Examining location factors of coworking spaces in peripheral areas
An empirical study of rural coworking in Germany

Vogl, Thomas; Micek, Grzegorz

DOI
10.1108/F-09-2024-0125

Publication date
2025

Document Version
Final published version

Published in
Facilities

Facilities

Examining location factors of coworking spaces in peripheral areas: an empirical study of rural coworking in Germany

Thomas Vogl
Department of Management in the Built Environment, Faculty of Architecture and the Built Environment, Delft University of Technology, Delft, The Netherlands, and BuiltEnvironment-Management-Institute, Faculty of Civil and Environmental Engineering, Bauhaus-Universität, Weimar, Germany, and

Grzegorz Micek
Faculty of Geography and Geology, Jagiellonian University in Kraków, Krakow, Poland

Received 11 September 2024
Revised 28 February 2025
19 March 2025
Accepted 6 April 2025

Abstract

Purpose – The coworking spatial model has evolved from predominantly metropolitan settings to include more nuanced, fewer core sites in recent years. CSs have emerged in peripheral areas that enjoy privileges in terms of housing and office markets. However, there is still limited insight into the location factors driving the popularity of CSs in peripheral areas. Hence, the study aims to investigate location determinants of coworking spaces in peripheral areas with emphasis on the significance of living conditions, real market characteristics and tourism development.

Design/methodology/approach – In this paper, an urban hierarchy perspective is applied to statistically test the potential demographic, economic, infrastructural, tourism-related and real estate market factors influencing the presence of coworking spaces (CSs).

Findings – The results reveal that areas with CSs demonstrate higher housing prices, a higher influx of tourists and lower living area per inhabitant. The authors argue that CSs are attracted by a vibrant tourism sector and housing market and vice versa. Moreover, it is argued that the location factors for rural CSs partly differ from urban CSs.

Originality/value – The research has practical implications for the location decisions of corporates and operators and enhances theoretical understanding of CSs in non-urban areas and their location patterns.

Keywords Germany, Rural areas, Coworking space, Peripheral areas, Location factors, Rural coworking

Paper type Research paper

Funding for this study has been provided by the Polish National Science Centre under the PRELUDIUM BIS 1 scheme [grant number 2019/35/O/HS4/00861]. The support of Karolina Kapustka (Jagiellonian University) in the production of one of the figures is acknowledged.

Conflict of interest statement: There is no conflict of interest. I confirm that neither I nor any of my relatives nor any institutions, organisations or businesses with which I am associated have any interest in or potential for personal gain from any of the entities linked to Emerald or Facilities journal.

Facilities

0263-2772
DOI 10.1108/F-09-2024-0125

F

1. Introduction

Over the past two decades, there have been significant shifts in work practices (Candido *et al.*, 2020) because of the advent of the collaborative economy and the emergence of novel forms of collaboration (Mitev *et al.*, 2019). One of the key outcomes of this transformation is the sustained growth of coworking spaces (CSs). Hence, the coworking model has become increasingly popular since the mid-2000s as an alternative solution to traditional office spaces and rigid working hours. The increasing flexibilisation of work has led to a significant *expansion* in the number of CS worldwide. According to Statista (2019), the number of such spaces increased from 3 to over 26,000 between 2005 and 2020. CSs first appeared in large metropolitan cities (namely, New York, London, Paris, Milan, etc.), with a concentration of urban amenities and proximity to high-skilled workers, business hubs and public transportation (Mariotti *et al.*, 2017). The concept of coworking is still evolving, taking into account several factors, including spatial changes, shifts in working habits, the emergence of new governance structures and the expansion from urban to rural areas (Mariotti *et al.*, 2023). This shift from urban towards non-urban locations is occurring concurrently with the process of suburbanisation, encouraged by more remote work opportunities, as well as the mounting pressure on land and building prices in the central districts of EU metropolises. As a result, CSs are being compelled to relocate from the central business districts to peripheral areas or disadvantaged inner-city locations with more affordable rents (Avdikos and Merkel, 2020).

The share of CSs located in rural (about 10% in Switzerland; see Thao Thi *et al.*, 2021) or non-urban peripheral areas (3% of the total number of privately owned CSs in Italy; see Mariotti *et al.*, 2023) is still relatively limited. However, peripheral areas (including rural ones) have recently started to attract a growing number of CSs in various European countries (Tomaz *et al.*, 2023; Hölzel *et al.*, 2022).

In the paper, it is argued that peripheral areas significantly contribute to coworking growth. There are different pull factors behind the emergence of CSs in these areas, stretching from the economic performance of the area (Mariotti *et al.*, 2023), proximity to users' place of residence (Appel-Meulenbroek *et al.*, 2021) and their need for community and spatial differentiation between work and private life (Vogl *et al.*, 2024a) and tourist areas (Vogl and Micek, 2023; Tomaz *et al.*, 2023) or general accessibility of amenities (see the concept of the 15-minute city, Mariotti *et al.*, 2022; di Marino *et al.*, 2023b). Some researchers (Tremblay and Scaillerez, 2020; di Marino *et al.*, 2023a, 2023b) recognise the benefit of the low rent prices in rural real estate markets and associate the establishment of coworking with the availability of affordable renting. *However, most of these determinants are not sufficiently quantitatively tested*, and there is still a general scarcity of papers focused on location factors of rural CSs (Knapp and Sawy, 2021; Vogl *et al.*, 2024b). Hence, this paper addresses the following research question (RQ): What is the role of living conditions (RQ1), real estate market characteristics (RQ2) and tourism development (RQ3) in attracting CSs in peripheral areas? Based on the literature review (Section 2), we respectively put forward three research hypotheses (end of Section 2) suggesting the large role of these three socio-economic dimensions.

A mapping of the CSs in peripheral areas is undertaken to illustrate the geographical context of research questions. The present study examines the case of Germany, one of the most affluent and economically developed countries in Europe, with the highest gross domestic product (GDP) in the European Union and a strong, knowledge-driven, well-situated labour force, which represents a key target group for CSs (Vogl and Micek, 2023). Furthermore, Germany's appeal as a tourist destination is multifaceted, offering a rich cultural heritage reflected in historic towns and UNESCO sites surrounded by the sea in the North and the Alps in the South. Hence, Germany shows, besides a strong tourism sector (responsible for 4% of national GDP), the strongest domestic tourism activity (about 80%) of all the OECD countries (OECD, 2020). Consequently, Germany has become a magnet for digital nomads from abroad, with Berlin being recognised as one of the leading digital nomad cities worldwide, as indicated by the Nomad List (Orel, 2019). In addition, there has been a notable increase in the popularity of rural retreats for workation purposes, which are attracting corporate entities from urban centres (Voll *et al.*, 2023).

After providing a literature review of the CSs and its spatial trends, the most significant location factors were drawn from literature for the quantitative analysis. Setting up the discussion in the peripheral context, the next section introduces the used database and variables. The empirical section is divided into two parts. First, the spatial pattern of CSs in Germany is briefly discussed. Second, in our case, the location factors of CSs are identified. In the end, a summarisation of the major location determinants of CSs is concluded. The research has practical implications for the location decisions of corporates and operators and enhances theoretical understanding of CSs in non-urban areas and their location patterns.

2. Literature review

2.1 Spatial and social trends of peripheral coworking spaces

Rural areas have become more popular during the COVID-19 pandemic (Hölzel and Vogl, 2023) because of the growing amount of employees working at home (Borzikowsky *et al.*, 2023) and, therefore, the growing demand from local residents, emerging entrepreneurs, remote workers (Bürgin *et al.*, 2021) and the influx of skilled migrants from large cities. Three spatial trends in the spatial decentralisation of the CS can be observed. First, during the COVID-19 pandemic, CSs tended to be located closer to users' homes, meaning that suburban areas and smaller cities became attractive locations (Mariotti and di Matteo, 2022; Mariotti *et al.*, 2023). Thus, after the first round of closures during the COVID-19 lockdowns, several CSs were opened and many people shifted from working at home to working at CSs located in peripheral areas (Gruenwald, 2020; Mariotti *et al.*, 2023; Tomaz *et al.*, 2023).

Secondly, it can be observed that tourist destinations that are both visually appealing and inspiring and that are not exclusively located in metropolitan areas (for example, Thailand, Portugal or Bulgaria) have the potential to attract the development of CSs. This is because of the fact that such locations are often occupied by digital nomads and working tourists, who are seeking a community and digital infrastructure that will enable them to maintain their hybrid working lifestyles. To do so, they are willing to take advantage of hybrid CS opportunities that combine work and leisure functions (Richards, 2015; Orel, 2019; Cook, 2020; Tomaz *et al.*, 2023). When tourism demand was lower during the first waves of the COVID-19 pandemic, the presence of CSs may have supported the economic survival (Vogl and Micek, 2023) like in the mountain regions in Switzerland (Thao Thi *et al.*, 2021). Third, there is a growing tendency to counter urbanisation, which is manifesting in a shift of population from large cities to more peripheral areas (Höland, 2021) and has been observed in numerous European countries – e.g. France, Portugal and Belgium (Tomaz *et al.*, 2023), Switzerland (Thao Thi *et al.*, 2021) and Germany (Hölzel and de Vries, 2021). This development has resulted in the relocation of jobs to rural regions and, therefore, made corporates move closer to the place of residence of their employees (Hölzel and de Vries, 2021). Consequently, as workspaces can be seen as a key asset for attracting and keeping talent (Candido *et al.*, 2020), there is

F

an increasing demand from corporations for non-urban CS in catchment areas of central cities to complement both home offices and corporate offices (Reh *et al.*, 2021) and attract skilled workers, reduce commuting time or costs and enhance the flexibility and productivity of their employees (Vogl *et al.*, 2024b).

2.2 Selected groups of coworking spaces' location factors

The location factors of CSs are divided into six broad subgroups, namely:

(1) demography;
(2) economic factors;
(3) infrastructure;
(4) quality of life/living conditions;
(5) real estate market; and
(6) tourism development.

The importance of the other location factors, such as access to ICT infrastructure or the presence of policies to attract remote workers, is acknowledged. However, it is argued that it is difficult to operationalise these soft factors using the available variables.

Regarding *demography* (i), population size (including density) and growth should be treated as a proxy for market size (Mariotti *et al.*, 2023). In addition, areas that attract immigration, especially diverse and foreign populations, are more likely to attract CSs. The role of diversity in attracting CSs is emphasised in some recent work (see, for example, Bosworth *et al.*, 2023; Méndez-Ortega *et al.*, 2024). Bosworth *et al.* (2023, 557) argue that a critical mass of diverse and vibrant "human and social capital operating in rural places is essential to developing CSs as hubs for enterprising businesses". *Economic factors* (ii) include the market potential and economic performance of the area (Mariotti *et al.*, 2023; Méndez-Ortega *et al.*, 2024), most often proxied by GDP per capita. In addition to digital connectivity, *infrastructural factors* (iii) include the presence of good physical infrastructure (Bosworth *et al.*, 2023), for example, in the form of a dense network of transport infrastructure (Mariotti *et al.*, 2017; di Marino and Lapintie, 2018). Based on a sample of 200 German CS users, Gruenwald (2020) argues that in these areas, ample parking spaces for cars, motorcycles and bicycles are very important, as is easy access to main roads and public transport. Working in the countryside is often a way of avoiding the environmental burden of long commuting times typical of working in metropolitan areas (Ohnmacht *et al.*, 2020; Thao Thi *et al.*, 2021). In Germany, travel times to peripheral CSs are relatively short (Hölzel and de Vries, 2021). Based on the above-average proportion of employed workers in Germany, Hölzel and de Vries (2021) argue that users can save time and reduce pressure on transport infrastructure by using CSs close to their place of residence. As demonstrated in the extant literature, the three aforementioned groups of location factors have been the subject of extensive research. In contrast, there are other factors that have received comparatively less investigation.

CSs are attracted to some peripheral areas by a *high quality of life* (iv) (including environmental amenities; green urban areas and landscape; and cultural and social neighbourhood facilities). Studies of employees from peripheral areas have shown that in Italy the quality of life in peripheral areas is higher than in urban areas (Mariotti and di Matteo, 2022). Employees often choose to live in relatively affluent, non-core areas. Mariotti and di Matteo (2022) further argue that coworkers using CSs in Italian peripheral areas have a higher chance of increasing their income compared to individuals working in urban CSs.

However, the spatial context is important. The study conducted in Milan showed that CSs are located in neighbourhoods where the number of immigrants is higher.

Living conditions are impacted by *real estate market* (v) characteristics. Urban studies show that larger CSs are often concentrated in areas where the cost of premises is lower and the availability of office space is higher (Mariotti *et al.*, 2017). However, the revitalisation of abandoned commercial properties in community centres and the resulting gentrification can have spillover effects on the housing market in the form of higher rents and house prices (Vogl and Akhavan, 2022) in the gentrifying areas and neighbouring areas (Wilhelmsson *et al.*, 2022). These may go back to the findings that both homeowners and renters prefer properties with good structural, location and neighbourhood characteristics (Cui *et al.*, 2018), which are all characteristics and success factors of CS (BNP Paribas, 2022; Vogl *et al.*, 2024a, 2024b). Homeowners prefer a higher quality of life in a gentrified environment (BNP Paribas, 2022). Renters are more concerned with proximity to a job centre and ease of public transport (Cui *et al.*, 2018). Proximity to public transport infrastructure has a direct impact on house and apartment purchase prices and rents (Efthymiou and Antoniou, 2013), which can also be seen as a key location driver of CS (Gruenwald, 2020; BNP Paribas, 2022).

Finally, the development of *tourism* (vi) also facilitates the operation of CSs. With the growth of digital nomads and different working models (Vogl and Micek, 2023; Voll *et al.*, 2023), touristically attractive areas are used by employees. However, recent research on the role of CS operating in peripheral and tourist areas of Germany (Vogl and Micek, 2023) has shown that the impact of tourism development is moderate.

The final three types of factors are intertwined with each other and may have a substantial impact on the rise of CSs. The quality of life, as proxied by living conditions (iv; *H1*), the strength of the residential real estate market (v; *H2*) and dynamic tourism development (vi; *H3*) have been argued to significantly impact the emergence of CSs in peripheral areas. Furthermore, it has been suggested that the impact of these factors differs depending on the level of peripherality of the areas in question.

3. Material and methods

The identification of CSs was carried out based on accessible data (Bähr *et al.*, 2020), extended by desk research of available CS databases (officebase.info, coworking-spaces.info, sharednc.com, coworkingguide.de) and verified by the websites of the identified CSs. In total, 1,201 CSs are identified (as of August 2021) and assigned to administrative districts (counties, NUTS3).

In this paper the spatial categorisation model of core and peripheral areas of the Federal Institute for Research on Building, Urban Affairs and Spatial Development [Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR), 2017; Ries, 2019] is applied. Such a typology of administrative districts (NUTS3) is based on the daytime population, which is the sum of the number of residents and commuters. Districts are assigned to one of four groups (very central, central, peripheral and very peripheral). In this paper, we restrict the analysis to 144 peripheral (n = 125) and very peripheral (n = 19) districts in Germany, of which 65 host at least one CS. In the database, they represent mainly rural areas, small towns and a few smaller medium-sized towns with up to 50,000 inhabitants.

We constructed a database of accessible variables published by the Federal Statistical Office (Statistisches Bundesamt, 2020b) and the statistical offices of the Federation and the Länder (Statistische Ämter des Bundes und der Länder, 2020) to identify location factors of CS. Finally, we fed this database with property prices and rent levels calculated for each peripheral administrative district. For this purpose, we conducted desk research based on a publicly available platform (Immo Scout24 2022 [1] and calculated the price and rent ranges (first quartile, median, third quartile and price/rent ratio) for residential property as well as the rent range for office space (for more details see Vogl and Micek, 2022). Based on data from AirDNA Marketfinder (2023), we calculated the number of Airbnb rentals, their average daily rate, occupancy rate and monthly revenue for each neighbourhood, given the role of short- and medium-term residential rentals in stimulating flexible work arrangements.

We enriched the database by introducing the district's position in the quality of life ranking (Hünnemeyer and Kempermann, 2020; Preker *et al.*, 2020), which takes into account seven indicators such as crime, personal debt per person, share of natural areas, physician density, building permits and migration balance (25–30 and 30–50 years old) and represents the key factor for the success of a region (Hünnemeyer and Kempermann, 2020).

To explain the location of peripheral CSs, the focus is not narrowed on the role of living conditions, real estate market characteristics and tourism development but widened to six groups of location factors (Table 1) corresponding to the categories identified in Section 2.2 and in the empirical analysis explained by 31 dependent variables. By doing so, a broader analysis is performed, where the number of CSs is used as the dependent variable. The descriptive statistics of selected variables is provided in the Appendix. We argue that peripherality can modify the explanatory power of variables, so the degree of peripherality was used as a control variable [2].

The correlation between the number of CSs and the potential predictors of the model was calculated using Spearman's correlation coefficient, which is often used to illustrate the strength of the relationship between counts and continuous variables [3]. The *p*-values were calculated by asymptotic t-approximation (Table 2).

Eight of 31 variables have been significantly correlated with the count of CSs. Because the number of overnight stays per capita strongly correlates with the other variables, finally,

Table 1. Selected variables organised in the subgroups of location factors

Subgroup of factors	Variable (abbreviations in brackets)
Demography	Population (*pop*), Population growth (2012–2019; *pop_grow*), Population density (*pop_den*), Net migration ratio (*net_mig*), Foreign immigration ratio (*for_immig*), Share of foreign pupils (*for_pup*), Total immigration ratio (*immig*)
Economy	GDP per capita (*GDP_cap*)
Infrastructure	Traffic area (% of total area; *traff_area*), Traffic area per 1 inhabitant (*traff_pop*)
Quality of life	Position in the ranking of quality of life (*qol*)
Tourist development	Number of Airbnb rentals (*airbnb_rent*), Airbnb daily rate (*airbnb_daily_rate*), Airbnb occupancy rate (*airbnb_occ_rate*), Airbnb monthly revenue (*airbnb_occ_rate*), Bed occupancy (*bed_occ*), Growth of bed occupancy (2012–2019; *bed_occ_grow*), Number of overnight stays (*overn_stay*), Number of overnight stays per capita (*overn_stay_cap*), Growth of overnight stays per capita (2012–2019; *overn_stay_cap_grow*)
Real estate market	Living area per 1 inhabitant (*liv_area_pop*), Housing rent (first quartile; *hous_rent_1q*), Housing rent (second quartile; *hous_rent_2q*), Housing rent (third quartile; *hous_rent_3q*), Housing price (first quartile; *hous_price_1q*), Housing price (second quartile; *hous_price_2q*), Housing price (third quartile; *hous_price_3q*), Office rent (first quartile; *off_rent_1q*), Office rent (second quartile; *off_rent_2q*), Office rent (third quartile; *off_rent_3q*), Price to rent ratio (*PTR*)

Source(s): Authors' own work

Table 2. Results of Spearman correlation analysis between the number of CSs and individual variables

Variable	ρ	p	Variable	ρ	p
Pop	0.14	0.106	bed_occ	0.13	0.128
pop_grow	0.15	0.148	bed_occ_grow	−0.13	0.122
pop_den	0.04	0.625	*overn_stay*	*0.18*	*0.032*
net_mig	0.14	0.093	*overn_stay_cap*	*0.17*	*0.048*
for_immig	0.04	0.666	overn_stay_cap_grow	0.03	0.727
for_pup	0.09	0.281	*liv_area_pop*	*−0.17*	*0.043*
immig	0.13	0.134	hous_rent_1q	0.00	0.995
GDP_cap	0.01	0.931	hous_rent_2q	0.02	0.841
traff_area	−0.01	0.899	hous_rent_3q	0.05	0.578
traff_pop	*−0.19*	*0.026*	*hous_price_1q*	*0.24*	*0.004*
qol	0.02	0.789	*hous_price_2q*	*0.21*	*0.013*
airbnb_rent	0.16	0.053	*hous_price_3q*	*0.22*	*0.008*
airbnb_daily_rate	0.10	0.215	off_rent_1q	0.13	0.114
airbnb_occ_rate	0.11	0.178	off_rent_2q	0.13	0.114
airbnb_month_rev	0.10	0.241	off_rent_3q	0.05	0.577
			PTR	*0.26*	*0.002*

Note(s): Variables significant at the 0.05 level are given in italics
Source(s): Authors' own work

seven proxies were selected for further analysis, namely: traffic area per 1 inhabitant (*traff_area_pop*), number of overnight stays (*overn_stay*), living area per 1 inhabitant (*liv_area_pop*), housing price first quartile (*hous_price_1q*), second quartile of housing price (*hous_price_2q*), third quartile of housing price (*price_3q*) and price to rent ratio (*PTR*). The correlation analysis highlights that the distribution of CSs in the peripheral regions of Germany might be influenced by factors such as tourism potential and the nature of the real estate market.

In the subsequent phase, the most appropriate regression model was selected. This analysis was conducted at two levels: counties (NUTS3) and regions (NUTS2)/mega-regions (NUTS1). For NUTS3 (Model 1), a count regression model was used, and the regression model selection algorithm developed by Perumean-Chaney *et al.* (2013) was used. It is important to note that observations must be independent of one another, and the mean of a Poisson random variable must be equal to its variance (conditions of using the Poisson model). Therefore, the Poisson regression model (ZIP) with all selected predictors was fitted. The results of the overdispersion Cameron and Trivedi's (1990) test performed on the fitted Poisson model ($\lambda = 0.48$, $p = 0.632$) suggested that at a 95% level of significance, there was equidispersion of the data. In light of these results, there was evidence that the Poisson or zero-inflated Poisson regression would be preferable in comparison with the negative binomial regression or zero-inflated negative binomial models. In the next step, we fitted the zero-inflated Poisson model, which detects the presence of excessive zeros in the dependent variable, and compared it with the Poisson regression estimate. Standard measures such as the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) were used to detect the highest-quality model. A good model, i.e. one with a smaller AIC and BIC, will have a good balance between a good fit and a small number of parameters. The results of Vuong's (1989) non-nested excess zeros test ($z = -0.19$ and $p = 0.421$), as suggested by Cameron and Trivedi (2013), showed that the two models did not differ significantly in their adequacy, with a Poisson model (Model 1) chosen as the final one for NUTS 3 regions.

To ensure that the assumptions of the Poisson regression models were adequately met, the key diagnostic checks were conducted, including multicollinearity assessment, homogeneity of variance and analysis of residual uniformity. First, the assumption of no collinearity was met because the variation inflation factor was low (VIF < 5) [4] for all predictors of the model. Second, Figure 1 illustrates that the assumption of homogeneity of variance was met – the reference line was flat and horizontal. Third, Figure 1 also reveals that the assumption of normality of residuals was also met: no significant deviation was found. To sum up, all the assumptions of the regression model were met, so the prediction based on the fitted model can be considered reliable.

In the next step of the research, we have decided to run the modelling of location factors at a more general spatial level, namely, in different German regions (Länder) and megaregions

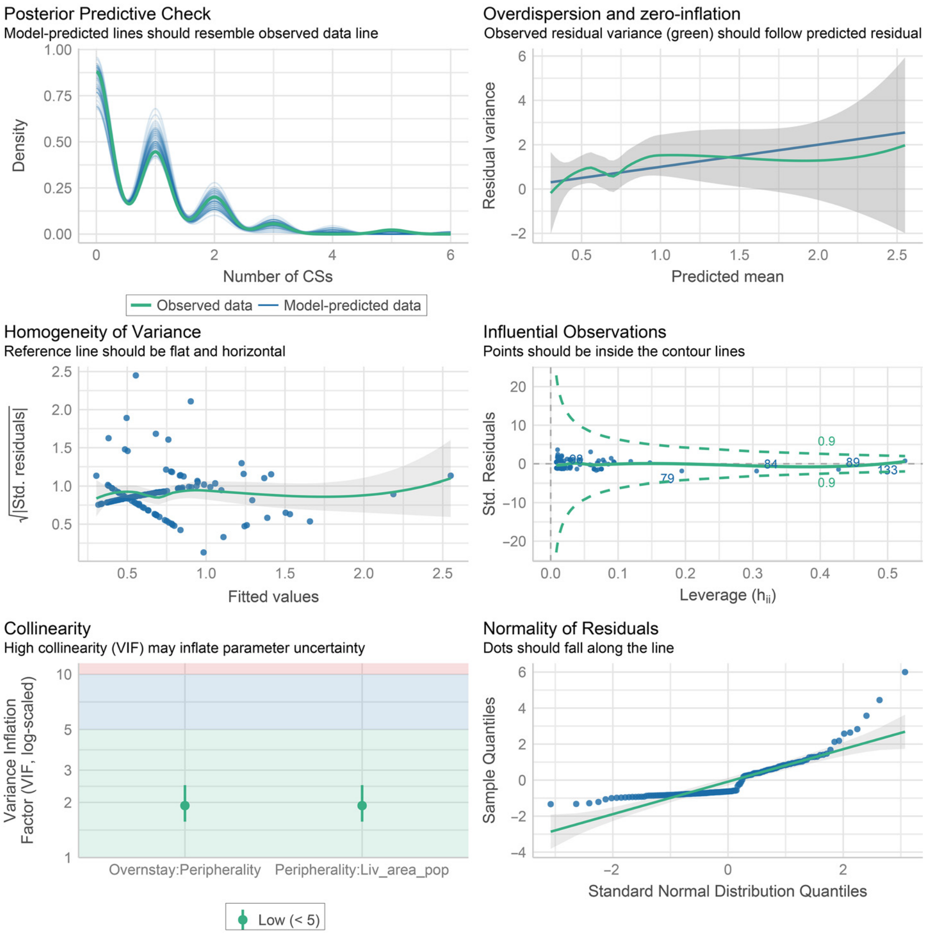

Figure 1. Assessment of the assumptions on the homogeneity of variance, normality of residuals, posterior predictive check, influential observations, collinearity, overdispersion and zero inflation

Source(s): Created by the authors

(NUTS1). The rationale behind this decision was twofold: firstly, to check if the large role of the factors identified at the NUTS3 level also holds for larger administrative units; and secondly, to ensure whether the location factors differ between regions.

Initially, similar NUTS3-level models with a count-type outcome variable were fitted using the Poisson distribution. To formally evaluate the presence of overdispersion, the residual deviance was compared to the Chi-squared distribution with an equivalent number of degrees of freedom. The results indicated significant overdispersion in all models ($p < 0.05$). Consequently, to address this issue, the final models were fitted using the negative binomial distribution.

Predictor selection for the model was conducted using a stepwise algorithm with backward elimination based on the evaluation of the AIC parameter. The spatial meta-factors of the analysed objects were incorporated into the models as random effects using a generalised linear mixed model (GLMM), represented as random intercept interactions. This approach allowed for the representation of the nested structure of regions within mega-regions (spatial effects). To measure the exploratory power of the constructed models, Nagelkerke R-square [5] was applied. In a manner analogous to the testing of the Poisson model, GLMM has also been subjected to rigorous scrutiny to ascertain the homogeneity of variance, the presence of multicollinearity and the normality of the residuals. The collective outcomes of these evaluations serve to provide a comprehensive validation of the model's adequacy and robustness when applied to the data set under consideration.

4. Results

4.1 Spatial patterns of coworking spaces in Germany

After grouping the CSs regarding the BBSR location types, 8.3% of CSs out of the total of 1,201 CSs can be assigned to the peripheral or very peripheral categories of the BBSR typology.

As can be seen in Figure 2, 45% of all German CS are to be found in 14 large cities with a population of more than 500,000 inhabitants. Combining the results of the subcategories of

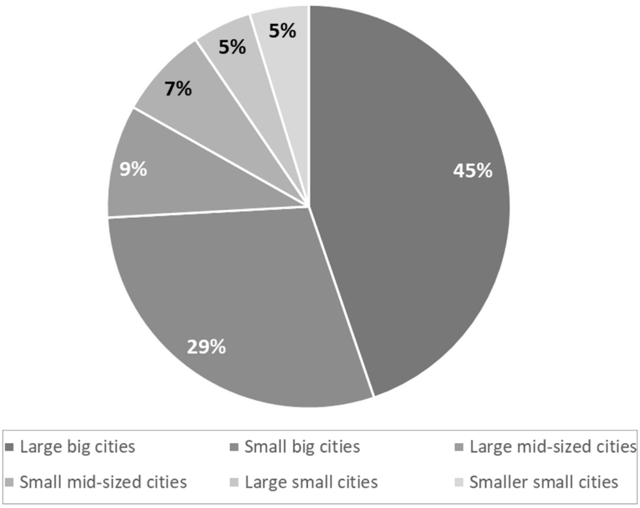

Figure 2. Distribution of CSs from an urban hierarchy perspective
Source(s): Created by the authors based on Vogl (2024)

F

big cities, it can be seen that 74% of all CSs are located in big cities with more than 100,000 inhabitants, highlighting the urban character of CSs (Mariotti *et al.*, 2017). In addition, almost 10% are identified in the categories of small cities. This value roughly corresponds to the percentage of the peripheral and very peripheral categories of the BBSR typology and can therefore be considered as peripheral municipalities from an urban point of view. This degree of alignment cannot be seen from a real estate perspective, as Vogl and Micek (2022) identified 209 CSs in the periphery of the office market and concluded that, apart from the large A-cities with high office space demand and rents, these peripheral office markets attract a significant number of CSs because of their lower rents.

The existence of CS in the German periphery is a new phenomenon. Around 86% of these CSs were established in 2017 or later, and the median year of establishment was 2019, with 31% of CSs in peripheries established during the COVID-19 pandemic. A comprehensive examination of the database revealed that the vast majority of these spaces are privately owned, with only 26% falling under the purview of the public sector. This may be because of the constraints of the COVID-19 pandemic, when many private companies sublet unused space to external users.

In the peripheral areas defined by the BBSR (NUTS3 level), 100 CS were identified. A total of 30% of the identified peripheral CSs (Figure 3) are located in southern Germany, more precisely in the federal state of Bavaria. As one of the wealthiest and most touristic regions in Germany, the whole region of Bavaria is a good escape destination for workers (Thees *et al.*, 2020; Vogl and Micek, 2023). Another cluster of CSs was identified in the regions of Mecklenburg-Western Pomerania and Schleswig-Holstein (23 CSs), which can also be seen as tourist destinations.

4.2 Predictors selecting and model 1 building (NUTS 3 level)

We started with the model with the count of CSs as the dependent variable and searched to include the following independent variables: living area per 1 inhabitant, traffic area per one inhabitant, housing price (first, second and third quartiles), housing PTR ratio and the number of overnight stays.

Based on the lowest values of AIC (327.5) and BIC (327.4) [6], the model with two predictors (*Overn_stay* and *Liv_area_pop*) provided the best balance between goodness of fit and a small number of parameters. The inclusion of the dichotomous variable *Peripherality* (19 very peripheral vs 125 peripheral districts according to BBSR) as a control variable in the final model took the form of interaction (without factor crossing) for each covariate of Model 1:

$$Number\ of\ CSs \sim Overnstay : Peripherality + Liv\_area\_pop : Peripherality.$$

We fitted a Poisson model estimated using maximum likelihood to predict the *Number of CSs* with *Overn_stay*, *Peripherality and Liv_area_pop* covariates. The model's explanatory power was weakly moderate (Nagelkerke R^2 = 0.17). The model's intercept B_0, corresponding to *Overnstay* = 0, *Peripherality* = very peripheral and *Liv_area_pop* = 0, was at 2.33 (95% CI [0.00, 4.59], $p = 0.048$). The Poisson regression model (Model 1) that was applied has provided validation for the outcomes observed in the Spearman's correlation analysis, affirming the significance of tourism growth and living conditions in the emergence of CSs.

4.3 Modelling at the NUTS2 level (Models 2–5)

At the NUTS 2 level, four models (2–5) have been constructed (Table 3). Model 2 incorporated variables describing living conditions, real estate market characteristics and

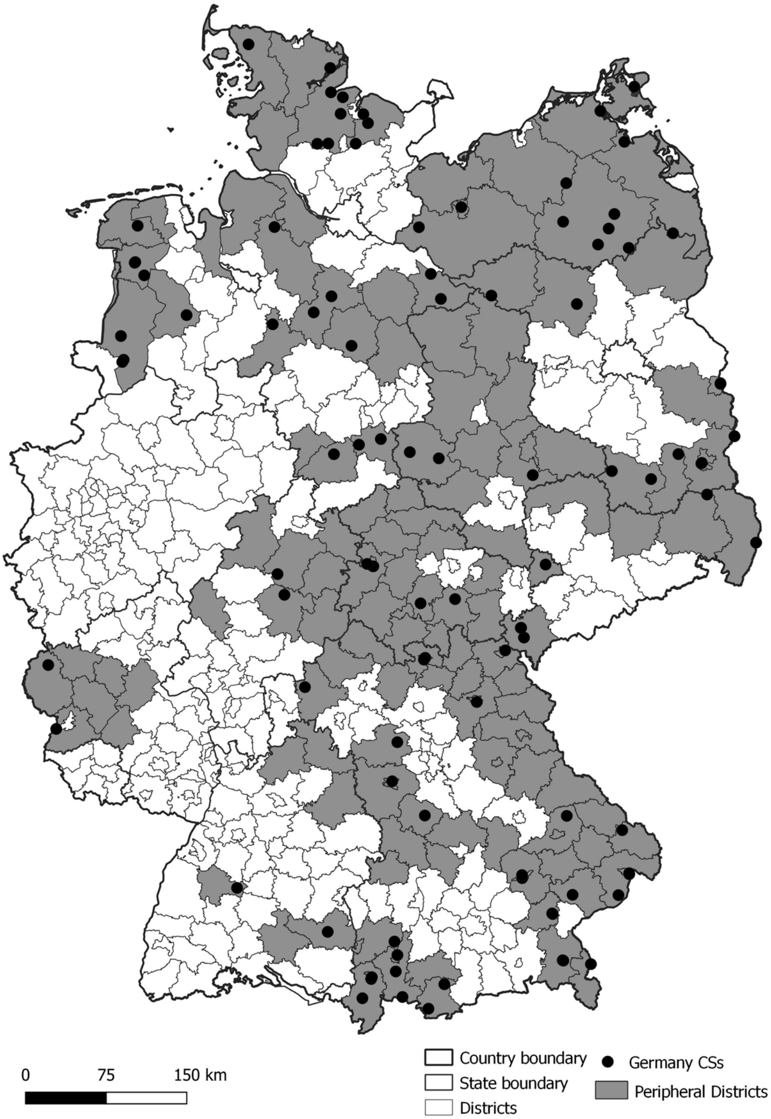

Figure 3. Location of CSs in peripheral areas of Germany
Source(s): Created by the authors

traditional tourism development. Model 3 entailed variables describing exclusively the number of Airbnb-related variables, whereas in Models 4 and 5 we split bed occupancy and overnight stays, respectively. These models encompass both fixed effects (predictors listed above) analysed under the moderating influence of the peripherality factor and random effects (spatial variability across regions and mega-regions).

Table 3. Regression coefficients and random effects of the fitted GLMM models (2–5)

Variables	Model 2 (living area per inhabitant, housing prices [first, second and third quartiles], price-to-rent ratio, number of overnight stays)			Model 3 (number of Airbnb rentals, Airbnb daily rate, Airbnb occupancy rate and Airbnb monthly revenue)			Model 4 (bed occupancy; bed occupancy growth)			Model 5 (number of overnight stays per capita; growth of overnight stays per capita)		
Predictors	IRR	95% CI	*p*	IRR	95% CI	*p*	IRR	95% CI	*p*	IRR	95% CI	*p*
(Intercept)	0.02	0.00–0.41	*0.011*	0.32	0.12 – 0.86	*0.024*	0.29	0.10 – 0.80	*0.016*	0.04	0.00 – 0.68	*0.027*
Living area per inhabitant (centred by *Mdn* = 48.74) × peripherality [peripheral]	0.94	0.88–1.00	0.067									
Living area per inhabitant (centred by *Mdn* = 48.74) × peripherality [very peripheral]	0.92	0.80–1.05	0.206									
Overnstay (logarithm) × peripherality [peripheral]	1.30	1.04–1.62	*0.023*							1.24	1.00 – 1.54	0.054
Overnstay (logarithm) × peripherality [very peripheral]	1.33	1.07–1.64	*0.010*							1.27	1.03 – 1.56	*0.023*
Number of Airbnb rentals (logarithm) × peripherality [peripheral]				1.14	0.95 – 1.36	0.158						
Number of Airbnb rentals (logarithm) × peripherality [very peripheral]				1.20	1.03 – 1.41	*0.020*						
Bed occupancy × peripherality [peripheral]							1.02	0.99 – 1.05	0.113			
Bed occupancy × peripherality [very peripheral]							1.04	1.01 – 1.08	*0.014*			

(*continued*)

Table 3. Continued

Variables	Model 2 (living area per inhabitant, housing prices [first, second and third quartiles], price-to-rent ratio, number of overnight stays)			Model 3 (number of Airbnb rentals, Airbnb daily rate, Airbnb occupancy rate and Airbnb monthly revenue)			Model 4 (bed occupancy; bed occupancy growth)			Model 5 (number of overnight stays per capita; growth of overnight stays per capita)		
Predictors	IRR	95% CI	*p*	IRR	95% CI	*p*	IRR	95% CI	*p*	IRR	95% CI	*p*
Random effects												
σ^2		0.99			1.03			1.02			1.02	
$\tau_{00\ \mathrm{Region}\ \times\ \mathrm{Mega\ region}}$		0.02			0.02			0.00			0.03	
R-square		0.15			0.06			0,07			0.11	

Note(s): IRR (the incidence rate ratio) indicates how a one-unit increase in the predictor affects the expected count of CSs, holding other variables constant; CI = confidence interval, σ^2 = the residual variance or the variance of the outcome variable that remains unexplained by the fixed effects and random effects in the model; $\tau_{00\mathrm{Mega\ region}}$ = the variance of random intercepts at the level of mega-regions (NUTS-1). It captures the variability in the outcome variable attributable to differences between mega-regions
Source(s): Authors' own work

Models 3 and 4 offer very weak explanatory power. The largest level of explanation is provided by Model 2, containing the same variables as Model 1 and used for further analysis. In Model 2, the intercept corresponds to the baseline incidence rate ratio (IRR), which is very low (0.02) and statistically significant ($p = 0.011$), suggesting a low baseline number of CSs when all predictors are at their reference levels.

The overnight stays variable, in interaction with peripherality, has a significant effect, and the results suggest that higher overnight stays are associated with increased CS counts, particularly in more peripheral regions. The interaction effect (Overnstay × Peripherality (very peripheral)) is significant similarly in Models 2 and 5. In general, the interaction effects of peripherality on tourism-related variables (overnight stays – Models 2 and 5, bed occupancy – Model 4, number of Airbnb rentals – Model 3) are more significant in very peripheral areas. It may be deduced that the most peripheral areas need tourism activities to attract CS to a greater extent than less peripheral areas. Moreover, it might be a prerequisite for CSs' establishment to boost tourism in the most lagging behind areas. Nevertheless, an opposite argument may also be valid: the presence of CSs in very peripheral areas may affect the number of tourists in less peripheral areas to a greater extent, although we assume that this relationship has the lower explanatory power.

The random effects (Table 3) reveal low variability at the mega-region level ($\tau_{00} = 0.00$) and a small amount of variability at the region × mega-region level ($\tau_{00} = 0.02$). The 2% of the variance in CS counts can be attributed to regional and mega-regional grouping effects, suggesting that the fixed effects explain most variability.

The spatial effects in Table 4 show the random effects for specific regions nested within mega-regions. Most regions have IRRs close to 1, indicating minimal deviations from the average rate of CSs. However, some regions, such as Thüringen (IRR = 0.89 for Model 2) and Bayern (IRR = 1.10 for Model 2), show slight deviations, suggesting lower or higher counts of CSs, respectively, compared to the overall model average. This means that tourist development may be treated as a strong location factor of CSs in Bayern. With regard to other regions, tourism is crucial for the emergence of CSs in Brandenburg (see the spatial effects for Models 4 and 5 in Table 4).

Table 4. Random (spatial) effects for the specific interaction of regions and mega-regions

	Incidence rate ratios		
Region: Mega-region	Model 2	Model 3	Model 5
Baden-Württemberg: South	0.95	0.97	0.95
Bayern: South	1.10	1.08	1.11
Brandenburg: East	1.05	1.10	1.11
Hessen: West	0.99	0.98	0.97
Mecklenburg-Vorpommern: North	0.99	1.03	1.04
Niedersachsen: North	1.06	1.00	1.03
Rheinland-Pfalz: West	0.98	0.95	0.93
Sachsen: East	1.01	1.03	1.03
Sachsen-Anhalt: East	1.03	1.03	1.04
Schleswig-Holstein: North	0.97	0.94	0.92
Thüringen: East	0.89	0.92	0.89

Note(s): In Model 4, there were no significant differences in random (spatial) effects
Source(s): Authors' own work

5. Discussion

The results revealed the spatial structure of CS in Germany, with a special focus on the role of peripheral areas. In total, peripheral areas (identified on the basis of the BBSR typology) have managed to attract 8% of all German CS. This figure is in line with findings from neighbouring Switzerland (Thao Thi *et al.*, 2021). In our case, the peripheral CSs are concentrated in northern and southern Germany. The south of Germany in particular is characterised by a strong economy (Eurostat, 2022), a strong knowledge-intensive sector (Statista, 2022) and a flourishing tourism industry (Tourismus.bayern, 2024).

In relation to the hypotheses, *H1* concerning the role of living conditions is substantiated, albeit in an opposing direction to that anticipated. Using Model 1 and the value of the Spearman correlation ratio, it can be hypothesised that the limited availability of residential space is perceived to impact the CSs' emergence (*H1*). In addition, the findings of the present study lend support to *H2*, which postulates that housing prices are positively correlated with the number of CSs. The results of testing the *H3* hypothesis are the most obvious and the strongest. The constructed models indicate that tourism development and the presence of CSs coexist, particularly in very peripheral regions. The causal relations observed by the other authors support the hypothesis that dynamic tourism development (in terms of overnight stays, Airbnb rentals and bed occupancy) exerts a significant but moderate influence on the emergence of CSs, thereby confirming the assumptions made in the extant literature (Thao Thi *et al.*, 2021; Vogl and Micek, 2023).

It is noteworthy that, based on Poisson regression, areas with a lower average residential area per inhabitant (RQ1) attract more CSs, while wages and taxes tend to work in the opposite direction (Umweltbundesamt, 2021). This effect is more pronounced in the most peripheral regions of Germany. This phenomenon may be attributed to the correlation between property prices and income levels in residential areas. In areas where housing prices are high, residents tend to have higher average incomes and consequently higher tax revenues. Consequently, not all residents in such areas possess the financial means to procure larger living spaces, resulting in an average residential area per inhabitant that is comparatively diminished. Furthermore, Spearman's correlation analysis (RQ2) revealed a positive correlation between wealthy areas with higher house prices, PTR and CS, thereby confirming the findings of Vogl and Micek (2022).

The present study also demonstrates the moderate impact of tourism on the growth of CSs in peripheral areas (RQ3), hereby confirming the assumptions of Vogl and Micek (2023), who identified digital nomads and working tourists as a new and significant customer segment for CSs. It is suggested that working tourists are drawn to peripheral landscapes to support cognitive functioning, physical health and psychological well-being (Barton and Le, 2023). This is particularly important for remote workers and sole proprietors to maintain contact with a working community and avoid social isolation (Bauer *et al.*, 2019; Vogl and Orel, 2024).

In all models, the effect of the studied independent variables on the number of CSs is stronger for very peripheral regions (see Models 2–5). The argument is posited that CSs emerge in the most peripheral regions in response to specific combinations of living conditions, tourism development and characteristics of the real estate market which interact with each other. Strong tourism and real estate markets are argued to be prerequisites for CS development in such regions.

However, it is important to acknowledge that the statistical analysis conducted reveals solely the existence of potential factors. It is imperative to recognise that statistical correlation does not invariably imply causation, in spite of our conviction that this is the case in the present paper. The direction of the causal mechanism remains ambiguous. In this paper, we have examined a series of potential location factors of CSs and argued that the emergence of CSs may not only be attributed to the development of tourism, the competitive nature of the residential real estate market, or better living conditions, but may also function as a trigger factor for the progression of these processes and mechanisms.

Some literature suggests that the introduction of CSs in town centres promotes the revitalisation of commercial buildings (Hölzel and de Vries, 2021) as well as the influx of knowledge workers, which consequently leads to rising house prices and rents in the long run (Vogl and Akhavan, 2022). However, the common thesis that peripheral areas with more knowledge workers, leading to higher GDP and higher house prices or rents, host more CS could not be confirmed within the scope of this study (see Model 1). Our findings seem to be in line with Bosworth *et al.* (2023) argument that in a post-COVID reality, residential preferences will be an important success factor for rural CS's providers (see also McKinsey, 2021).

This research shows that "taken-for-granted" factors do not necessarily attract CSs. Our analysis reveals that in the peripheral regions of Germany, social and demographic factors (immigration, social and ethnic diversity) do not play a role in attracting CSs (see Model 1). This goes against the findings of a study by Mariotti *et al.* (2023), who found that the areas that attract CS have higher numbers of immigrants. The findings indicate that non-urban CS operators, office space providers and developers must consider a range of factors when making location decisions and that some of the used factors which are taken-for-granted should be reconsidered, as there is no statistical evidence to support them (at least in the German context). This could be crucial for the success of CSs in non-urban locations, as the primary challenge for non-urban CSs is to attract a sufficient number of users (Vogl *et al.*, 2024a).

6. Conclusion

This paper argues, on one hand, that tourist development, the limited availability of space and the constrained market conditions in urban residential property markets are influencing the emergence of CSs in peripheral areas of Germany. On the other hand, CSs benefit from lower rents, accommodation costs and larger living areas in some rural real estate markets.

This paper makes a novel contribution to the field by focusing on CSs located in non-urban areas and their location factors. While large CS chains such as WeWork and Regus are primarily situated in urban areas and possess considerable financial capacity, private CSs with limited liquidity are prevalent in non-urban areas and are seeking innovative concepts to attract a sufficient number of users to establish economically viable businesses. The findings of this study can assist CS providers and those planning to incorporate non-urban CSs into their corporate real estate portfolios in making informed decisions regarding the location of their facilities. Furthermore, they illustrate potential avenues for the development of economically sustainable CS concepts.

It should be acknowledged that this research has not covered all potential factors influencing the location of CSs. These include proximity to universities and research centres (Mariotti *et al.*, 2017; Mourad *et al.*, 2021; di Marino *et al.*, 2023a), the role of the creative industries (Coll-Martínez and Méndez-Ortega, 2020; Mariotti *et al.*, 2023) and economic diversity (Méndez-Ortega *et al.*, 2022). In light of the suggestions by Bosworth *et al.* (2023), it is important to consider the potential influence of spatial diversity, the presence of creative industries and knowledge-intensive business services on the future trajectory of rural coworking. Additionally, the levels of entrepreneurship (Gauger *et al.*, 2021) and public policies aimed at fostering flexible work organisations (Houghton *et al.*, 2018) have not been analysed. The absence of suitable indicators at the district level has also precluded the application of variables that would elucidate the extent of digital rural development (Bosworth *et al.*, 2023), a key driver of multilocal work arrangements (Bürgin *et al.*, 2021). Because the applied models provide moderate effects in terms of their explanatory power, the significance of applied variables should be tested in other spatial contexts.

Notes

1. The database is the largest real estate platform in Germany and provides data about renting, selling or buying real estate of various types on a municipality or administrative district (NUTS3) level.
2. Analyses were conducted using the R Statistical language (version 4.1.1; R Core Team, 2024) on Windows 10 Pro 64 bit (build 19044), using the packages overdisp (version 0.1.1), pscl (version 1.5.5), DHARMa (version 0.4.6), purrr (version 0.3.4), emmeans (version 1.8.2), ggeffects (version 1.1.1), sjPlot (version 2.8.11), performance (version 0.10.0), report (version 0.5.1.3), leaps (version 3.1), tibble (version 3.1.7), psych (version 2.1.6), MASS (version 7.3.57), ggplot2 (version 3.4.0), stringr (version 1.4.0), forcats (version 0.5.1), tidyverse (version 1.3.2), dplyr (version 1.0.10), tidyr (version 1.2.0), readr (version 2.1.3), readxl (version 1.4.3), lme4 (version 1.1.35.2), Matrix (version 1.6.5) and lattice (version 0.22.5).
3. Based on the skewness coefficient (see Appendix) and their comparison with standard errors, we decided not to use the Pearson correlation coefficient due to non-normality of the distribution. Next, we checked for a monotonical correlation between variables, and the results were very positive; hence, we used Spearman's correlation coefficient.
4. It is generally acknowledged that a VIF value above 5 indicates that multicollinearity between variables might exist.
5. Nagelkerke R-square ranges from 0 to 1, with values closer to 1 indicating a better fit of the model.
6. The other models employing traffic area per 1 inhabitant, housing prices and PTR ratio have received AIC and BIC values exceeding 345.

References

AirDNA Marketfinder (2023), "[WWW site]", available at: https://airdna.co/ (accessed 5 August 2024).

Appel-Meulenbroek, R., Weijs-Perrée, M., Orel, M., Gauger, F. and Pfnür, A. (2021), "User preferences for coworking spaces; a comparison between The Netherlands, Germany and the Czech Republic", *Review of Managerial Science*, Vol. 15 No. 7, pp. 2025-2048.

Avdikos, V. and Merkel, J. (2020), "Supporting open, shared and collaborative workspaces and hubs: recent transformations and policy implications", *Urban Research and Practice*, Vol. 13 No. 3, pp. 348-357.

Barton, G. and Le, A.H. (2023), "The importance of aesthetics in workplace environments: an investigation into employees' satisfaction, feelings of safety and comfort in a university", *Facilities*, Vol. 41 Nos 13/14, pp. 957-969, doi: 10.1108/F-03-2023-0016.

Bauer, S.C., Silver, L. and Schwartzer, J. (2019), "The impact of isolation on new principals' persistence: evidence from a Southern US state", *Educational Management Administration and Leadership*, Vol. 47 No. 3, pp. 383-399.

Bähr, U., Biemann, J., Lietzau, J. and Hentschel, P. (2020), "Coworking im ländlichen raum, menschen, modelle, trends", CoWorkLand, Bertelsmann Stiftung, available at: https://das-otto-neuburg.de/Dokumente/Cowo_im_laendlichen_Raum.pdf (accessed 4 August 2024).

BNP Paribas (2022), "European property market, searching for Value - Outlook H1 2022", available at: https://realestate.bnpparibas.com/european-property-market-outlook-h1-2022 (accessed 4 August 2024).

Borzikowsky, C., Raimer, S. and Kowalski, J. (2023), "New work in modern times: predicting employees' choice to work from home", *Facilities*, Vol. 41 Nos 13/14, pp. 855-867, doi: 10.1108/F-04-2023-0037.

Bosworth, G., Whalley, J., Fuzi, A., Merrell, I., Chapman, P. and Russell, E. (2023), "Rural co-working: new network spaces and new opportunities for a smart countryside", *Journal of Rural Studies*, Vol. 97, pp. 550-559.

Bürgin, R., Mayer, H., Kashev, A. and Haug, S. (2021), "Digital multilocality: New modes of working between center and periphery in Switzerland", *Journal of Rural Studies*, Vol. 88, pp. 83-96.

Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) (2017), "Laufende stadtbeobachtung – raumabgrenzungen", available at: https://bbsr.bund.de/BBSR/DE/forschung/raumbeobachtung/Raumabgrenzungen/deutschland/gemeinden/StadtGemeindetyp/StadtGemeindetyp.html (accessed 1 August 2024).

Cameron, A.C. and Trivedi, P.K. (1990), "Regression-Based tests for overdispersion in the poisson model", *Journal of Econometrics*, Vol. 46 No. 3, pp. 347-364.

Cameron, A.C. and Trivedi, P.K. (2013), *Regression Analysis of Count Data*, University Press, Cambridge, Vol. 53.

Candido, C., Marzban, S., Haddad, S., Mackey, M. and Loder, A. (2020), "Designing healthy workspaces: results from Australian certified open-plan offices", *Facilities*, Vol. 39 Nos 5/6, pp. 411-433, doi: 10.1108/F-02-2020-0018.

Coll-Martínez, E. and Méndez-Ortega, C. (2020), "Agglomeration and coagglomeration of coworking spaces and creative industries in the city", *European Planning Studies*, Vol. 31 No. 3, pp. 445-466.

Cook, D. (2020), "The freedom trap: digital nomads and the use of disciplining practices to manage work/leisure boundaries", *Information Technology and Tourism*, Vol. 22 No. 3, pp. 355-390.

Cui, N., Gu, H., She, T. and Feng, C. (2018), "The impact of micro-level influencing factors on home value: a housing price-rent comparison", *Sustainability*, Vol. 10 No. 12, p. 4343.

Di Marino, M. and Lapintie, K. (2018), "Exploring multi-local working: Challenges and opportunities for contemporary cities", *International Planning Studies*, Vol. 25 No. 2, pp. 1-21.

Di Marino, M., Rehunen, A., Tiitu, M. and Lapintie, K. (2023a), "New working spaces in the Helsinki metropolitan area: understanding location factors and implications for planning", *European Planning Studies*, Vol. 31 No. 3, pp. 508-527.

Di Marino, M., Tomaz, E., Henriques, C. and Chavoshi, S.H. (2023b), "The 15-minute city concept and new working spaces: a planning perspective from Oslo and Lisbon", *European Planning Studies*, Vol. 31 No. 3, pp. 598-620.

Efthymiou, D. and Antoniou, C. (2013), "How do transport infrastructure and policies affect house prices and rents? Evidence from Athens. Greece", *Transportation Research Part A: Policy and Practice*, Vol. 52, pp. 1-22.

Eurostat (2022), "GDP per capita, consumption per capita and price level indices", available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_per_capita,_consumption_per_capita_and_price_level_indices#Price_levels_in_Europe (accessed 12 April 2024).

Gruenwald, H. (2020), "Coworking spaces in Germany during the covid-19 crisis utilized for homeoffice and homeschooling", *South Asian Journal of Social Studies and Economics*, Vol. 8 No. 4, pp. 57-67.

Gauger, F., Pfnür, A. and Strych, J.-O. (2021), "Coworking spaces and Start-ups: empirical evidence from a product market competition and life cycle perspective", *Journal of Business Research*, Vol. 132, pp. 67-78, doi: 10.1016/j.jbusres.2021.04.008.

Houghton, K., Foth, M. and Hearn, G.N. (2018), "Working from the other office: trialling coworking spaces for public servants", *Australian Journal of Public Administration*, Vol. 77 No. 4, pp. 757-778.

Höland, C. (2021), “Stadtflucht: Wieso die corona-pandemie uns aufs land treibt”, available at: https://rnd.de/wirtschaft/stadtflucht-wieso-die-corona-pandemie-uns-aufs-land-treibt-I264DC3Y7ZHUVMQ5F7Q6CO4M3Y.html (accessed 1 August 2024).

Hölzel, M. and de Vries, W.T. (2021), “Digitization as a driver for rural development—an indicative description of German coworking space users”, *Land*, Vol. 10 No. 3, pp. 326-347.

Hölzel, M., Kolsch, K.-H. and de Vries, W.T. (2022), “Location of coworking spaces (CWSs) regarding vicinity, land use and points of interest (POIs)”, *Land*, Vol. 11 No. 3, p. 354.

Hölzel, M. and Vogl, T. (2023), “Impact of the COVID-19 pandemic on remote working and coworking spaces in Germany—narrative literature analyses”, in Akhavan, M., Hölzel, M. and Leducq, D. (Eds), *European Narratives on Remoting Working and Coworking During the COVID-19 Pandemic*, SpringerBriefs in Applied Sciences and Technology, Springer, Cham.

Hünnemeyer, V. and Kempermann, H. (2020), “Ländliche regionen in Deutschland - Ergebnisse des IW-Regionalrankings 2020”, available at: https://iwkoeln.de/fileadmin/user_upload/Studien/IW-Trends/PDF/2020/IW-Trends_2020-02-04_H%C3%BCnnemeyer-Kempermann.pdf (accessed 1 August 2024).

Immo Scout24 (2022), available at: https://immobilienscout24.de (accessed 5 August 2024).

Knapp, M.T. and Sawy, A. (2021), “Coworking spaces in small cities and rural areas: a qualitative study from an operator and user perspective”, in Orel, M., Dvouletý, O. and Ratten, V. (Eds), *The Flexible Workplace. Human Resource Management*, Springer, Cham.

Mariotti, I. and di Matteo, D. (2022), “Are coworkers in the italian peripheral areas performing better? A counterfactual analysis”, *Sustainability*, Vol. 14 No. 1, p. 550.

Mariotti, I., Pacchi, C. and di Vita, S. (2017), “Co-working spaces in Milan: location patterns and urban effects”, *Journal of Urban Technology*, Vol. 24 No. 3, pp. 47-66.

Mariotti, I., Akhavan, M. and Rossi, F. (2023), “The preferred location of coworking spaces in Italy: an empirical investigation in urban and peripheral areas”, *European Planning Studies*, Vol. 31 No. 3, pp. 467-489.

Mariotti, I., Giavarini, V., Rossi, F. and Akhavan, M. (2022), “Exploring the ‘15-Minute city’ and near working in Milan using mobile phone data”, *TeMA: Territorio Mobilità e Ambiente, Special Issue*, Vol. 2 No. 15, pp. 39-56.

McKinsey (2021), “The future of work after COVID-19”, available at: www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19 (accessed 5 August 2024).

Méndez-Ortega, C., Micek, G. and Małochleb, K. (2022), “How do coworking spaces coagglomerate with service industries? The tale of three European cities”, *Cities*, Vol. 130, p. 103875.

Méndez-Ortega, C., Smit, M.J. and Micek, G. (2024), “Location patterns and drivers of coworking spaces in European regions”, *Tijdschrift Voor Economische en Sociale Geografie*, Vol. 115 No. 2, pp. 281-301.

Mitev, N., de Vaujany, F.-X., Laniray, P., Bohas, A. and Fabbri, J. (2019), “Co-working spaces, collaborative practices and entrepreneurship”, in Riemer, K., Schellhammer, S. and Meinert, M. (Eds), *Collaboration in the Digital Age*, Springer International Publishing, Cham, pp. 15-43.

Mourad, H., Shafik, Z. and El-Husseiny, M. (2021), “Space-time mapping of co-working spaces in Cairo: shifting paradigms from openness to technologically controlled spaces”, *Journal of Engineering and Applied Science*, Vol. 68 No. 1, pp. 1-17.

Ohnmacht, T., Z’Rotz, J. and Dang, L. (2020), “Relationships between coworking spaces and CO2 emissions in work-related commuting: first empirical insights for the case of Switzerland with regard to urban-rural differences”, *Environmental Research Communications*, Vol. 2 No. 12, p. 125004.

Orel, M. (2019), "Coworking environments and digital nomadism: balancing work and leisure whilst on the move", *World Leisure Journal*, Vol. 61 No. 3, pp. 215-227.

Perumean-Chaney, S.E., Morgan, C., McDowall, D. and Aban, I. (2013), "Zero-inflated and overdispersed: what's one to do?", *Journal of Statistical Computation and Simulation*, Vol. 83 No. 9, pp. 1671-1683.

Preker, A., Walter, M. and Sayami, H.O. (2020), "Muschderländle Brandenburg. Spiegel. Wirtschaft, arbeitsmarkt, lebensqualität, IW-Regionalranking zu wirtschaft, arbeitsmarkt, lebensqualität", available at: https://spiegel.de/wirtschaft/soziales/iw-regionalranking-zu-wirtschaft-arbeitsmarkt-lebensqualitaet-a-b3c656dc-60d8-473e-befe-b2aa980f00b2 (accessed 5 August 2024).

R Core Team (2024), *R: A Language and Environment for Statistical Computing*, R Foundation for Statistical Computing, Vienna, Austria.

Reh, S., Schmied, A. and Haunschild, A. (2021), "Coworking als chance fur etablierte unternehmen trotz paradoxaler erwartungen bei corporate coworking", in Werther, S. (Ed.), *Coworking Als Revolution Der Arbeitswelt*, Springer.

Richards, G. (2015), "The new global nomads: youth travel in a globalizing world", *Tourism Recreation Research*, Vol. 40 No. 3, pp. 340-352.

Ries, E.J. (2019), "Mittelstädte als stabilisatoren ländlich-peripherer räume. Technische universität kaiserslautern, selbstverlag lehrstuhl regionalentwicklung und raumordnung, kaiserslautern", available at: https://regionalentwicklung-raumordnung.de/wp-content/uploads/2019/04/AzR_Band20_Ries.pdf (accessed 1 August 2024).

Statistische Ämter des Bundes und der Länder (2020), "Bruttoinlandsprodukt, bruttowertschöpfung in den kreisfreien städten und landkreisen der bundesrepublik deutschland", available at: https://statistikportal.de/de/veroeffentlichungen/bruttoinlandsprodukt-bruttowertschoepfung-0 (accessed 1 August 2024).

Statistisches Bundesamt (2020b), "Städte (alle gemeinden mit stadtrecht) nach fläche, bevölkerung und bevölkerungsdichte", available at: https://bundesverband-coworking.de/2020/06/zahl-der-coworking-Spaces-hat-sich-vervierfacht/ (accessed 5 August 2023).

Statista (2022), "Anteil der beschäftigung in wissensintensiven dienstleistungsbereichen an der gesamtbeschäftigung von 2010 bis 2021", available at: https://de.statista.com/statistik/daten/studie/161772/umfrage/anteil-der-beschaeftigung-in-wissensintensiven-dienstleistungsbereichen/ (accessed 7 September 2022).

Statista (2019), "Coworking spaces grew more than 1,000% in a decade", available at: https://statista.com/chart/19028/coworking-spaces-worldwide (accessed 5 August 2024).

Thao Thi, V., von Arx, W. and Nada, E. (2021), "Local office with soul: Business models of coworking spaces in Switzerland", available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3881035 (accessed 1 August 2024).

Thees, H., Zacher, D. and Eckert, C. (2020), "Work, life and leisure in an urban ecosystem – co-creating Munich as an entrepreneurial destination", *Journal of Hospitality and Tourism Management*, Vol. 44, pp. 171-183.

Tomaz, E., Moriset, B. and Teller, J. (2023), "Rural coworking spaces in the covid-19 era. A window of opportunity?", in Mariotti, I., Di Marino, M. and Bednar, P. (Eds), *The COVID-19 Pandemic and the Future of Working Spaces*, Routledge, London-New York, NY.

Tourismus.bayern (2024), "Statistiken und studien zum tourismus in Bayern", available at: https://tourismus.bayern/wissensmanagement/statistiken-und-studien/, (accessed 4 April 2024).

Tremblay, D.-G. and Scaillerez, A. (2020), "Coworking spaces: new places for business initiatives?", *Journal of Innovation Economics and Management*, Vol. n° 31 No. 1, pp. 39-67.

Umweltbundesamt (2021), "Wirkungen veränderter einkommen auf den ressourcenverbrauch", in Oehlmann, M., Linsenmeier, M., Kahlenborn, Wl, Götting, K., Klaas, K., Ciroth, Al., Bunsen, J.

and Rossbach, M. (Eds), *Umweltforschungspland Des Bundesministeriums Für Umwelt, Naturschutz Und Nukleare Sicherheit*, Umweltbundesamt, Dessau-Roßlau, available at: https://umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2021_12_08_texte_04-2021_einkommen_ressourcenverbrauch.pdf (accessed 1 August 2024).

Vogl, T. and Akhavan, M. (2022), "A systematic literature review of the effects of coworking spaces on the socio-cultural and economic conditions in peripheral and rural areas", *Journal of Property Investment and Finance*, Vol. 40 No. 5, pp. 465-478.

Vogl, T. and Micek, G. (2022), "Why do they go to the peripheries? Studying the relations between the real estate market and coworking spaces in the peripheral areas of Germany", *Journal of Property Investment and Finance*, Vol. 40 No. 5, pp. 479-492.

Vogl, T. and Micek, G. (2023), "Work-leisure concepts and tourism: studying the relationship between hybrid coworking spaces and the accommodation industry in peripheral areas of Germany", *World Leisure Journal*, Vol. 65 No. 2, pp. 276-298.

Vogl, T. (2024), "A real estate perspective of coworking spaces in non urban areas", *Schriften der Professur Baubetrieb und Bauverfahren*, Eigenverlag der Professur Baubetrieb und Bauverfahren, Weimar, doi: 10.25643/dbt.64205.

Vogl, T., Orel, M. and Appel-Meulenbroek, R. (2024a), "Exploring the characteristics of non-urban coworking spaces in Germany and their perceived benefits for corporate users: novel means for supporting corporate real estate management strategies", *Journal of European Real Estate Research*, Vol. 17 No. 1, pp. 137-156, doi: 10.1108/JERER-11-2023-0045.

Vogl, T., Sinitsyna, A. and Micek, G. (2024b), "Systematic literature review of location factors of coworking spaces in non-urban areas", in Mariotti, I., Tomaz, E., Micek, G. and Méndez-Ortega, C. (Eds), *Evolution of New Working Spaces: changing Nature and Geographies*, SpringerBriefs in Applied Sciences and Technology, Cham.

Vogl, T. and Orel, M. (2024), "The promise and perils of coworking in residential areas: a systematic review of health and community impacts", *International Journal of Workplace Health Management*, Vol. 17 No. 2, pp. 156-174, doi: 10.1108/IJWHM-05-2023-0069.

Voll, K., Gauger, F. and Pfnür, A. (2023), "Work from anywhere: Traditional workation, coworkation and workation retreats: a conceptual review", *World Leisure Journal*, Vol. 65 No. 2, pp. 150-174.

Vuong, Q.H. (1989), "Likelihood ratio tests for model selection and non-nested hypotheses", *Econometrica*, Vol. 57 No. 2, pp. 307-333.

Wilhelmsson, M., Ismail, M. and Warsame, A. (2022), "Gentrification effects on housing prices in neighbouring areas", *International Journal of Housing Markets and Analysis*, Vol. 15 No. 4, pp. 910-929.

Further reading

Akhavan, M. and Mariotti, I. (2022), "Coworking spaces and well-being: an empirical investigation of coworkers in Italy", *Journal of Urban Technology*, Vol. 30 No. 1, pp. 95-109.

De Peuter, G., Cohen, N. and Saraco, F. (2017), "The ambivalence of coworking: on the politics of an emerging work practice", *European Journal of Cultural Studies*, Vol. 20 No. 6, pp. 687-706.

Lindkvist, C., Temeljotov, A.S., Collins, D., Bjørberg, S. and Haugen, T.B. (2021), "Exploring urban facilities management approaches to increase connectivity in smart cities", *Facilities*, Vol. 39 Nos 1/2, pp. 96-112, doi: 10.1108/F-08-2019-0095.

Mariotti, I., di Vita, S. and Limonta, G. (2015), "Una geografia degli spazi di coworking a milano", *Imprese e Città*, Vol. 8, pp. 39-47.

Orel, M. (2020), "Supporting work-life balance with the use of coworking spaces", *Equality, Diversity and Inclusion: An International Journal*, Vol. 39 No. 5, pp. 549-565.

Reuschke, D., Clifton, N. and Fisher, M. (2021), "Coworking in homes – mitigating the tensions of the freelance economy", *Geoforum*, Vol. 119 No. 10, pp. 122-132.

Robelski, S., Keller, H., Hart, V. and Mache, S. (2019), "Coworking spaces: the better home office? A psychosocial and Health-Related perspective on an emerging work environment", *International Journal of Environmental Research and Public Health*, Vol. 16 No. 13, pp. 2379-2391.

Ross, P.K. and Ressia, S. (2015), "Neither office, not home: Coworking as an emerging workplace choice", *Employment Relations Record*, Vol. 15 No. 1, pp. 42-57.

Spinuzzi, C. (2012), "Working alone together. co-working as emerging workplace choice", *Employments Relations Record*, Vol. 15 No. 1, pp. 42-57, doi: 10.1177/1050651912444070.

Statistisches Bundesamt (2020a), "Ankünfte und übernachtungen in beherbergungsbetrieben nach bundesländern im zeitverlauf", available at: https://destatis.de/DE/Themen/Branchen-Unternehmen/GastgewerbeTourismus/_inhalt.html (accessed 3 September 2023).

Weijs-Perrée, M., van de Koevering, J., Appel-Meulenbroek, R. and Arentze, T. (2019), "Analysing user preferences for co-working space characteristics", *Building Research and Information*, Vol. 47 No. 5, pp. 534-548.

Corresponding author
Grzegorz Micek can be contacted at: grzegorz.micek@uj.edu.pl

Appendix

Table A1. Descriptive statistics for independent variables

Variable	Mean	SD	Median	Q1	Q3	Min	Max	Sk.	Kurt.
Population	123,391.7	57,867.8	109,793.0	80,700.5	157,243.3	36,789.0	326,954.0	0.89	0.57
Population growth (2012–2019)	4.93	38.27	3.15	−22.79	35.04	−80.07	110.05	−0.09	−0.56
Population density	184.20	228.23	104.50	83.50	137.50	36.00	1,118.00	2.73	6.87
Migration Saldo	8.14	11.28	5.90	3.17	9.64	−7.96	86.28	4.73	27.58
Foreign immigration ratio	3.50	7.47	2.22	0.97	3.68	−1.71	80.18	7.96	75.51
Share of foreign pupils	0.08	0.03	0.07	0.06	0.10	0.02	0.19	0.62	0.69
Total immigration ratio	82.79	39.80	79.60	63.01	92.16	43.03	464.34	6.49	57.14
Living area per 1 inhabitant	49.01	4.09	48.74	46.16	52.16	33.46	59.28	−0.13	0.79
Traffic area (% of total area)	4.79	1.64	4.43	3.87	5.08	1.98	10.02	1.31	1.49
Traffic area per 1 inhabitant	42.40	18.94	41.77	31.19	54.06	7.21	107.60	0.46	0.57
GDP per capita	34,378.98	11,706.77	31,857.00	27,346.50	37,415.50	1,532.29	100,123.00	2.10	7.46
Quality of life	215.47	104.40	233.50	124.00	299.25	3.00	390.00	−0.20	−1.15
Housing rent (first quartile)	6.59	1.58	6.40	5.50	7.60	0.70	10.60	0.18	0.52
Housing rent (second quartile)	7.62	1.76	7.50	6.30	8.70	4.60	12.00	0.48	−0.63
Housing rent (third quartile)	8.87	2.14	8.70	7.28	10.33	5.00	14.30	0.48	−0.53
Housing price (first quartile)	1,494.99	1,113.87	1,144.35	639.55	2,084.00	224.40	6,638.00	1.51	2.85
Housing price (second quartile)	2,196.76	1,503.42	1,805.90	1,131.68	2,954.85	351.10	11,579.80	2.41	10.54
Housing price (third quartile)	2,981.52	1,789.84	2,491.75	1,821.83	3,810.43	750.00	14,988.60	2.74	13.76
Office rent (first quartile)	6.25	1.49	6.20	5.00	7.33	3.50	10.00	0.27	−0.80
Office rent (second quartile)	7.40	1.85	7.05	6.00	8.70	4.00	12.90	0.56	−0.40
Office rent (third quartile)	8.73	2.45	8.10	7.00	10.00	4.50	18.80	0.95	1.17
Price to rent ratio	22.78	11.34	21.33	14.64	28.67	4.37	92.79	1.96	9.12
Number of Airbnb rentals	598.40	1,480.46	157.00	85.00	392.50	11.00	12,450.00	5.43	34.13
Airbnb daily rate	90.99	15.29	89.00	79.00	101.00	61.00	141.00	0.55	0.32
Airbnb occupancy rate	69.21	6.93	70.00	65.00	73.25	50.00	84.00	−0.41	0.30
Airbnb monthly revenue	1,307.42	284.69	1,242.50	1,102.00	1,487.00	705.00	2,184.00	0.59	0.15
Bed occupancy	33.95	7.64	33.90	28.48	38.50	16.20	58.80	0.39	0.45
Growth of bed occupancy (2012–2019)	0.90	0.10	0.90	0.83	0.95	0.66	1.43	1.15	4.50
Number of overnight stays	123,2109.4	1,677,159.6	719,378.0	353,678.3	1,253,451.3	76,741.0	11,319,914.0	3.57	15.96
Number of overnight stays per capita	943.37	1,004.53	588.83	335.00	1,102.52	143.78	6,562.92	2.69	9.05
Growth of overnight stays per capita (2012–2019)	1.12	0.20	1.11	1.03	1.19	0.11	2.06	0.07	7.01