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COVID-19 and the Pandemic's Spatio-Temporal Impact on Tourism Demand in Bavaria (Germany)

Abstract

Being a unique hazard, COVID-19 led to various global distortions. Tourism was significantly affected, and numerous authors are discussing future implications for the industry. However, only a few studies consider the effects of COVID-19-related measures on tourism's demand side. For the state of Bavaria (Germany), we introduce the relevant legislative measures and their implications on tourism demand. Following Sigala's (2020) suggestion, we illustrate the tourism demand development during the pandemic in space and time by analysing Bavaria's overnight stays on the districts' administrative level. For the first nine months of the ongoing pandemic, we identify the district's population density, its relative location to major cities, and tourism intensity being decisive for both, decline and recovery. Recommendations for policy action can be derived directly from the different spatial and temporal developments we have identified. Thus, it appears that individual districts vary considerably, especially in the speed and extent of their recovery following the first shutdown, in part due to the factors identified. Due to the varying degrees to which the districts and their tourism businesses recover after the crisis, we argue that customised, regionally differentiated political measures should be considered.

Keywords: COVID-19, tourism demand, economic impact, spatio-temporal analysis, Bavaria, Germany

1. Introduction

Tourism is affected by and vulnerable to multiple types of disasters (Faulkner, 2001). Natural disasters such as heatwaves, hurricanes, and earthquakes (Rosselló et al., 2020) and human-made crises and disasters, such as the global financial crises 2007 to 2009 (Li et al., 2010) or the BP oil spill in the Gulf of Mexico in 2010 (Ritchie et al., 2014) and in particular terrorism as well as political instability (Drakos & Kutan, 2003; Sönmez, 1998) are well known for their far-reaching effects on the tourism industry (Schmude et al., 2020).

The COVID-19 pandemic, which likely originated in Wuhan City (China) and spread worldwide (Rothan & Byrareddy, 2020), is characterised as a biological hazard and evolved into a global health crisis with substantial sociological repercussions (Ozili, 2020). Like the Influenza Epidemic, the COVID-19 pandemic is not damaging infrastructure but having persistent impacts on the population (Santos et al., 2013). Therefore, it is unlike other natural disasters. Due to its health risks, unprecedented at least in the Western world, it has

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substantial and profound effects on people's behaviour (van Bavel et al., 2020), on political measures (Oh et al., 2020), and therefore (with a few exceptions such as medical supplies) adverse impacts on most branches of the economy (Nicola et al., 2020). The tourism industry is no exception to this, and instead, is eminently vulnerable. Non-pharmaceutical interventions to counter the pandemic like lockdowns, shutdowns, physical distancing (also called social distancing), voluntary and required quarantine, the closure of restaurants and lodgings, restraints on concerts and festivals, and the ban on larger gatherings in general concern tourism directly and indirectly. Travel restrictions on international, national, and regional levels imposed by many countries made travelling temporarily impossible (Gössling et al., 2020).

Due to the pandemic's economic and social relevance, it is worth taking a closer look at its effects on the tourism demand-side. A regionally differentiated view is particularly evident, as the impacts tend to be, as Sigala (2020) states, uneven in space and time. Instead of already revealing potential future scenarios of COVID-19 recovery, we intend to initially describe, assess, and explain the present pandemic's regional repercussions. To achieve this, we use Bavaria, one of the most frequented federal states in Germany for tourism, as a study area and in a demand-side consideration. Our approach provides a temporal overview of the pandemic's development in Bavaria and the corresponding political measures. Additionally, it includes the spatial analysis of overnight stays in Bavaria during the COVID-19 pandemic (January to September 2020) on a regional level. The study aims to draw attention to the existing regional differences and highlights the different impacts on Bavaria's tourism demand and the varying rates of progress between lockdown and recovery. Therefore, it adds knowledge about resilience factors to facilitate future research and can be a strong hint to political decision-makers on organising crisis funds in a spatially diverse manner. It also enables destinations and businesses to prepare for possible future pandemic events.

2. Literature review

During the last two decades, tourism has repeatedly been hit by external shocks. The handling of these crises and the perception of risk have been the subject of much tourism research (Karl & Schmude, 2017). That a pandemic, such as the one triggered by the SARS virus, influences tourism demand, is known from numerous studies (Haryanto, 2020; Kim et al., 2018). According to Chen et al. (2020), however, science generally still pays too little attention to the risk posed by diseases relevant to tourism. Moreover, both the science and tourism industry often only react retrospectively when such diseases occur. This can also be seen in the case of the ongoing COVID-19 pandemic. However, it must be said that the current COVID-19 pandemic cannot be compared to the past crises mentioned above. Its uniqueness becomes apparent when considering the unprecedented global restrictions on travel and stay-at-home orders that have triggered the global economy's greatest disruption since the Second World War (Brouder, 2020; Gössling et al., 2020). This underscores the relevance of a closer examination of the massive impact of the COVID-19 pandemic – in particular on tourism demand.

In many respects, the current literature on the impact of the COVID-19 pandemic on tourism demand can be described as heterogeneous: numerous disciplines such as tourism studies, economics, geography and environmental studies are examining the topic and analysing the problem from various (specialist) perspectives. As might be expected, the majority of publications explicitly dealing with tourism demand against the backdrop of the COVID-19 pandemic come from the field of tourism and hospitality, e.g.:

- "Changes in air passenger demand as a result of the COVID-19 crisis: using Big Data to inform tourism policy" (Gallego & Font, 2020),
- "COVID-19: potential effects on Chinese citizens' lifestyle and travel" (Wen et al., 2021),

- "Threat of infectious disease during an outbreak: Influence on tourists' emotional responses to disadvantaged price inequality" (Zhang et al., 2020) and
- "Travel behaviour after the pandemic: the case of Bulgaria" (Ivanova et al., 2020).

Also, the disciplines economics and business finance in particular, examine questions relating to tourism demand during the COVID-19 pandemic, e.g. with the following publications:

- "Sustainability of airlines in India with COVID-19: Challenges ahead and possible ways out" (Agrawal, 2020),
- "Asymmetric impact of COVID-19 induced uncertainty on inbound Chinese tourists in Australia: insights from nonlinear ARDL model" (Ghosh, 2020) and
- "The fall into 2020 recession…" (Grigoryev et al., 2020).

Generally, tourism can be examined from two perspectives: on the one hand, it plays the role of a (potential) driver for the spread of the COVID-19 virus (e.g., Ying et al., 2020) and is thus a "perpetrator". On the other hand, the tourism industry is particularly hard-hit by restrictions on travel and falling demand and is therefore a "victim" of the pandemic (e.g., Agrawal, 2020).

These few examples already give an idea of the broad range of focus, whereby many studies are of anecdotal character. There are also initial conceptual studies examining the COVID-19 pandemic and tourism demand in addition to empirical analyses. For example, Brouder (2020, p. 1) uses "key concepts in evolutionary economic geography, especially path dependence/creation and institutional inertia/innovation, [in order] to show variations in pathways for travel and tourism in a COVID-19 world". He predicts: "A path that leads to transformation in tourism can be realised if sufficient institutional innovation occurs on both the demand and supply side of tourism that can foster the emergence of new paths" (Brouder, 2020, p. 1). It is also noticeable that in addition to case studies and conceptual studies, there are numerous editorials and commentaries (e.g., Aalbers et al., 2020; Chang et al., 2020; Haywood, 2020; Jones & Comfort, 2020) addressing the topic of the COVID-19 pandemic and – in part with a normative orientation – linking it with concepts such as sustainability, resilience, and transformation processes. A series of papers also contain an overview or an overall review of the literature on the subject (e.g., Chen et al., 2020; Falk et al., 2020; Nasir et al., 2020), which, however, can only ever be viewed as a snapshot of the current situation.

One major challenge in studying the COVID-19 pandemic is that this is an ongoing situation and that the corresponding state of knowledge changes from day to day. Whereas, for example, Choe et al. (2020) examine the impact of the Middle East Respiratory Syndrome (MERS) coronavirus on inbound tourism in South Korea and cover the period from July to August 2015 in their essay published in 2020, current publications on the subject of the COVID-19 pandemic are, so to speak, dealing with an "ongoing process". The periods covered in publications range from the beginning of the COVID-19 pandemic (Barcaccia et al., 2020: February to April 2020; Tran et al., 2020: January to April 2020) to scenarios for the post-pandemic era (e.g. Falk et al., 2020; Ivanova et al., 2020; Polyzos et al., 2020). Above and beyond this, some studies compare various phases: Corbisiero and La Rocca (2020), for example, characterise the tourism-city relationship before, during, and after the COVID-19 pandemic.

In addition to the differences in the periods under examination, differences can also be seen as regards spatial approaches or aggregation levels. Some publications present a comprehensive, global perspective on the COVID-19 pandemic (e.g., Brouder, 2020; Gössling et al., 2020; Hall et al., 2020; Nasir et al., 2020), while others focus on a specific area or the spatial differences between countries: for example, Mariolis et al. (2020) or Aydın and Ari (2020) each examine tourism demand against the backdrop of the COVID-19 pandemic based on "only" one country (Greece and Turkey respectively). Čorak et al. (2020) analyse the specific role of practitioners and academics using the example of Croatia, whereas Kostynets et al. (2020), for example,

focus on two countries (e.g., Italy, France). On the other hand, Sukharev (2020) compares the United States, Germany, and Russia, while Lee et al. (2021) examine the impact of geopolitical risks on international tourism demand for a panel of 16 countries – and under special consideration of the COVID-19 pandemic. However, the case studies examined are analysed mainly at the nation-state level without further spatial differentiation.

Sigala (2020) highlights that the impacts of the COVID-19 pandemic on tourism will be unequal in space and time. However, spatially differentiated consideration within a country or a region, taking into account regional and temporal differences in tourism demand due to the COVID-19 pandemic, do not exist so far to the best of our knowledge. Where geographical variations in tourism demand occur, suitable explanatory models allow various options for spatially differentiated management of the crisis within a national or regional area of responsibility. The present study proceeds from the assumption that "geography matters" by examining the geographical differences in Bavaria's tourism demand during the COVID-19 pandemic.

3. Methodology

3.1. Aim of the study

Despite the relatively recent topic, the impact of the COVID-19 pandemic on tourism demand-side is already under research. However, there is a lack of studies on the impact on tourism's demand on a small spatial scale. Therefore, this study explores the spatial and temporal development of the impact of the COVID-19 pandemic on Bavarian tourism at the administrative districts' level. It aims to identify underlying factors for the uneven development of the demand side, measured by the relative change in the number of overnight stays in 2020 compared to previous years and on the level of Bavarian districts. Identifying, explaining, and illustrating these differences can help policymakers and should encourage further research in regionally differentiated impact assessment.

3.2. Study area

While, with a share of 9.1% of GPD in 2019, tourism is an essential sector for the German economy (World Travel & Tourism Council [WTTC], 2020), the federal state of Bavaria takes first place in tourism, measured by the number of overnight stays in Germany (Destatis, 2020). Bavaria itself is subdivided into seven government regions (Regierungsbezirke) comprising 71 rural districts (Landkreise) and 25 urban districts (Stadtkreise) (Landesamt für Digitalisierung, Breitband und Vermessung [LDBV], 2020). The 96 districts can be categorised according to their population structure and relative location to larger agglomerations, as shown in Figure 1 into four classes. 1) Rural districts, with a low population density and no direct proximity to major urban districts, 2) peri-urban districts, with direct proximity to major urban districts, 3) urban districts with up to 100,000 inhabitants and 4) major urban districts with more than 100,000 inhabitants.

Tourism is a model economy in Bavaria and the accommodation numbers for the state for the year 2019 show around 40 million tourists and approx. 101 million overnight stays – foreign tourists are particularly significant for city and cultural tourism, accounting for roughly 20% of this. Over 600,000 jobs depend directly or indirectly on tourism. In 2019, Bavaria generated approximately 20% of the total added value created by tourism in Germany (StMWi, 2020). In addition to the great importance of tourism in Bavaria, a further reason for selecting it as our study area is that official statistics for the state are available promptly (which is not the case for many other federal states). This means that the analyses conducted in this study for Bavaria are not possible for Germany as a whole at present.

Figure 1a
Bavaria's government regions and division of districts according to their population structure and relative location

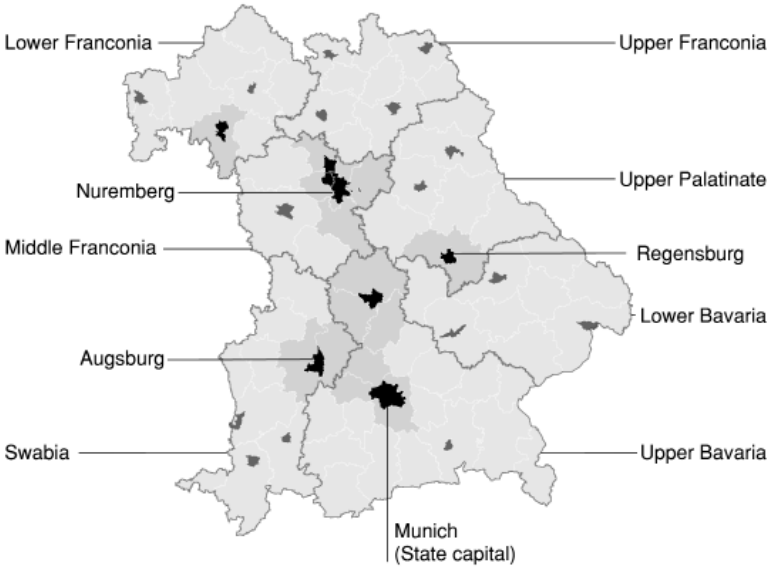


Figure 1b
Location of the State of Bavaria in Germany

Class	Count	Area in km²	Population*	Overnight stays*	Population density[a,#]	Tourism intensity[b,#]
Major urban district (≥100,000 inhabitants)	8	1,087	2,958,623	26,252,512	2,723.06	8,873.22
Urban district (<100,000 inhabitants)	16	960	885,434	4,150,969	921.90	4,688.06
Peri-urban district	15	11,212	2,421,226	7,597,042	215.95	3,137.68
Rural district	57	57,296	6,859,454	62,911,266	119.72	9,171.47
Sum	96	70,555	13,124,737	100,911,789		

*2019, [a]Inhabitants per km², [b]Overnight stays per 1,000 inhabitants, #Weighted arithmetic mean

Source: Own illustration and classification, calculation based on Bavarian Office for Statistics (2020); map based on LDBV (2020).

3.3. Methods

This study evaluates decreases and increases in tourism demand, measured by the relative change of overnight stays in 2020 to the average of the five preceding years (2015 to 2020) in the two complementary dimensions: space and time. A differentiated geographical view based on Bavaria's districts is provided for each month from January to September 2020. The Bavarian Office for Statistics' (2020) official accommodation numbers were used as a data basis. By calculating the deviation from the mean value of the past years, it is possible to examine the relative development in the number of overnight stays by tourists before, during, and after the COVID-19 shutdown by various spatial categories and for intervening factors. By utilising the deviation from the long-term average, we identify the varying degrees to which the regions were affected in decline and recovery over time without overstating potential statistical outliers.

Based on this, we examine the relative development of the tourism demand in 2020 during the pandemic concerning various influencing factors. As such, we present the monthly relative deviation of overnight stays for each year from 2016 to 2020 from the respective previous year as a function of population density. Also, we present and describe the correlation between the relative change in overnight stays in 2020 compared to the five previous years and tourism intensity at a monthly level and for all Bavarian districts. To understand the relationship of the decline, initiated by the pandemic and the measures introduced to combat it, and the recovery, resulting from the easing of those measures at a spatial level, we use the classification of municipalities presented in Figure 1. For each class, we calculated the relative development to previous years at the monthly

level. This comparative approach allows us to include the relative location of a districts (for example, to a major urban district) as an additional explanation.

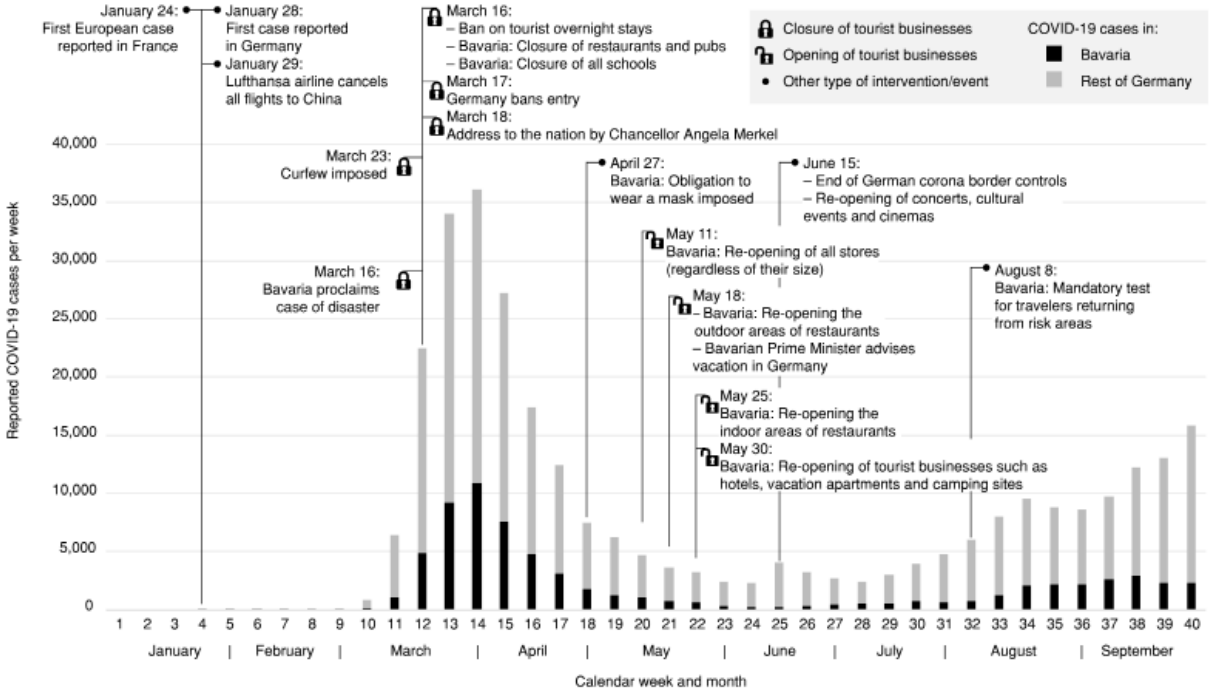
3.4. Practical framework

For a more comprehensive understanding of the significant impact of COVID-19 and the pandemic-related measures on the demand side of tourism, it is crucial to consider this study against these measures' background and progression. Therefore, in the following, we provide a practical framework in which our study is embedded.

As in many parts of Europe and the world (cf. Gössling et al., 2020), the first three quarters of the year 2020 in Bavaria (and Germany) were dominated by the rapid spread of the COVID-19 pandemic. The course of the pandemic from January to September 2020, before the second wave in the fourth quarter, can be described as an alternation between "lockdown and recovery". Periods with high case numbers, major restrictions on social life (at first regionally, then on a federal and later also on a local level) and political measures and aid programs for the economy were followed by periods in which case numbers were low, restrictions were lifted, and considerations turned to recovery from the crisis (cf. Figure 2).

The first measures implemented in January 2020 saw the suspension of flights to the Asian region. At this point, the virus was perceived as a phenomenon that, like, for example, SARS (from 2002), had massive consequences on a local and regional level (cf. Kuo et al., 2008; Mao et al., 2010; McKercher & Chon, 2004), but that, like SARS, would have little or no impact on life in the rest of the world (Niewiadomski, 2020). It was not until the Robert Koch Institute (2020) reported the first cases in Germany at the end of January and in February 2020 that the political authorities increasingly adopted measures to curb the infection rate at both federal and state level (Bavarian State Government, 2020). These measures had far-reaching effects on tourism in Germany and the individual federal states.

Figure 2
Development of COVID-19 case numbers per week and political measures (at federal and state level) between January and September 2020 in Germany and Bavaria



Source: Own illustration and calculation, based on own media analysis and Robert Koch Institute (2020).

As of mid-March, extensive bans on events and operating bans were imposed, and all schools in the federal state were closed. On 16 March, hotels, guesthouses, bars and restaurants were ordered to close, and a general ban on the provision of accommodation of any kind for private tourism was announced and – on the federal level – the German borders were closed on 17 March for non-essential travel (cf. Figure 2). This meant losing foreign tourists for city destinations and vastly reduced business tourism and decreasing German shopping, culture, and city tourism. The decrease in business tourism is primarily caused by companies and the authorities' reduction of business trips and the cancellation of trade fairs (as the ITB in Berlin, the Consumenta in Nuremberg or the Expo Real in Munich) and events (as the Asia Tourism Forum in Munich) due to additional hygiene measures or bans imposed by the federal or national government.

Whereas curfews and operating bans for most businesses were gradually lifted from 20 April onward, restrictions for the catering industry and hotels essentially remained in place until 30 May (cf. Figure 2). Only overnight stays by business travellers in essential cases, and the sale of food-to-go remained allowed.

As the curve of the new infection rate in Bavaria flattened out in May (Robert Koch Institute, 2020) and with the introduction of numerous hygiene concepts for the tourism industry, the ban on overnight stays in Bavaria's tourist accommodation facilities was lifted on 30 May (Bavarian State Government, 2020). Border controls for inbound travellers imposed due to COVID-19 were lifted for the whole of Germany on 15 June. However, with the easing of travel restrictions, many travel destinations in and outside Europe were declared risk areas. This classification meant that tourists could cancel bookings free of charge. It also meant that many tourists who originally planned to vacation abroad now chose destinations within Germany instead. Politicians also encouraged people to spend their vacations in Germany (Bavarian prime minister Söder on 20 April 2020). Increasing demand soon led to high capacity utilisation in Bavaria in popular holiday destinations that already saw high tourism intensity before the COVID-19 pandemic.

With the end of the summer holidays in Germany, there was a rise – initially moderate – in the incidence numbers, followed by a stronger increase from mid-September and resulting in a second shutdown beginning in November. Overall, the pandemic's progression in Bavaria mostly follows the same course as the incidence numbers for Germany as a whole (Robert Koch Institute, 2020). The pandemic's progression as described in this paper for the study area and the federal and state government's measures to counteract the virus's further spread directly influenced travel options, willingness to travel, and actual travel decisions on the demand side.

The restrictions on the freedom of movement and growing uncertainty about the pandemic's further progression led to major changes in travel intentions. This coincides with Karl (2018) and Fischhoff et al. (2004), who conclude that both subjectively perceived uncertainty and subjective country-specific risk perception influence travel decisions.

4. Results and discussion

The imposed travel restrictions and the decreased willingness to travel lead to reduced travel activity in Germany during the COVID-19 pandemic. Germany registers a decline in overnight stays of -30.0% from January to September 2020 compared to the average in the five previous years. April (-87.9%) and May (-74.5%) were particularly affected. Here, the decrease in foreign travellers (-56.8%) is considerably higher than for domestic travellers (-30,0%). There are also apparent differences in the extent to which individual German states are affected. The three city-states, Berlin (-55.4%), Hamburg (-44.1%) and Bremen (-33.9%) recorded comparatively high declines in tourist overnight stays from January to September compared to the average in the five previous years. In contrast, the losses of federal states with classic vacation regions such as Mecklenburg-Western Pomerania (-6.9%) or Schleswig-Holstein (-3.8%) are relatively low (Destatis, 2020).

In addition to the spatial differences at the federal states' level, there are also differences within the German accommodation sector. For example, German youth hostels recorded more than six million overnight stays

from January to September 2020. This represents a decline of -62.3% compared with the average of the five previous years. By contrast, the camping segment (+5.4%), as well as overnight stays in holiday homes and flats (+9.8%), increased, especially in the summer months following the partial lifting of the accommodation bans (e.g., +68.0% in the camping segment in September). However, the hotel sector in cities with more than 100,000 inhabitants saw dramatic declines (-45.6% January to September) (Destatis, 2020). The increased demand for camping and holiday homes can be explained by the subjectively easier compliance with hygiene rules and the perceived lower health risk.

Within the 13 non-city-states, that are comparatively less densely populated, there are apparent spatial and temporal differences in the development of tourist overnight stays. Due to Bavaria's relative importance for tourism in Germany (cf. Methodology), the following analysis of the tourism demand development is based on the federal state's district level. The comparison with the previous years clearly shows a spatial and temporal differentiation in how Bavarian tourism is affected by tourism consumers' actual travel decisions. On average, over the last five years (2015 to 2019), Bavaria recorded around 74.0 million overnight stays in the period of January to September. However, in the same period in 2020, only about 50.8 million overnight stays are documented (Bavarian Office for Statistics, 2020), a decline of -31.4%. The loss of more than 23 million overnight stays results in revenue losses of approximately 1.4 to 1.7 billion euros (at average room prices of 60 to 75 euros (own calculation based on Destatis, 2020)).

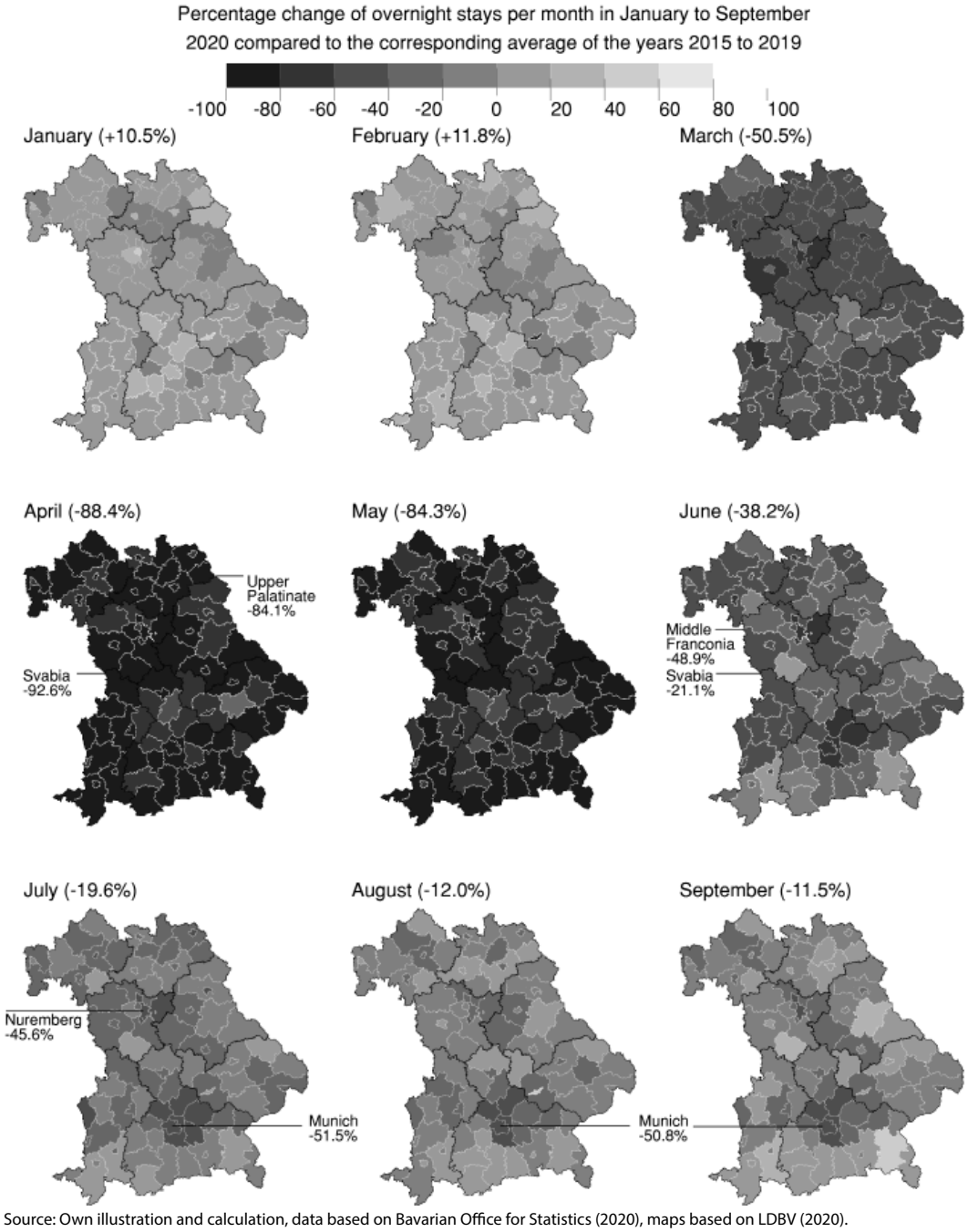
With a few regional exceptions, January (+10.5% for Bavaria) and February (+11.8%) show a positive trend for most districts when comparing the overnight stays of 2020 to the average of the five preceding years. The first COVID-19 cases in Germany and rising incidence numbers caused first restrictions through measures on federal and regional levels (cf. Methodology), resulting in a deteriorating situation in March (-50.5%). April (-88.4%) shows the highest declines across the whole of Bavaria, reaching their maximum in Swabia's governmental district with -92.6%, while the Upper Palatinate records the smallest decline with -84.1% (cf. Figure 3), while the differences in the degree of impact are relatively small (8.5 percentage points). First signs of improvement can be identified in May (-84.3%). These recovery tendencies intensify in June (-38.1%) along with the lifting of the ban on overnight stays. However, regional differences become more apparent in the following months: In Swabia, the decline in tourist overnight stays, compared to the average of the five previous years, improves from -83.8% in May to -21.1% in June, whereas Middle Franconia (cf. Figure 3) only recovered by about 36 percentage points from -84.6% in May to -48.9% in June. In July (-19.6%) and August (-12.0%), the recovery process continues when considering the entire federal state but slows down in September (-11.5%) (Bavarian Office for Statistics, 2020).

Using the classification of administrative districts introduced in the Methodology chapter and with reference to table 1, it becomes clear that in Bavaria peri-urban districts were less affected by the decline in overnight stays in April and May but are then affected considerably more than many rural districts from June to September of 2020. In March and April, all classes decline, major urban districts (≥100,000 inhabitants) showing the highest average decreases, and small differences in the coefficients of variation, indicating a comparable impact on all of them within this phase. For instance, the city of Munich loses 50.8% of its overnight stays in September 2020 (cf. Figure 3), the month of the Oktoberfest, compared to the average in the same month in the previous five years (Bavarian Office for Statistics, 2020). Rural districts and urban districts show a faster and more lasting recovery than major urban districts and peri-urban districts in their proximity (cf. Table 1). Particularly the rural districts in southern Bavaria are characterised by a fast and robust recovery. These districts, located close to the Alps and therefore well-known tourist summer destinations, benefit disproportionately from travel restrictions to foreign destinations and the political appeal for domestic vacations. Most of them have more overnight stays in August and September 2020 than in the average of the five previous years.

From July onwards, urban districts develop much more positively than peri-urban districts. This effect, which increases in July, can be explained by the peri-urban districts' support function for overnight stays in the

major urban districts (≥100,000 inhabitants). Accordingly, the negative development of these major urban districts, driven by the loss of conferences, congresses, and trade fairs, also impacts the wider surrounding area, illustrated in Figure 3 in July displaying Munich and Nuremberg as examples. The high variation between rural districts and the urban districts in August points to opposing developments within this group: The rural districts along the Alps in Upper Bavaria and Swabia show a substantial increase in overnight stays compared to the five previous years, whereas peripheral rural districts in Lower Bavaria, Upper Palatinate, Middle and Lower Franconia, in particular, continue to remain well below the average (cf. Table 1 and Figure 3).

Figure 3
Development of overnight stays in lodging establishments with more than ten beds in Bavaria from January to September 2020



Source: Own illustration and calculation, data based on Bavarian Office for Statistics (2020), maps based on LDBV (2020).

Table 1
Deviations in overnight stays in four different regional categories in Bavaria between January and September 2020 in the monthly comparison to the average of the five previous years

		Rural districts	Peri-urban districts	Urban districts <100,000 inhabitants	Major urban districts ≥100,000 inhabitants
January	MEAN	7.18	8.90	17.65	14.32
	CV	124.41	115.27	84.68	80.25
February	MEAN	9.90	3.52	17.92	9.44
	CV	96.45	348.26	107.17	77.63
March	MEAN	-46.96	-46.73	-46.14	-57.36
	CV	20.81	24.59	26.63	10.56
April	MEAN	-84.75	-76.50	-82.66	-88.29
	CV	12.89	12.60	8.93	5.43
May	MEAN	-80.64	-70.70	-74.46	-84.46
	CV	11.49	15.43	9.92	4.65
June	MEAN	-35.24	-44.01	-43.93	-62.12
	CV	48.31	27.56	23.18	11.41
July	MEAN	-17.03	-31.37	-21.66	-38.90
	CV	89.40	42.47	65.01	24.30
August	MEAN	-4.97	-24.59	-6.41	-36.01
	CV	360.96	56.31	168.32	28.32
September	MEAN	-9.06	-21.81	-6.73	-27.47
	CV	148.34	68.36	270.77	36.44

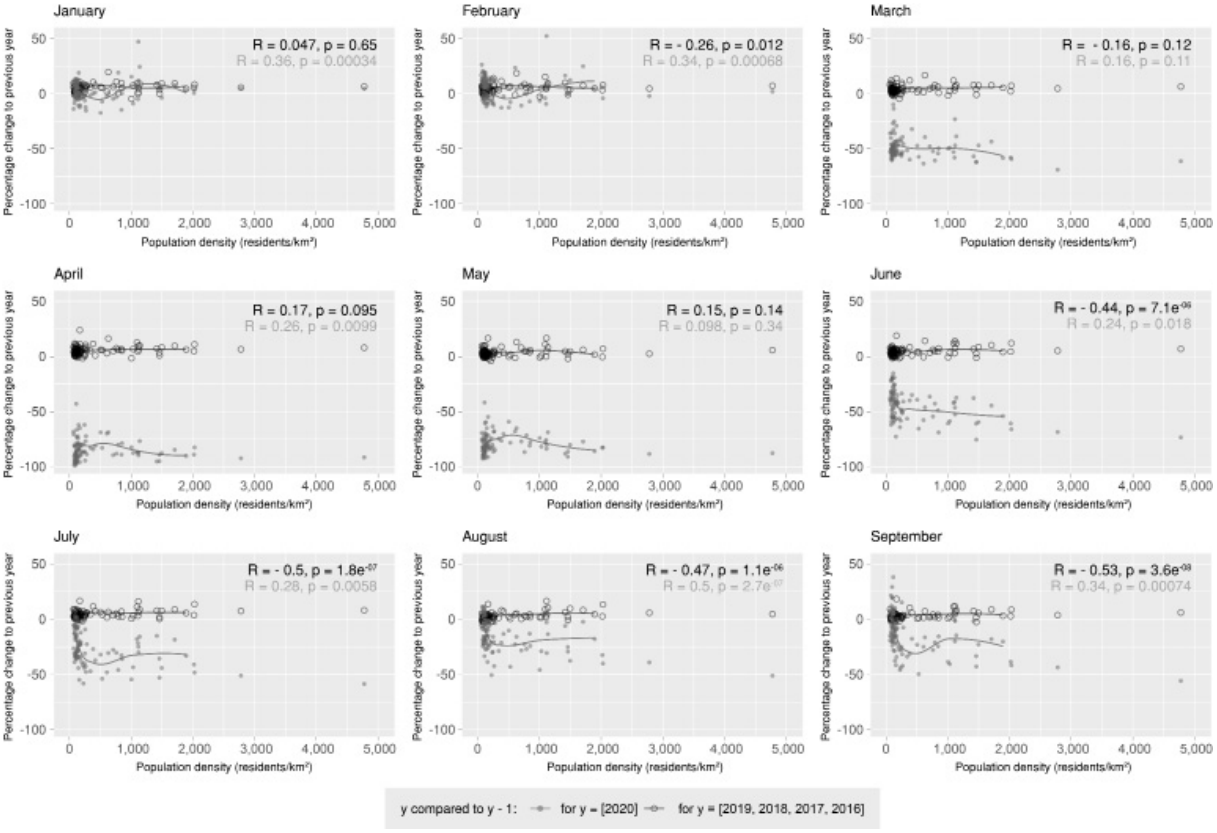
Source: Own illustration and calculation, data based on Bavarian Office for Statistics (2020).

To explain the affectedness and the differences in recovery, we use population density analogously to Hamidi et al. (2020), but in our case, to explain the spatial and temporal distribution of tourism demand from January to September 2020. In Figure 4 for each Bavarian district, we set the population density in relation to the relative change in the overnight stays compared to the respective month of the previous year: 2016 vs 2015, 2017 vs 2016, 2018 vs 2017 and 2019 vs 2018 as pre-COVID-19 consideration (displayed as circles) and 2020 vs 2019 to illustrate the COVID-19 induced effects (as points).

Spearman's correlation coefficient (R_S) indicates the relationship's direction and strength. Additionally, the p-value (p) of the two-sided correlation test, calculated with an asymptotic t-distribution approximation, indicates the acceptance/rejection of the null hypotheses of no correlation. While a small p-value (<0.05) implies that the correlation is significant, a large (positive or negative) R-value can be interpreted as a strong correlation and vice versa.

While January and February are relatively similar to the previous years' total, considerable differences for all further months become apparent. Districts with a higher population density tend to be more affected by tourism restrictions in March, April, and May 2020. In the months June to September, they tend to recover more slowly. In contrast, most districts with a very low population density of fewer than 250 residents/km² recover faster, in August and September in some cases completely. COVID-19-induced tourism demand changes can explain this distribution: 1) reduced classical city and cultural tourism, primarily due to foreign visitors' absence. 2) reduced business trips, partly replaced by video conferencing. 3) absence of larger events such as musicals, concerts or sporting events, but also trade fairs and other events (e.g., the Oktoberfest in Munich), which tend to occur in densely populated areas. A further explanation for decreasing city tourism is that potential tourists perceive urban agglomerations (subway, crowds, foreigners, hardly controllable surroundings) as a health hazard (Hamidi et al., 2020).

Figure 4
Decline in overnight stays compared to each previous year as a function of population density (2019) at the district level before (2015 to 2019) and during (2020) the COVID-19 pandemic in Bavaria

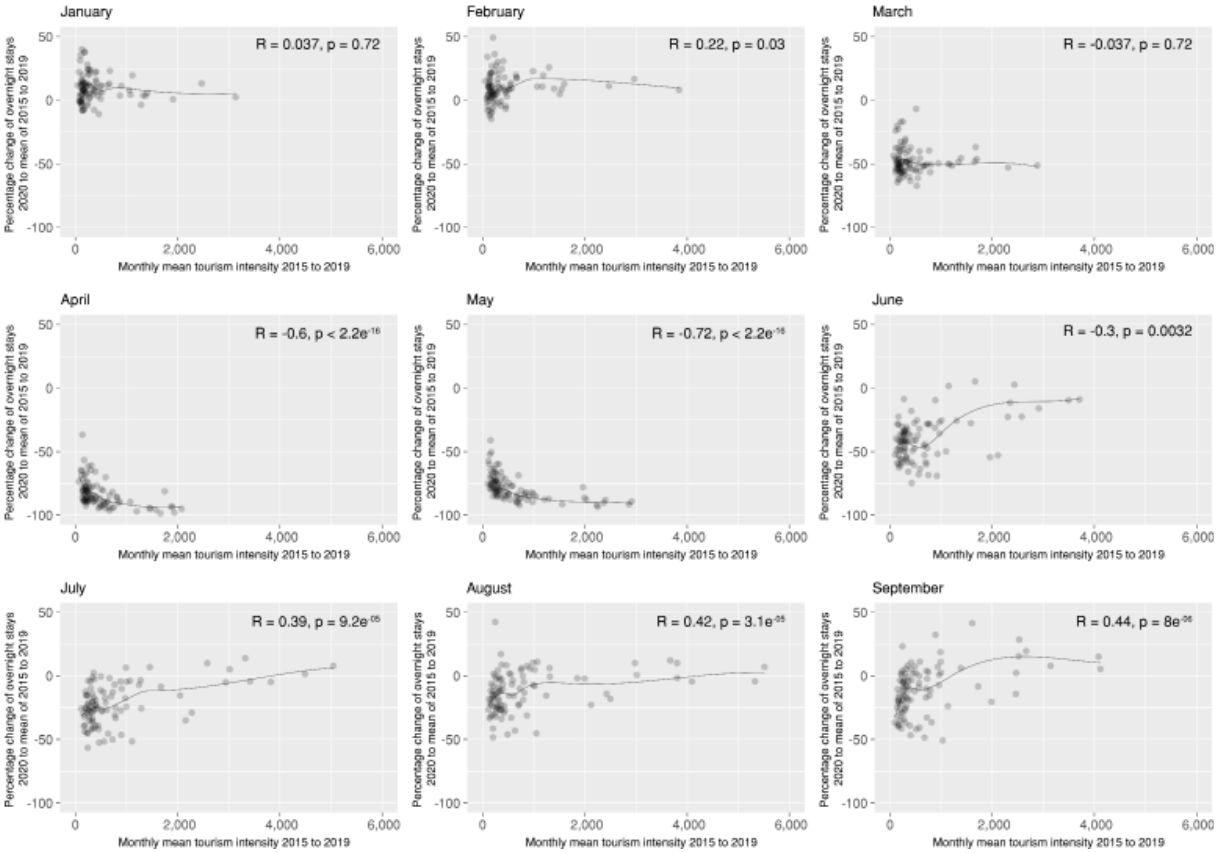


Source: Own illustration and calculation, data based on Bavarian Office for Statistics (2020).

Tourism intensity, here defined by the number of overnight stays per thousand residents and calculated monthly, is a crucial variable to assess the dependency of a region on tourism. The higher the value, the higher the dependency (Tokarchuk et al., 2016). In the following, we use the variable to explain tourist demand development during COVID-19 over the months January to September 2020 for all Bavarian districts. In contrast to Figure 4 that illustrates population density for each district constant over the year, Figure 5 shows the monthly tourism intensity. Therefore, it is essential to note that a single district (represented as a single point) might vary due to seasonal variations in monthly tourism intensity (and therefore its position on the X-axis might shift). For our analysis, we consider percentage change in tourists' overnight stays in 2020 compared to the mean of 2015 to 2019 as a function of the monthly mean tourism intensity of 2015 to 2019 (cf. Figure 5).

The first two months of 2020, as previously described, perform comparatively well, although in February, in contrast to January, districts with a high level of tourism intensity tend to benefit slightly more ($R = 0.22$, $p = 0.03$). With an R-value comparatively close to 0 (but unlike January's negative value), all Bavarian districts lose equally in March, regardless of their tourism intensity. In April and particularly in May ($R= -0.72$, $p <2.2e^{-16}$), it becomes apparent that especially those districts with a high intensity of tourism are hit predominantly hard by COVID-19-induced decline in tourism demand. This effect reverses toward June. In July, August, and September, noticeably stronger recovery processes can be seen among the tourism-intensive districts in the respective month. These districts with a higher tourism intensity in the respective month tend to recover much faster, in our case from July to September. After lifting the state-imposed travel restrictions, with a few exceptions, tourists might return to places previously characterised by and known for tourism rather than unknown places away from the tourist hotspots.

Figure 5
Decline in overnight stays 2020 vs mean of 2015 to 2019 as a function of monthly mean tourism intensity (2015 to 2019) at the district level during January to September 2020, corresponding splines, Spearman's correlation coefficient (RS) and, uncertainty (p) in Bavaria



Source: Own illustration and calculation, data based on Bavarian Office for Statistics (2020).

5. Conclusion

Using the state of Bavaria (Germany) as a study area, this research initially presents the federal and state policy measures to prevent the spread of COVID-19 adopted between January and September 2020 chronologically and discusses their impact on the tourism demand side. The choice of one federal state, in this case Bavaria, as a research area is motivated by Germany's federal structure and its resulting individual federal responsibilities in tourism. This federal structure leads to different funding programs and policies in the individual states and influences the data's respective availability.

Following Sigala's (2020) statement, we analyse the COVID-19 pandemics' effects on Bavaria's demand-side in space and time. In sum, we find major temporal and spatial differences in tourism demand, measured by the overnight stays, during COVID-19 in Bavaria in both decline and recovery. The spatial differences can be seen above all in the disparity between urban and rural tourism development and within the rural districts. We explain both, the differences and the disparities, with relation to population density and the intensity of tourism. After lifting travel restrictions, districts with high population density recover more slowly than those with a low population density. In contrast, those districts with a comparably higher monthly tourism intensity recover much faster. The southern Bavarian Alpine region, in particular, has experienced a remarkable recovery. The rural districts in this region fulfil all the characteristics mentioned above: A high tourism intensity, a low population density, a certain distance to major urban districts.

For political decision-makers, all findings are an indication that support measures should have a spatial and temporal dimension. Following Schmude et al.'s (2018) proposal for disaster management, the following is also useful for mitigating the impact of the COVID-19 pandemic on Bavaria's tourism accommodation: Government measures, such as subsidies or aid to overcome the crises, should not be dispersed throughout an area, but should have a regional differentiation and fit. These should consider regional differences not only in the degree to which individual districts are affected (due to the small differences identified) but especially in the timespan and extent to which a recovery process has taken place (due to the identified large differences).

The results and conclusions of this study can be applied to other spatial entities. Given the data availability, a transfer to other German territorial states or other countries is possible. In particular, when there are significant spatial differences in tourism intensity, small-scale analyses are useful and relevant to determine regionally differentiated impacts of the COVID-19 pandemic to guide and evaluate individual governmental measures.

For the spatial analysis of the overnight stays, we expect little to no limitations of the validity. There might be minor inaccuracies in the official statistics due to delays in receiving reports or not received reports from individual accommodation facilities (Bavarian Office for Statistics, 2020). These should be compensated for by considering district and monthly level data. Small businesses with less than ten beds are not obliged to report their numbers of overnight stays (Bavarian Office for Statistics, 2020). Such businesses are more common in rural areas and are particularly popular under COVID-19 (Deutscher Bauernverbande e. V. [DBV], 2020). Therefore, we might underestimate the recovery rates in rural areas, and they might be even more intense than described.

Future research on the regionalised impact of the COVID-19 pandemic on tourism demand should consider the three influencing factors we identified, relative location, tourism intensity and population density. The loss of overnight stays is a result of two developments that should be considered in the future: 1) the change in individual travel decision making, tourists' perception of potential health risks, the changes in their travel behaviour, and the travel decision process, and 2) the cancellations of business trips, in no small extent substituted by virtual meetings.

It is likely that the COVID-19 pandemic will occur in further waves and may affect tourism globally for years to come. Accompanying research must monitor the recovery process, especially the industry's adaptation measures and the government's mitigation measures. Space and time will continue to play a role in this as geography matters.

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