

## STUDY REGARDING RURAL TOURISM IN THE SIBIU COUNTY USING THE GAUSSIAN GRAPHICAL MODEL

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### Abstract

*This study aims to examine rural tourism in the Sibiu County, by comparing the number of accommodation units, accommodation capacity, tourist arrivals, total nights spent, average length of stay and occupancy rate for 33 villages and rural townships during the last ten years. Corroborated with this approach and attempting to provide an explanation for the variance of average touristic arrivals between villages, a database of points of interest located around the studied villages and rural townships was created. This database includes Google Maps review score and number of reviews (as a proxy for notoriety of the attractions) of touristic attractions, restaurants, bars, cafes, banks and ATMs. A gaussian graphical model was created using this data in order to assess the impact of attractions, establishments providing food and beverages, accessibility of financial services, proximity to the major urban areas and demographic factors.*

**Key words:** network approach, gaussian graphical model, rural tourism, Sibiu County, impact of touristic attractions, factor analysis.

### INTRODUCTION

According to the World Tourism Organisation (UNWTO, 2019), rural tourism is "a type of tourism activity in which the visitor's experience is related to a wide range of products generally linked to nature-based activities, agriculture, rural lifestyle / culture, angling and sightseeing". As stated in the same source, the defining traits of non-urban or rural areas are low population density, landscape and land-use dominated by agriculture and forestry and traditional social structures and lifestyles. Several attempts to identify rural space and to pinpoint the definition rurality have been made. Earlier approaches to this dimension of research were influenced by an instrumentalist paradigm, as the definition of rurality can be selected, augmented and modified in order to best fit with the study being conducted (Cloke, 1977) or maintaining that a strict and inflexible definition of rurality can be counterproductive (Cloke, 2003), proposing instead the concept of ruralities or rurals. In this case, an individual rural would be defined by a set

of specific salient traits that are different from those of other rurals, while also taking into account similarities with other rural spaces. We argue that this approach has some merit, as rural spaces are diverse, with differences in culture and natural factors influencing functional characteristics (such as the size, materials used and the placement of households in rural areas) and aesthetical characteristics (architecture, design elements). However, this approach fails in identifying a common denominator for rurality (or ruralities). More recent definitions attempt to address this. One such definition of rurality is “place-based homeliness shared by people with common ancestry or heritage and who inhabit traditional, culturally defined areas or places statutorily recognised to be rural” (Chigbu, 2013). In this case, the authors consider that homeliness consists of either a feeling of familiarity, a pleasant sense of simplicity or a sort of charm most associated with rustic aesthetics.

Considering the importance placed on the location and the heritage inherent to it, the main aim of this study is to explore the relationship between average tourist arrivals measured in rural areas in the Sibiu County and the popularity score of touristic attractions, along with the accessibility of financial services and the popularity of restaurants, bars and cafes, while also accounting for population size and distance to the capital of the county, Sibiu.

The Sibiu County is located in central Romania, in the Transylvania historical region and is bordered by the Braşov, Alba, Argeş, Vâlcea and Mureş Counties. The capital city of the Sibiu County is Sibiu. The Sibiu County had a population of 375.998, as measured by the 2011 Romanian Census. The total area of the Sibiu County is 5.432 square kilometres, resulting in an average population density of 69,21 people/square kilometre. (Recensământul populaţiei şi locuinţelor, 2011)

The history of the Sibiu area was heavily influenced by the local German community, the Transylvanian Saxons. The colonisation of Saxons began during the 12th century, corresponding with the period when Transylvania was integrated into the Kingdom of Hungary. In 1486 Sibiu began hosting the Universitas Saxonum, the political and administrative institution that governed the affairs of the German people living in Transylvania and was represented in the Transilvan Diet, together with the Hungarian and Szekely political institutions. Later, during the 16th century, the majority of the Saxons adhered to the Reform movement, with the headquarters of the Evangelic Church being moved to Biertan, a village near Sibiu, in 1572 and then moved back again in 1867 (Official website of the city of Sibiu, n.d.)

## MATERIAL AND METHOD

The primary data used in this research article consists of time series data for the tourism activity of 33 villages in the Sibiu County, available publicly on the Romanian National Statistics Institute (Tempo Online, n.d.). This is corroborated with data concerning touristic attractions, as well as restaurants, bars, banks and ATMs located in the same radius. The second sequence of data was gathered from Google Maps, using the Google API via the “googleway” (Googleway documentation, n.d.) package in R. Further data processing was done in Rstudio and Microsoft Excel.

The time series used contain information regarding the total number of accommodation units, total accommodation capacity, tourist arrivals and total nights spent at the accommodation units located in Alma, Alțâna, Apoldu De Jos, Arpașu De Jos, Bârghiș, Bazna, Biertan, Blajel, Boița, Cârța, Cârțișoara, Chirpăr, Cristian, Dârloș, Gura Râului, Hoghilag, Jina, Laslea, Merghindeal, Moșna, Orlat, Poiana Sibiului, Poplaca, Porumbacu De Jos, Rășinari, Râu Sadului, Roșia, Sadu, Șelimbăr, Slimnic, Șura Mare, Șura Mică, Turnu Rosu. The occupancy rates and average length of stay were also calculated using the primary data (Albu & Păcurar, 2019)

Google placed some limitations on the Google Maps Places API, the most prominent one being a hard limit of 60 places (points of interest, or in the case of this study, touristic attractions, restaurants, bars, cafes, banks and ATMs) located around a certain spot, as defined by GPS coordinates (Google Maps Platform Documentation, n.d.). In order to alleviate this shortcoming and to remove the need to account for distances in the process of generating synthetic scores for the three variables (touristic attractions, restaurants and financial services), the search radius for touristic attractions was limited to 15 kilometres away from the centre of the village. In the case of the other points of interest, the search radius was set to 5 kilometres.

Further refinement concerning this part of the methodology might be possible, with several possible approaches. A first approach would be to conduct a survey of the tourists’ willingness to travel in order to visit touristic attractions and restaurants in order to define an appropriate search radius. Secondly, the search could be extended in order to populate the list of objectives up to the limit. In this case, a normalised (Joel, 2015) coefficient could be assigned to the distance between the studied village and the point of interest, with the relationship between distance and the coefficient being inverse. This approach presumes that the willingness to travel decreases as distances increase. Another presumption that derives from the previous one is that the impact of a very well-known touristic attraction, but that is far away from the location where the tourist is accommodated would be minimal. At the same time, the differentiation of

the tourism product can be a significant factor influencing the overall attractiveness of the location (Neves et al., 2015). Future research can also account for this.

A mix of the two approaches could be beneficial, as the distance coefficient can be non-linear or influenced by the type of the touristic attraction and its attractiveness, as highlighted by previously cited literature. Those points can constitute the basis of a future research project.

The synthetic scores for the touristic attractions and food and beverages establishments were calculated in the following way:

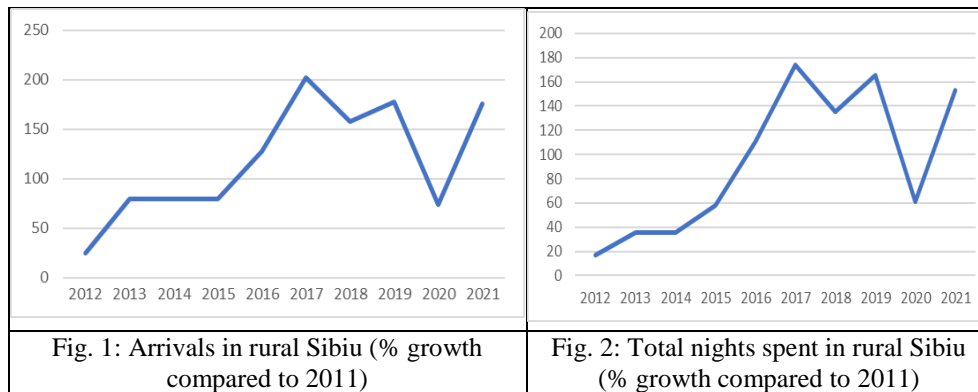
- 1) The review score for each point of interest was divided by 5, in order to penalise low review scores, resulting in a coefficient of attractiveness. This was done based on the assumption that lower review scores are associated with lower levels of interest manifested by tourists.
- 2) The number of reviews was multiplied by the coefficient of attractiveness, in order to account for both quantitative (number of reviews) and qualitative (review score) in the generation of data to be used for the network model.
- 3) For each of the 33 villages, a synthetic score was generated by summing the individual results generated in the previous step. This score was inserted into a tibble in R, together with the other relevant variables used in the model. (Campbell, 2019)

Lastly, in order to model the relationship between the average value of touristic arrivals in the 33 villages and the synthetic scores of touristic attractions and restaurants, bars and cafes, as well as the availability of financial services (number of banks and ATMs) and population size network model uses a gaussian graphical approach (Isvoranu & Epskamp, 2021) in order to estimate the partial correlations between the variables, providing a robust statistical framework for the study. The package used for estimating the network is “bootnet”, by using the EBICglasso method in order to remove spurious correlations from the model. (Epskamp et al., 2018).

The edges (lines) between the variables represent the correlations between them, with blue edges signifying a positive correlation while red edges signify negative correlations. The width of the edges represents the strength of the correlation, with thicker edges representing stronger correlations and thinner edges representing weaker correlations. (Epskamp, 2017) This method for representing correlation networks is highly intuitive and can be readily interpreted.

## RESULTS AND DISCUSSION

The first part of the study is centred around descriptive statistics, examining the number of arrivals, total nights spent, average length of stay, accommodation capacity and average occupancy rates. The total number of arrivals in the rural areas of the Sibiu county (fig. 1) generally followed a positive trend, peaking in 2017. This was followed by decreases in 2018 and 2019. 2020 marked a sharp decline, with levels comparable to 2015. In 2021, the number of arrivals jumped back to the levels registered in 2019. The same overall pattern is valid for the number of nights spent (fig.2).



Based on the absolute values of the number of arrivals and of total nights spent in rural Sibiu, we calculated the average length of stay. This ranges from 1,5 to 2 days during the studied years. It should be noted that previous theoretical and empirical research in the topic of yield management of hotels and accommodation units suggests that a higher length of stay is a positive outcome for the companies' financial positions (Wilson, 2013), with some research indicating that "hotels charge more per night when guests stay longer" (Riasi et al., 2017) and that the length of stay plays a role in customer loyalty (Nicolau et al., 2016). This should be an incentive for the touristic entrepreneurs in the rural Sibiu area to incentivise a longer length of stay, perhaps by providing a complex set of services in a coherent and attractive marketing mix, as previous research has shown that a good assessment of the accommodation unit is positively associated with the length of stay (Yang et al., 2011).

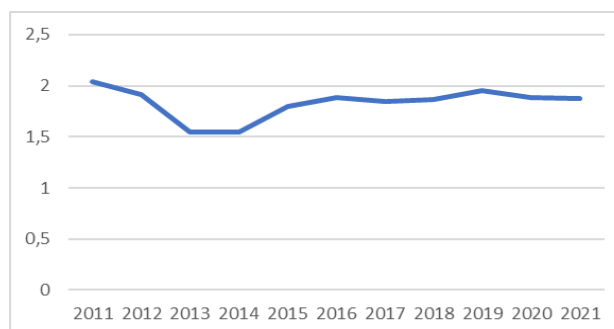
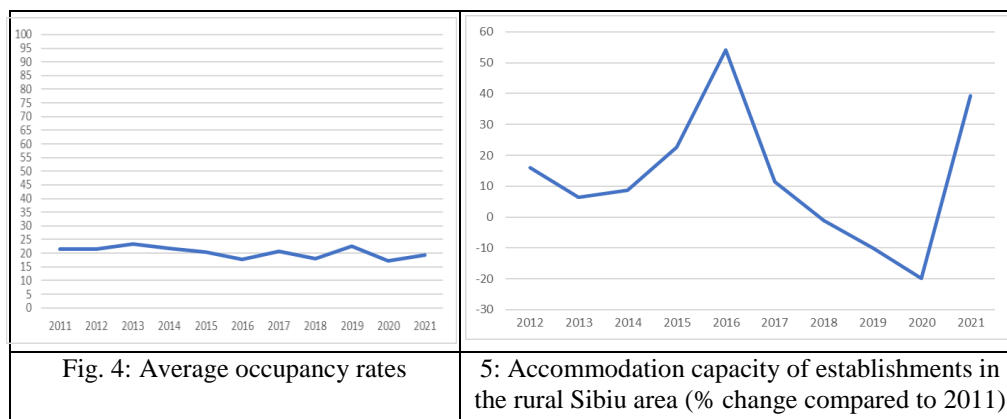


Fig. 3: Average length of stay in rural Sibiu accommodations

The average occupancy rate for accommodations located in the Sibiu rural area (fig. 4) did not vary in the time series, with values situated around the 20% threshold. This is in spite of the variation in accommodation capacity (fig. 5), peaking in 2016. 2020 was characterized by a significant decline in the accommodation capacity of the rural area of the Sibiu county. Many accommodation facilities were closed through 2020 and this was coupled with the months of lockdown, while in 2021 values returned to normal levels.



The partial correlation network (fig. 6) pictured suggest that there is a very strong correlation between the touristic attractions score and number of arrivals. A high concentration of guests in a certain location may be a cause for the popularity of local attractions, while at the same time a high number of popular attractions could be an incentive for guests to book their stay at a certain village close to the attraction. In parallel, two weaker, but significant correlation exists between the pairs of population size and restaurant scores and secondly, the number of arrivals and restaurant scores. This would suggest that both guests and the local population use the services provided at restaurants.

A negative correlation between the distance to Sibiu and the availability of financial services would suggest that those are mostly unavailable in rural areas and that they are centred in the capital city of the county. In some cases, the search radius of 5 kilometres for banks and ATMs managed to include points of interest located in the outskirts of Sibiu. The correlation between the availability of financial services and the number of arrivals is extremely weak, suggesting that this variable plays no role in the decision of the guests when booking a stay in rural Sibiu. It should be noted that this variable should not be confused with the measurement of the availability of payment methods. However, if a source for this kind of data should become publicly available, it can be integrated into the framework presented in this study. The usage of bank transfers and POS technology should present as an opportunity for local businesses to attract younger customers, accustomed perhaps to alternative means of payment.

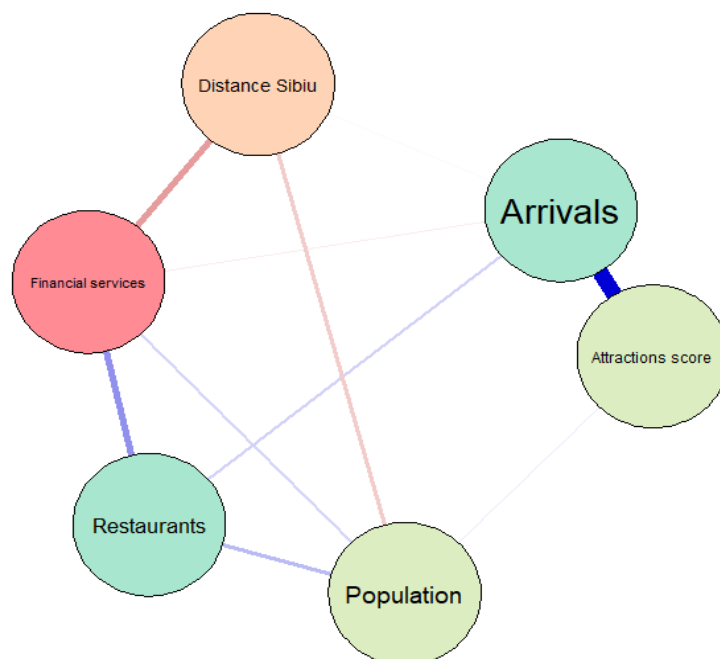


Fig. 6: Partial correlation network of studied variables

## CONCLUSIONS

Our findings suggest that touristic attractions are a very important component of the decision-making process of tourists, however further research would be needed to determine the nature of the causal relationships between arrivals and touristic attractions. This result should provide a starting point for a network with more variables and a higher sample size, focusing on the attributes assigned to touristic attractions. However, a higher sample size would present a major caveat: providing an integrative framework for rural tourism in a vast geographical area could fail to account for subtle changes in the traits present in the ruralities mentioned in the introduction. A mixed method approach, including a qualitative, ethnographic study could be employed. At the same time, economical data could also be a valuable addition.

Another result noted is that the offer for touristic accommodations in Sibiu is highly reactive, with accommodation capacity rates spiking higher than the immediate pre-pandemic levels.

We believe that future research utilizing this methodology would be appealing, due to the ease at which data is collected and to the highly intuitive way in which final results are shown.

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