

# The local impact of exceptional architecture on tourism: A synthetic control study of the Elbphilharmonie in Hamburg

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**Abstract.** Exceptional architecture is widely recognized for its transformative impact on the cultural and economic landscape of cities. However, pinpointing its specific influence on tourism, particularly in terms of measurable increases in visitor numbers, remains analytically challenging and empirically underexplored. This study addresses that gap by investigating the causal effects of the Elbphilharmonie concert hall in Hamburg on local tourism development. Employing the synthetic control method, we create a counterfactual scenario to estimate how Hamburg's tourism trajectory might have unfolded without the construction of the Elbphilharmonie. Our robust findings indicate that the concert hall has had a major effect on tourism. In the seven and a half years from its opening in January 2017 to the second quarter of 2024, the Elbphilharmonie is associated with an estimated 13 million additional overnight stays.

## 1 Introduction

Exceptional architecture is known for its transformative power to shape the economic and cultural landscape of their host cities (Alaily-Mattar et al., 2022; Nadia Alaily-Mattar, Dreher, et al., 2018; Dreher et al., 2023; Heidenreich & Plaza, 2015). Due to heightened urban competition (Häusler & Häusler, 2024; Sklair, 2017; Zenker & Beckmann, 2013), especially among urban destinations (De Frantz, 2018) this specific type of architecture can unleash attractive forces, has the potential to "act as a synecdoche for a city or region" (Alaily-Mattar et al., 2022, p. 1), and allure tourists and inward investment (Balke et al., 2018; Scerri et al., 2019). Particularly the opening of the Guggenheim Museum in Bilbao in 1997 has brought the

topic into the spotlight of scholarly attention. Its inauguration has been linked to amplified tourism, a revitalized local economy, and an elevated cultural reputation (Nadia Alaily-Mattar, Dreher, et al., 2018; Plaza, 2006; Plaza et al., 2009). However, the effectiveness of exceptional architecture in attracting tourists remains a subject of disagreement. While some scholars highlight the positive and lasting economic and tourism impacts, others argue that these effects are merely short-lived, failing to achieve the anticipated outcomes (Dreher et al., 2020, p. 442). Our study sheds light on this topic by providing empirical evidence on the influence of exceptional architecture on tourism, focusing on the case of the 'Elbphilharmonie' in Hamburg. The Elbphilharmonie (Elbe Philharmonic Hall), inaugurated in January 2017, is a multifunctional building in Hamburg that includes concert halls, a hotel, apartments, and a publicly accessible plaza. Designed by the renowned architects Herzog & de Meuron, the building stands out by its striking wave-shaped glass façade atop a historic warehouse at Hamburg's harbor (Dreher et al., 2020; Hofmeister, 2021). It is recognized as one of Germany's most notable recent architectural achievements (Dreher & Thiel, 2022, p. 108). Described as a "signature building in a key location" (Heuer & Runde, 2022, p. 90), and "tourist lighthouse" (Just, 2022, p. 55) that was "build to compete with New York, London or Sydney" (Zenker & Beckmann, 2013, p. 647), it ranks as one of the costliest concert halls ever constructed worldwide (Heuer & Runde, 2022). To assess the causal effect of the Elbphilharmonie's inauguration on tourism overnight stays in the city of Hamburg, we employ the synthetic control method (Abadie, 2021; Abadie & Gardeazabal, 2003), a robust statistical approach that enables to estimate

the counterfactual scenario of Hamburg's tourism in the absence of the Elbphilharmonie. Our analysis contributes to the empirical literature on the impact of exceptional architecture on tourism, addressing previous studies that reported "rather sobering findings" (Dreher et al., 2020, p. 449). In doing so, our procedure also confronts methodological challenges in understanding the genuine impact of architecture projects on additional tourism. Traditional approaches like input-output methods or correlation analysis, as exemplified in the analysis of the economic and tourist impact of the Guggenheim Museum in Bilbao (Plaza, 2000; Plaza, 2006), are recognized as valuable for evaluating infrastructure benefits (Scerri et al., 2019). However, these methods have limitations in causally linking them back to specific events (Doerr et al., 2020; Tkalec et al., 2017), also when it comes to making statements about temporal effects (Dreher et al., 2020). In this context, the synthetic control method serves as an innovative tool in economic geography and tourism research, providing more accurate and detailed insights. Prior studies have successfully applied this method to evaluate the impact of European Union cohesion policies on tourism and culture (Brandano & Crociata, 2023), the influence of popular television series on (film) tourist arrivals (Tkalec et al., 2017), the effects of transport infrastructure on regional tourism (Albalate et al., 2023; Doerr et al., 2020), or the consequences of natural disasters on tourism and migration (Antonaglia et al., 2024; Kim & Lee, 2023).

Our empirical findings indicate that the Elbphilharmonie has had a sustained positive impact on tourism development in Hamburg, resulting in an additional 13 million overnight stays within seven and a half years since its opening. In the following sections, we will first outline the theoretical and empirical discussions regarding the influence of exceptional architecture on tourist attractiveness, while also addressing the methodological challenges associated with identifying causal effects. Section 3 presents the Elbphilharmonie as a case study, followed by a description of the data and the synthetic control method in Section 4. We then report the empirical results in Section 5, which includes the estimated 'Elbphilharmonie Effect' and its regional implications for tourism. Additionally,

we will conduct robustness checks to validate our findings, concluding with a discussion of the broader implications.

## 2 Tourism and architecture

Over the past decades, tourism has evolved into one of the largest and fastest-growing industries globally, contributing substantially to the gross domestic product of many regions. For example, in 2019, tourism revenues in Europe amounted to a substantial 514.9 billion euros (World Tourism Organization, 2021). However, the pandemic triggered a sharp decline (Plzáková & Smeral, 2022; World Tourism Organization, 2023), as travel restrictions, testing requirements, and quarantines created lasting travel hesitancy among some individuals (Gössling & Schweiggart, 2022; McKercher & Tkaczynski, 2024). Nevertheless, and despite initial pessimistic forecasts, the tourism industry is undergoing a robust recovery in most places, a phenomenon powered by and often referred to as "revenge tourism" (Meenakshi et al., 2024; Vogler, 2022). Motivated by a strong urge to travel once borders reopened, some travelers created 'bucket lists' to satisfy their craving for heightened excitement (Meenakshi et al., 2024) making destinations renowned for their exceptional architecture an appealing choice. In response to the economic relevance to attract tourists and the increasing competition among urban centers for economic development (Häusler & Häusler, 2024; Sklair, 2017; Zenker & Beckmann, 2013), many European cities have invested in prestigious architectural projects (Andersson, 2014; Ponzini et al., 2020). The underlying idea is that exceptional architecture can stimulate new tourism, employment opportunities, and additional tax revenues, which can be economically beneficial for urban development (Alaily-Mattar & Thierstein, 2018; Plaza, 2006). This phenomenon occurs because exceptional architecture may act as a unique selling point that contributes to the attractive image of a city and adds a layer of urban prestige (Andersson, 2014; Romão, 2025). As a result, these buildings often become representative symbols of urban progress, motivating tourists to choose their host cities as destinations (Balke et al., 2018; Boniface et al., 2021; Scerri et al., 2019; Specht, 2014). This aligns with the findings from Plaza et al. (2024), who link the effects of

exceptional architecture with findings from cognitive psychology and social cognition (DiMaggio, 1997). They emphasize that such architecture holds major cultural and symbolic meanings, as they can create strong symbolic associations and are easily remembered due to their distinctiveness, elevating the global visibility of their locations and making them memorable to potential visitors and media consumers. These architectural icons, therefore, can serve as crucial connectors in the global media landscape, reinforcing the prominence and boosting the attractiveness (for visitors) of their host locations. Taking a leading role and gaining visibility is especially important in the context of post-pandemic tourism, as the recovery intensifies competition among tourism-dependent economies to attract visitors (Abbas et al., 2024). However, measuring the precise effects of exceptional architecture on tourism remains challenging. For example, studies of the ‘Guggenheim Effect’ show that museum visitors played a major role in the growth of tourism in the Basque Country after the opening (Plaza, 2000). However, there are methodological hurdles in determining the actual effects. In the specific case of the Guggenheim Museum, idiosyncratic factors such as the dissolution of the terrorist organization ETA, general tourism developments, economic cycles, the increasing attractiveness of neighboring regions, and comprehensive urban developments must be taken into account, making it challenging to isolate the phenomenon (Plaza, 2000; Voltes-Dorta et al., 2016). Another example underscores the difficulty of capturing the causal effects of exceptional architecture on tourism. The study by Dreher et al. (2020) examines the tourist effect of the Kunsthau Graz, Austria (an architecturally exceptional art exhibition center inaugurated in 2003) based on the number of museum visitors on the number of overnight stays in the city. The results show that, despite a decline in visitor numbers to the museum, overnight stays in the city increased. The authors characterize the study’s outcome as a “rather sobering finding” (p. 449), since they discovered no statistical proof indicating that Kunsthau Graz played a direct role in the upswing of overnight tourism. However, they posit that the impact on tourism is more attributed to the architecture itself rather than the exhibitions because the museum operates as an icon representing the city,

drawing in tourists without necessarily motivating them to explore the art exhibitions. Our study builds on this assumption by using the Elbphilharmonie in Hamburg as a case study to explore the forward linkage effects (Gelman & Imbens, 2013; Hiller, 1998) of its inauguration to explore how exceptional architecture can influence overnight stays in the local tourism sector.

### 3 The Elbphilharmonie

Germany, a major player in the global tourism export market (Gössling & Schweiggart, 2022), has faced severe impacts from the COVID-19 pandemic, particularly in its hospitality sector. In this context the case of Hamburg becomes particularly interesting as it features the architectural masterpiece, the Elbphilharmonie. As a relatively recent addition to the city’s skyline, it may have emerged as a popular destination for travelers seeking unique experiences, especially following the easing of pandemic restrictions. From the outset, the Elbphilharmonie was ascribed identity-forming characteristics and recognized for its potential socio-economic influence due to its location, as well as the exceptional visual and emotional appeal (Alaily-Mattar et al., 2021). Architecturally integrated in/on the brick corpus of a former cocoa warehouse in Hamburg’s harbor area, it is adjacent to the historic warehouse complex and UNESCO World Heritage Site ‘Speicherstadt’ (Heuer & Runde, 2022) (see Figure 1). The constructions were completed in November 2016 and officially opened in early January 2017. The striking design features a conspicuous iceberg/wave structure made of glass that stands 110 meters tall. Designed by internationally renowned architects Herzog & de Meuron, who also created the Tate Modern in London and the ‘Bird’s Nest’ Olympic Stadium in Beijing, the building is situated in a prominent location (Nadia Alaily-Mattar, Bartmanski, et al., 2018), and - on par with comparable iconic architectural landmarks (Ghalejough et al., 2024) - has sparked extensive media coverage. These factors qualify it as a distinct type of exceptional architecture known as ‘star architecture’ (Dreher & Thiel, 2022). But the Elbphilharmonie also shares another attribute often associated with star architecture: it is “expensive and controversial” (Alaily-Mattar et al., 2022, p. 3). Initially estimated at 187 million euros, the construction

cost eventually rose to 866 million euros, making it one of the most expensive concert halls ever built (Hofmeister, 2021). During the selection process, there were some controversies, notably the awarding of the design contract to architects Herzog & de Meuron without an open bidding process or architectural competition (Alaily-Mattar et al., 2021, p. 101). From a functional perspective, the structure serves as a concert hall, which also includes a hotel and private residences. Moreover, situated at a height of 37 meters on top of the brick corpus, it encompasses an open plaza accessible to the public, offering residents and visitors an expansive view of the city (Holz et al., 2023). By early 2024, this plaza has been experienced by over 20 million visitors (DPA, 2024), while within a single year until mid-2024, 852,000 tickets were sold for the concert hall (Holz et al., 2024). Nevertheless, the Elbphilharmonie project is linked to a ‘Hamburg Effect’ instead of a ‘Guggenheim Effect’ (Heuer & Runde, 2022). Unlike the Guggenheim Museum in Bilbao, which was constructed as a catalyst for the regeneration of a “rundown” (Heidenreich & Plaza, 2015, p. 1441) industrial city and subsequently evolved into a major tourist attraction with tangible economic benefits and a thriving art and creative scene (Plaza et al., 2009), the Elbphilharmonie was designed with the primary goal of reinforcing Hamburg’s identity as a cultural and musical hub (Heuer & Runde, 2022). The focus to serve the local and national population gets evident in the origin of the audience attending performances in the concert hall, where the proportion of foreign attendees has not surpassed 6%. In contrast, approximately 60 to 70% of visitors to the Guggenheim Museum in Bilbao come from foreign countries (Heuer & Runde, 2022, p. 97). To study of the impact of exceptional architecture on local tourism, using the Elbphilharmonie in Hamburg as an example, is beneficial in two ways. Firstly, the relatively low number of foreign concert attendees suggests that, if there was a positive effect, it is the architectural attraction itself rather than the concerts that attracts tourists, providing empirical support for the assumptions of (Dreher et al., 2020). Secondly, when measuring the touristic development in Bilbao in the 1990s, multiple factors beyond the opening of the Guggenheim Museum contributed to the city’s attractive for tourists, including extensive urban redevelopment

of former industrial areas, economic diversification, and a decline in ETA-related violence (Keating & De Frantz, 2003; Gómez & González, 2001). Or, as Hassink et al. (2025) frame it, “the megaproject of the museum and its surrounding area [...] became the symbol of urban change but, arguably, it was not its cause” (p. 257). In contrast, during the opening of the Elbphilharmonie, Hamburg did not experience similar large scale idiosyncratic contextual factors (for a discussion, see Section 5), making it more feasible to accurately estimate the isolated causal effects of exceptional architecture on tourism.

## 4 Data and Method

### The synthetic control method

In this paper, we use the synthetic control method (Abadie, 2021) to assess the touristic impact of the Elbphilharmonie. The synthetic control method aims to answer the question of whether a discrete intervention (here, the building of the Elbphilharmonie) had a causal effect on some quantity of interest (here, overnight stays), i.e., whether there was an increase (or decrease) in the quantity of interest which would not have occurred without the intervention. In pursuit of this goal, the method follows a comparative case study design which contrasts the unit for which the intervention occurred (Hamburg) with a set of comparable units where the intervention did not occur (other cities). More specifically, the synthetic control method proceeds by constructing a weighted average of contrast cases representing a ‘synthetic’ version of the intervention unit, which can be used to assess counterfactual scenarios. Weights are determined in a way as to maximize the pre-intervention similarity of the synthetic and the real unit in terms of the quantity of interest. Similarity is determined based on a set of predictors, which themselves have associated importance weights also subject to optimization. Given sufficient pre-intervention similarity (taken to indicate that the behaviour of the quantity of interest is well-approximated by the weighted average of the control units), post-intervention deviations between the synthetic and the real case are then interpreted as a consequence of the intervention.

An important assumption is the absence of other idiosyncratic shocks that could lead to a deviation



Figure 1: (a) Elbphilharmonie Hamburg with its wave-shaped glass façade ©T.Rätzke (b) View over the Speicherstadt ©T.Rätzke (c) Architecture and construction details ©Herzog&de Meuron (d) Brick corpus of the cocoa warehouse in 1967 ©Zoch. Source: (Elbphilharmonie & Laeiszhalle, 2024).

of the treated unit in terms of the outcome of interest. While there was a considerable shock to tourism throughout the observation period in the form of the COVID-19 pandemic, this was not idiosyncratic: The pandemic lead to almost universal travel restrictions which in turn led to an almost universal and dramatic decline in visitor numbers (as can be seen in Figure 2). Nevertheless, the pandemic led to considerable variability, which can make the identification of a clear signal more difficult. Accordingly, it is important to check the robustness of the causal interpretation of a treated-control divergence, which can be achieved through two different kinds of placebo tests: First, placebos can be constructed by assigning the intervention to other units than the one for which it occurred. Second, instead of switching the unit, the analysis can be rerun with intervention shifted to different points in time. If these analyses yield similarly large post-intervention differences, results are likely to represent noise and should be interpreted with care. If these simulations yield similarly large effects as the actually treated unit, results are again deemed

not robust. All analyses were conducted with the `tidysynth` package for the R programming language (Dunford, 2025).

### Predictors and control cases

Our primary variable of interest is the number of overnight stays, observed at quarterly level from 1998 to Q2 2024. Compared to other measures of touristic activity, such as arrivals, the number of overnight stays was the most complete series, and preliminary tests indicated that arrivals did not yield substantively different findings. The latter is not surprising, as the average length of stay (overnight stays divided by arrivals) for city breaks has remained comparatively constant over time (source). As primary predictors for the identification of weights that minimize pre-intervention differences between the observed series of overnight stays and the weighted average of the control units constituting the synthetic series, we then use averages for all 5-year pre-intervention periods, separated by quarter (i.e., different averages for each quarter for each period). This specification allows

for different periodicity patterns (e.g., coastal vs. alpine tourism) to influence the selection of optimal weights. In addition, we also use 5-year periodic averages for per capita GDP as well as population size in the three years preceding the intervention as predictors. GDP per capita and population size are valuable additional predictors for constructing the synthetic Hamburg as they capture the key economic and demographic fundamentals that influence tourism demand and ensure the control units reflect similar structural conditions prior to the intervention. For the candidate pool of control cases we selected 18 German cities, including Berlin, Munich, and Cologne as comparatively sized candidates, as well as Rotterdam, Amsterdam, Copenhagen, and Helsinki. The former capture national touristic trends, as well as Germany-specific policy responses to the pandemic. The latter were included to allow for tourism dynamics specific to the hanseatic cities of the North Sea and Baltic Sea coastal areas. Inclusion of further cities or removal of the included smaller German cities did not lead to significant differences in the findings, supporting the selection reported here.

### Data sources

The data for German cities were obtained from two primary sources. Initial data were drawn from the online portals of the respective federal state statistical offices, where certain information is available in digital formats. Because the data available from the public interfaces were incomplete, we supplemented this initial effort with archival data obtained through a cross-regional request to the federal statistical offices. This request was managed by the Bavarian State Office for Statistics, which coordinated with the other statistics offices to consolidate a comprehensive dataset. For Munich and Nuremberg, pre 2005 data was only available on a yearly basis. For these cases, we interpolated quarterly data by using the post 2005 share for each quarter (which was checked to be sufficiently stable over time) and then distributing the available yearly data accordingly. Data for cities outside Germany were collected directly from the online platforms of the respective national statistical offices (Statistics Netherlands, Statistics Denmark, and Statistics Finland). Data on GDP and population were obtained from Eurostat for the corresponding NUTS3 region.

## 5 Results and discussion

### Tourism development in Hamburg

Hamburg has experienced a steady increase in tourism over the past 30 years, mirroring trends observed in other major German and Northern European cities. Figure 2 shows the quarterly number of overnight stays for Hamburg and the 22 other sampled cities, revealing a growth trajectory that aligns closely with cities such as Munich or Amsterdam. From 1998 to 2024, overnight stays in Hamburg more than tripled, rising from approximately 4.5 million to nearly 16 million. Among the highlighted cities, Berlin stands out with the steepest increase, particularly from the early to mid-2000s. This growth can be attributed to Berlin's evolving role as the capital of reunified Germany, its emergence as a global cultural and political hub, and a surge in international conferences, exhibitions, and events. Munich also exhibits strong growth, supported by its prominence in the business travel sector and large-scale cultural events. Amsterdam shows consistent increases in demand, though this has been more recently tempered by regulatory constraints. The city's 'Tourism in Balance' policy, introduced in 2021, caps annual tourist hotel overnight stays at 20 million in response to concerns over overtourism and resident wellbeing (City of Amsterdam, 2025). In contrast, Hamburg has traditionally lacked the same scale of recurring mega-events or administrative centrality. While it today has a strong tourism base and a vibrant cultural sector, its international profile has historically been more modest. A notable moment in the data is the dip around 2001 across several cities, particularly Berlin, Amsterdam, and Munich. This downturn likely reflects the global travel shock triggered by the 9/11 terrorist attacks, which disproportionately affected internationally exposed destinations. Hamburg, whose tourism at the time was more domestically oriented, appears less impacted by the immediate fallout. Despite Hamburg's steady long-term growth, these descriptive trends alone are insufficient to isolate the effect of a single intervention such as the construction of the Elbphilharmonie. To more precisely evaluate its impact, we turn to the synthetic control method in the following section.

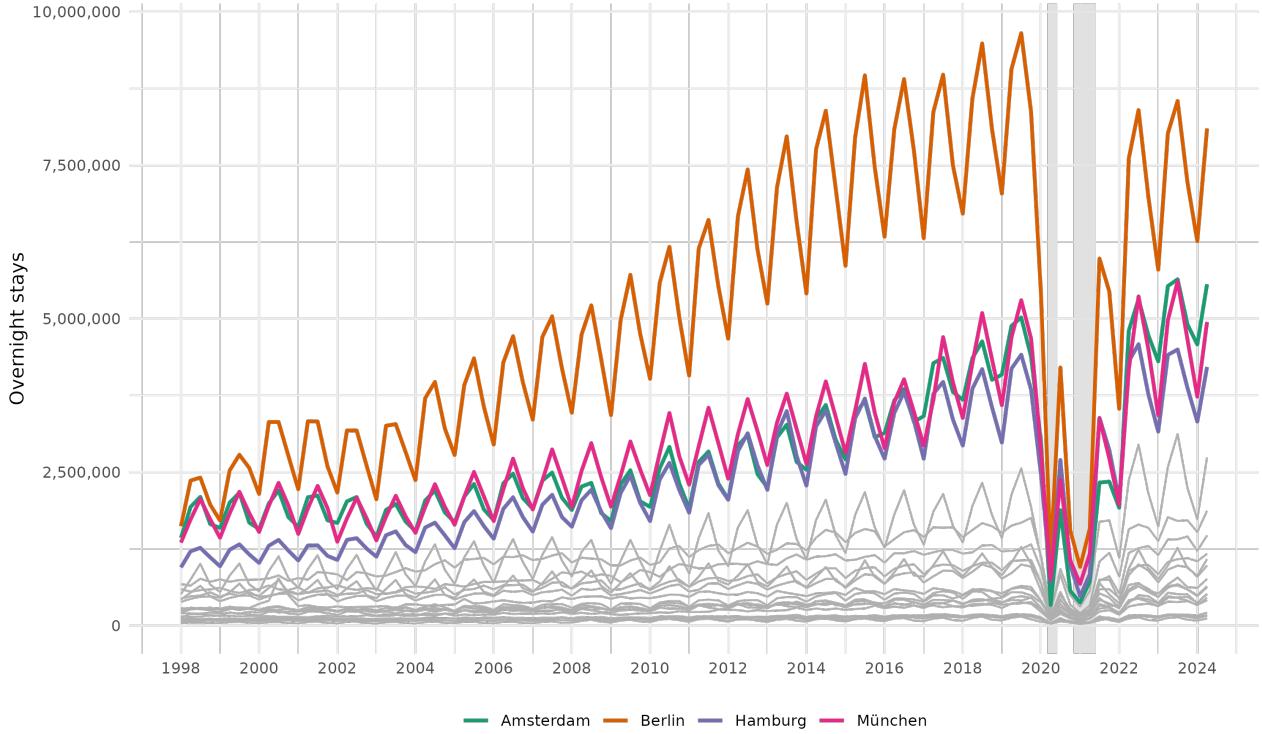


Figure 2: Quarterly number of overnight stays for Hamburg and the 22 sampled control cases. Hamburg and selected comparable cities are highlighted. The grey shaded areas mark major pandemic-related lockdowns from March to May 2020 and from late 2020 to May 2021.

Table 1: Pre-intervention comparison of selected predictors

Variable	Hamburg	Synthetic Hamburg	Control cases
Overn. stays 2007-2011 Q1	1,654,918	1,659,182	681,325
Overn. stays 2007-2011 Q2	2,234,093	2,226,265	864,132
Overn. stays 2007-2011 Q3	2,444,491	2,428,994	960,991
Overn. stays 2007-2011 Q4	2,025,721	2,086,033	836,028
GDP 2005-2009	53,460	53,403	44,821
POP 2014-2016	1,765,514	1,539,810	849,368

Note: All values are averages over the indicated period. Synthetic Hamburg is the weighted average of control cases using the optimized weights, while the control cases column reports the simple average.

## The Elbphilharmonie effect

The synthetic control method estimates a surplus of 13 million overnight stays in the 7.5 years between the opening of the Elbphilharmonie in January 2017 and the end of the observation period in Q2 2024, compared to the counterfactual Hamburg without Elbphilharmonie. Figure 3 shows the quarterly series of overnight stays for Hamburg and its ‘synthetic twin’ (a) and the difference between the two (b). Despite the volatility due to the COVID-19 pandemic, there is a clearly visible divergence in the period following the intervention, with larger than

expected numbers of overnight stays especially in the period after the end of the pandemic. The difference peaks in Q2 2022, where an extra 1,039,103 overnight stays are recorded. Vice-versa, troughs of the difference plot align with pandemic-induced lockdowns in Germany (as indicated by the shaded areas in Figure 3) and are followed by peaks. This might be an indication of the Elbphilharmonie – still being relatively recent at the time of the pandemic – contributing to Hamburg attracting ‘revenge tourism’, i.e., tourism driven by a disproportionate willingness to travel after the lockdown

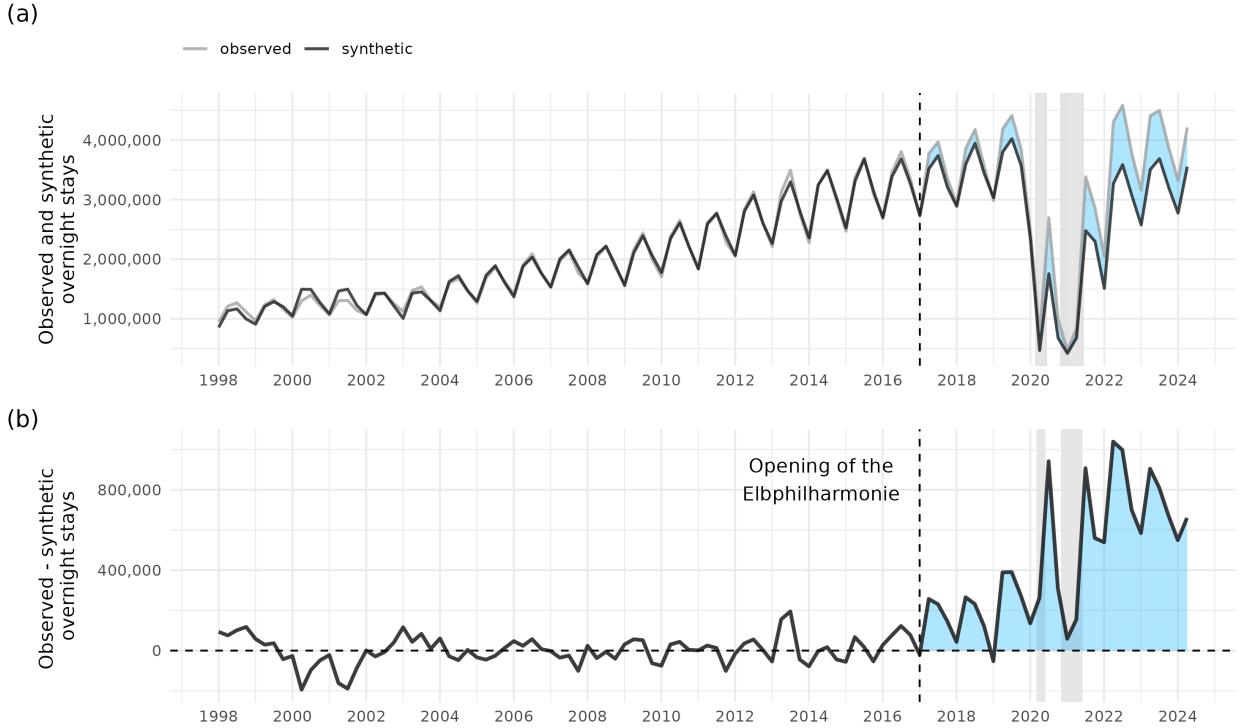


Figure 3: (a) Synthetic and observed series of overnight stays, (b) difference between synthetic and observed series. Blue shaded areas highlight the post-treatment different between the synthetic and observed series. The grey shaded areas mark major pandemic-related lockdowns from March to May 2020 and from late 2020 to May 2021.

(Vogler, 2022). Whether recent landmarks and the visibility they create systematically interact with such rebound effects is however speculative at best and beyond the scope of this study.

The synthetic control method is only meaningful if a sufficiently good pre-intervention match between the synthetic and the observed outcome series can be achieved. In addition to visual guidance to this effect provided in Figure 3, Table 1 provides numerical comparisons between the observed and synthetic units and the donor pool average for overnight stays (2007 to 2011 period), as well as GDP and population statistics. While the donor pool average is far below Hamburg in both the outcome variable (overnight stays) as well as the additional predictors (per-capita GDP and population), the weighted average of the synthetic unit comes quite close, with an error of less than 1% for most predictors, except for overnight stays in 1998-2001 (<5%) and population (12.8%). Regarding the composition of the estimate, the optimization procedure allocates most of the weight to five cities: Berlin (0.35), Bonn (0.35), Düsseldorf (0.22), Cologne (0.06), and Amsterdam (0.03). While the large weight for Berlin seems plausible given the

surface-level similarities in size, economy, and geography, the equally large weight for Bonn is more difficult to explain. This is a known limitation of the synthetic control method - the optimal weights are not always easily interpreted (Abadie, 2021). Similarly, variable importance weights are available for inspection but somewhat difficult to assess: The most important predictor (0.20) is the number of overnight stays in Q4 over the period 2002 to 2006. Overall, it seems that Q4 is more relevant than the other quarters for identifying a good match for Hamburg's pre-intervention tourism dynamics. GDP and size are less important, with GDP in the 2005 to 2009 period as the highest-weight non-overnight-stays predictor in position six. A more accessible metric is the ratio of post-intervention to pre intervention mean squared predictive error (MSPE, Figure 4), which indicates how much better the synthetic series matches the observed series before vs. after the intervention. Given a significant effect of the intervention, this should be large for the treated unit but not for the control units. This is indeed the case for Hamburg, with a post-intervention error that is more than 60 times higher than before the intervention, clearly indicating a change-

point in the tourism dynamics around the opening of the Elbphilharmonie.

### Robustness checks via placebo trials

While the synthetic control research design is not amenable to classical statistical hypothesis tests, the robustness of the results can nevertheless be assessed by conducting ‘placebo trials’.

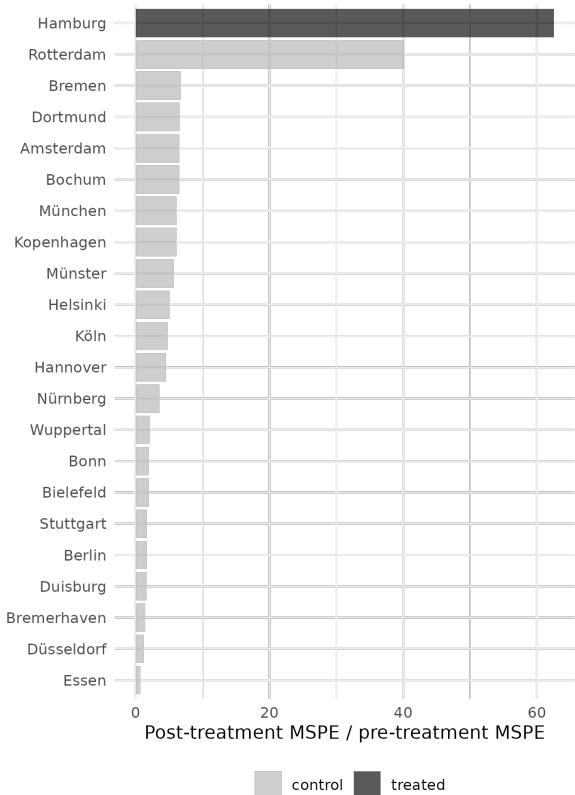


Figure 4: Ratio of mean squared predictive error (MSPE) before and after the intervention for the treated and the control units.

This is arguably especially important in a case like the one discussed here, where a global shock in the form of the covid pandemic introduces uncertainty into the studied system. We accordingly conduct two kinds of placebo trials: First, a unit-switching placebo trial which implies running the synthetic control method for units that did not receive the intervention (Abadie et al., 2015). And second, a backdating placebo trial, pretending that the intervention took place at an earlier point in time than the actual intervention (Abadie, 2021). If effects similar in size to the one identified by running the synthetic control method for the correct unit at the correct time can be obtained by placebo trials, the result is deemed not robust. Figure 5 (a) shows

the results of the unit-switching placebo trial with the analysis repeated for all control units in the donor pool. While there is a significant amount of variation for the control unit trials, none of them match the same effect magnitude as the one identified for Hamburg. The closest control is Rotterdam, which is the only control unit with a considerably elevated ratio of post-intervention to pre-intervention MSPE (Figure 4). This might be an indication of Rotterdam having received its own ‘intervention’ during the same period in the form of considerable efforts to increase its touristic appeal (SOURCE). However, the difference series for Rotterdam shows considerable fluctuation even after the end of the covid pandemic and its characteristics should probably not be overstated. The backdating robustness check also gives no indication that a similar effect to the one obtained for the actual intervention can be recovered from a temporal placebo. Figure 5 (b) shows the result of running the synthetic control procedure with the intervention advanced from 2017 to 2010: The synthetic series does not significantly diverge from the observed series between the placebo intervention and the actual intervention, but does still recover the divergence observed after the opening of the Elbphilharmonie in 2017. Together, these results make us confident that the observed divergence is not purely a result of noise. However, this does not mean that the result is not noisy; there is still a significant amount of variation which likely renders the estimate of the actual effect rather imprecise and accordingly care should be taken in its interpretation.

A final potential source of confounding is the designation of the *Speicherstadt*, in which Elbphilharmonie is located, as world heritage in 2015. This carries the risk of misattribution of a potential world heritage effect on overnight stays to the Elbphilharmonie. Since this is also an idiosyncratic shock to the treated unit and occurred at a similar time, such misattribution would not be caught by the synthetic control method. Accordingly, we rely on Google search trend data (Google Trends, 2025) to assess the degree to which world heritage might have had an impact on tourism similar to the one of the Elbphilharmonie. Figure 6 shows the search index for the two terms ‘Elbphilharmonie’ and ‘Speicherstadt’ and shows a clear difference in visibility:

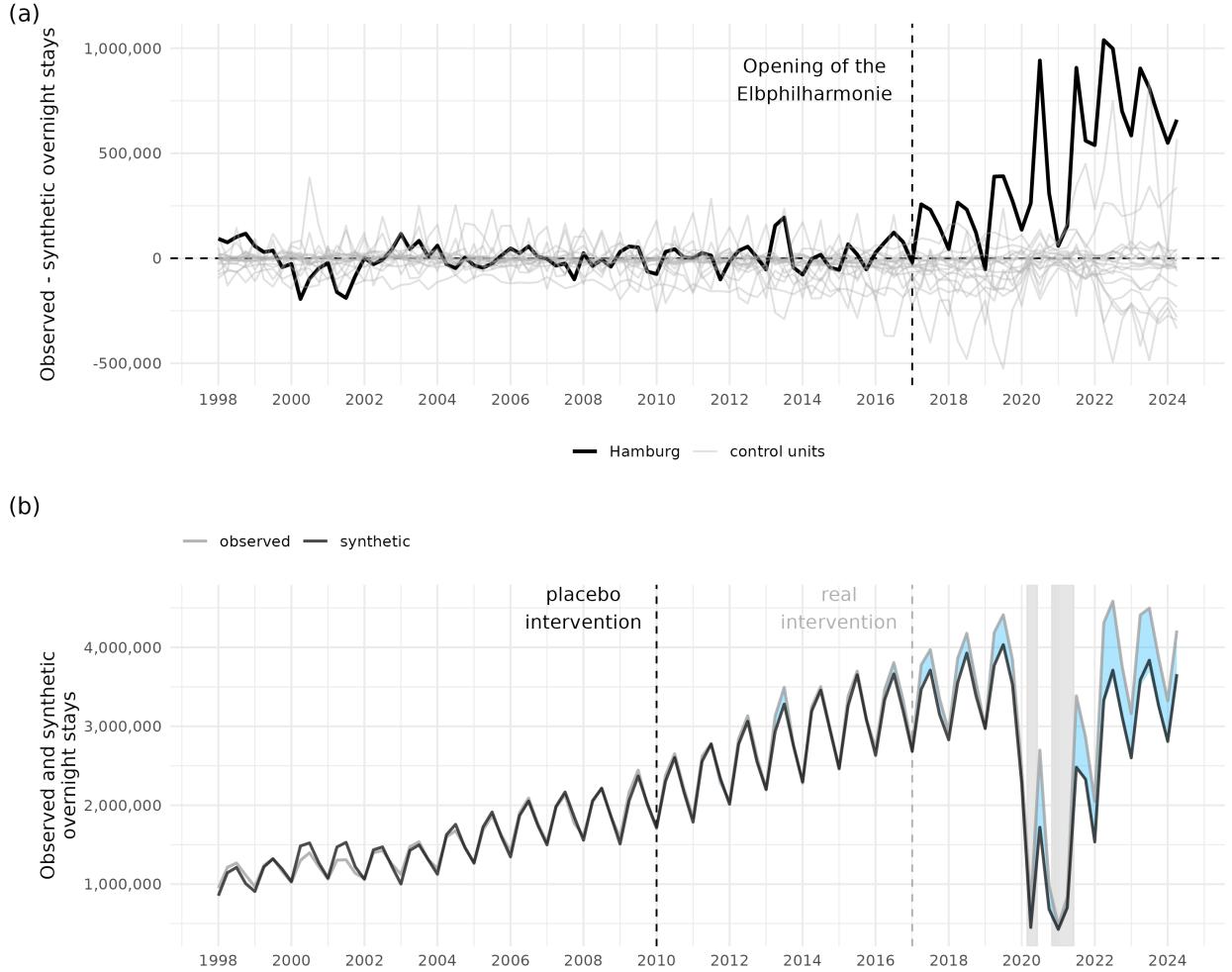


Figure 5: (a) Difference between observed and synthetic overnight stays for Hamburg (black line) and placebo test with control units (grey lines). (b) Synthetic and observed series with the intervention predated to 2010.

While there is a notable spike around the opening of the Elbphilharmonie, there is only a minuscule reaction in search behaviour around the time of the world heritage nomination. Because Google Trends has been shown to be a reasonable tool to approximate destination interest or to forecast tourism demand and evaluate the impact of major events (Dinis et al., 2019; Önder, 2017; Botha & Saayman, 2024), we are quite confident that the possibility of misattribution error does not dominate our findings.

## 6 Conclusion

This study examines the causal impact of exceptional architecture on urban tourism by analyzing the inauguration of the Elbphilharmonie in Hamburg. By applying the synthetic control method, we provide evidence that the building generated an estimated 13 million additional overnight stays in

the seven and a half years following its opening in 2017. Our use of the synthetic control method addresses ongoing concerns in tourism studies regarding methodological rigor (Zopiatis et al., 2021). By constructing a data-driven counterfactual using a weighted combination of control cities, we present a replicable framework that enhances causal inference and can be adapted to evaluate other place-based interventions across different regions and time periods. We further provide empirical clarity in a field often characterized by mixed findings and case-specific contingencies. Our results offer evidence that a single, exceptional architectural intervention can have measurable and lasting effects on local tourism flows, independent of confounding regional developments. More broadly, our findings are situated within a growing body of research on urban megaprojects, as such projects have become major drivers of economic development in both

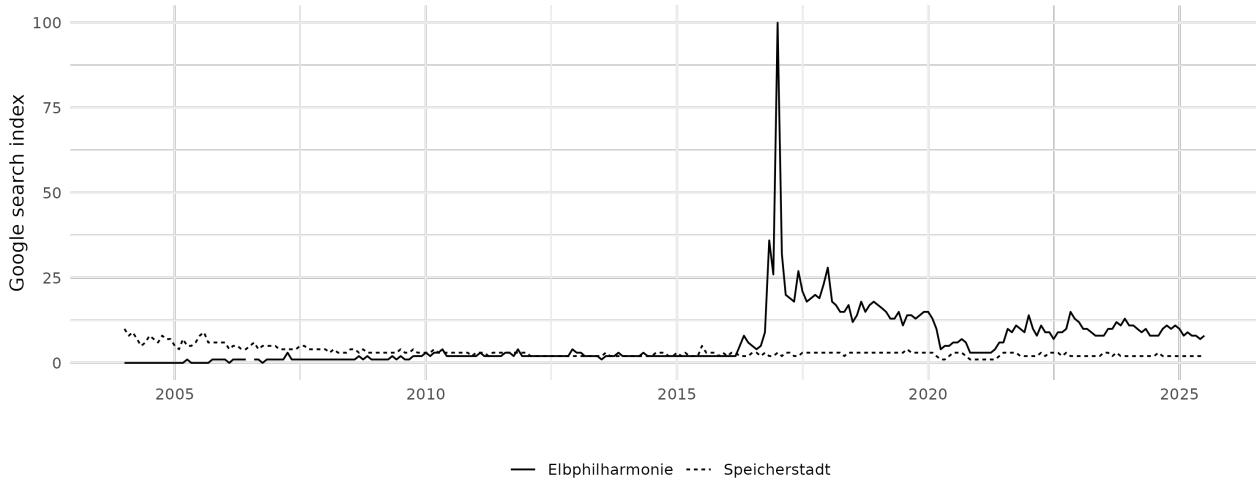


Figure 6: Google trends for search terms ‘Elbphilharmonie’ and ‘Speicherstadt’. Data retrieved from Google Trends (2025).

industrialized and emerging economies (Hassink et al., 2025, p. 255). While some scholars caution that the tourism impact of star architecture may be fleeting (Alaily-Mattar 2020), the Elbphilharmonie seems to defy this trend, demonstrating persistent effects nearly eight years after its opening.

However, there are also critical voices, as such projects can reflect and reinforce power structures, serving the symbolic and material interests of dominant actors. They may be used to legitimize neoliberal agendas and promote post-political forms of urban governance, where the spectacle of innovation conceals the exclusionary and commercial logics underlying development (Sklair, 2006; Balke et al., 2018; Häusler & Häusler, 2024). Future research can incorporate our findings and extend them beyond economic metrics and explore the broader cultural and institutional implications of exceptional architecture. Recent work suggests that such buildings may serve as ‘field-configuring places’ (Capron & Delacour, 2024), or function as sites of innovation and institutional change (Dreher & Thiel, 2022; Lawrence & Dover, 2015).

## References

- Abadie A (2021) Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects. *Journal of Economic Literature* 59(2), 391–425.
- Abadie A, Diamond A, Hainmueller J (2015) Comparative Politics and the Synthetic Control Method. *American Journal of Political Science* 59(2), 495–510.
- Abadie A, Gardeazabal J (2003) The Economic Costs of Conflict: A Case Study of the Basque Country. *The American Economic Review* 93(1), 113–132.
- Abbas J, Mamirkulova G, Al-Sulaiti I, Al-Sulaiti KI, Dar IB (2024) Mega-Infrastructure Development, Tourism Sustainability and Quality of Life Assessment at World Heritage Sites: Catering to COVID-19 Challenges. *Kybernetes* 54(4), 1993–2018.
- Alaily-Mattar N, Akhavan M, Hein C (2021) Marking a New Chapter in the History of Our City. Newspaper Narratives of Proposed Waterfront Star Architecture. *European Journal of Creative Practices in Cities and Landscapes* 4(1), 95–112.
- Alaily-Mattar Nadia, Bartmanski, et al. (2018) Situating Architectural Performance: 'Star Architecture' and Its Roles in Repositioning the Cities of Graz, Lucerne and Wolfsburg. *European Planning Studies* 26(9), 1874–1900.
- Alaily-Mattar Nadia, Dreher, et al. (2018) Repositioning Cities through Star Architecture: How Does It Work?. *Journal of Urban Design* 23(2), 169–192.
- Alaily-Mattar N, Lindsay G, Thierstein A (2022) Star Architecture and Urban Transformation:

- Introduction to the Special Issue. *European Planning Studies* 30(1), 1–12.
- Alaily-Mattar N, Thierstein A (2018) Urban Transformations through Exceptional Architecture: Introduction to the Special Issue. *Journal of Urban Design* 23(2), 165–168.
- Albalate D, Campos J, Jiménez JL (2023) Local Tourism Effects of HSR in Small Cities: Three Synthetic Control Case Studies. *Current Issues in Tourism* 26(14), 2301–2316.
- Andersson I (2014) Beyond "Guggenheim": From Flagship Buildings to Flagship Space in Sweden. *Norwegian Journal of Geography* 68(4), 228–237.
- Antonaglia F, De Simone E, Dorato L, Gaeta GL, Pinto M (2024) The Effect of Natural Disasters on Inbound Tourism: Synthetic Control Evidence from Italy. *Journal of Regional Science* 65(2), 429–445.
- Balke J, Reuber P, Wood G (2018) Iconic Architecture and Place-Specific Neoliberal Governmentality: Insights from Hamburg's Elbe Philharmonic Hall. *Urban Studies* 55(5), 997–1012.
- Boniface BG, Cooper R, Cooper CP (2021) *World-wide Destinations: The Geography of Travel and Tourism*, London: Routledge.
- Botha I, Saayman A (2024) Does Google Analytics Improve the Prediction of Tourism Demand Recovery?. *Forecasting* 6(4), 908–924.
- Brandano MG, Crociata A (2023) Cohesion Policy, Tourism and Culture in Italy: A Regional Policy Evaluation. *Regional Studies* 57(4), 763–779.
- Capron E, Delacour H (2024) Field-Configuring Places: Unpacking the Role of Place in Field Evolution. *Organization Studies* 45(11), 1669–1696.
- City of Amsterdam (2025) *Uitvoeringsprogramma Bezoekerseconomie 2025*, Amsterdam.
- DiMaggio P (1997) Culture and Cognition. *Annual Review of Sociology* 23(1), 263–287.
- Dinis G, Breda Z, Costa C, Pacheco O (2019) Google Trends in Tourism and Hospitality Research: A Systematic Literature Review. *Journal of Hospitality and Tourism Technology* 10(4), 747–763.
- Doerr L, Dorn F, Gaebler S, Potrafke N (2020) How New Airport Infrastructure Promotes Tourism: Evidence from a Synthetic Control Approach in German Regions. *Regional Studies* 54(10), 1402–1412.
- DPA (2024) Mehr Als 20 Millionen Besucher Auf Plaza Der Elbphilharmonie. *Sueddeutsche Zeitung*.
- Dreher J, Alaily-Mattar N, Thierstein A (2023) Star Architecture Projects and Their Effects: Tracing the Evidence. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 16(1), 65–83.
- Dreher J, Alaily-Mattar N, Thierstein A (2020) Star Architecture Projects. The Assessment of Spatial Economic Effects by Means of a Spatial Incidence Analysis. *Raumforschung und Raumordnung / Spatial Research and Planning* 78(5), 439–453.
- Dreher J, Thiel J (2022) Star Architecture Projects and the Geographies of Innovation across the Construction Supply Chain: The Case of the Elbphilharmonie. *European Planning Studies* 30(1), 105–120.
- Dunford E (2025) Tidysynth: A Tidy Implementation of the Synthetic Control Method.
- Elbphilharmonie & Laeiszhalde (2024) Press Kit: Elbphilharmonie Hamburg.
- De Frantz M (2018) Tourism Marketing and Urban Politics: Cultural Planning in a European Capital. *Tourism Geographies* 20(3), 481–503.
- Gelman A, Imbens G (2013) *Why Ask Why? Forward Causal Inference and Reverse Causal Questions*, Cambridge.
- Ghalejough AP, Abbasi SA, Haghparast F, Gharehbagni M (2024) Star Architecture in Online Public Discourse: Exploring Reddit User-Generated Content on the Vessel, New York, through a Text Analytics Approach. *Archnet-IJAR: International Journal of Architectural Research*.

- Google Trends (2025) Global Search Interest in "Elbphilharmonie" and "Speicherstadt" since 2014.
- Gómez MV, González S (2001) A Reply to Beatriz Plaza's 'The Guggenheim-Bilbao Museum Effect'. *International Journal of Urban and Regional Research* 25(4), 898–900.
- Gössling S, Schweiggart N (2022) Two Years of COVID-19 and Tourism: What We Learned, and What We Should Have Learned. *Journal of Sustainable Tourism* 30(4), 915–931.
- Hassink R, Kogler DF, Ponzini D, Ren X (2025) The Symbolic Value of Megaprojects in Urban and Regional Development. *Cambridge Journal of Regions, Economy and Society* 18, 255–263.
- Heidenreich M, Plaza B (2015) Renewal through Culture? The Role of Museums in the Renewal of Industrial Regions in Europe. *European Planning Studies* 23(8), 1441–1455.
- Heuer T, Runde J (2022) The Elbphilharmonie and the Hamburg Effect: On the Social Positioning, Identities and System Functions of a Building and a City. *European Planning Studies* 30(1), 85–104.
- Hiller HH (1998) Assessing the Impact of Mega-Events: A Linkage Model. *Current Issues in Tourism* 1(1), 47–57.
- Hofmeister S (ed) (2021) *Herzog & de Meuron: Architektur Und Baudetails / Architecture and Construction Details*, München: Edition Detail.
- Holz L, Alatur M, Schulz TR, Verheyen D (2023) *Elbphilharmonie Und Laeiszhalle Hamburg Jahresbericht 2022/2023*, Hamburg.
- Holz L, Schulz TR, Verheyen D (2024) *Elbphilharmonie Und Laeiszhalle Hamburg Jahresbericht 2023/2024*, Hamburg.
- Häusler E, Häusler J (2024) *How Cities Become Brands: Developing City Brands Purposefully and Thoughtfully*, Wiesbaden: Springer.
- Just M (2022) *Kultur- & Tourismusstrategie Für Hamburg*, Hamburg.
- Keating M, De Frantz M (2003) Culture-Led Strategies for Urban Regeneration: A Comparative Perspective on Bilbao.. *International Journal of Iberian Studies* 16(3), 187–194.
- Kim H, Lee J (2023) Natural Disasters, Risk and Migration: Evidence from the 2017 Pohang Earthquake in Korea. *Journal of Economic Geography* 23(5), 1017–1035.
- Lawrence TB, Dover G (2015) Place and Institutional Work: Creating Housing for the Hard-to-House. *Administrative Science Quarterly* 60(3), 371–410.
- McKercher B, Tkaczynski A (2024) The Reticent Tourist in a COVID-adapted World. *Tourism Management* 2024(103), 104885.
- Meenakshi N, Dhir A, Mahto RV, Nicolau JL, Kaur P (2024) Travelers' Coping Strategies in the Backdrop of Revenge Tourism. *Journal of Travel Research* 63(6), 1473–1489.
- Plaza B (2000) Evaluating the Influence of a Large Cultural Artifact in the Attraction of Tourism: The Guggenheim Museum Bilbao Case. *Urban Affairs Review* 36(2), 264–274.
- Plaza B (2006) The Return on Investment of the Guggenheim Museum Bilbao. *International Journal of Urban and Regional Research* 30(2), 452–467.
- Plaza B, Esteban M, Aranburu I, Johny J (2024) Iconic Architecture as a Catalyst for Wine Tourism: A Case Study of Marqués de Riscal. *European Countryside* 16(1), 168–182.
- Plaza B, Tironi M, Haarich SN (2009) Bilbao's Art Scene and the "Guggenheim Effect" Revisited. *European Planning Studies* 17(11), 1711–1729.
- Plzáková L, Smeral E (2022) Impact of the COVID-19 Crisis on European Tourism. *Tourism Economics* 28(1), 91–109.
- Ponzini D, Alaily-Mattar N, Thierstein A (2020) Introduction: Star Architecture in and across Cities in Europe, *About Star Architecture*, 1–19.
- Romão J (2025) *Economic Geography of Tourism*, Cham: Springer.

Scerri M, Edwards D, Foley C (2019) Design, Architecture and the Value to Tourism. *Tourism Economics* 25(5), 695–710.

Sklair L (2006) Iconic Architecture and Capitalist Globalization. *City* 10(1), 21–47.

Sklair L (2017) Iconic Architecture and the Rise of Globalizing Cities. *Brown Journal of World Affairs* 23(2), 127–137.

Specht J (2014) *Architectural Tourism: Building for Urban Travel Destinations*, Wiesbaden: Springer Fachmedien Wiesbaden.

Tkalec M, Zilic I, Recher V (2017) The Effect of Film Industry on Tourism: Game of Thrones and Dubrovnik. *International Journal of Tourism Research* 19(6), 705–714.

Vogler R (2022) Revenge and Catch-up Travel or Degrowth? Debating Tourism Post COVID-19. *Annals of Tourism Research* 2022(93), 103272.

Voltes-Dorta A, Jiménez JL, Suárez-Alemán A (2016) The Impact of ETA's Dissolution on Domestic Tourism in Spain. *Defence and Peace Economics* 27(6), 854–870.

World Tourism Organization (ed) (2021) *International Tourism Highlights, 2020 Edition*, Madrid: World Tourism Organization (UNWTO).

World Tourism Organization (ed) (2023) *International Tourism Highlights, 2023 Edition*, Madrid: World Tourism Organization (UNWTO).

Zenker S, Beckmann SC (2013) Measuring Brand Image Effects of Flagship Projects for Place Brands: The Case of Hamburg. *Journal of Brand Management* 20(8), 642–655.

Zopiatis A, Pericleous K, Theofanous Y (2021) COVID-19 and Hospitality and Tourism Research: An Integrative Review. *Journal of Hospitality and Tourism Management* 2021(48), 275–279.

Önder I (2017) Forecasting Tourism Demand with Google Trends: Accuracy Comparison of Countries versus Cities. *International Journal of Tourism Research* 19(6), 648–660.