-50007

TOURISM RECREATION RESEARCH
https://doi.org/10.1080/02508281.2022.2116541

OPEN ACCESS Check for updates

Importance of land characteristics for resilience of domestic tourism demand

Martin Falk [a], Eva Hagsten [a] and Xiang Lin [b]

[a]School of Business, University of South-Eastern Norway, Bø, Norway; [b]Department of Economics, Södertörn University, Huddinge, Sweden

ABSTRACT

This study investigates empirically if land characteristics (especially forests and mountains) are of importance for the local ability to withstand the shock of the Covid-19 on domestic tourism demand during the summer of 2020. A second step of the analysis focuses on the recovery stage in the subsequent summer. Three tourism indicators are considered: arrivals, overnight stays and length of stay. Official data on land use characteristics of 2029 villages in the Federal state of Bavaria (South Germany) are employed for the analysis. Estimations using the Spatial Durbin model combined with the Heckman selection model reveal that there is a significant relationship between the proportion of forest within as well as surrounding the village and the demand for domestic tourism compared with the 2019 baseline. There is also a significant relationship with the altitude of the surrounding areas. The importance of mountains and forests is present in both the initial year of the pandemic and in the recovery year of 2021, although the magnitude is lower in the summer of 2021. Direct and spatial effects can also be found for lakes and rivers on overnight stays and length of stay.

ARTICLE HISTORY
Received 13 October 2021
Accepted 10 August 2022

KEYWORDS
Domestic tourism; land use; forests; villages; spatial econometric models; Heckman selection model

Introduction

The Covid-19 pandemic has disrupted international travel and transformed domestic tourism demand toward new leisure activities (Arbulú et al., 2021; Fotiadis et al., 2021; Gössling & Schweiggart, 2022). In the wake of events, researchers pay particular attention to destinations that manage to withstand the pandemic-related decline in demand (Boto-García & Mayor, 2022; Duro et al., 2022). An ability to resist or recover quickly from an unexpected shock is commonly referred to as resilience (Calgaro et al., 2014; Farsari, 2021). Studies suggest that destinations with natural attractions, a strong focus on the domestic market and rural regions have higher levels of tourism resilience (Duro et al., 2022). Boto-García and Mayor (2022) show that regions with successful pre-pandemic tourism destinations have a better recovery pathway. So far, the findings are based on information at the regional level for the first pandemic year, whereas land characteristics and a finer granularity of data are not systematically considered.

This study aims to empirically investigate if land characteristics (especially forests and mountains) are of importance for the local ability to withstand the shock of the Covid-19 on domestic tourism demand during the summer of 2020. A second step in the analysis focuses on the recovery of domestic tourism demand in the subsequent summer 2021. Three tourism indicators are considered: local arrivals, overnight stays and length of stay.

Official data of 2029 villages in the Federal state of Bavaria (South Germany) are employed for the analysis. Land characteristics define how the surface is covered: by water and lakes, forests or road networks. Topographic characteristics measure the elevation of the village. The Federal state of Bavaria is selected for the analysis because it has many tourist destinations while it is also rich in forests, lakes and high mountains. Recreational activities in forests also have a long tradition in Germany (Williams, 2007; Wilson, 2019).

Spatial econometric models that allow possible cross-village effects of land use and elevation are employed for the estimations (see Deng & Athanasopoulos, 2011; Yang & Fik, 2014; Yang & Wong, 2012 for modelling for spatial econometric models applied to tourism flows). To account for the fact that 60% of the villages do not host domestic tourists or only to a limited extent, the sample selection model developed by Heckman (1979) is applied, where the total surface of an area is used as the exclusion restriction.

CONTACT Xiang Lin xiang.lin@sh.se Södertörn University, Alfred Nobels allé 7 Flemingsberg, 141 89 Huddinge, Sweden

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

In connection with the Covid-19 pandemic, there is a growing interest in factors that determine the resilience of regional tourism (Boto-García & Mayor, 2022; Duro et al., 2022). A related literature models actual domestic tourism and travel flows during the pandemic based on different aggregation levels (Altuntas & Gok, 2021; Falk et al., 2022a, 2022b, 2022c; Li, Gong, et al., 2021; Li, Zhang, et al., 2021; Marques et al., 2021; Wen et al., 2021). These latter studies demonstrate that the change in domestic tourism flows during the Covid-19 pandemic affects regions unevenly. Generally, rural or remote areas (Falk et al., 2022b; Marques et al., 2021), those with low economic activity (Falk et al., 2022a) or regions that are remote with poor connections to urban areas (Falk et al., 2022c) perform relatively better during the pandemic. Based on ticket sales data for tourist attractions in China, Li, Gong, et al. (2021) also show that tourists tend to prefer destinations closer to home, especially local attractions.

This study contributes to the growing empirical literature on the determinants of domestic tourism resilience in several ways. Firstly, it considers the role of place specific factors such as forests and elevation, a causality seldom explored in tourism research. Secondly, it uses both more granular and timely regional data (at the village level) than in most other studies where the NUTS 3 (Nomenclature of Territorial Units for Statistics) level is dominating (Duro et al., 2022; Falk et al., 2022a, 2022b; Schmude et al., 2021). A similar high aggregation level is often used for spatial econometric models of regional tourism demand in Europe (NUTS 2 level for Spain: Almeida et al., 2021; De la Mata & Llano-Verduras, 2012; NUTS 3 level for Spain: Alvarez-Diaz et al., 2020; NUTS 3 level for Italy: Marrocu & Paci, 2013; NUTS 2 level for Europe: Romão & Nijkamp, 2019). Methodologically, the study contributes an application of the sample selection model by Heckman (1979) in combination with spatial econometrics. There is also limited literature on how resilient domestic tourism demand is to the pandemic (Utkarsh & Sigala, 2021; Yang et al., 2021).

The study is organized as follows: The conceptual background of destination resilience and land characteristics is outlined first, followed by the empirical approach, data description, and the empirical results and discussion sections, respectively. The concluding remarks were presented at the end.

Conceptual background

Ability to withstand external shocks

Destination resilience, or the related concepts of destination vulnerability, can be defined in a number of ways and, more broadly, encompass various aspects such as sustainability and socio-ecological systems (Calgaro et al., 2014; Farsari, 2021). Tourism resilience is commonly defined as the response of tourism to a negative shock (Boto-García & Mayor, 2022; Calgaro et al., 2014). In the context of regional tourism, resilience can be understood as the ability of regions to recover from sudden shocks. Examples include the global financial crises (Benítez-Aurioles, 2020; Cellini & Cuccia, 2015), natural disasters (Filimonau & De Coteau, 2020), climate change (Scott et al., 2012), terror attacks (Liu & Pratt, 2017) or the spread of dangerous diseases such as the Covid-19 pandemic (Boto-García & Mayor, 2022; Bui & Wickens, 2021; Duro et al., 2022; Sharma et al., 2021).

Resilience of domestic tourism demand may vary across regions, where, for instance, competitive areas of Spain exhibit the strongest resistance during the first year of the pandemic (Boto-García & Mayor, 2022). Duro et al. (2022) document that regional tourism resilience is higher in the northern areas of Spain, which specialize in nature tourism. Provinces already focused on the domestic market and less densely populated areas also perform relatively better despite the general decline in mobility.

In this study, domestic tourism flows at the detailed village level for the summers of 2020 and 2021 are used to assess the response to the outbreak of the pandemic. The development of demand for domestic tourism is measured by the change in the number of overnight stays, number of arrivals or by the length of stay in comparison with a pre-pandemic base year. Among the tourism indicators, length of stay is an important performance indicator for destination management as it is relevant for transport and carbon emissions (Gössling et al., 2018).

Land characteristics and hypotheses

Landscape features play an important role in the literature on the determinants of outdoor recreation (Hansen, 2021; Kienast et al., 2012; Willibald et al., 2019) while they are less common in the context of tourism demand resilience. Aspects of importance include ruggedness of the landscape, presence of streams, rivers and lakes (Willibald et al., 2019), forests (Agimass et al., 2018; Willibald et al., 2019) as well as national parks (Schägner et al., 2017). Previous studies on land use characteristics and tourism, generally examine the opposite causality. That is, how tourists may affect the landscape, not how the latter attracts or changes demand, as is the focus of this study. Examples of studies include the change in land use intensity through the process of tourism development (Xi et al., 2014), land use conflicts in tourism (Hjalager, 2020), the role of tourism development as a factor in forest loss or fragmentation (Liu et al., 2016) as well as the perspective of land use planning and tourism development (Almeida et al., 2018). Land use can be distinguished by the spatial extent of arable, pasture, forest and cultivated land (Schulp et al., 2019).

Several studies argue that tourists try to escape from densely populated to remote areas during the pandemic (Florida et al., 2021; Helgadóttir & Dashper, 2021; Zenker & Kock, 2020). Mountainous regions and areas with large forests are typically rural or remote and suitable for activities such as hiking, climbing, adventures, canoeing, rafting, nature studies including bird watching, photography, hunting, biking, horse riding, landscape watching and river fishing (Lane, 1994). These kinds of activities can easily be carried out without encountering large crowds of people. Forest areas and mountains also offer flora, biodiversity, wildlife, fresh air and space (Nepal & Chipeniuk, 2005).

Literature on the determinants of outdoor recreation and leisure activities suggests that forest areas are important destinations for visitors who want to enjoy both the natural environment and recreational activities, including different kinds of sports (Andkjær & Arvidsen, 2015; Lee et al., 2007). Forests are also important natural attractions for recreation and tourism activities in their own right (Hall, 2011). Additionally, there is research that emphasizes that outdoor recreational activities, such as forest walks (forest air bathing), have positive effects on mental health, well-being, anxiety and stress, for instance (Antonelli et al., 2022; Kaplan, 1995; Morita et al., 2007; Oh et al., 2017). Buckley and Westaway (2020) find that hiking in nature or multi-week trekking in the wilderness can actually improve the mental health of tourists. Positive effects of hiking in nature on mental health include psychological transformation, happiness, gratitude, relaxation, clarity and insight, appreciation of nature, challenge and achievement, and sociability and community effects (Buckley & Westaway, 2020). Lee et al. (2010) show that forest landscapes and settings, together with climatic conditions, most strongly characterize the attractiveness of forest recreational tourism. Some scholars even argue that the forest has a potential for sustainable tourism with a focus on mindfulness-based experiences (Farkic et al., 2021).

Forests are per definition often remote or located in mountain areas. Destinations with a large forest area are likely to be particularly attractive for those who wish to avoid large crowds of persons, such as in the early summer of 2020. This relationship might be justified by the push–pull concept developed by Dann (1977). Cites are hit first in the pandemic (Florida et al., 2021), something that may lead to a desire for remote destinations. Nature tourism is also potentially a low-cost recovery mechanism for post-pandemic mental health (Buckley & Westaway, 2022).

There is limited evidence on the role of forests or nature-based areas in the pattern of domestic tourism demand during the summers of 2020 and 2021. An exception to this is information on activities of day trippers. Based on visitor data for a larger forest area near a city in Germany, Derks et al. (2020) demonstrate that the number of visitors increases dramatically during the general lockdowns in the spring of 2020 but subsequently decreases again with relaxed mobility restrictions. Based on a large survey of 3204 adult residents of the state of Vermont (United States), Morse et al. (2020) find that the majority of respondents engaged in frequent hiking, jogging, walking and wildlife watching, biking, fishing as well as hunting during the pandemic. The authors conclude that a significant proportion of people avoid activities that involve other people or crowds. Other studies emphasize the positive effects of physical exercise and 'forest bathing' on the ability of the immune system to fight diseases associated with Covid-19 (Roviello et al., 2022).

Thus, the presumptive importance of forest areas as destinations in the summer of 2020 constitutes the first hypothesis:

> Hypothesis 1: Villages with a large proportion of forests benefit from domestic tourism demand during the first summer of the pandemic.

Nature seeking tourists not only consider the village and place of stay but also that of the neighbouring areas. This means that there could be a relationship not only between resistance to an external shock and land use characteristics within the destination but also with the features of the surrounding destinations. This leads to the formulation of the second hypothesis:

> Hypothesis 2: Villages surrounded by a large proportion of forests benefit from domestic tourism demand during the first summer of the pandemic.

Another variable that could influence domestic travel and tourism behaviour and regional tourism resilience in the Covid-19 era is the presence of mountains (Osti & Nava, 2020; Seraphin & Dosquet, 2020). Based on a survey of travel intentions in 2020, Osti and Nava (2020) reveal that tourists perceive mountains as safer than other destinations. Mountains offer space, clean air as well as numerous hiking and recreational opportunities. The existence of mountains can be measured by various indicators such as steepness, altitude or volume (Nepal & Chipeniuk, 2005). Even though altitude of the village alone may not be considered a sufficient measure, data availability in this study does not allow more sophisticated calculations. This leads to the formulation of the third hypothesis:

> Hypothesis 3: Villages at high elevations benefit from domestic tourism demand during the first summer of the pandemic.

Similar to the existence of forests, mountains in the nearby villages may also be crucial for tourism demand, leading to the fourth hypothesis:

> Hypothesis 4: Villages surrounded by high elevation benefit from domestic tourism demand during the first summer of the pandemic.

Emerging evidence indicates that the role of land characteristics decreases as the pandemic progresses. Well into the subsequent waves of the pandemic, small towns and rural areas are equally affected as large and populated areas (Florida et al., 2021; Nathan & Overman, 2020). With more knowledge about the virus and how it spreads, fear of domestic travel may diminish (Kock et al., 2020; Zenker & Kock, 2020). This could lead to a normalization of domestic tourism demand in a more pronounced recovery phase. Thus, the fifth hypothesis emphasizes the recovery phase:

> Hypothesis 5: The benefits of forests and altitude for domestic tourism demand decrease in the recovery phases of the pandemic.

Besides forests and elevation, there are additional land characteristics such as lakes and rivers/waterfalls. Margaryan and Fredman (2017) suggest that forests, lakes and rivers are the most important amenities for nature-based tourism. The proportion of lakes (including rivers) is used as a control variable in this analysis.

Empirical approach

The change in domestic tourism demand in the first and second summer seasons of the pandemic compared with the summer 2019 reflects the ability of the destinations to withstand the shock (see Boto-García & Mayor, 2022). No reduction in domestic tourism demand in village *i* in relation to the baseline summer indicates a high ability to resist this particular external shock.

The starting point for the analysis is the theory of tourism demand, but given the short time period the standard determinants of this demand such as price and income are considered constant and are excluded (see Song et al., 2019 for an overview of tourism demand determinants). There is also no information available on prices at the village level of the analysis. An additional assumption is made that the recession caused by the Covid-19 pandemic impacts equally domestic tourism arrivals and overnight stays.

The analysis focuses on two major phases of the pandemic: the initial shock during the summer of 2020 and the recovery phase in 2021. Unfortunately, there is no information about the place of residence of the tourist, implying that a typical gravity model based on bilateral tourism flow data cannot be applied (see e.g. Alvarez-Diaz et al., 2020; Harb & Bassil, 2020; Massidda & Etzo, 2012; Morley et al., 2014).

The change in domestic tourism demand during the two summers (July to September) of the Covid-19 pandemic is modelled as a function of the land characteristics (surface covered by water and lakes, forest and (log of) elevation). By use of the pre-pandemic year 2019 as the base, the change in domestic tourism demand (arrivals, overnight stays or length of stay in accommodation), *dlnMT*, is specified as follows:

$$dlnMT_i = c + \beta_1 Water_i + \beta_2 Forest_i + \beta_3 lnElevation_i + u_{1i}, \quad (1)$$

where $i = 1, \ldots, 812$ villages, *ln()* denotes the natural logarithm and *d* is the difference operator. $Water_i$ is measured as the proportion of surface covered by lakes and water while $Forest_i$ relates to the area in the village covered by forests. The variable $lnElevation_i$ denotes the logarithm of the elevation of the centre of the village, u_{1i} is the error term and *c* is the intercept. Land use characteristics refer to the year 2019.

The change in the number of domestic tourism arrivals, overnight stays and length of stay may not only depend on land characteristics within the local administrative domain but could as well relate to those in neighbouring villages. Because of this and due to other features of the neighbouring areas, the indirect relationship between the share of forests and elevation is important to capture.

Thus, the demand for domestic tourism is specified as a generalized spatial model (Manski, 1993) that allows geographical spillover effects of the proportion of forests and elevation, tourism flows and other variables:

$$dlnMT = c + \beta_1 Water + \beta_2 Forest + \beta_3 lnElevation + \tilde{\rho}_s dlnMT + \beta_4 WWater + \beta_5 WForest + \beta_6 WlnElevation + u_1 \quad (2)$$

where *W* is the *N*N* spatial weight matrix based on the geographical distance between one core district of a village to another. All variables are expressed in terms of vectors in (2). Parameters β_4 to β_6 measure the indirect relationships between the geographical variables and the change in domestic tourism indicators. The extent to which the dynamics of domestic tourism arrivals, overnight stays and length of stay are dependent on the change in the neighbouring villages is indicated by parameter $\tilde{\rho}_s$. Equation 2 is known as the Spatial Durbin Model (SDM) (Elhorst, 2010; Golgher & Voss, 2016; LeSage & Pace, 2009). The SDM model is important when there are several potentially relevant regional characteristics that could not be considered due to lack of data. Without taking into account spatially lagged residuals, there is a possibility of an omitted variable bias arising from unmeasurable factors at the regional level. When the spatial autoregressive parameter $\tilde{\rho}_s$ equals 0, Equation (2) is reduced to Spatially Lagged X (SLX) model (LeSage & Pace, 2011) that is suitable to capture the 'local' effects.

The Spatial Durban Model (Equation (2)) is estimated by the Maximum Likelihood (ML) estimator. ML estimation requires that the residuals are normally distributed. Robust errors can deal with possible non-normality. In this study, the cluster robust standard errors based on the classification of whether a village is a town are employed. A special feature of the data set is that 60% of the existing 2029 villages do not host tourists. Excluding these villages would lead to a sample selection problem. Instead, the resulting sample selection problem is solved by the use of the full maximum likelihood estimator developed by Heckman (1979) where other land characteristics, such as surface covered by buildings, agricultures, recreations and industries are used as exclusion restrictions:

$$\gamma z + u_2 > 0 \tag{3}$$

where $z = (building, agriculture, recreation, industry, lnArea)$, γ is the vector of the parameters and u_2 is the error term following the standard normal distribution. The correlation between u_1 in Equation (2) and u_2 in Equation (3) is $\rho = corr(u_1, u_2)$. When ρ is significantly different from 0, estimations based on Equation (2) will be biased. Asymptotically efficient estimates can be obtained by combining Equations (2) and (3) (Heckman, 1979).

In case of a non-significant ρ, the estimates of Equation (2) would be unbiased, but the results of both equations are reported for the purpose of comparison. When the spatial coefficient $\tilde{\rho}_s$ in Equation (2) is insignificant, both Equations (2) and (3) would be re-estimated with a restriction that this coefficient is zero. In other words, the SLX model would be considered. The interpretations of these models can be found in Golgher and Voss (2016).

The spatial model (Equation (2)) can be used to calculate the direct and indirect effects based on the mean values. Direct effects are those exerted by an explanatory variable (forests, for instance) in village *i* on the dependent variable (change in domestic overnight stays or arrivals) for the same village *i*. The indirect effects, on the other hand, are brought by the explanatory variables of village *j* on village *i*. The total effects are the sum of the direct and indirect effects (Elhorst, 2010).

Data and stylized facts

This analysis employs data from official sources on the number of domestic overnight stays, arrivals and length of stay for all 2029 villages in Bavaria (South Germany) during the summers (July to September) 2019–2021 (source: https://www.statistikdaten.bayern.de/genesis/online). The three possible dependent variables (domestic overnight stays, arrivals, and length of stay) encompass accommodations establishments as well as camping sites.

Information on the proportion of the surface area of the village covered by lakes or forests and road network or other features (buildings, recreational facilities and agriculture) is also official and can be found in the land use statistics from the Federal statistical office (same source: https://www.statistikdaten.bayern.de/genesis/online). These statistics provide detailed data on land coverage split by vegetation, water body, residential area, recreational facilities, road network, agricultural land and cultural features of the land surface. The elevation in metres refers to the centre of the village and also comes from the Bavarian Statistical Office. Information on longitude and latitude of the location is provided by the Bavarian Statistical Office. The Haversine distance measure between geographical coordinates is used for the calculation of the spatial weight matrix (Drukker et al., 2013). In this case it means distance to the core centre of the village. The Stata command *spmat* is used with a cut-off point of 100 kilometres.

On average, domestic overnight stays decline by approximately one tenth in the summer of 2020 compared with the same period in 2019 while they stagnate in 2021 (1.4%) as compared to summer 2019 (Table 1). The decline is more pronounced when measured in terms of domestic arrivals with −20.2% in 2020 and −10.3% in 2021 as related to the base year 2019. In contrast, the length of stay of domestic tourists is found to be increasing in both summer periods (with 8% and 9%, respectively). Forest covers on average 31.5% of the villages and lakes on average 1.5%. The building share in 2019 was 3.5% and the recreation share was 0.8%. Agricultural land amounts to approximately half

Table 1. Descriptive statistics.

	Mean	Std. dev.	Min	Max
Growth rate of domestic arrivals in summer 2020 as compared to summer 2019 in per cent	−0.202	0.352	−2.423	1.052
Growth rate of domestic arrivals in summer 2021 as compared to summer 2019 in per cent	−0.103	0.370	−2.099	3.309
Growth rate of domestic overnight stays in summer 2020 as compared to summer 2019 in per cent	−0.123	0.359	−1.824	1.324
Growth rate of domestic overnight stays in summer 2021 as compared to summer 2019 in per cent	−0.014	0.362	−2.128	2.301
Growth rate of length of stay in summer 2020 as compared to summer 2019 in per cent	0.079	0.166	−1.035	1.020
Growth rate of length of stay in summer 2021 as compared to summer 2019 in per cent	0.089	0.163	−1.008	1.449
Lake share in 2019 in per cent	0.015	0.025	0.000	0.485
Forest share in 2019 in per cent	0.315	0.164	0.000	0.898
Log of elevation	6.043	0.356	4.700	6.951
Building share in in 2019 per cent	0.035	0.035	0.001	0.499
Agriculture share in 2019 in per cent	0.500	0.162	0.016	0.902
Recreation share in 2019 in per cent	0.008	0.010	0.000	0.086
Log of area in 2019	3.244	0.714	0.329	5.492
Industry share in 2019 in per cent	0.010	0.013	0.002	0.201

Source: Federal Statistical Office of Bavaria.

of the surface on average while the proportion of industrial land is 1%. As per the official data, the average altitude of the villages is 421 metres above sea level and the highest village is situated at 1044 metres.

Changes in domestic tourism flows are significantly positively correlated both with the forest share and the average altitude in the first summer of the pandemic 2020 as well as in the recovery period 2021 (p-values $< .01$) (Table 2). Areas with lakes and water are not significantly related to the change in domestic overnight stays or arrivals.

Empirical results and discussion

Estimation results based on the SDM/SLX reveal that both the forest share in the village as well as in the surroundings are significantly related to the change in domestic overnight stays (or alternatively arrivals) as compared to the base period of summer 2019 (Table 3). In addition, altitude of the surrounding villages is highly significant. Typically, the relationships are stronger in the first summer of the pandemic than in the recovery phase in 2021.

The parameter rho is significant at the 5% level in three out of six cases indicating that there is sample selection in the group of villages and separate estimates of the outcome equation lead to biased results. Subsequently, the selection equation includes general land use characteristics of the village such as the proportion of land for buildings, agriculture, recreation and industries, all measured as per cent to total surface. In addition, total surface of the village (logarithm of) is included which serves as the exclusion restriction. This variable is markedly significant indicating that villages with a larger area have a higher likelihood of providing accommodation (Table 3).

Spatial effects for the proportion of forests and elevation are significant at the 1% level (Table 3). This is robust with respect to the indicator of domestic tourism flows (arrivals or overnight stays) and the time periods analysed (summer 2020 or summer 2021). A comparison of spatial effects reveals that the indirect effects of elevation are all higher and more significant than the direct ones for arrivals and overnight stays while the opposite is the case for the proportion of forests. Concerning spatial effects of lakes, there are significant estimates for the length of stay but not for the two other tourism indicators.

While the importance and relevance of mountains and forest areas is present in both summer seasons during the Covid-19 pandemic, the magnitude tends to be lower in the recovery period of 2021. These results indicate that Hypotheses 1, 2, 4 and 5 cannot be rejected, while Hypothesis 3 cannot be confirmed in the case of direct effects.

The direct and indirect marginal effects give an indication of the magnitude of the results. Indirect effects of the proportion of forests appear for both summer seasons with marginal effects ranging between 0.11 and 0.13 and the indicator of domestic tourism flows (Table 4). This implies that an increase in the spatially

Table 2. Correlation coefficients of domestic tourism indicators.

	Changes in domestic arrivals		Changes in domestic overnight stays		Changes in length of stay (domestic)	
	2020–2019	2021–2019	2020–2019	2021–2019	2020–2019	2021–2019
Lake share	0.025	0.006	0.029	0.009	0.001	0.005
	(0.48)	(0.86)	(0.42)	(0.80)	(0.80)	(0.88)
Forest share	0.230***	0.146***	0.177***	0.114***	−0.104***	−0.078**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)
Log of elevation	0.133***	0.092***	0.152***	0.099***	0.047	0.010
	(0.00)	(0.01)	(0.00)	(0.00)	(0.18)	(0.77)

Note: p-values are in parentheses.
Source: Federal Statistical Office of Bavaria and own calculations.

Table 3. Spatial Durbin Model estimation on arrivals, overnight stays and length of stay.

	Domestic arrivals		Domestic overnight stays		Length of stay (Domestic)	
	2020	2021	2020	2021	2020	2021
Lake share	0.463***	0.281*	0.389***	0.140	−0.091	−0.162***
	(0.00)	(0.15)	(0.09)	(0.18)	(0.06)	(0.01)
Forest share	0.353***	0.236**	0.283**	0.152	−0.076**	−0.082***
	(0.10)	(0.10)	(0.14)	(0.10)	(0.03)	(0.00)
Log of elevation	−0.138***	−0.105	−0.114	−0.071	0.023	0.038***
	(0.02)	(0.07)	(0.07)	(0.06)	(0.05)	(0.00)
Constant	−0.874***	−0.706***	−0.956***	−0.641***	−0.046***	0.060***
	(0.13)	(0.13)	(0.17)	(0.12)	(0.01)	(0.00)
Spatial coefficients						
Lake share	0.431	0.133	0.581	0.506***	0.135**	0.375***
	(0.41)	(0.20)	(0.36)	(0.08)	(0.06)	(0.11)
Forest share	0.122***	0.120***	0.106***	0.132***	−0.026*	0.013
	(0.03)	(0.00)	(0.02)	(0.01)	(0.01)	(0.01)
Log of elevation	0.218***	0.181**	0.222**	0.154**	0.001	−0.031***
	(0.04)	(0.08)	(0.09)	(0.07)	(0.05)	(0.00)
$\tilde{\rho}_s$	0.126***		0.100***		0.119***	0.083***
	(0.05)		(0.02)		(0.00)	(0.00)
Heckman selection equationl						
Building share	6.291***	6.722***	6.374***	6.762***	6.339***	6.711***
	(0.71)	(0.41)	(0.69)	(0.42)	(0.70)	(0.46)
Agriculture share	−2.182***	−2.110***	−2.185***	−2.111***	−2.172***	−2.107***
	(0.22)	(0.22)	(0.21)	(0.22)	(0.22)	(0.22)
Recreation share	25.445***	25.551***	25.348***	25.482***	25.862***	25.648***
	(0.33)	(1.40)	(0.38)	(1.40)	(0.24)	(1.35)
InArea	1.060***	1.090***	1.060***	1.090***	1.063***	1.091***
	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)	(0.17)
Industry share	7.111	5.759	6.956	5.724	6.602	5.710
	(5.26)	(6.01)	(5.29)	(5.99)	(5.49)	(5.99)
Constant	3.163***	−3.287***	−3.165***	−3.287***	−3.179***	−3.292***
	(0.59)	(0.62)	(0.58)	(0.61)	(0.60)	(0.61)
Wald test rho = 0	5.60**	0.85	7.98***	6.69***	1.75	0.32
Selected observations	812	820	812	820	812	820

Notes: ***, **, * reflect significances at 1%, 5%, and 10%, respectively. The standard errors are reported in the parentheses. Dependent variable: Deviations of log of domestic stays from average of the same months in the pre-pandemic summer (2019). Names of model represent the data of dependent variable used. Cluster robust standard errors based on classification of whether a village is a town is employed. Wald test: A test with null of all spatial-autoregressive coefficients are zero. The number of observations in the Heckman selection equation model is 2029.

Table 4. Direct, indirect, and total average effects on arrivals, overnight stays and length of stay.

	Domestic arrivals		Domestic overnight stays		Length of stay (domestic)	
	2020	2021	2020	2021	2020	2021
Direct						
Lake share	0.530***	0.281*	0.432***	0.140	−1.103	−0.176***
	(0.03)	(0.15)	(0.11)	(0.18)	(0.07)	(0.01)
Forest share	0.404***	0.236**	0.314*	0.152	−0.087**	−0.089***
	(0.13)	(0.10)	(0.16)	(0.10)	(0.04)	(0.00)
Log of elevation	−0.158***	−0.105	−0.127	−0.071	0.026	0.041***
	(0.03)	(0.07)	(0.08)	(0.06)	(0.06)	(0.00)
Indirect						
Lake share	0.502	0.136	0.657	0.516***	0.157**	0.415***
	(0.51)	(0.20)	(0.43)	(0.09)	(0.07)	(0.13)
Forest share	0.133***	0.115***	0.113***	0.126***	−0.028**	0.014
	(0.02)	(0.00)	(0.02)	(0.01)	(0.01)	(0.01)
Log of elevation	0.250***	0.181**	0.247**	0.154**	0.001	−0.034***
	(0.05)	(0.08)	(0.10)	(0.07)	(0.06)	(0.00)
Total						
Lake share	1.032*	0.417	1.089**	0.656**	0.053***	0.239**
	(0.54)	(0.36)	(0.53)	(0.27)	(0.00)	(0.12)
Forest share	0.538***	0.351***	0.427***	0.278***	−0.115***	−0.074***
	(0.11)	(0.10)	(0.15)	(0.11)	(0.02)	(0.01)
Log of elevation	0.092***	0.076***	0.120***	0.082***	0.027***	0.007***
	(0.02)	(0.01)	(0.02)	(0.01)	(0.00)	(0.00)

Notes: ***, **, * reflect significances at 1%, 5%, and 10%, respectively. The standard errors are reported in the parentheses. Marginal effects are based on the regressions reported in Table 3 and mean values of the variables involved.

weighted forest share by 10% is associated with a 1.1–1.3 percentage points surge in the growth rate of domestic overnight stays (or arrivals) in the summers of 2020 or 2021 compared with 2019. Thus, there are strong geographical spillovers from forests in neighbouring areas. Similarly, elevation of the surrounding villages is highly significantly related to both number of arrivals and overnight stays. The marginal effects of elevation of the surrounding villages range between 0.15 and 0.25. This implies that villages that are surrounded by areas with an average elevation of 900 metres (as compared to the sample average of 450 metres) have a 15–25 percentage points higher growth rates of domestic tourism arrivals or overnight stays than lower-lying villages.

Total marginal effects (both direct and indirect) reveal that a 10% rise in the proportion of forest cover in and around the surrounding villages is associated with a 2.8–5.4 percentage points increase in the growth rate of domestic arrivals or overnight stays, depending on the summer period. A 10% higher altitude within or in the surrounding area to the village is associated with an increase in domestic overnight stays or arrivals of between 0.8 and 1.2 percentage points.

Overall, the results indicate that domestic tourism demand resists the initial shock of the Covid-19 pandemic better if the village is situated at or surrounded by areas with high elevations and has a certain degree of forests nearby. This result coincides with evidence of asymmetric resilience of domestic tourism demand across a group of countries in the north and the south of Europe during the first summer of the pandemic (Duro et al., 2022; Falk et al., 2022a, 2022c). French regions with high economic activity and Spanish tourism intensive areas are found most vulnerable to the pandemic. Remote and poorly connected Nuts 3 regions in three northern and three southern European countries, withstand the pandemic better in terms of domestic tourism demand in the first summer of the pandemic (Falk et al., 2022c).

The level of detail and spatial approach in this study take present research further by informing on the specific characteristics of the areas that best withstand the crisis. To some extent, the results also confirm the *ex ante* findings from travel intention surveys where natural areas and mountains are suddenly exhibiting a steep increase in interest (Osti & Nava, 2020; Seraphin & Dosquet, 2020). No other study introduces the elevation of the area as a measure of tourism resilience, implying that this part of the results cannot be benchmarked against other analyses. Another novelty compared with recent studies is the timely data that allows the inclusion of the second summer of the pandemic. Even if the magnitudes are somewhat smaller, the results show similar tendencies in the recovery phase of the second summer of the pandemic. Additionally, the results also indicate that domestic tourism demand at least temporarily experiences a reverse trend in comparison with the urban tourism boom in the years before the pandemic (Namberger et al., 2019). What will happen to this trend is currently unclear. Finally, the results imply that changes in domestic tourism flows during the early phase of the Covid-19 pandemic can only be identified by the use of fine-granular data.

Several robustness checks are conducted. First, the two-stage Heckman selection model is employed instead of the ML. The results show that there are no differences between the ML and the two-stage model when normal standard errors are used. A further robustness check concerns the functional form between the change in domestic overnight stays (or arrivals) on the one hand and forest share and elevation on the other. Results that allow for the quadratic form of these variables show no improvement in the goodness of fit. The likelihood ratio test rejects the inclusion of the quadratic variables (with p-values between 0.25 and 0.58).

Conclusions

This study investigates empirically if land characteristics (especially forests and mountains) are of importance for the local ability to withstand the shock of the Covid-19 on domestic tourism demand during the summer of 2020. A second step of the analysis focuses on recovery of domestic tourism demand in the subsequent summer 2021. This kind of resilience analyses is uncommon in relation to tourism demand as is the use of land-use characteristics as determinants. Three tourism indicators are considered: local arrivals, overnight stays and length of stay. Fine-granular data on 2029 villages in South Germany is used for the spatial Durbin combined with the Heckman selection model estimations. The latter takes into account the fact that 60% of the villages do not host tourists or do not pass the minimum reporting threshold.

Results of the analysis show that villages with or close by (indirect effects) large forests resist the shock of the Covid-19 pandemic better than other villages in the summer of 2020. This effect is present also in the recovery phase of 2021, but with a smaller magnitude. Villages surrounded by high mountains record a better tourism resilience which lasts until the second summer of 2021. On average, an increase in the proportion of forests within or surrounding the village by 10% is associated with a growth rate of domestic arrivals or overnight stays between 2.8 and 5.4 percentage points higher than other villages. Villages that are surrounded by 10% more higher mountains show an increase in domestic overnight stays or arrivals between 0.8 and 1.2 percentage points. The proportion of lakes and rivers is generally less relevant but has a significant positive influence on the length of stay.

Several conclusions can be drawn from the results for both academics and policy makers that go beyond the case of the Covid-19 pandemic. The pandemic has, at least temporarily, lead to a structural break in the pattern of domestic tourism flows towards natural areas. These shifts are somewhat weaker in the second summer of the pandemic and may abate further over time as people become more familiar with the new reality. This would imply that both supply and demand will normalize after some time. However, as tourism resilience varies considerably in both first two summers of the pandemic across regions, it is not unlikely that the pattern will continue to fluctuate for some time, meaning that the long-term impact, if any, is not yet known. Future work is therefore needed to understand the presumed long-term effects on domestic tourism behaviour. This also cannot be separated from how international travel and tourism flows evolve in the wake of the crisis.

Theoretically, a crucial result of the analysis is that there are strong spatial relationships in the importance of land characteristics for domestic tourism demand. This means that simple bivariate links without the indirect spatial effects would lead to omitted variable bias and thus misleading results. The results also verify that changes in domestic tourism flows during the Covid-19 pandemic need to be identified by the use of fine-granular data, spatial econometric models and consider sample selection issues because not all destinations host or report the number of tourists. Thus, future analysis using data on domestic tourism flows and domestic tourism resilience should take these spatial effects into account.

There are several limitations to the present study. First, the study focuses on the initial shock of the Covid-19 pandemic in the summer of 2020 and its recovery phase the subsequent summer 2021. It is not clear to what extent the changed pattern of domestic tourism flows to forest and mountain areas is temporary or persists in the next summer seasons. Second, the results refer to one federal state in Germany and may not be generalizable to other regions of the world, although many areas in the middle of Europe have similar conditions. Third, due to data availability, several variables of importance cannot be considered.

There are numerous opportunities for future research. Official data are regularly updated implying that the analysis can easily be updated to include the course of the next summer seasons. In addition, the database can be linked to weather data or to additional destination-specific characteristics, although the latter requires the collection of new data (information on the number of natural and cultural amenities can be taken from TripAdvisor). Another promising research strand is the extension of the database to include municipalities or villages from other regions and countries, which will allow the study of common characteristics and international comparisons in the regional shift in tourism flows.

Future work should also use individual data. This would allow for the study of spending patterns. It is often claimed that rural visitors are assumed to engage in fewer leisure activities and spend less money compared to city tourists. In academia, there is also a Covid-19 pandemic effect, expressed as an increased interest in studies on the determinants of domestic tourism flows. Domestic tourism is in many ways more sustainable as the travel-related carbon footprint is lower.

Acknowledgements

The authors would like to thank the participants of the TOURMAN 2021 virtual conference for their comments and suggestions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Martin Falk is Professor of Innovation and Entrepreneurship at the University of South-Eastern Norway (Campus Bø). His research interests include innovation, sustainability and tourism. Since 2016 he is visiting professor at the Shanghai Lixin University of Accounting and Finance (School of economics and trade).

Eva Hagsten holds a PhD in economics from the University of Iceland and a master's degree in economics from Örebro University (Sweden). She is an Associate Professor at the University of South-Eastern Norway. Her research interests encompass applied economics oriented towards firm behaviour, firm performance, tourism economics, ICT and international economics. She also has experience from leadership of large EU-funded research projects.

Xiang Lin is an Associate Professor in Economics at Södertörn University, Sweden. He holds a PhD in economics from Stockholm University. His research interests include macroeconomics, finance, tourism and entrepreneurship.

Data availability statement

Data is available upon request.

ORCID

Martin Falk http://orcid.org/0000-0003-0518-6513
Eva Hagsten http://orcid.org/0000-0001-7091-1449
Xiang Lin http://orcid.org/0000-0003-3747-9038

References

Agimass, F., Lundhede, T., Panduro, T. E., & Jacobsen, J. B. (2018). The choice of forest site for recreation: A revealed preference analysis using spatial data. *Ecosystem Services*, *31*, 445–454. https://doi.org/10.1016/j.ecoser.2017.11.016

Almeida, A., Golpe, A., & Justo, R. (2021). Regional tourist heterogeneity in Spain: A dynamic spatial analysis. *Journal of Destination Marketing & Management*, *21*, 100643. https://doi.org/10.1016/j.jdmm.2021.100643

Almeida, J., Costa, C., & Da Silva, F. N. (2018). Collaborative approach for tourism conflict management: A Portuguese case study. *Land Use Policy*, *75*, 166–179. https://doi.org/10.1016/j.landusepol.2018.03.034

Altuntas, F., & Gok, M. S. (2021). The effect of COVID-19 pandemic on domestic tourism: A DEMATEL method analysis on quarantine decisions. *International Journal of Hospitality Management*, *92*, 102719. https://doi.org/10.1016/j.ijhm.2020.102719

Alvarez-Diaz, M., D'Hombres, B., Ghisetti, C., & Pontarollo, N. (2020). Analysing domestic tourism flows at the provincial level in Spain by using spatial gravity models. *International Journal of Tourism Research*, *22*(4), 403–415. https://doi.org/10.1002/jtr.2344

Andkjær, S., & Arvidsen, J. (2015). Places for active outdoor recreation – A scoping review. *Journal of Outdoor Recreation and Tourism*, *12*, 25–46. https://doi.org/10.1016/j.jort.2015.10.001

Antonelli, M., Donelli, D., Carlone, L., Maggini, V., Firenzuoli, F., & Bedeschi, E. (2022). Effects of forest bathing (shinrin-yoku) on individual well-being: An umbrella review. *International Journal of Environmental Health Research*, *32*(8), 1842–1867. https://doi.org/10.1080/09603123.2021.1919293

Arbulú, I., Razumova, M., Rey-Maquieira, J., & Sastre, F. (2021). Can domestic tourism relieve the COVID-19 tourist industry crisis? The case of Spain. *Journal of Destination Marketing & Management*, *20*, 100568. https://doi.org/10.1016/j.jdmm.2021.100568

Benítez-Aurioles, B. (2020). Tourism resilience patterns in Southern Europe. *Tourism Analysis*, *25*(4), 409–424. https://doi.org/10.3727/108354220X16010020096118

Boto-García, D., & Mayor, M. (2022). Domestic tourism and the resilience of hotel demand. *Annals of Tourism Research*, *93*, 103352. https://doi.org/10.1016/j.annals.2022.103352

Buckley, R., & Westaway, D. (2020). Mental health rescue effects of women's outdoor tourism: A role in COVID-19 recovery. *Annals of Tourism Research*, *85*, 103041. https://doi.org/10.1016/j.annals.2020.103041

Buckley, R., & Westaway, D. (2022). Women report that nature tourism provides recovery from psychological trauma. *Tourism Recreation Research*, *47*(4), 443–447. https://doi.org/10.1080/02508281.2021.1917892

Bui, P. L., & Wickens, E. (2021). Tourism industry resilience issues in urban areas during COVID-19. *International Journal of Tourism Cities*, *7*(3), 861–879. https://doi.org/10.1108/IJTC-12-2020-0289

Calgaro, E., Lloyd, K., & Dominey-Howes, D. (2014). From vulnerability to transformation: A framework for assessing the vulnerability and resilience of tourism destinations. *Journal of Sustainable Tourism*, *22*(3), 341–360. https://doi.org/10.1080/09669582.2013.826229

Cellini, R., & Cuccia, T. (2015). The economic resilience of tourism industry in Italy: What the 'great recession' data show. *Tourism Management Perspectives*, *16*, 346–356. https://doi.org/10.1016/j.tmp.2015.09.007

Dann, G. M. S. (1977). Anomie, ego-enhancement and tourism. *Annals of Tourism Research*, *4*(4), 184–194. https://doi.org/10.1016/0160-7383(77)90037-8

De la Mata, T., & Llano-Verduras, C. (2012). Spatial pattern and domestic tourism: An econometric analysis using inter-regional monetary flows by type of journey. *Papers in Regional Science*, *91*(2), 437–470. https://doi.org/10.1111/j.1435-5957.2011.00376.x

Deng, M., & Athanasopoulos, G. (2011). Modelling Australian domestic and international inbound travel: A spatial–temporal approach. *Tourism Management*, *32*(5), 1075–1084. https://doi.org/10.1016/j.tourman.2010.09.006

Derks, J., Giessen, L., & Winkel, G. (2020). COVID-19-induced visitor boom reveals the importance of forests as critical infrastructure. *Forest Policy and Economics*, *118*, 102253. https://doi.org/10.1016/j.forpol.2020.102253

Drukker, D. M., Egger, P., & Prucha, I. R. (2013). On two-step estimation of a spatial autoregressive model with autoregressive disturbances and endogenous regressors. *Econometric Reviews*, *32*(5-6), 686–733. https://doi.org/10.1080/07474938.2013.741020

Duro, J., Perez-Laborda, A., & Fernandez, M. (2022). Territorial tourism resilience in the COVID-19 summer. *Annals of Tourism Research Empirical Insights*, *3*(1), 100039. https://doi.org/10.1016/j.annale.2022.100039

Elhorst, J. P. (2010). Applied spatial econometrics: Raising the bar. *Spatial Economic Analysis*, *5*(1), 9–28. https://doi.org/10.1080/17421770903541772

Falk, M., Hagsten, E., & Lin, X. (2022a). High regional economic activity repels domestic tourism during summer of pandemic. *Current Issues in Tourism*, *25*(8), 1209–1225. https://doi.org/10.1080/13683500.2021.1968805

Falk, M., Hagsten, E., & Lin, X. (2022b). Uneven domestic tourism demand in times of pandemic. *Tourism Economics*. https://doi.org/10.1177/13548166211059409

Falk, M. T., Hagsten, E., & Lin, X. (2022c). Domestic tourism demand in the north and the south of Europe in the Covid-19 summer of 2020. *The Annals of Regional Science*, 1–17. https://doi.org/10.1007/s00168-022-01147-5

Farkic, J., Isailovic, G., & Taylor, S. (2021). Forest bathing as a mindful tourism practice. *Annals of Tourism Research Empirical Insights*, *2*(2), 100028. https://doi.org/10.1016/j.annale.2021.100028

Farsari, I. (2021). Exploring the nexus between sustainable tourism governance, resilience and complexity research. *Tourism Recreation Research*, 1–16. https://doi.org/10.1080/02508281.2021.1922828

Filimonau, V., & De Coteau, D. (2020). Tourism resilience in the context of integrated destination and disaster management (DM2). *International Journal of Tourism Research*, *22*(2), 202–222. https://doi.org/10.1002/jtr.2329

Florida, R., Rodríguez-Pose, A., & Storper, M. (2021). Cities in a post-COVID world. *Urban Studies*. https://doi.org/10.1177/00420980211018072

Fotiadis, A., Polyzos, S., & Huan, T. C. T. (2021). The good, the bad and the ugly on COVID-19 tourism recovery. *Annals of Tourism Research*, *87*, 103117. https://doi.org/10.1016/j.annals.2020.103117

Golgher, A. B., & Voss, P. R. (2016). How to interpret the coefficients of spatial models: Spillovers, direct and indirect effects. *Spatial Demography*, *4*(3), 175–205. https://doi.org/10.1007/s40980-015-0016-y

Gössling, S., & Schweiggart, N. (2022). Two years of COVID-19 and tourism: What we learned, and what we should have learned. *Journal of Sustainable Tourism*, *30*(4), 915–931. https://doi.org/10.1080/09669582.2022.2029872

Gössling, S., Scott, D., & Hall, C. M. (2018). Global trends in length of stay: Implications for destination management and climate change. *Journal of Sustainable Tourism*, *26*(12), 2087–2101. https://doi.org/10.1080/09669582.2018.1529771

Hall, C. M. (2011). Seeing the forest for the trees: Tourism and the international year of forests. *Journal of Heritage Tourism*, *6*(4), 271–283. https://doi.org/10.1080/1743873X.2011.620115

Hansen, A. S. (2021). Understanding recreational landscapes – A review and discussion. *Landscape Research*, *46*(1), 128–141. https://doi.org/10.1080/01426397.2020.1833320

Harb, G., & Bassil, C. (2020). Gravity analysis of tourism flows and the 'multilateral resistance to tourism'. *Current Issues in Tourism*, *23*(6), 666–678. https://doi.org/10.1080/13683500.2018.1544612

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, *47*(1), 153–161. https://doi.org/10.2307/1912352

Helgadóttir, G., & Dashper, K. (2021). 20 years of Nordic rural tourism research: A review and future research agenda. *Scandinavian Journal of Hospitality and Tourism*, *21*(1), 60–69. https://doi.org/10.1080/15022250.2020.1823246

Hjalager, A. M. (2020). Land-use conflicts in coastal tourism and the quest for governance innovations. *Land Use Policy*, *94*, 104566. https://doi.org/10.1016/j.landusepol.2020.104566

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Kienast, F., Degenhardt, B., Weilenmann, B., Wäger, Y., & Buchecker, M. (2012). GIS-assisted mapping of landscape suitability for nearby recreation. *Landscape and Urban Planning*, *105*(4), 385–399. https://doi.org/10.1016/j.landurbplan.2012.01.015

Kock, F., Nørfelt, A., Josiassen, A., Assaf, A. G., & Tsionas, M. G. (2020). Understanding the COVID-19 tourist psyche: The evolutionary tourism paradigm. *Annals of Tourism Research*, *85*, 103053. https://doi.org/10.1016/j.annals.2020.103053

Lane, B. (1994). What is rural tourism? *Journal of Sustainable Tourism*, *2*(1-2), 7–21. https://doi.org/10.1080/09669589409510680

Lee, C. F., Huang, H. I., & Yeh, H. R. (2010). Developing an evaluation model for destination attractiveness: Sustainable forest recreation tourism in Taiwan. *Journal of Sustainable Tourism*, *18*(6), 811–828. https://doi.org/10.1080/09669581003690478

Lee, J., Graefe, A. R., & Burns, R. C. (2007). Examining the antecedents of destination loyalty in a forest setting. *Leisure Sciences*, *29*(5), 463–481. https://doi.org/10.1080/01490400701544634

LeSage, J. P., & Pace, R. K. (2009). *Introduction to spatial econometrics*. Chapman & Hall/CRC. https://doi.org/10.1201/9781420064254

LeSage, J. P., & Pace, R. K. (2011). Pitfalls in higher order model extensions of basic spatial regression methodology. *Review of Regional Studies*, *41*(1), 13–26. https://doi.org/10.52324/001c.8141

Li, X., Gong, J., Gao, B., & Yuan, P. (2021). Impacts of COVID-19 on tourists' destination preferences: Evidence from China. *Annals of Tourism Research*, *90*, 103258. https://doi.org/10.1016/j.annals.2021.103258

Li, Z., Zhang, X., Yang, K., Singer, R., & Cui, R. (2021). Urban and rural tourism under COVID-19 in China: Research on the recovery measures and tourism development. *Tourism Review*, *76*(4), 718–736. https://doi.org/10.1108/TR-08-2020-0357

Liu, A., & Pratt, S. (2017). Tourism's vulnerability and resilience to terrorism. *Tourism Management*, *60*, 404–417. https://doi.org/10.1016/j.tourman.2017.01.001

Liu, Y., Feng, Y., Zhao, Z., Zhang, Q., & Su, S. (2016). Socioeconomic drivers of forest loss and fragmentation: A comparison between different land use planning schemes and policy implications. *Land Use Policy*, *54*, 58–68. https://doi.org/10.1016/j.landusepol.2016.01.016

Manski, C. (1993). Identification of endogenous social effects: The reflection problem. *The Review of Economic Studies*, *60*(3), 531–542. https://doi.org/10.2307/2298123

Margaryan, L., & Fredman, P. (2017). Natural amenities and the regional distribution of nature-based tourism supply in Sweden. *Scandinavian Journal of Hospitality and Tourism*, *17*(2), 145–159. https://doi.org/10.1080/15022250.2016.1153430

Marques, C. P., Guedes, A., & Bento, R. (2021). Rural tourism recovery between two COVID-19 waves: The case of Portugal. *Current Issues in Tourism*, *25*(6), 857–863. https://doi.org/10.1080/13683500.2021.1910216

Marrocu, E., & Paci, R. (2013). Different tourists to different destinations. Evidence from spatial interaction models. *Tourism Management*, *39*, 71–83. https://doi.org/10.1016/j.tourman.2012.10.009

Massidda, C., & Etzo, I. (2012). The determinants of Italian domestic tourism: A panel data analysis. *Tourism Management*, *33*(3), 603–610. https://doi.org/10.1016/j.tourman.2011.06.017

Morita, E., Fukuda, S., Nagano, J., Hamajima, N., Yamamoto, H., Iwai, Y., Nakashima, T., Ohira, H., & Shirakawa, T. (2007). Psychological effects of forest environments on healthy adults: Shinrin-yoku (forest-air bathing, walking) as a possible method of stress reduction. *Public Health*, *121*(1), 54–63. https://doi.org/10.1016/j.puhe.2006.05.024

Morley, C., Rosselló, J., & Santana-Gallego, M. (2014). Gravity models for tourism demand: Theory and use. *Annals of Tourism Research*, *48*, 1–10. https://doi.org/10.1016/j.annals.2014.05.008

Morse, J. W., Gladkikh, T. M., Hackenburg, D. M., & Gould, R. K. (2020). COVID-19 and human-nature relationships: Vermonters' activities in nature and associated nonmaterial values during the pandemic. *PLoS One*, *15*(12), e0243697. https://doi.org/10.1371/journal.pone.0243697

Namberger, P., Jackisch, S., Schmude, J., & Karl, M. (2019). Overcrowding, overtourism and local level disturbance: How much can Munich handle? *Tourism Planning & Development*, *16*(4), 452–472. https://doi.org/10.1080/21568316.2019.1595706

Nathan, M., & Overman, H. (2020). Will coronavirus cause a big city exodus? *Environment and Planning B: Urban Analytics and City Science*, *47*(9), 1537–1542. https://doi.org/10.1177/2399808320971910

Nepal, S. K., & Chipeniuk, R. (2005). Mountain tourism: Toward a conceptual framework. *Tourism Geographies*, *7*(3), 313–333. https://doi.org/10.1080/14616680500164849

Oh, B., Lee, K. J., Zaslawski, C., Yeung, A., Rosenthal, D., Larkey, L., & Back, M. (2017). Health and well-being benefits of spending time in forests: Systematic review. *Environmental Health and Preventive Medicine*, *22*(1), 1–11. https://doi.org/10.1186/s12199-017-0677-9

Osti, L., & Nava, C. R. (2020). Loyal: To what extent? A shift in destination preference due to the COVID-19 pandemic. *Annals of Tourism Research Empirical Insights*, *1*(1), 100004. https://doi.org/10.1016/j.annale.2020.100004

Romão, J., & Nijkamp, P. (2019). Impacts of innovation, productivity and specialization on tourism competitiveness – A spatial econometric analysis on European regions. *Current Issues in Tourism*, *22*(10), 1150–1169. https://doi.org/10.1080/13683500.2017.1366434

Roviello, V., Gilhen-Baker, M., Vicidomini, C., & Roviello, G. N. (2022). Forest-bathing and physical activity as weapons against COVID-19: A review. *Environmental Chemistry Letters*, *20*(1), 131–140. https://doi.org/10.1007/s10311-021-01321-9

Schägner, J. P., Maes, J., Brander, L., Paracchini, M. L., Hartje, V., & Dubois, G. (2017). Monitoring recreation across European nature areas: A geo-database of visitor counts, a review of literature and a call for a visitor counting reporting standard. *Journal of Outdoor Recreation and Tourism*, *18*, 44–55. https://doi.org/10.1016/j.jort.2017.02.004

Schmude, J., Filimon, S., Namberger, P., Lindner, E., Nam, J. E., & Metzinger, P. (2021). COVID-19 and the pandemic's spatio-temporal impact on tourism demand in Bavaria (Germany). *Tourism: An International Interdisciplinary Journal*, *69*(2), 246–261. https://doi.org/10.37741/t.69.2.6

Schulp, C. J., Levers, C., Kuemmerle, T., Tieskens, K. F., & Verburg, P. H. (2019). Mapping and modelling past and future land use change in Europe's cultural landscapes. *Land Use Policy*, *80*, 332–344. https://doi.org/10.1016/j.landusepol.2018.04.030

Scott, D., Simpson, M. C., & Sim, R. (2012). The vulnerability of Caribbean coastal tourism to scenarios of climate change related sea level rise. *Journal of Sustainable Tourism*, *20*(6), 883–898. https://doi.org/10.1080/09669582.2012.699063

Seraphin, H., & Dosquet, F. (2020). Mountain tourism and second home tourism as post COVID-19 lockdown placebo? *Worldwide Hospitality and Tourism Themes*, *12*(4), 485–500. https://doi.org/10.1108/WHATT-05-2020-0027

Sharma, G. D., Thomas, A., & Paul, J. (2021). Reviving tourism industry post-COVID-19: A resilience-based framework. *Tourism Management Perspectives*, *37*, 100786. https://doi.org/10.1016/j.tmp.2020.100786

Song, H., Qiu, R. T., & Park, J. (2019). A review of research on tourism demand forecasting: Launching the Annals of Tourism Research curated collection on tourism demand forecasting. *Annals of Tourism Research*, *75*, 338–362. https://doi.org/10.1016/j.annals.2018.12.001

Utkarsh, & Sigala, M. (2021). A bibliometric review of research on COVID-19 and tourism: Reflections for moving forward. *Tourism Management Perspectives*, *40*, 100912. https://doi.org/10.1016/j.tmp.2021.100912

Wen, J., Kozak, M., Yang, S., & Liu, F. (2021). COVID-19: Potential effects on Chinese citizens' lifestyle and travel. *Tourism Review*, *76*(1), 74–87. https://doi.org/10.1108/TR-03-2020-0110

Williams, J. A. (2007). *Turning to nature in Germany: Hiking, nudism, and conservation, 1900–1940*. Stanford University Press.

Willibald, F., van Strien, M. J., Blanco, V., & Grêt-Regamey, A. (2019). Predicting outdoor recreation demand on a national scale – The case of Switzerland. *Applied Geography*, *113*, 102111. https://doi.org/10.1016/j.apgeog.2019.102111

Wilson, J. K. (2019). *The German forest*. University of Toronto Press.

Xi, J., Zhao, M., Ge, Q., & Kong, Q. (2014). Changes in land use of a village driven by over 25 years of tourism: The case of Gougezhuang village, China. *Land Use Policy*, *40*, 119–130. https://doi.org/10.1016/j.landusepol.2013.11.014

Yang, Y., & Fik, T. (2014). Spatial effects in regional tourism growth. *Annals of Tourism Research*, *46*, 144–162. https://doi.org/10.1016/j.annals.2014.03.007

Yang, Y., & Wong, K. K. (2012). A spatial econometric approach to model spillover effects in tourism flows. *Journal of Travel Research*, *51*(6), 768–778. https://doi.org/10.1177/0047287512437855

Yang, Y., Zhang, C. X., & Rickly, J. M. (2021). A review of early COVID-19 research in tourism: Launching the Annals of Tourism Research's curated collection on coronavirus and tourism. *Annals of Tourism Research*, *91*, 103313. https://doi.org/10.1016/j.annals.2021.103313

Zenker, S., & Kock, F. (2020). The coronavirus pandemic – A critical discussion of a tourism research agenda. *Tourism Management*, *81*, 104164. https://doi.org/10.1016/j.tourman.2020.104164