WINTER IS COMING! OR NOT? THE EFFECT OF FILM INDUSTRY ON TOURISM *

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Abstract

Nowadays it seems there is competition in attracting film producers to screen their productions in specific locations, but at the same time, there is also a lack of data-driven academic research that measures the effects of film industry on local tourism. This study evaluates the effects of film industry on tourism outcomes in one of the most popular tourist destinations in Europe and in the World—Dubrovnik, Croatia. Using the synthetic control methodology developed by Abadie & Gardeazabal (2003), we estimate the effect of a highly broadcasted TV series, *Game of Thrones*, on tourist arrivals. We find a robust and positive effect of filming the *Game of Thrones* TV series in Dubrovnik on the number of tourist arrivals. Additionally, we show that there are possibly large positive spillover effects on other Croatian counties and the whole country. Using placebo tests, we show that the estimated effects are relatively large when compared to other Croatian counties implying our results are not driven simply by chance.

Keywords: Dubrovnik, film tourism, *Game of Thrones* (GoT), synthetic control.

JEL codes: C32, L83, Z3.

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1 Introduction

With the surge of new technologies as an important communication medium, product placement of various goods and services has been dramatically redefined. One aspect where product placement can be especially effective is the nexus between film industry and tourism. Indeed, filming locations, serving as a background and locale for interesting and exciting events and stories, are hence sublimely promoted. This notion is not new as various local authorities acknowledge this type of location placement and do try to attract film producers into their region (O'Connor *et al.*, 2011; Hudson & Ritchie, 2006b). With the recent revival of interest for TV shows[1], the potential of location placement of touristic sites has only grown. High-quality TV shows are massively popular, their area of influence surpasses the TV medium and spills over to other mass communication media, notably social networks; and their longer run time and periodic broadcast time can give longer and repeated exposure to a particular locale. Therefore, having a TV series filmed in ones region or city can improve its tourism and economic performance.

While this fact has been recognized by local administrations, the academic interest, although increasing, has been limited so far. Tooke & Baker (1996) were one of the first to investigate the potential impact of TV movies on people's excursion destination choices. As they state, until then, most information about the impacts of film focused on the money spent in communities by production companies while other effects attracted less attention. They find increased visitation rates in places where BBC TV shows were filmed. Riley *et al.* (1998) gather the data for 12 US locations where movies were filmed and find support for anecdotal evidence for movie-induced tourism. Furthermore, they find that visitation kept increasing for at least four years after movies were released. Kim & Richardson (2003) find that movies significantly affect destination image components and interest in visitation. Busby & Klug (2001) use the area from the *Notting Hill* movie as a location for their research. Although they do not find the effect of the movie on Notting Hill visitation, surveyed respondents would all consider traveling to film locations in the future. They also establish that every tourist is motivated by different factors to visit locations which have been featured on TV or in the cinema. Hudson & Ritchie (2006a) study examines tourism impacts of *Captain Corelli's Mandolin*, which was filmed on the island of Cephalonia in Greece and concludes that the film has had a strong impact on travel decisions. Croy (2010) explores the case of New Zealand as the filming location for *The Lord of the Rings* and explains how films are used in creating a

[1]For example, the number of Netflix subscribers increased almost four times in the last five years (from 23 million in the third quarter of 2011 to almost 87 million in the same quarter of 2016).

destination image strategy. Finally, Kim (2012) shows that the filming of the TV drama *Jewel in the Palace* increased the likelihood of visiting the screening location in South Korea. While these studies do explain the nexus between the filming industry and tourism, they do not establish the causal link between major TV series/movie success and tourist visitation.

In this paper, we estimate the causal effect of filming the *Game of Thrones* (GoT) TV series on tourist performance of Dubrovnik, Croatia. *Game of Thrones* is a massively popular fantasy TV show based on George R. R. Martin's saga *A Song of Ice and Fire*, that has been airing for six seasons, where each season consists of ten 60-minute episodes. Dubrovnik, one of the Mediterranean gems, has been a TV set for King's Landing, an important place in saga's narrative. Given the saga's quasi-medieval context, Dubrovnik's touristic highlights, the City Walls and the well-preserved historical center, have been displayed numerous times on the show. While there is plenty anecdotal evidence that *Game of Thrones* have actually benefited tourism in Dubrovnik, there has not been an attempt to establish a causal link in a rigorous and sound fashion.

To do so, we use the synthetic control approach developed in Abadie & Gardeazabal (2003). In a nutshell, using data on the remaining 20 Croatian counties, we construct a synthetic Dubrovnik county which represents the county in a scenario where *Game of Thrones* had not been filmed. The difference between the observed Dubrovnik tourist outcome and the synthetic one represents the casual effect we estimate. Results indicate that there is a robust and positive effect of *Game of Thrones* on tourism in Dubrovnik that is statistically significant. The cumulative effect in the 2012–2015 period amounted up to almost 245 thousand more tourist arrivals, one and a half million more overnight stays, and almost 126 million euro more foreign currency revenues from travels. In a series of placebo tests, we show that the effect for Dubrovnik is large relative to the estimates for other counties. There is also evidence in favor of a spillover effect that the filming of *Game of Thrones* in Dubrovnik has on other Croatian counties and the whole country.

As the literature on policy evaluation in tourism is practically nonexistent, we can say that this study contributes to the empirical literature of treatment effect analysis in tourism research. Apart from this rather technical contribution, the study provides answers on the true effectiveness of the film industry on tourism of the Dubrovnik county. While the interest of academia in the impact of the film industry on tourism is increasing, no attempt has yet been made to estimate this impact by constituting a credible counterfactual. By applying the novelty approach in this area of study—the synthetic control method, we contribute to the existing literature on the impact of film industry on tourism. This approach enables us to estimate the "what would have been" element and to infer

the causal link between films and tourism.

The rest of the paper is organized as follows. In the second section we motivate our research idea and discuss recent trends in Croatian tourism. Section three describes the data and methodology used, while in section four, we present the results and robustness checks. This is followed by a discussion of the results, while the last section concludes the paper.

2 Tourism in Croatia and *Game of Thrones*

Tourism is Croatia's most important economic sector. In 2015 more than 14 million tourists visited Croatia, which is three and a half times the size of the population. According to the last available Tourism Satellite Account (Ivandić, 2014), the direct share of tourism in GDP in 2011 amounted to 10.4 percent and it probably increased further in the years that followed. Nine percent of total employed individuals in 2011 came from the tourism sector, and when other sectors are added, the ones that are indirectly involved in tourism (such as retail trade, transportation, culture and recreation), the share of tourism in GDP is even larger, 14.3 percent of GDP in 2011. Tourism is also an important source of foreign currency necessary to finance the goods trade deficit ongoing since the Croatian independence. Foreign currency inflow, mostly generated by tourism, is indirectly responsible for 20 years of a stable exchange rate regime—a soft peg to the euro because tourism contributed greatly to the accumulation of foreign exchange reserves that are mandatory for maintaining such an exchange rate regime (Šošić & Kraft, 2006).

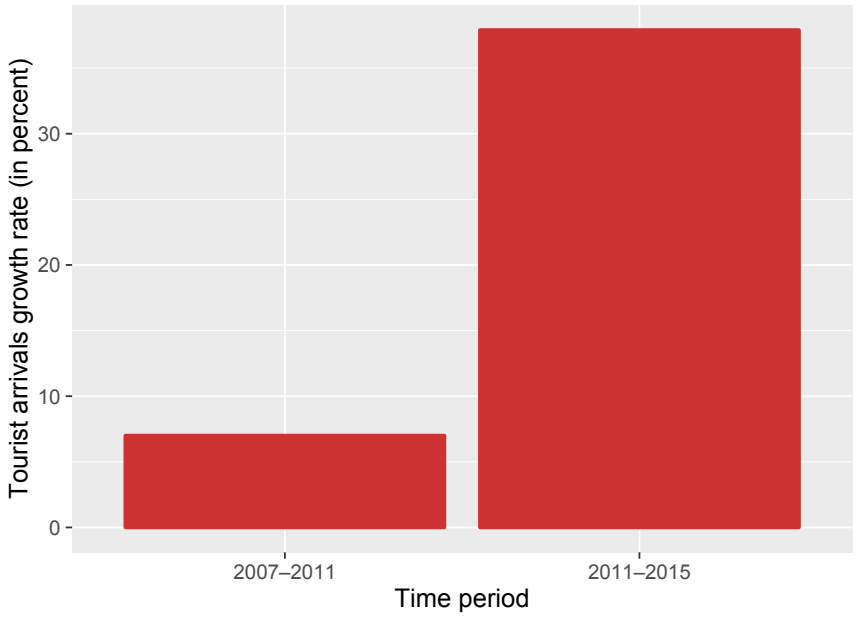
Unlike most other economic sectors in Croatia, tourism sector depicted growth in the recession years 2009–2014 as increasing foreign demand absorbed domestic tourism capacities. Tourism was therefore a stabilizing factor in the economy as it contributed positively to GDP growth and employment and it was the only sector in which investment did not decrease, whereas the rest of the economy struggled with vanishing public investment downsized mostly due to fiscal consolidation.

We focus on a major event with potential substantial impact on Croatian tourism—the effect of film industry on tourism in Dubrovnik. This is a good candidate for a treatment effect analysis, as *Game of Thrones* has been filmed in Dubrovnik and the county has been identified with the TV series unlike some other regions in Croatia, which were not "treated" with GoT and which will serve as controls.

Game of Thrones is a six-season television fantasy/adventure/drama HBO (Home Box Office) series that was released in spring 2011 and has been playing since. It has been made after a series

of fantasy novels *A Song of Ice and Fire* written by George R. R. Martin. The series gained momentum around the world and it has been setting records since its release. According to IMDb (the Internet Movie Database), the most popular online source for movie, television and celebrity information, GoT is the highest rated adventure, fantasy and drama television series ever, scoring 9.5 out of possible 10. Besides, from the release of the first season in 2011 up to the release of the sixth season in 2016, GoT was also the most "downloaded" TV series in 2012, 2013, 2014, and 2015 and it recorded 5.5, 5.9, 8.1 and 14.4 million downloads in those years (according to TorrentFreak). As of 2012 and season 2, GoT has been filmed in Dubrovnik, depicting mostly scenes from King's Landing—the capital of Seven Kingdoms. King's Landing is an important location which appears often in the series. Most of the characters are linked to this city and since it is the capital, it is a place of political plots, intrigues, and secrets. The medieval-like context of the series highlights Dubrovnik's most attractive tourist assets such as the rich and preserved historic town center. The vistas of Dubrovnik appear many times in GoT, especially the city walls, Fort Lovrijenac, island of Lokrum, and the seaside vistas. This has made a powerful impact on the viewers because King's Landing is a magnificent seaside capital and the fact that the locations belong to a real city have spurred demand for tourist visits to Dubrovnik.

Figure 1: Tourist arrivals in Dubrovnik

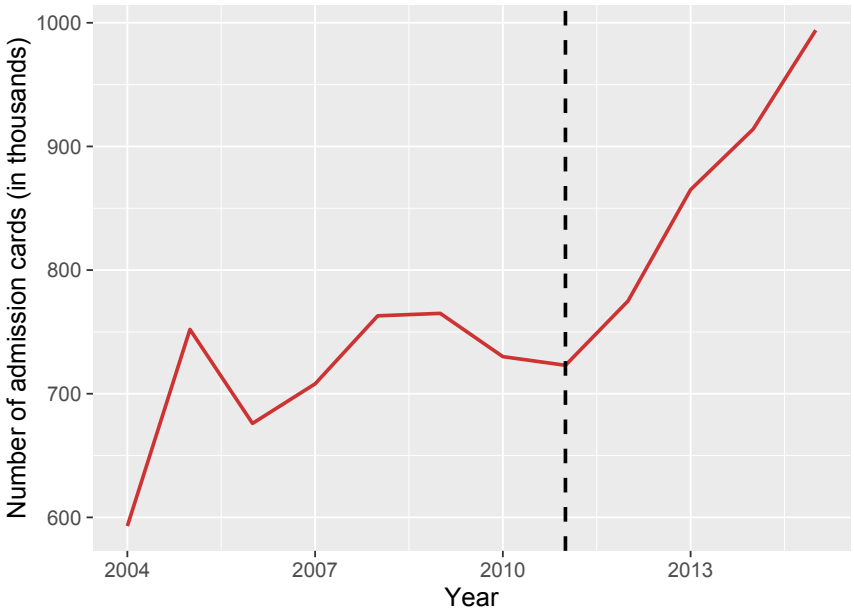


Source: Croatian Bureau of Statistics.

In support of this, Croatian national statistics reports that tourist arrivals to the Dubrovnik county

increased by 37.9 percent in the period 2011–2015, accompanied by an increase in overnight stays by 28.5 percent. Figure 1 presents the dynamics of tourist arrivals for the Dubrovnik county in the four-year period before GoT or 2007–2011, and in the period after GoT or 2011–2015. In the pre-GoT period ,tourist arrivals increased by seven percent as opposed to 37.9 percent in the period when the elements of Dubrovnik were released. A similar pattern repeats itself with overnight tourist stays, which went up by 28.5 percent in the post-GoT period, 20.3 percentage points above the rate in the pre-GoT period.

Figure 2: Number of admission cards sold for visiting the Dubrovnik City Walls



Source: Dubrovnik City Walls.

Dubrovnik City Walls, being the most characteristic location often shown in the series, depicted very strong growth rates of sold admission cards after the release of season two. For example, in the 2007–2011 period, the number of admission cards sold increased by only 2.1 percent. In the period after the release of season two and until 2015, it depicted a remarkable increase amounting up to 37.5 percent (Figure 2).

3 Methodology and Data

Treatment effect refers to the causal effect of a given treatment, intervention, policy or program on an outcome variable of interest (Angrist & Pischke, 2008). Estimation of the causal effect builds on

the potential outcomes framework developed by Rubin (1974). There are two potential outcomes—outcome given that the item has been treated, and the outcome given that the item has not been treated. The fundamental problem of policy evaluation is that for each item, only one potential outcome is observed. In policy evaluation there is a battery of methods that estimate treatment effects by relating the unobserved potential outcome with the observed potential outcome of the control unit. The choice of these methods, Instrumental Variables (IV), Regression Discontinuity (RD), Matching, Difference in Differences (DD), depends on data availability, on the policy that is being analyzed, and on the research question (see Angrist & Pischke (2008) and Imbens & Wooldridge (2009)). Given the case-study nature of our research question, DD estimation seems suitable. This methodology relies on comparing the outcomes of interest before and after the policy change for the treated and for the control group. However, as we have only one treated unit and only a few controls (remaining 20 untreated Croatian counties), the choice of the control unit is problematic. Therefore, we turn to a data-driven construction of the control unit. In particular, we use the synthetic control approach developed by Abadie & Gardeazabal (2003). The applicability of this synthetic control method is very large, especially in case-study research, when the number of treated and control units is not very large (Abadie *et al.*, 2012; Hinrichs, 2012; Cavallo *et al.*, 2013).

The synthetic control approach essentially suggests that a combination of units (for example, regions, counties or cities) provides a better comparison for the unit exposed to the treatment than any single unit alone. A combination of units then approximates what the single unit would have experienced in the absence of the treatment. In the study of the effect of California's tobacco control program, Abadie *et al.* (2012), for example, use a combination of 38 US states to approximate the annual per capita cigarette consumption that California would have experienced in the absence of anti-tobacco legislation.

Next, we explain the methodology we use to estimate the causal effect of GoT filming on the touristic outcome of Dubrovnik—the synthetic control method developed by Abadie & Gardeazabal (2003) and Abadie *et al.* (2012).

We observe j units, where $j = 1, ..., J + 1$, for t periods, where $t = 1, ..., T_0, ..., T$. Time periods $t = 1, ..., T_0$ are pretreatment and $t = T_0 + 1, ..., T$ are post-treatment periods. Following the potential outcomes framework developed by Rubin (1974), we define potential outcomes as: Y_{it}^N, which corresponds to the outcome for the unit i in period t if the unit was not treated; and Y_{it}^I, which stands for outcome for the unit i in period t if the unit was treated. The casual parameter of

interest in time t is $\alpha_{it} = Y_{it}^I - Y_{it}^N$. Of course, the fundamental problem is that we always observe only one potential outcome, thus making it unfeasible to estimate the causal link without additional assumptions. A causal link could be inferred by comparing the treated unit with a control unit which serves as a counterfactual—what would the treated unit look like if it was not treated. In order to avoid inherent arbitrariness of choosing the control unit, Abadie & Gardeazabal (2003) and Abadie *et al.* (2012) propose a data-driven control-group selection procedure. Intuitively, a synthetic control is a weighted average of nontreated units which approximates the pretreatment treated unit in observables. In order to construct a synthetic control we need to estimate a $(J \times 1)$ vector of weights $W = (w_2, ..., w_{J+1})'$ such that $w_j \geq 0$ and $w_2 + \cdots + w_{J+1} = 1$ for $j = 2, ..., J+1$ (unit $j = 1$ is the treated one). Let U_i be a $(r \times 1)$ vector of observable covariates (usually predictors for the outcome variable) for each unit. Also define a $(T_0 \times 1)$ vector $K = (k_1, ..., k_{T_0})'$ that denotes some linear combination of pretreatment outcomes: $\bar{Y}_i^K = \sum_{s=1}^{T_0} k_s Y_{is}$ (for example, mean); we can include as many as M combinations of pretreatment outcomes as long as $M \leq T_0$. Abadie & Gardeazabal (2003) and Abadie *et al.* (2012) propose to select an optimal $W^* = w_2^* + \cdots + w_{J+1}^*$ such that $\sum_{j=2}^{J+1} w_j^* \bar{Y}_j^{K_1} = \bar{Y}_1^{K_1}$ and $\sum_{j=2}^{J+1} w_j^* U_j = U_1$. The first condition requires that optimal weights should be chosen in a manner that the weighted average of the linear combination of pretreatment period outcomes of nontreated units is (approximately) equal to the linear combination of the pretreatment outcome of the treated unit[2], while the second condition states that the weighted average of pretreatment-period covariates of control units (approximately) equal to pretreatment covariates of the treated unit. The causal parameter of interest is then estimated as $\hat{\alpha}_{it} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$. In other words, weights are chosen such that the synthetic control resembles, in terms of pretreatment covariates and outcome, the most to the treated unit.

In order to implement the estimator numerically, let us define a $(k \times 1)$ vector of pretreatment characteristics of the treated unit $X_1 = (U_1', \bar{Y}_1^{K_1}, ..., \bar{Y}_1^{K_M})$ and $(k \times J)'$ matrix of pretreatment characteristics of control units X_0, where the j-th row is $(U_j', \bar{Y}_j^{K_1}, ..., \bar{Y}_j^{K_M})'$. Optimal weights are obtained by minimizing $||X_1 - x_0 W||_V = \sqrt{(X_1 - x_0 W)' V (X_1 - x_0 W)}$, where V is a $(k \times k)$ positive and semidefinite matrix, and Abadie & Gardeazabal (2003) and Abadie *et al.* (2012) propose that V^* should be estimated such that the mean squared prediction error of the outcome variable is minimized in the pretreatment period[3].

[2]We wrote this condition only for one linear combination, there can be up to $M \leq T_0$ independent linear combinations and approximate equivalence should hold for all of them.

[3]We implement this methodology using R package *Synth*. More on the package and its implementation can be found in Abadie *et al.* (2012).

In our case, the treatment group will be the Dubrovnik–Neretva County[4], while other Croatian counties will serve to build the synthetic group.

In order to check that our results have not been driven simply by chance, we use placebo tests as in Abadie & Gardeazabal (2003). To do that, we apply the synthetic control method to untreated counties and measure how much the size of the effect in those counties differs from the effect obtained for the treated county. In case we find similar magnitudes of effects often, there is reason to doubt the significance of our estimates for the treated county. If placebo tests show that the gap between the synthetic and the actual outcome is unusually large for Dubrovnik when compared to other counties, we can argue that there is significant evidence of a positive effect of film industry on tourism in Dubrovnik. Placebo tests will also be done for the year of the treatment. We will reassign the treatment to years in which there was no treatment and in that way additionally check if our results are driven by chance only.

We use county-level panel data for the period 1998–2015.GoT with scenes of Dubrovnik were first broadcasted in spring 2012 giving us 14 years of pretreatment data and four years of treatment. The synthetic Dubrovnik county is constructed as a weighted average of the control counties represented by the remaining 20 Croatian counties. The weights are determined so that the synthetic county is most likely to resemble that county in case the treatment had never been introduced. This is achieved using a set of predictors of tourism outcomes in the years before the treatment.

Our tourism outcome variable is annual tourist arrivals at the county level. We include pretreatment predictors of tourist arrivals for the treated county and a set of predictors for the untreated counties. Our predictors of tourist arrivals are real GDP per capita, employment in tourism, gross value added of the tourism sector, investment in tourism per capita, number of bed-places in tourist accommodation, and prices. These predictors are common in tourism literature and besides the logical ones that are directly linked to tourism, real GDP per capita is shown to be a good predictor for tourism arrivals. Table 1 presents some general statistical information for the variables used. More information about the variables used can be found in the Appendix.

4 Results

The synthetic Dubrovnik county is obtained by combining the remaining 20 counties that mostly resemble the "treated" county in the pretreatment period. Figure 3 presents the pretreatment

[4]Dubrovnik is situated in the Dubrovnik–Neretva County. It is the biggest city in the county and the administrative center of the county.

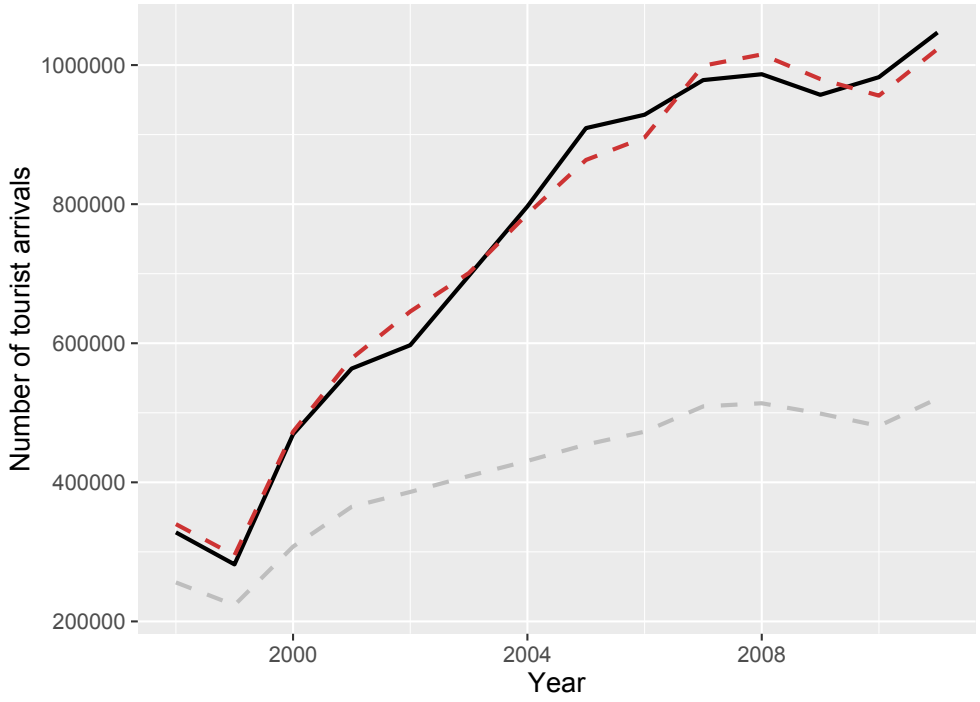
Table 1: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
Tourist arrivals	378	473,090.0	748,514.1	2,582	3,369,905
Real GDP per capita	294	7,560.0	2,860.6	3,098.4	19,625.2
Gross value added in tourism	294	18.7	6.2	8.9	38.2
Investment in tourism per capita	335	545.4	1,183.2	0.1	10,245.1
Tourism employment	322	1,899.3	2,377.0	87	10,975
Bed-places	252	24,479.1	45,865.1	134	202,291
Prices	168	114.8	12.7	100.0	151.3

Note: Descriptive statistics is given for 21 counties for the time period 1998–2015; tourist arrivals is the outcome variable.
Source: Croatian Bureau of Statistics.

outcome variable for the actual or real Dubrovnik–Neretva County and for its synthetic version. The grey line represents the mean value of the outcome variable for the 20 control counties. Evidently, the average of counties is not a suitable control group for the Dubrovnik—Neretva County, implying a simple DD would be misleading as the parallel path assumption is violated. Meanwhile, the synthetic version closely resembles the actual values for Dubrovnik prior to the treatment.

Figure 3: Tourist arrivals means – Dubrovnik

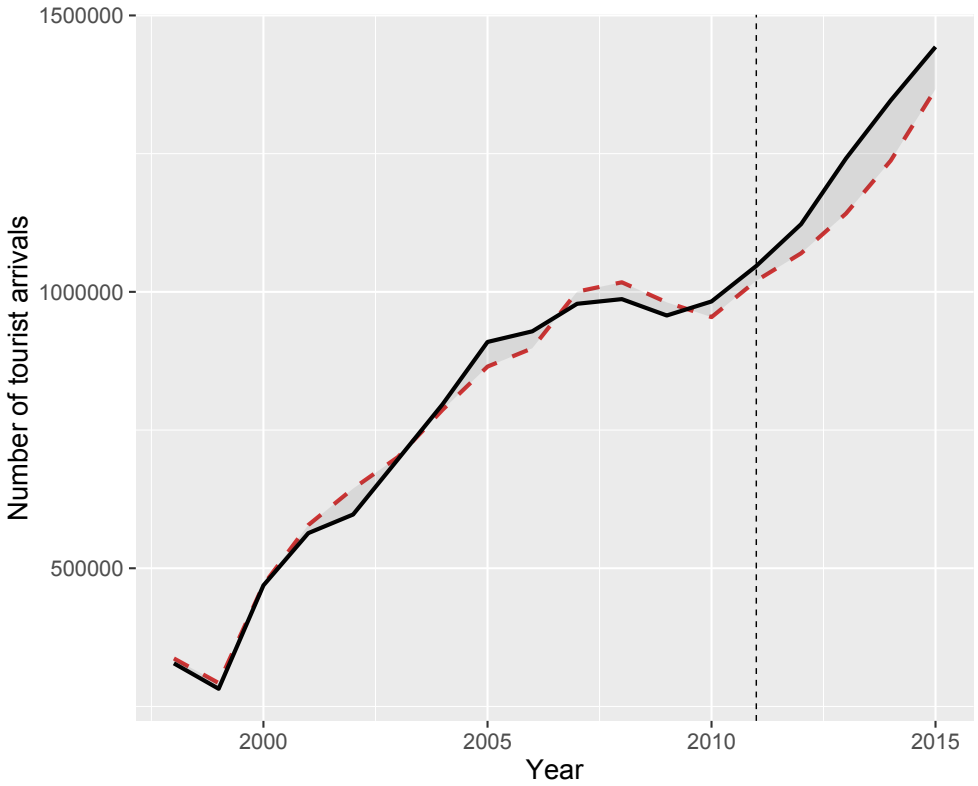


Note: The black line represents the Dubrovnik–Neretva County, while the red dashed line shows its synthetic version; the grey dashed line presents the mean of the remaining 20 counties.

The result of our baseline specifications is given in Figure 4. Baseline specification for the Dubrovnik county takes tourist arrivals as the outcome variable and real GDP per capita, employment in tourism, gross value added in tourism, investment in tourism per capita, number of bed-places and prices as predictors. In this specification, synthetic Dubrovnik is composed of the following weights: 0.364 for Lika–Senj County, 0.350 for the Zadar County, 0.285 for the Split–Dalmatia County, and 0.001 for the City of Zagreb. Although all other counties have a weight of zero, one could only expect such a result as the Dubrovnik county mostly resembles other tourist counties such as the Adriatic ones and the capital Zagreb.

Tourist arrivals in synthetic Dubrovnik closely match the dynamics in the period up to the treatment. This gives us confidence that the synthetic version of the Dubrovnik–Neretva County is also a reliable approximation to the number of tourists that would have arrived to the county in the 2012–2015 period if GoT had not been filmed in Dubrovnik.

Figure 4: The effect of GoT on Dubrovnik tourism



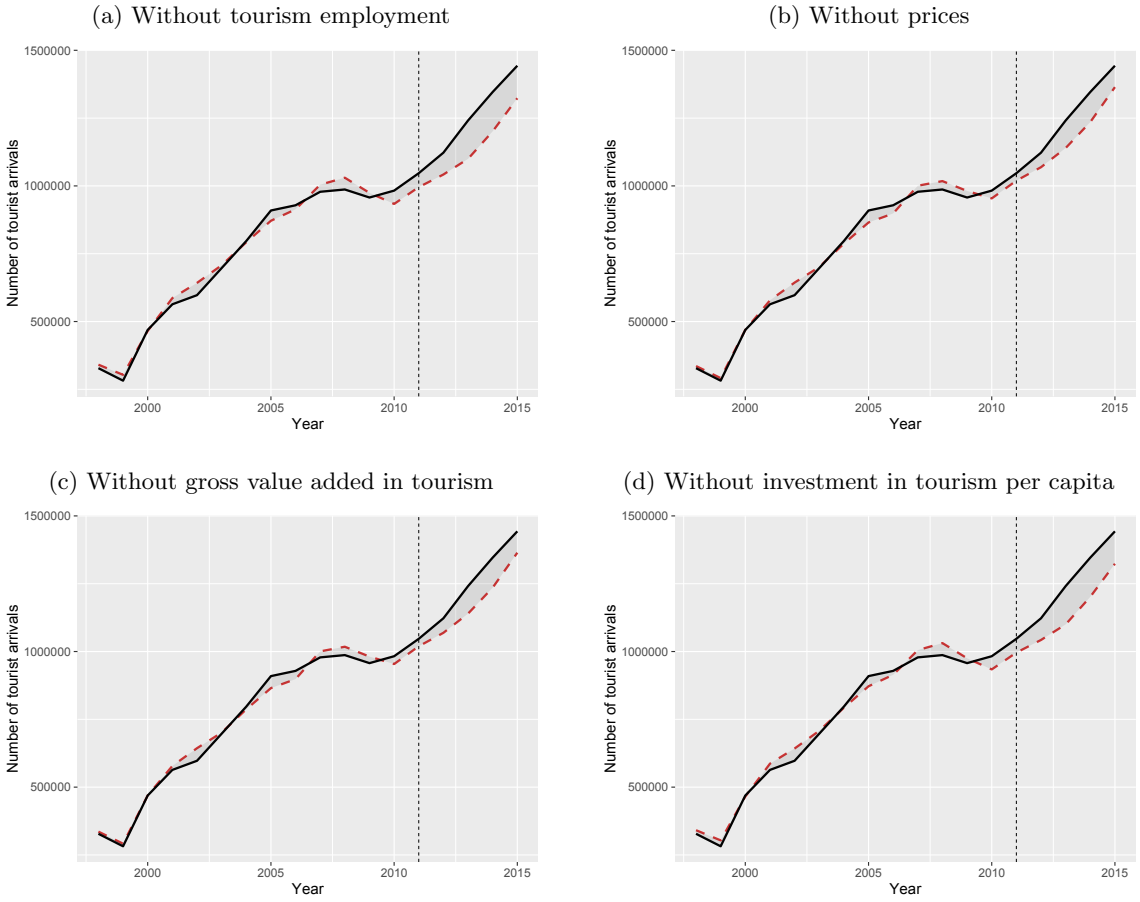
Note: The black line represents the Dubrovnik–Neretva County, while the red dashed line shows its synthetic version.

The effect of filming GoT in Dubrovnik is estimated as the difference between the black and the red lines, or the shaded grey area in the period after 2011. The two lines start to diverge already

in 2012, and the effect propagates in the period after the treatment. The gap as of 2012 implies a positive effect of GoT filming in Dubrovnik on its tourist arrivals. The estimated effect in the four post-treatment years cumulatively amounts to more than 244 thousand more tourist arrivals.

Figure 5 provides results using different specifications, in terms of exclusion of different predictors. They serve as a robustness check that reinforces the baseline result. From all four alternative specifications we can conclude that our results are robust as the outcome for synthetic Dubrovnik changes only marginally when compared to the baseline.

Figure 5: Robustness of results – different specifications



Note: The black lines represent the Dubrovnik–Neretva County, while the red dashed lines show its synthetic versions.

In order to analyze the significance of our estimates, we run a series of placebo tests. The first type of placebo tests we run are those in which we apply the synthetic control method to every other county. We reassign the treated county to one that is not Dubrovnik, and we put Dubrovnik in the control group. This way we assign the treatment to a county that did not receive treatment.

We repeat this procedure for all remaining 20 counties and calculate the gaps between the actual and synthetic for each county. Figure 6 presents the results for the GoT placebo tests. The red lines represent the gaps coming from the remaining 20 iterations of the test. The black dashed line shows the gap for the Dubrovnik–Neretva County. The first panel of Figure 6 suggests that the biggest positive gap in the post-treatment period, relative to the controls, does not come from the Dubrovnik–Neretva County. As in Abadie *et al.* (2012), we calculate the pretreatment mean squared prediction errors (MSPEs) for all counties[5]. For the Dubrovnik–Neretva County the MSPE is about 6.5 to the power of 8, while the MSPE mean for the remaining 20 counties is about 116 to the power of 8. Mean MSPE for the remaining 20 counties is rather large owing to a few outliers. When three of these outliers are discarded, the mean MSPE significantly declines. The last three panels of Figure 6 show the placebo test results when we exclude these outliers, counties with exceptionally high pretreatment MSPE with respect to the Dubrovnik–Neretva County. At the end, we are left with 18 counties shown in the last panel of Figure 6.

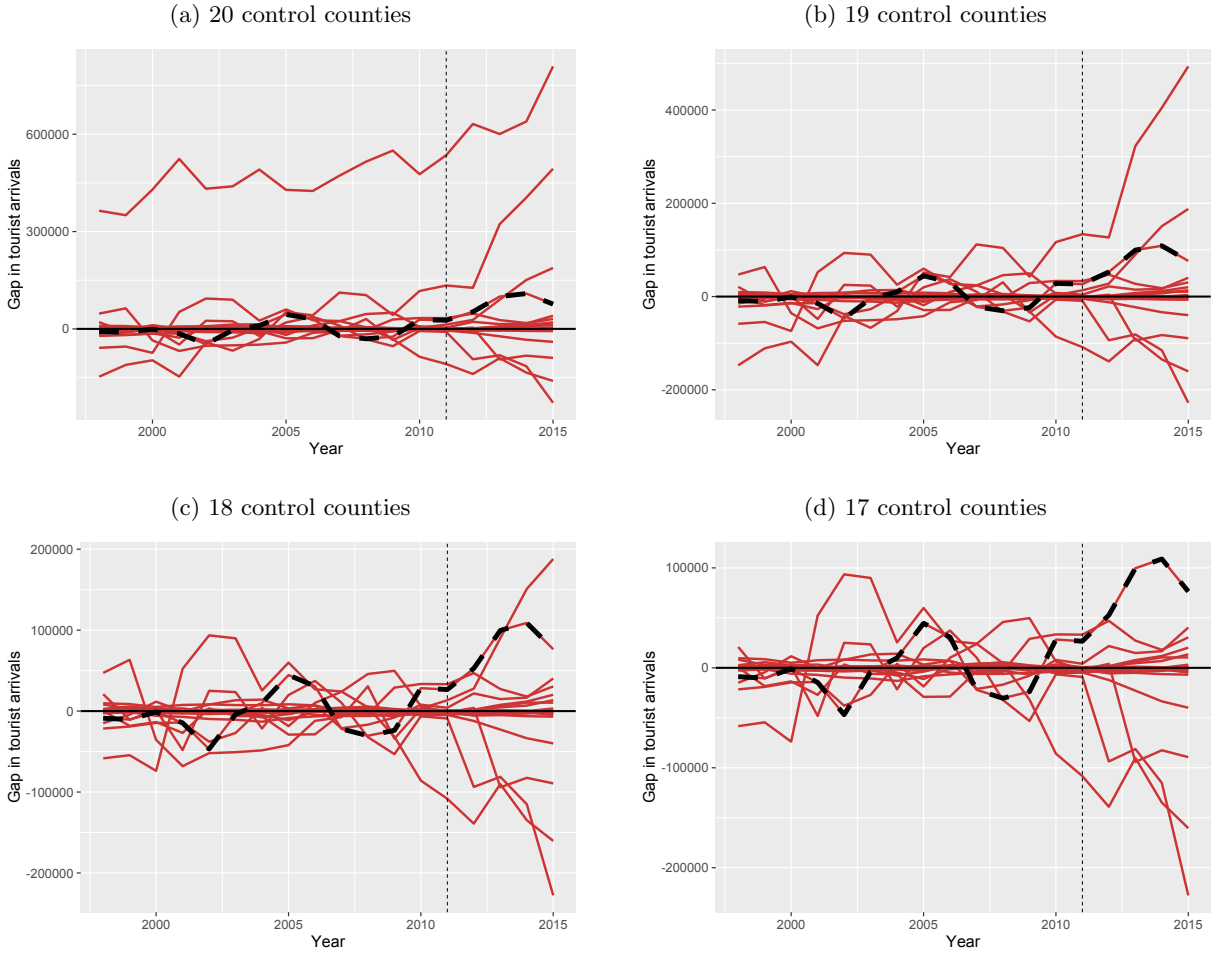
Since we eventually include 17 control counties, and since Dubrovnik has the largest gap out of the analyzed 18 counties, the probability of estimating a gap as large as the one found for Dubrovnik under permutation of the treatment is 5.5 percent (as $1/18 = 0.055$), marginally above the standard statistical significance threshold.

In the second type of placebo tests we apply the synthetic control method to different timing of treatment; instead of 2012, we put the treatment in different time periods. The earliest possible treatment is in 2005, as the variable "prices" is not available before that year, and the last possible year of treatment is 2012, as we would like to have at least four years in the post-treatment period. We have therefore eight different possibilities for the Dubrovnik–Neretva (2005–2012), and although we cannot make any discussion about statistical significance (due to the small sample size), we can calculate the gaps and compare them after adjusting for the post-treatment years[6]. We estimate that the gap is the biggest when the treatment is imposed in 2012, exactly when the treatment was actually imposed, providing us with additional evidence of a positive effect of GoT on tourism in Dubrovnik.

[5]MSPE is the average of the squared discrepancies between observed tourist arrivals and its synthetic counterpart during the pretreatment period or 1998–2011.

[6]The adjustment is necessary because simply adding up the gaps would lead to the biggest cumulative gap for the earlier treatment. Therefore, we divide the cumulative gap with the number of years in the treatment.

Figure 6: Tourist arrivals gaps in Dubrovnik–Neretva and placebo gaps in control counties



Note: Black dashed lines represent the Dubrovnik–Neretva County, while the red lines show the remaining Croatian counties; in the second panel, we discard one county with pretreatment MSPE 329 times higher than Dubrovnik–Neretva; in the third pane,l we discard one county with pretreatment MSPE 15 times higher than Dubrovnik–Neretva; in the fourth panel, we discard one county with pretreatment MSPE 3 times higher than Dubrovnik–Neretva.

5 Discussion

Our results suggest there is a positive effect of GoT filming on Dubrovnik tourism that started in 2012, and has propagated in the period afterwards. Using some simple back-of-the-envelope calculations for the Dubrovnik–Neretva County we calculate the cumulative size of the effect in the 2012–2015 period. The county received 60 thousand more tourists every year due to GoT, or as much as 244,415 more tourist arrivals in the 2012–2015 period. This figure translates into almost one and a half million more overnight stays (1,441,359) and almost 126 million euro more foreign currency revenues from travel (125.9 million euro).

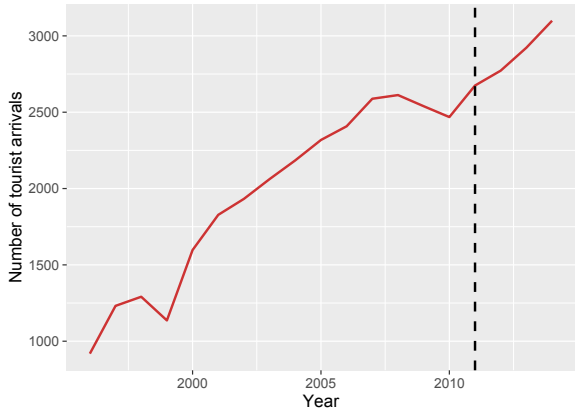
Although we find an effect in 2012, it is possible that some completely different effect caused the spike in tourist arrivals. We therefore try to think of some of the more obvious candidates. First, one could expect a jump in tourist arrivals when Croatia became an EU member state. However, since Croatia joined the EU in July 2013 with the ratification process being completed in late as April 2013—and we observed a spike already in 2012—it seems unreasonable that EU joining could have had such a strong effect prior to the joining itself. Second, as Dubrovnik is a popular cruise destination, we considered the possibility of the number of cruise ships jumping in 2012. Using data from the Croatian Bureau of Statistics we find that in the 2012–2015 the number of cruise ships in Dubrovnik actually declined by 7.5 percent together with the number of passengers on these ships which declined by 8.2 percent. In 2012 itself, the number of cruise ships declined by 3.3 percent, or 28 fewer ships in 2012 when compared to the previous year. If not by sea, maybe tourists arrived by road. Croatia was actually a big motorway building site in the last 15 years in which the north and the continental part of the country were connected with the south and the coastal regions. The motorway connecting the capital Zagreb and the second largest Croatian city, the coastal city of Split, was opened in 2005, long before scenes of Dubrovnik were broadcast on GoT. The motorway did not stop in Split but continued to the city of Ploče, situated only 100 kilometres north of Dubrovnik. However, this part of the motorway was opened in December 2013, one and a half year after the first Dubrovnik scenes appeared on GoT. This can explain more tourist arrivals in 2014 and 2015, but not as early as 2012. Third, it is possible that advertising or some other form of promotion had such an effect on Dubrovnik tourism, but unfortunately, we do not have adequate data to corroborate this assumption.

Although we do find a positive effect for the Dubrovnik–Neretva County, there are still three counties that have a bigger effect than the Dubrovnik–Neretva County. These are the Istria County, the Split–Dalmatia County and the City of Zagreb. As these three counties are all tourist destinations, we could be witnessing spillover effects from GoT being filmed in Dubrovnik on other Croatian counties and the whole country. The Split–Dalmatia County, for example, is adjacent to the Dubrovnik–Neretva County, Zagreb is the capital and the air flight hub for Croatia, while Istria has always been the most advanced tourist region in Croatia. If you look at Figure 6, Istria is the one on top, demonstrating poor pretreatment fit in all time periods. This is because Istrian type of tourism is different when compared to the rest of the Adriatic counties. It is more focused on hotel accommodation and extending the season throughout the whole year, while other counties still have the dominant apartment-type of tourism and a short season narrowed to the June–September

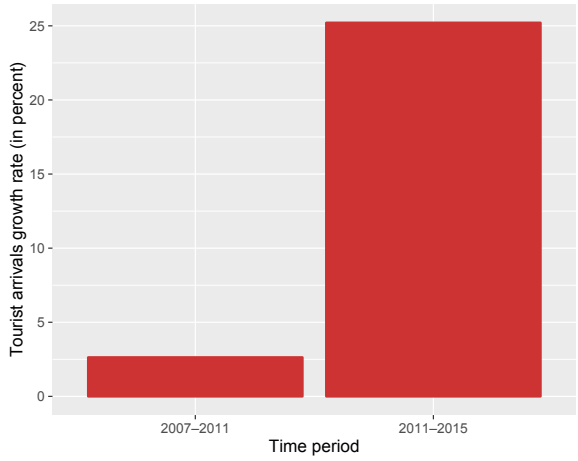
period. To corroborate the spillover argument, we present figures that compare Croatian tourism outcomes with the outcomes for other European countries.

Figure 7: Tourist arrivals in Croatia

(a) Number of tourist arrivals



(b) Growth rate of tourist arrivals



Source: Croatian Bureau of Statistics.

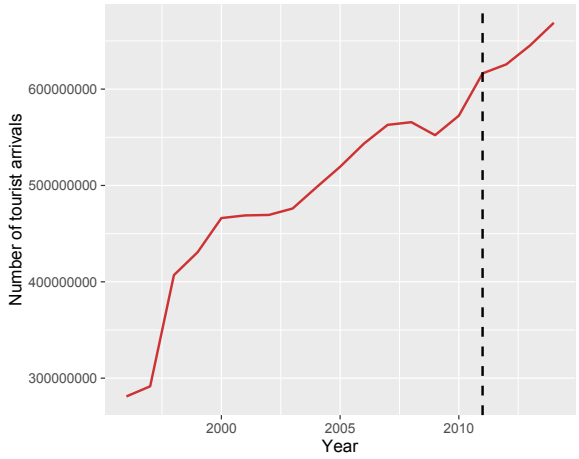
Tourist arrivals in Croatia increased by 25.2 percent in the period 2011–2015, accompanied by an increase in overnight stays that amounted up to 18.6 percent. Figure 7 presents the dynamics of tourist arrivals for Croatia in the four-year period before GoT or 2007–2011, and post-GoT period or 2011–2015. In the pre-GoT period, tourist arrivals increased only by 2.6 percent as opposed to 25.2 percent in the post-GoT period with elements of Dubrovnik. We find a similar pattern for overnight tourist stays that went up by 18.6 percent in the post-GoT period, which is 10.8 percentage points above the rate in the pre-GoT period.

Meanwhile, the rest of Europe[7] recorded marginally more tourist arrivals in 2012 when compared to 2011 (Figure 8). In 2012, only 1.5 percent more tourists arrived to Europe which is one of the smallest annual increases in the period examined. The growth rates in the pre-GoT period and in the post-GoT period for Europe are comparable, 9 percent compared to 8.5 percent. We even observe a modest deceleration in the growth rate of tourist arrivals in the post-treatment period. Although we were not able to construct a credible counterfactual for Croatia using other European countries, these descriptive statistics provide argumentation for a spillover effect of GoT being filmed in Dubrovnik to the whole country.

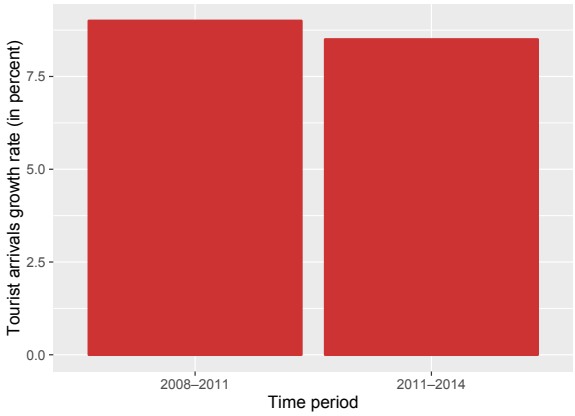
[7]In our European sample we have 29 countries. Some of these are EU members and some are not. We have collected data from all countries that publish their data on tourist outcomes. For Norway and the UK there are missing values for tourist arrivals in the post-treatment period.

Figure 8: Tourist arrivals in Europe

(a) Number of tourist arrivals



(b) Growth rate of tourist arrivals



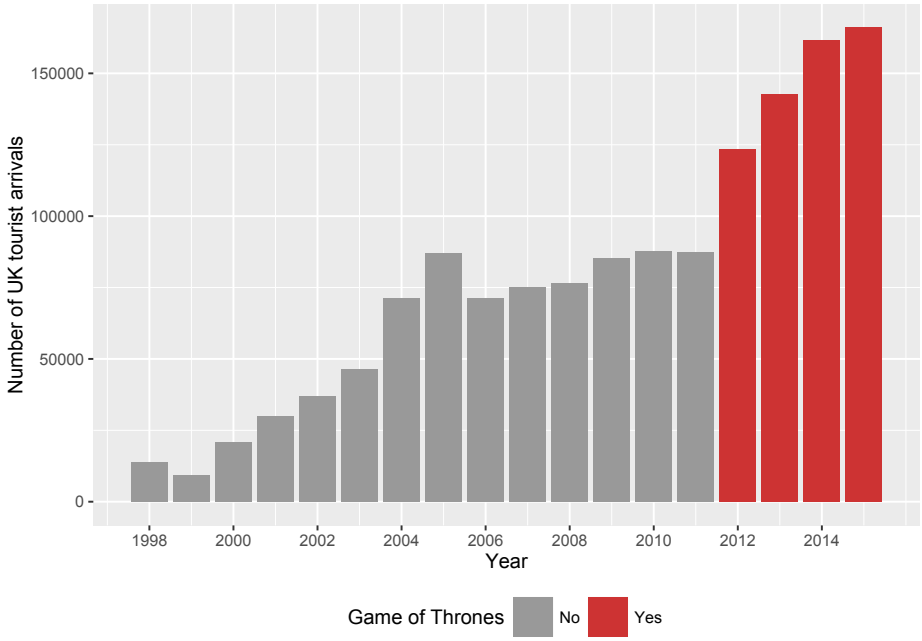
Note: 26 European countries for which we have data on tourist arrivals in the period examined.
Source: Croatian Bureau of Statistics, Eurostat, national statistical offices.

We find strong evidence of a positive effect for Dubrovnik in 2012 and possibly of a spillover effect on the country level. It seems reasonable to try to isolate the effect in Dubrovnik using tourist arrivals data by country of origin. The show was especially followed in the UK, and numerous popular media reports witness this popularity. For example, upon broadcasting the first episode of the sixth season in 2016, 60,000 fans in the UK tuned up at 2 a.m. to see the US première. We could use the geographical distribution of the shows' popularity as a variation in the treatment intensity, however, given the limited data on the country of origin of tourist arrivals in Croatian official statistics, we are not able to replicate the synthetic control approach. We do present descriptive statistics which showcase the increased interest in Dubrovnik that coincides with GoT broadcasting. Figure 9 presents arrivals of UK tourists to the Dubrovnik–Neretva County, and we can clearly see a surge in the number of UK arrivals as of 2012. In particular, in 2011, 87,287 UK tourists arrived, while in 2012, the number increased to 123,352 which corresponds to a 41.3 percent increase.

6 Conclusion

Empirical research in tourism is rarely characterized by a clear-cut identification strategy which enables an estimation of the causal effects of interest. In this paper, we estimate the causal effect of *Game of Thrones* filming on tourism performance of Dubrovnik. To do so, we use a synthetic control approach—a data-driven procedure to build a credible synthetic counterfactual unit which

Figure 9: UK tourist arrivals in the Dubrovnik–Neretva County



Source: Croatian Bureau of Statistics.

enables us to answer the "what if" type of questions.

Our results suggest the effect is positive, large, and statistically significant at a 5.5 percent level. Using placebo tests we find that if one were to place the treatment in a different time period, the biggest effect will still be found exactly for the year of the treatment, 2012. Results also indicate that there might be spillover effects of GoT broadcasting on other counties in Croatia, which implies that we have estimated a lower bound of the effect on Dubrovnik tourism. Back-of-the-envelope calculations of the cumulative effect on Dubrovnik tourism and economy suggest that GoT broadcasting was significant not only on a statistical, but also on an economic and social level.

This study has few important limitations and most of them are related to data availability. In particular, county-level data are rather scarce in Croatia, which results in a short pre- and post-treatment time span, as well as in a limited set of predictors used. Also, data for promotion expenses are, for example, completely nonexistent and one could argue that we are missing one of the potentially most important predictors of tourism outcomes. Although we have tried to identify alternative sources of the effect and did not find them credible, the possibility of a confounded treatment is not completely ruled out. Therefore, the potential of future work on this topic lies in

better and more comprehensive datasets; for example, one could look at the effect on restaurants and retail shops, as well as on smaller geographical units.

Even so, keeping these limitations in mind, we believe that this research is a small, but important step towards identification-based empirical work in tourism research. Identification of causal effects is a popular paradigm in applied econometrics, and using one of the data-driven methods in tourism research can provide valuable policy inputs and also facilitate a greater understanding of the tourist phenomenon.

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Appendix

A Variables description

Variable name	Description
Tourist arrivals	Total annual tourist arrivals
Real GDP per capita	Real GDP per capita based on the ESA 2010 methodology
Gross value added in tourism	Share of real gross value added of wholesale and retail trade, transportation and storage, accommodation and food service activities in total gross added value based on the ESA 2010 methodology
Investment in tourism per capita	Investment in tourism per capita
Tourism employment	Number of employed individuals in hotels and restaurants on March 31
Bed-places	Total number of available bed-places
Prices	Consumer basket prices

Note: All variables are gathered from the Croatian Bureau of Statistics; all per capita variables are calculated based on Eurostat population estimates.