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The impact of TV series on tourism performance: the case of Game of Thrones

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Abstract

TV series and cinema productions are considered one of the most recent and promising instruments to promote tourist destinations and to increase tourist flows. However, a few papers analyze empirically their impact on tourist choices. We contribute to the scarce literature by investigating the impact of one of the most successful TV series of all times: Game of Thrones (GoT). The series was internationally broadcasted and filmed around the world. We focus on fourteen filming locations in three different countries: Spain, Croatia and Malta. To estimate how much of their recent tourism performance is due to the visibility obtained through GoT, we use county-level panel data in the years 2007–2019 and apply an event study design as methodology. We deal with the issue of treatment effect heterogeneity over time and across counties by adopting an interaction-weighted estimator which focuses on season-specific treatment effect. The results show a positive and persistent impact of GoT on tourism performance, on both new tourist arrivals and overnight stays, and are not driven by spillover effects. Overall, findings confirm the ability of TV productions to boost the tourist flows in the filming locations.

Keywords Film-induced tourism · Tourism performance · Event study · Heterogeneous treatment effect

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1 Introduction

TV Series, films and documentaries tell stories, emotions, but also 'places.' They can capture the audience's attention with images, sounds and characters. They also show the beauty of the places where they are filmed, influencing the audience's perception of them (Cardoso et al. 2017).

Scholars and policy makers recognize a capacity of TV and cinema productions to impact on the choice of tourist destinations, causing an increase in tourism arrivals and overnight stays. The related literature defines this impact in multiple ways, such as *film-induced tourism*, *film tourism*, *movie-induced tourism*, *cineturismo*, *screen tourism* and *on-screen tourism* (Connell and Meyer 2009; Mostafanezhad and Promburom 2018; de Albuquerque Meneguel et al. 2017).

In the literature, the film tourism presents different definitions (see, for instance, Busby and Klug (2001); Hudson and Ritchie (2006)). With respect to this analysis, particularly interesting is the definition proposed by Cardoso et al. (2017), who have defined the tourism generated by the TV and cinema production as visits made to the sites and sets of such films, whether full-length feature films or television programs and series and correspondingly including theme parks and cultural heritage sites, visits famous film studies, tourism destination promotional films with celebrities and, thus, anything and everything involving the audio–visual domain and tourism visits (Cardoso et al. 2017, p. 24). Following this definition, film tourism presents a time period that starts with the choice of film location and filming phase and not only after the broadcasting. This means that the impact of the TV and cinema production should be evaluated starting at least from the filming phase to correctly evaluate the real impact on a tourism destination.

This paper aims to evaluate the causal impact of Games of Thrones (GoT), one of the most successful TV series recently broadcasted, on tourist arrivals and overnight stays in fourteen filming locations in three countries: Spain, Croatia and Malta. The analysis is performed at the county level, which is the perfect setting to identify the treatment effect since it allows to distinguish between treated and untreated counties and recover the necessary counterfactual outcome. In summary, we try to answer the following research question: What is the overall impact of GoT on the locations where it has been filmed?

Over time, film-induced tourism has been studied for its important ability to improve the visibility of destinations, to promote them and to attract potential tourists by influencing their choice of destination for vacations (Beeton 2006; Ji and BeetOn 2011; Connell 2012; Oviedo-García et al. 2016; Mendes et al. 2017; Teng and Chen 2020). It has been associated with the desire of people to visit the places where films and television programs are shot and to relive the film experience (Busby and Klug 2001; Vagionis et al. 2011).

Generally, all researchers seem to agree on the ability of movies to influence the number of tourists in a destination, and several important results have been already achieved in the investigation of the impact of movies on tourism flows (see, for instance, Riley et al. (1998) and Cortón and Ebrahimpour (2014)).

Croy (2010) and D'Alessandro et al. (2015) and Qiao et al. (2016) highlighted how movies and TV series can influence the tourists' perception of a destination and might have either a positive, mild or negative impact on its tourism performance.

Movies like *The Lord of the Rings*,*The beach*, *Harry Potter* and *Notting Hill* have positively influenced the locations where they have been shot (respectively, New Zealand, Phi Phi islands, UK and the city of London), determining an increase in the number of visitors (Gjorgievski and Melles Trpkova 2012; Strielkowski et al. 2017; Rattanaphinanchai and Rittichainuwat 2018). Moreover, Riley et al. (1998) evaluated the impact of twelve TV and cinema productions on tourism destinations, like national parks, monuments and museums. The analysis has shown an increase in the median number of visits until five years later the broadcasting. Another example is available in Cortón and Ebrahimpour (2014), that predicted the impact of the film 'Dolphin Tale' on the Clearwater Marine Aquarium, located in St. Petersburg (Florida). The results have shown a strong increase in the number of tourists, starting from the teaser trailer of the movie until long after the release of the film. The impact on tourism flows has been recorded not only in the Clearwater Marine Aquarium but even for the St. Petersburg destination.

However, another strand of the literature sees the relationship between movies and the tourists' choice of a destination not very strong since only a reduced number of travelers might be influenced. Specifically, the film-induced tourism seems to be only a specific niche market which interests a small percentage of tourists (Qiao et al. 2016). Moreover, movies may only be considered as a secondary motivator or contributing factor (Macionis and Sparks 2009).

On the contrary, TV series like Gomorra has offered a negative and frightful image of the city of Naples, negatively impacting on the perception of tourists (D'Alessandro et al. 2015).

The above-mentioned evidence shows how the image conveyed through movies can influence the perception of a destination and have an impact on the viewers' decision-making process in terms of travel choices (Suni and Komppula 2012; Josiam et al. 2020).

The starting point of this paper is the work of Tkalec et al. (2017). They evaluated the impact of GoT on the number of tourist arrivals in the city of Dubrovnik. They used a synthetic control approach to spot the existence of a specific effect of the TV series on the number of arrivals. The results have shown a positive and significant effect of GoT on tourism flows in Dubrovnik.

The Croatian city is only one of the numerous locations where GoT has been filmed. It is not clear whether GoT has had the same impact on other locations. We add to the related literature in two significant ways. Firstly, our analysis focuses on fourteen locations where GoT has been filmed. This gives us the possibility to recover an average effect with a higher level of external validity.

Secondly, we apply a dynamic analysis that allows to study the path of the effect along time which is robust to treatment effect heterogeneity over time and across groups of counties. To do so, we implement an interaction-weighted estimator applied to staggered event studies with heterogeneous treatment effects, proposed by Sun and Abraham (2020). In fact, since we cannot exclude that the treatment effect differs across counties, this choice allows to get rid of potential bias arising when treated

units do not share the same path of treatment effect. Our results are then robust to treatment effect heterogeneity over time and across groups of counties.

Overall, they suggest a positive, persistent and increasing over time impact of GoT on tourism arrivals and overnight stays in the location where the TV series has been filmed. Additionally, we also show that our main findings are not driven by spillover effects that may weaken the validity of our research design if visitors cross over borders and both treated and untreated counties experience contamination effects. Addressing this point is particularly relevant from a policy perspective, since policymakers should analyze the cross-border effects if interested in whether there is a positive effect on tourism into the whole country and avoid potential counterproductive competition between counties that may arise especially if the decisions are made at the local level.

The positive impact of GoT on tourism flows has been previously evidenced for the county of Dubrovnik-Neretva by Tkalec et al. (2017) and, with more granular data, for the city of Dubrovnik by Depken et al. (2020). In this study, we evaluate the GoT impact in different countries, using county-level data as in Tkalec et al. (2017), and apply a dynamic analysis that takes into account treatment effect heterogeneity over time and across counties.

The rest of the paper is organized as follows. The second section is focused on the presentation of GoT and the analysis of tourism development of Spain, Croatia and Malta. The third section presents the data and an excursus of the methodology. The results of the application and a placebo test are shown in the forth section. The managerial and theoretical implications are the focus of the fifth section and the concluding remarks are stated in the sixth section.

2 The Game of Thrones series and tourism

Game of Thrones is one of the most successful TV series of all times. It is an American television drama and an adaptation of fantasy novels written by George R. R. Martin. The series is made of 8 seasons and 73 episodes. The filming started in 2010 and ended in 2018, while the international broadcasting began in 2011 and finished in 2019.

The series has had a huge success worldwide. The number of viewers has increased constantly during the years when the series was originally broadcasted. In the USA, the first episode of the first season has been watched by 2.2 million viewers in 2011, whereas the first episode of the eighth season has been watched by 11.67 million viewers in 2019.

The last episode has been broadcasted in 171 countries at the same time, which represents a Guinness World Record. Nonetheless, it has won numerous awards, namely 59 Emmy Awards, 8 Screen Actors Guild Awards and a Peabody Award.

According to Irdeto (2015), a world leader in digital platform security, the GoT episodes of seasons from 1 to 4 have been illegally downloaded more than 7 million times between February 5 and April 6, 2015, with an average of 116,000 illegal downloads per day in 2015.

GoT has been filmed in different countries like Croatia, Iceland, Northern Ireland, Malta, Morocco and Spain, as shown in Table 1. The locations have been used in more than one season, giving them major and constant visibility.

Table 1 Game of Thrones: seasons and locations

Season	Filming	First aired	Last aired	Locations
Season 1	2010	April 17, 2011	June 19, 2011	Northern Ireland (Belfast, Down e Antrim), Malta (Mdina, Gozo), Scotland, Morocco, Croatia (Dubrovnik)
Season 2	2011	April 1, 2012	June 3, 2012	Croatia (Dubrovnik), Iceland, Northern Ireland
Season 3	2012	March 31, 2013	June 9, 2013	Northern Ireland, Croatia (Dubrovnik), Morocco, Iceland (Dimmuborgir and the Grjótagjá cave), Los Angeles
Season 4	2013	April 6, 2014	June 15, 2014	Croatia (Dubrovnik, Split), Iceland (Thingvellir National Park)
Season 5	2014	April 12, 2015	June 14, 2015	Croatia (Dubrovnik), Iceland, Spain (Seville and Cordoba)
Season 6	2015	April 24, 2016	June 26, 2016	Spain (Navarra, Guadalajara, Seville, Almeria, Girona, Peniscola), Croatia (Dubrovnik)
Season 7	2016/2017	July 16, 2017	August 27, 2017	Northern Ireland (Belfstaf), Spain (Seville, Cáceres, Almodovar del Rio, Santiponce, Zumaia and Bermeo)
Season 8	2017/2018	April 14, 2019	May 19, 2019	Northern Ireland (Moneyglass and Saintfield), Iceland and Croatia (Dubrovnik)

Source Own elaborations based on https://en.wikipedia.org/wiki/Game_of_Thrones#Filming (accessed on 07/06/2020)

In our analysis, we focus on three European countries where GoT has been filmed—Spain, Croatia and Malta, where tourism is an important economic sector.

In Spain, 11.8% of GDP was generated by tourism in 2017, whereas in 2018 tourist arrivals have been 82.8 million (+1.1% compared to 2017) and have generated 89.8 billions of euros in international receipts (+3.3% compared to 2017).

In Croatia, the contribution of tourism to the GDP was even more significant, with 19.6% of the entire GDP in 2018. The international tourists have been 16.6 million, with 83.2 million nights spent in all Croatian destinations, and the Croatian government is working to constantly improve the impact of tourism on the national economy.

In Malta, tourism is one of the most relevant economic sectors. It counted for 12.8% of total GDP in 2018 and is one of the top five contributors to the economy. The international arrivals have been 3.2 million in 2018 (OECD 2020).

Generally, after the financial crisis, the three countries have recorded a constant increase in the number of arrivals and bed nights, as shown in Fig. 1. Only in Malta, a drop in the number of bed nights has been recorded.

In order to have a first glance on how this recent tourist performance might have been influenced by the increased visibility of locations offered by GoT, we looked into the Google search data. Specifically, we downloaded the Google Trends related

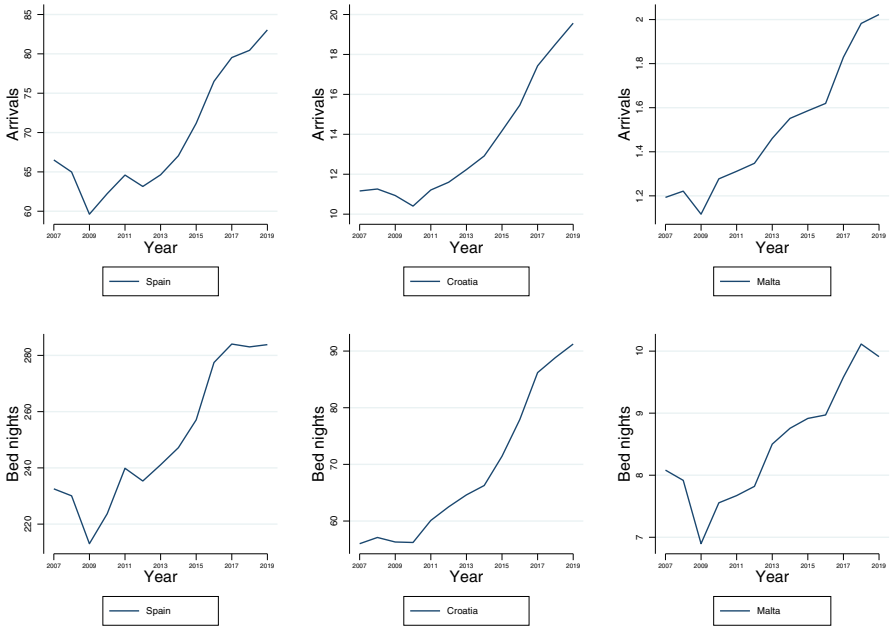

Fig. 1 Arrivals and bed nights by country (in millions). *Source*: Own elaborations

to the topic *Game of Thrones location* both at the country and at the county level in the period between the filming phase and the broadcasting of the last season of the show. We used as a keyword 'Game of Thrones' followed first by the name of the filming locations (countries and counties, respectively). Moreover, we focused the search on the area 'Travel' to collect the trends related to the vacation planes. As evidenced in Fig. 8 in Appendix, the interest in the GoT has increased over time in Spain, Croatia and Malta. Peaks have been recorded after the broadcasting of the different seasons. We believe that the broadcasting of the different seasons in official TV channels, the replicas and the illegal downloads of the episodes generate continuous attention on the TV series, which may affect the tourist decision choices in time. The analysis of the trends also shows an increase in the Google search during the Easter period and summer season, when we expect an increase in the tourist flows, but, interestingly, is also the period when the relevant GoT seasons were aired. A similar pattern occurs when investigating the Google Trends related to the counties where GoT has been filmed. Due to data limitations, we focus on 9 counties where GoT has been shot and the Google data highlight an increase in the appeal of the destination following the broadcasting, as shown in Fig. 9 in Appendix.

The Google Trends analysis seems to confirm the capacity of GoT to generate interest into filming locations.

3 Methodology and data

Identifying and causally interpreting the effect of some treatment (e.g., a policy, an intervention, a program) on an outcome variable of interest represents a crucial point

to guide policymakers seeking to improve social and economic performance. Ideally, we would precisely identify the treatment effect as the simple difference between what happened to an individual's outcome when he receives the treatment and, like in a parallel universe, without the treatment. However, in the real world, an individual experiences one and only one treatment status at each point in time, such that the outcomes with and without treatment for the same individual are unobservable. Thus, a fundamental identification issue in the analysis of treatment response is the selection of the appropriate counterfactual to be compared to the individuals that received the treatment. When the random assignment is not possible, difference-in-differences estimation (DD hereafter) is the most widely used quasi-experimental research design to estimate the causal effect of a treatment.

In DD estimation, a researcher compares the change in outcomes in a non-random treatment group (which makes this method 'quasi-experimental' instead of 'experimental') before and after treatment takes effect in one area (first difference), to the change in the same outcomes in a comparison group that did not receive the treatment (second difference). The first difference alone would lead to an incorrect counterfactual, because it compares the same individuals before and after the treatment and it does not control for time trends. The second difference compares participants to those not in the program without getting rid of potential selection into treatment. The DD approach removes these confounds by differencing them out, leaving us with a credible quasi-experimental estimate of the treatment effect of interest.

In our case of interest, likewise many real applications, treatment occurs at different times. The DD approach is often used to estimate the impact of interventions that are implemented at different times in different locations. When units experience such staggered treatment, researchers typically implement DD using two-way fixed effects models, controlling for both period-specific and unit-specific shocks under the standard 'common trends' assumption. Indeed, the credibility of the DD design relies on the assumption about the comparability of treatment and control groups. In other words, we must assume that the control group reflects how the treated individuals would have behaved had they not received the treatment.

However, recent research has questioned the validity of staggered DD analyses, which rely on the assumption that the treatment effect is homogeneous across groups and time. Since we usually cannot exclude that the treatment effect differs across individuals and over time, an influential piece of the literature has arisen some concerns on the bias deriving from the heterogeneity of treatment effect (Sun and Abraham 2020; de Chaisemartin and d'Haultfoeuille 2019; Goodman-Bacon 2021; Callaway and Sant'Anna 2020). Goodman-Bacon (2021) shows that, in a staggered framework, the two-way fixed effects DD estimator results in a weighted average of all possible 2x2 DD estimators that compare timing groups to each other. Some compare individuals treated at a particular time and untreated individuals, as standard. Some others use as controls individuals treated at two different points in time. More specifically both later-treated group before its treatment kicks in and earlier-treated group after its treatment begins are used as comparison groups. The bias arises because already-treated individuals act as a control group for newly treated ones. If the treatment effect is immediate and constant, it would be differenced out when calculating the outcome trends of the second difference. But if the effect is not homogeneous across groups

Table 2 Cohort identification

Locations (provinces)	Filming	First aired	Last aired	Season	Cohort
Dubrovnik-Neretva, Malta, Gozo	Second half of 2010	April 17, 2011	June 19, 2011	Season 1	1
Split-Dalmatia	July - November 2013	April 6, 2014	June 15, 2014	Season 4	2
Seville, Córdoba	July - December 2014	April 12, 2015	June 14, 2015	Season 5	3
Navarra, Guadalajara, Almeria, Girona, Castellón	July - December 2015	April 24, 2016	June 26, 2016	Season 6	4
Gipuzkoa, Bizkaia, Cáceres	August 2016 - February 2017	July 16, 2017	August 27, 2017	Season 7	5

Source: Own elaborations

Table 3 Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Arrivals	1191639.060	1477174.079	4753	10604684	923
Overnight stays	4608622.044	8656256.788	12370	59375940	923
Population	550137.681	493888.274	31036	2560000	781
Real GDP per capita	17533.399	7022.252	1979.464	37413	781

Data sources are the Spanish Statistical Office - INE, the Croatian Bureau of Statistics and the National Statistics Office - Malta. The number of observations is lower for real GDP and population because these data are available for the three countries only until 2017.
Source: Own elaborations.

and times, the second difference would include an evolving treatment effect that the newly treated group never experience, causing a bias in the estimated effect.

The nature of our research settings, where the GoT series was filmed in different locations and broadcasted in different seasons, makes a DD estimation with a staggered adoption design suitable. To avoid the potential bias arising from the violation of the assumption that the treatment effect is homogeneous across groups and over time, we adopt the new estimation method proposed by Sun and Abraham (2020). This method is robust to treatment effect heterogeneity and is an interpretable analog of the relative period coefficients from the two-way fixed effects regression.

To estimate how much of the recent tourism performance shown in Sect. 2 is due to GoT in Spain, Croatia and Malta, we use county-level panel data for the years 2007-2019.[1] With the available data, we can divide the selected counties into five cohorts, where counties in the same cohort share the same year of filming and broadcasting. In other words, we focus on season-specific filming locations. Details are provided in Table 2. The panel data include tourist and social–economic variables, whose descriptive statistics are reported in Table 3[2]. We use annual tourist arrivals and overnight stays as outcome variables of interest. We examine the two outcomes variables, arrivals and overnight stays, by taking the natural logarithms, which are very convenient for describing relations between economic variables in percentage scale (Wooldridge 2012).

We include other common controls used in the tourism literature such as population and real GDP per capita, which are shown to be a good predictor of tourism flows (Tkalec et al. 2017; Lim 1997).

Due to data limitations, the analysis has been focused on the majority of the destinations where GoT has been filmed but it does not include information on the remaining countries. For those countries, in fact, data on tourist outcomes at the sub-national level were not available.

Following Sun and Abraham (2020), we adopt an event study design, which estimates a dynamic treatment effect extending the classical specification of a DD model.

[1] We exclude the two most popular and visited counties in Spain, Madrid and Barcelona, which represent two of the leading destinations in Europe. They act as outliers in our dataset and would bias our results significantly.

[2] Descriptive statistics disentangled at the country level can be found in Appendix.

In fact, since we are interested in estimating the impact of GoT being l years before and after relative to the filming, we add leads and lags of the treatment variable as regressors. This allows to disentangle the full dynamic response of tourism performance to the TV series. More specifically, our methodology consists in an estimation procedure in three steps:

(I) We estimate cohort-specific (equivalent to season-specific) average treatment effect (CATTs) (where units in the same cohort e share the same time period of the initial treatment E_i) using a linear two-way fixed effects specification that interacts relative period indicators with cohort indicators, excluding indicators for cohorts in the year before the filming of GoT, which represents the baseline category:

$$Y_{it} = \alpha_i + \lambda_t + \sum_{g \neq -1} \delta_{e,g}(I\{E_i = e\} * D_{it}^g) + \phi X'_{it} + \epsilon_{it} \tag{1}$$

where $ln(Y_{it})$ is the natural logarithm of the outcome variable of interest (tourist arrivals or overnight stays) for the county i in year t, D_{it} is a binary indicator of treatment equal 1 if the county was ever chosen as GoT location.

The estimated effects of GoT are the coefficients δ_{eg} of interaction of D_{it} with group-year dummies g, which, given an available observation window of $t = -8, ..., 0, ..., 6$, are equal 1 if a county is observed in event-year group g from the filming of GoT, where g is a category for $-7 \leq t, -6 \geq t \leq -2, t = 0, t = 1, t = 2, t = 3$ and $t \geq 3$.

In fact, in such frameworks, especially when studying long-run effects, the previous literature presents estimates for groups of leads or lags instead of focusing on yearly relative periods, while using the standard linear two-way fixed effects regression (e.g., Stevenson and Wolfers (2006); Bailey and Goodman-Bacon (2015)). In view of that, we summarize the magnitude and the joint statistical significance using, instead of individual event-year dummies l, year groups dummies D_j^g.

The year before the filming ($g = -1$) is omitted and represents the baseline category.

(ii) We estimate the weights by sample shares of each cohort in the relevant period g, $Pr\{E_i = e | E_i \in [-g, T - g]\}$. More formally, denote by $N_e = \sum_{N=1}^{N} I\{E_i = e\}$ the number of units in cohort e. Denote by h_g the set of cohorts that experience g periods of treatment relative to the initial treatment in each group of leads or lags g. The sample share of counties in cohort e among all counties that experience g periods of treatment is given by $N_e / \sum_{e \in h^g}$. The weights sum to one and are nonnegative.[3]

(iii) Lastly, in the third step, the cohort-specific estimates associated with relative period g from step one are averaged with weights estimates from step two to form the interaction-weighted estimator:

$$\hat{v}_g = \sum_e \hat{\delta}_{e,g} Pr\{E_i = e | E_i \in [-g, T - g]\} \tag{2}$$

Since we have never treated counties, we use all observations and we do not need to exclude any cohort from estimation.

[3] We report the weights used in our estimation procedures in Table 12 in Appendix.

Table 4 Impact of GoT on tourist arrivals

	(1)	(2)	(3)	(4)
7 years plus before filming	−0.015	−0.086	−0.078	−0.034
	(0.050)	(0.048)	(0.049)	(0.033)
2-6 years before filming	−0.001	−0.021	−0.020	0.005
	(0.019)	(0.017)	(0.018)	(0.017)
1 year before filming	OMITTED	OMITTED	OMITTED	OMITTED
year of filming	0.029***	0.035****	0.034***	0.027*
	(0.009)	(0.010)	(0.011)	(0.015)
year of broadcasting	0.035**	0.047***	0.045***	0.033
	(0.015)	(0.015)	(0.016)	(0.025)
1 year after broadcasting	0.038*	0.056***	0.049***	0.037
	(0.019)	(0.018)	(0.017)	(0.032)
2 years after broadcasting	0.052**	0.076***	0.063****	0.038**
	(0.024)	(0.022)	(0.013)	(0.018)
3 years plus after broadcasting	0.158****	0.155****	0.130****	0.133**
	(0.044)	(0.040)	(0.036)	(0.054)
Fixed effects	C-Y	C-Y	C-Y	C-Y
Country linear trend	NO	YES	YES	NO
Controls	NO	NO	YES	YES
County-specific linear trend	NO	NO	NO	YES

The stars correspond to a significance level of, respectively, less than 0.1% (∗∗∗), from 0.1 to 1% (∗∗∗), from 1 to 5% (∗∗), and from 5 to 10% (∗). The dependent variable is the natural logarithm of tourist arrivals. All models include county and year (C-Y) fixed effects. Standard errors are reported in parentheses and are clustered at the county level in the first step of the estimation procedure.

The identification of the causal effect of treatment depends on the existence of a valid control group that can be compared to the treated group, which should be identical to the control group except for the treatment. With this regard, the common concern is treatment endogeneity. For instance, counties that were already experiencing poor performance in the tourist sector may have tried to attract such interventions in order to boost their tourist outcomes. Alternatively, the director of GoT may have chosen already well known locations and visited by tourists in order to improve the popularity of the series and the fidelity of the audience. In both cases, the treatment would be endogenous and the estimated effect will be biased by the existence of these preexisting trends in the dynamics of tourism, which make treated and control groups systematically different and growing at a dissimilar pace.

A common diagnostic approach for such concern is to look at whether the treatment appears to affect the outcome before it occurs. If pre-trends are detected, strict exogeneity is likely to fail (Freyaldenhoven et al. 2019).

The dynamic specification adopted allows us to test immediately for the existence of pre-trends and to disentangle the full dynamics of the treatment effect, distinguishing the impact during the year of filming, in the year of broadcasting, and in the following years.

Table 5 Impact of GoT on tourist overnight stays

	(1)	(2)	(3)	(4)
7 years plus before filming	−0.036	−0.106*	−0.101*	−0.022
	(0.060)	(0.058)	(0.060)	(0.027)
2-6 years before filming	−0.008	−0.029	−0.030	0.012
	(0.021)	(0.018)	(0.020)	(0.010)
1 year before filming	OMITTED	OMITTED	OMITTED	OMITTED
year of filming	0.021**	0.028***	0.028***	0.019
	(0.008)	(0.009)	(0.010)	(0.015)
year of broadcasting	0.028*	0.042***	0.041***	0.024
	(0.015)	(0.015)	(0.015)	(0.024)
1 year after broadcasting	0.035*	0.056***	0.046***	0.030
	(0.020)	(0.019)	(0.017)	(0.030)
2 years after broadcasting	0.045*	0.072***	0.071****	0.056**
	(0.026)	(0.025)	(0.015)	(0.021)
3 years plus after broadcasting	0.122***	0.141***	0.116**	0.192***
	(0.040)	(0.052)	(0.044)	(0.069)
Fixed effects	C-Y	C-Y	C-Y	C-Y
Country linear trend	NO	YES	YES	NO
Controls	NO	NO	YES	YES
County-specific linear trend	NO	NO	NO	YES

The stars correspond to a significance level of, respectively, less than 0.1% (∗∗∗), from 0.1 to 1% (∗∗∗), from 1 to 5% (∗∗), and from 5 to 10% (∗). The dependent variable is the natural logarithm of tourist overnight stays. All models include county and year (C-Y) fixed effects. Standard errors are reported in parentheses and are clustered at the county level in the first step of the estimation procedure.

To explore the robustness of our results, we add covariates sequentially and include a country-specific linear time trend, able to capture any change at the country level, i.e., national policies influencing tourism dynamics or different social and demographic trends in each State.

Additionally, we estimate a model with a county-specific linear time trend, to rule out the possibility that treatment and control counties were already on differential growth trajectories in their tourist outcome variables. Standard errors are clustered at the county level in the first step of estimation procedure to control for an arbitrary within county covariance structure.

4 Results

We estimated four different models for each outcome variables, adding different covariates subsequently, and obtained similar results. They highlight a positive impact of GoT on tourist outcomes and provide no evidence of a differential trend in tourist flows in treated locations before GoT was filmed. The estimated pre-trends are small in magnitude and statically insignificant. This reassures on the validity of the casual

inference, since the absence of such pre-event trends is indicative of exogeneity of the treatment.

The estimated effects in the post-treatment years show a positive and significant increase starting from the year of filming. Specifically, analyzing Table 4, we can observe how the first model, which includes only counties and years fixed effects, provides evidence that tourist arrivals increase by almost 2.9% in the year of filming. The effect increases over time becoming 16% three years after broadcasting.

The second model includes the country-specific linear time trend. It suggests an even higher impact of GoT on tourism arrivals. Starting from 3.5% in the year of filming, it increases over time reaching almost 15% from three years after broadcasting onwards.

The third model may provide more precise estimates since it adds controls to the previous models. Obtained results are very similar to model 2 in the year of filming and broadcasting, whereas they show a slightly lower increase over time of the impact of GoT on tourist arrivals (13% 3 years plus after broadcasting).

Finally, the last model differs from the previous one because it substitutes the country-specific linear time trend with a county-specific linear time trend. Results show a similar pattern in sign, loosing significance in the earlier time indicators. This is not surprising since time trends might be over controlling and may even absorb part of the treatment effect, especially in the case of dynamic treatment effect Wolfers (2006).

The same positive results have been recorded for the overnight stays. The coefficients reported in Table 5 show a positive and increasing over time impact on overnight stays but smaller in magnitude with respect to the arrivals. The first model provides an impact in the long run not higher than 12.2% becoming 14.1% when we add country-specific linear time trend and 11.6% when we add also controls.

The last model, which includes the county-specific linear trend, highlights a positive and significant impact only in the long run, being 19.2% three years after broadcasting onwards.

Overall, arrivals and overnight stays increase constantly over time. Thus, our results support the view that worldwide successful TV series attract a higher number of tourists in the locations where they have been filmed (Tkalec et al. 2017; Lundberg et al. 2018).

Interestingly, our findings highlight a poorer performance on overnight stays and, consequently, on the ability to keep tourists for more than one day.

4.1 Falsification exercise

To check whether our results have been driven only by chance, we run a placebo test applying the same estimation strategy of column 4 of Tables 4 and 5 only to untreated counties, randomly assigning the treatment status and time to counties in which there was no treatment. Specifically, we assign a random variable between 0 and 5 to any untreated county in the first year of observation (2007) and then extend that value to the following years. The aim is to simulate the filming of GoT by randomly generating a group of counties that remains untreated (which takes the value 0) and five placebo cohorts of 'fake treated' (which take the values 1–5). We replicate this exercise 1000 times and then compare the average and the distribution of these placebo studies with

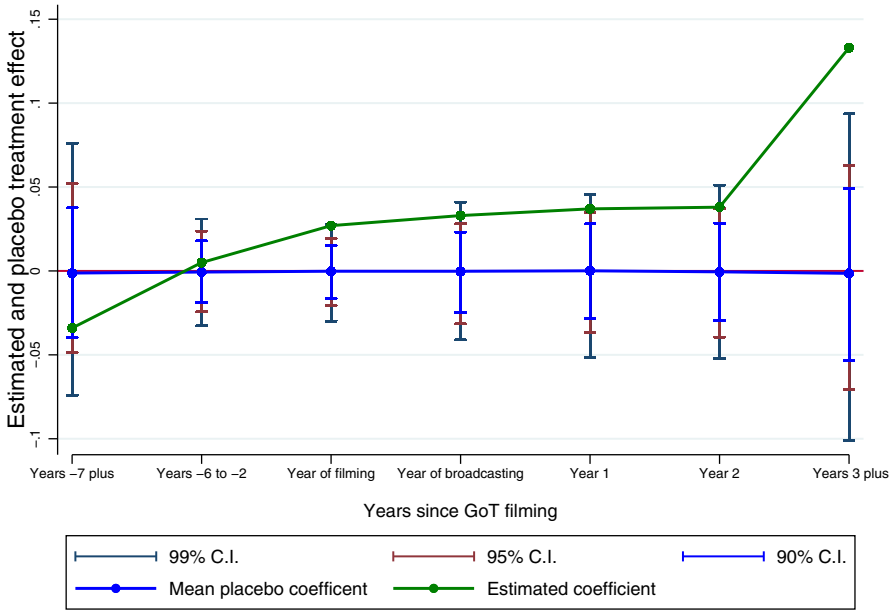

Fig. 2 Placebo studies on tourist arrivals. *Notes*: The coefficients are weighted estimates at the cohort level of parameters of equation 3 on the county sample of 57 never treated observed in period 2007–2017 (627 observations). The dependent variable is the natural logarithm of tourist arrivals. Regressions include county and year fixed effects, controls and county-specific linear trends

the results reported in Tables 4 and 5. In case we find significant effects in this group of counties that, in reality, did not experience the filming of the series, there is reason to doubt the main results for the treated counties. Results displayed in Fig. 2 for tourist arrivals and 3 for overnight stays show a pattern of the mean placebo treatment effect close to zero, confirming that the placebo group is not affected by the filming and broadcasting of GoT. In other words, the 'fake TV series' analysis provides analytical evidence that the effect does not exist where and when it should not exist. These results reassure on the validity of the causal finding in the main analysis of interest.

4.2 Spillover analysis

One possible threat to the validity of our results is that the effect of GoT series on tourism flows in filming locations may cross over borders and the untreated counties no longer identify the counterfactual outcome if they are somehow affected by the treatment. Indeed, if untreated counties, and specifically those that are 'close' to treated areas, as the effect of treatment normally fades out over a distance, experience contamination effects, when estimating by difference-in-differences techniques, the spillovers onto the control group are averaged into its change in outcomes. Thus, the spillover is subtracted from the treatment effect estimates and biases the results in the opposite sign of the spillover effect (Butts 2021). Spillovers onto the control group may be either positive or negative. Negative, if travelers reallocate themselves within a

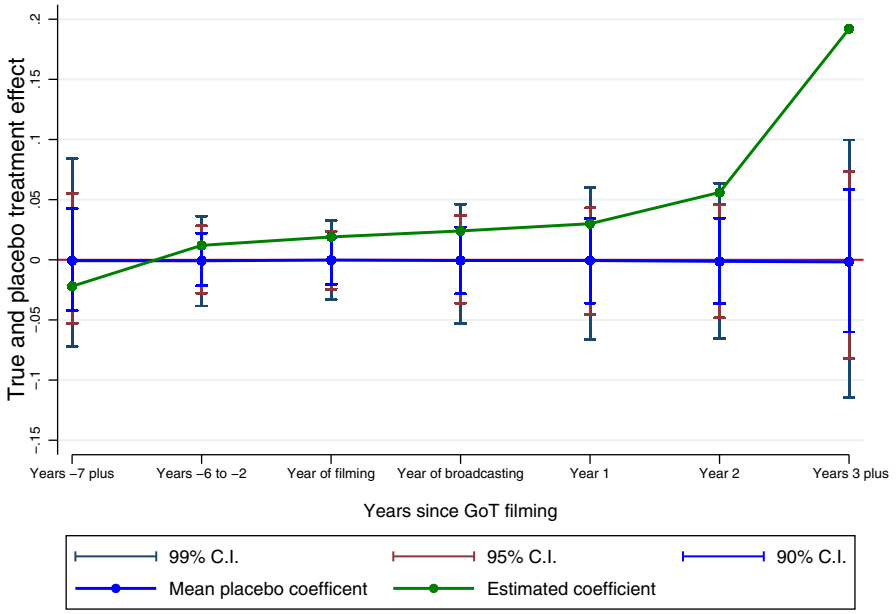

Fig. 3 Placebo studies on tourist overnight stays. *Notes*: The coefficients are weighted estimates at the cohort level of parameters of equation 3 on the county sample of 57 never treated observed in period 2007–2017 (627 observations) The dependent variable is the natural logarithm of tourist overnight stays. Regressions include county and year fixed effects, controls and county-specific linear trends

country, substituting a destination in the control group with a treated area. In this case, our estimates may suggest a positive impact of the TV series while the overall impact at the country level is net zero. Positive, if tourists visiting GoT filming locations are induced to travel to nearby untreated areas. Addressing these points is particularly relevant from a policy perspective, since policymakers should analyze the cross-border effects if interested in whether there is a positive effect on tourism into the whole country and avoid potential counterproductive competition between counties that may arise if, as in the case of attracting productions in the destinations discussed in Sect. 5, the decisions are made at the local level.

The graphical analysis with the comparison between treated cohort and never treated counties presented in Figs. 6 and 7 in Appendix never shows a decreasing trend in the tourism performance of untreated areas (depicted with the blue line) in the post-treatment period of their counterpart treated counties. This reassures us on the absence of a full substitution effect from control counties to treated ones that would make the tourism performance of a country growing at its natural trend.

However, we test the existence of untreated onto treated counties substitution effect by following a common approach that focuses on neighbor relationships and cross-border differences (see, e.g., Case et al. 1993; Boarnet 1998; Redding and Sturm 2008). Specifically, we test the existence of a substitution effect between treated and untreated counties by comparing the treated counties with those untreated that share a common border with the filming counties of GoT and those that a not 'close,' namely non-border

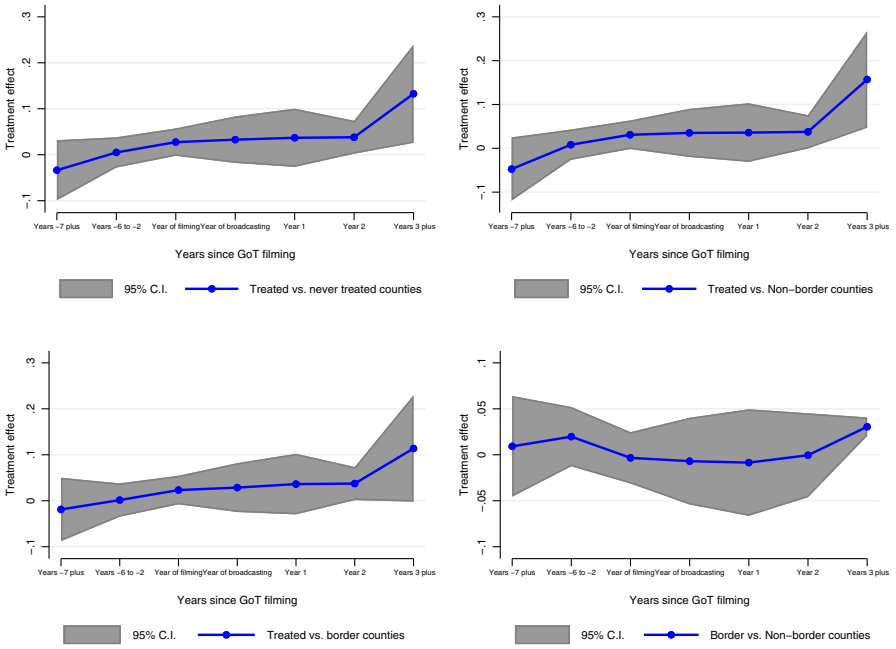

Fig. 4 Spillover analysis on tourist arrivals. *Notes*: The coefficients are weighted estimates at the cohort level of parameters of equation 1 on the county sample observed in period 2007–2017. The dependent variable is the natural logarithm of tourist arrivals. The top left panel displays our main results (column 4 of Table 4). The top right panel compares treated counties with border untreated counties. The bottom left panel shows treated counties against non-border untreated counties. The bottom right panel depicts the comparison between the border untreated counties and the non-border untreated counties. All regressions include county and year fixed effects, controls and county-specific linear trends

counties.[4] The intuition behind this approach is that, if a substitution mechanism exists, this should be stronger with closer counties, and the difference-in-differences estimates that compare treated and border untreated counties should be systematically higher than those that compare treated locations with non-border control counties. Figure 4 reports coefficients and confidence intervals of these comparisons for tourist arrivals while Fig. 5 displays results for overnight stays.[5] In detail, the top left panel displays our main results (column 4 of table 4). The top right panel compares treated counties with non-border untreated counties. The bottom left panel shows treated counties against border untreated counties. In each case, the estimates are very similar to those of the standard specification presented on the top left panel and are suggestive of an absence of negative spillover onto the control areas. Moreover, the bottom right panel of Figs. 4 and 5 depict the comparison between the border untreated counties and the non-border untreated counties, in order to test the existence of positive spillover effects onto control counties. In fact, if GoT filming counties are able to induce tourists to visit nearby areas, we should observe a positive difference in tourism performance between

[4] The list of border and non-border counties is presented in Table 9 in Appendix.

[5] The full set of estimates is also presented in Tables 10 and 11 in Appendix.

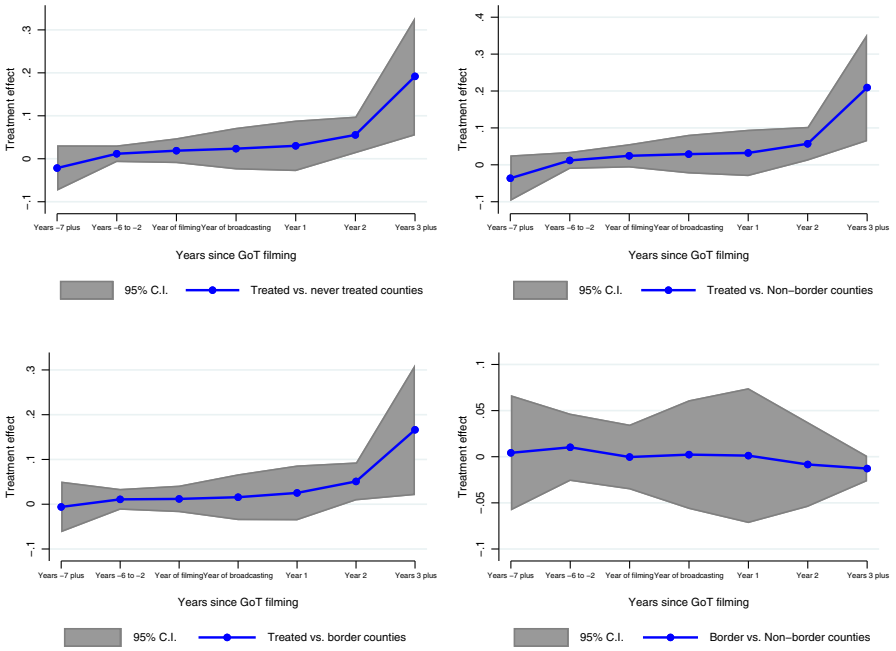

Fig. 5 Spillover analysis on tourist overnight stays. *Notes*: The coefficients are weighted estimates at the cohort level of parameters of equation 2 on the county sample observed in period 2007–2017. The dependent variable is the natural logarithm of tourist overnight stays. The top left panel displays our main results (column 4 of Table 5). The top right panel compares treated counties with border untreated counties. The bottom left panel shows treated counties against non-border untreated counties. The bottom right panel depicts the comparison between the border untreated counties and the non-border untreated counties. All regressions include county and year fixed effects, controls and county-specific linear trends

'close to treated' areas and those far away, less likely to be contaminated by positive spillovers. Results seem to suggest weak evidence of this potential mechanism for tourist arrivals, with a positive and significant coefficient only in the relative period '3 years plus,' while there is no significant evidence for overnight stays. This result is not surprising if we think that tourists may stay in a transit destination while going to visit GoT filming locations.

Overall, the evidence presented with the adopted approach is reassuring that, in our setting, our main results are not driven by spillover effects. These results also suggest the important implication that GoT increases the number of tourists in a country.

5 Theoretical insights and managerial implications

This research adds important theoretical implications to the field of tourism.

For the first time, an event study methodology robust to treatment heterogeneity across groups and over time is applied on a tourist phenomenon. The broadcasting of the TV series GoT represents a perfect case study to be evaluated with such novelty,

since it has been filmed and broadcasted differently across places and time. The potential heterogeneity of the tourist response in different counties and years may bias the results with more traditional methods, if not properly taken into account. Moreover, the event study design allows us to disentangle the full dynamics of the treatment effect in the pre-event period, in the short and the medium–long run. This flexible specification precisely identifies both the impact in the year of filming, in the year of broadcasting, and in the subsequent years. The lack of statistical evidence of pre-trends reassures that tourist dynamic was similar in treated and untreated counties before the treatment.

Second, our findings show the capacity of the successful TV series GoT to impact on a tourism destination, causing an increase of tourism performance. Our results are in line with Riley et al. (1998); Cortón and Ebrahimpour (2014); Tkalec et al. (2017), that have previously highlighted the existence of the film-induced tourism phenomenon. Additionally, they also confirm the results of Hudson and Ritchie (2006); Busby et al. (2013) that have underlined how the TV series have become a relevant communication instrument able to influence the popularity of destinations.

Moreover, according to Paci and Marrocu (2014), the persistent and increasing over time effect of GoT on tourist flows may be due to spatial spillovers generated by the interactions among visitors and tourism operators at both the destination and origin. These interactions facilitate the circulation of information and activate further visitor flows.

Additionally, tourism may increase both the domestic and international demand for goods produced in the destinations and represent a significant driver of regional economic growth. The view that tourism could activate international demand for local goods is also supported by Brau and Pinna (2013). The relevance of exports is usually recognized for most countries in view of economic development, especially for smaller economies, given the difficulties related to accessing international markets.

Furthermore, the results show an impact that starts during the filming phase, even before broadcasting. In line with Hudson and Ritchie (2006); Cardoso et al. (2017); Josiam et al. (2020), these results suggest how the broadcasting is not the unique moment that impact on the tourism flows: the choice of a destination as film location and the relative public announcement is often enough to attract new tourists in a destination. Therefore, it is possible to say that the decision-making process that brings tourists to choose a destination can be influenced also during the filming phase, not only during the broadcasting of the show.

To summarize, we have applied a model capable of evaluating the real impact of the TV Series on the tourism performance, excluding the existence of pre-trends, any change at the country level, or the presence of differential growth trajectories. The model can evaluate the effective increase of the arrivals and overnights stays on the destination caused by GoT. From a managerial point of view, the desire of people to visit places where films are shot and relive the film experience can be used as a strategic tool to generate film-induced tourism (see, e.g., Beeton (2006); Martin-Fuentes et al. (2020).

In our case, GoT has been able to attract a higher number of tourists, but the major impact has been recorded on arrivals rather than on overnight stays. This suggests that GoT has been able to attract tourists, but not to retain them: it is an attractor, that nonetheless could and should be exploited by destination managers and policymakers

to foster the tourism development of a destination. Additionally, since the decision-making process of the choice of destination starts in the filming phase and it continues during the broadcasting, the destination managers should create a communication able to enhance and take advantage of the engagement generated by the films.

For this reason, according to Vagionis et al. (2011), Destination Management Organizations (DMOs) should create tourism services and experiences around the TV and cinema productions, to retain tourists for more days. DMOs should also cooperate with the local Film Commissions to attract new productions in the destinations, and, later, use the success of those productions to attract, and possibly maintain, tourists in the destinations.

THE role of Film Commissions is also crucial. They should promote specific destinations as location for movies, documentaries and TV Series, select those places (like beautiful landscapes, historical places or buildings, interesting pieces of architecture or art) to be used in TV or film productions, and also offer monetary and technical support before, during and after the broadcasting. As noted by Juvskelyte (2016), the visibility of a destination grows significantly if it becomes the shooting location of an international movie production. GoT is certainly the perfect example of it: it is an international production with a worldwide success, and, in some cases, its shooting locations have been used for several seasons, generating a broader visibility for many years. Thus, DMOs and Film Commissions should operate to attract TV series, like GoT, to promote destinations.

6 Conclusions

New instruments of promotion and communication are used by tourist destinations to increase their visibility and to attract a higher number of visitors. Among these instruments, TV Series and cinema productions are one of the most recent and promising tools to improve tourist performance. Numerous studies have evaluated the impact of films on the image and the strategic promotion of the destinations. A few papers analyze empirically the impact in terms of tourist flows.

In this paper, we contribute to the scarce literature by estimating the causal impact of GoT on tourism performance in a good number of locations where it has been filmed. To reach this aim, we applied a new estimation method robust to treatment effect heterogeneity over time and across groups. The results suggest the absence of a pre-trends and the relevant and positive impact determined by GoT on tourist flows. The increase looks higher for tourist arrivals rather than overnight stays, suggesting the capacity of GoT to attract more people in the destinations. Furthermore, our findings show that overnight stays are positively associated with having had the series but they grow at a lower pace than the arrivals. This result may shed light on some unexploited potential to provide the tourist with a richer and more extensive experience in order to maximize the tourism income.

This paper presents some limitations. The first is related to the unavailability of more comprehensive data and a longer observation period. Even though the analysis has been focused on the majority of the destinations where GoT has been filmed, it does not include information on the remaining countries, such as Iceland, North Ireland

and Morocco. A broader analysis including all the series locations would increase the external validity of the findings. Moreover, given the observation period that results in a panel balanced in calendar time but unbalanced in relative periods, we cannot exclude that the large estimate in the last period may be due to something specific about the first cohorts. One solution to this point may be focusing on a panel which is balanced in relative periods (i.e., each including all cohorts) and, as a result, not balanced in calendar time, to check if results differ. Unfortunately, the availability of data in our case does not allow to keep a reliable observation period for the analysis.

Furthermore, other controls, such as tourism employment, investment in tourism, bed places and prices, would increase the accuracy of our estimates, once the potential issue of reverse causality is taken into account.

Lastly, our empirical strategy fails to take into account if a destination appears in more seasons, namely to assess the intensity of the treatment. This aspect may give a major visibility to the destinations and increase the possibility to attract tourists over time. Anyway, any attempt to control for the actual visibility of a destination may fail due to the spreading of illegal downloads, online streaming or replicas.

Future researches may benefit from higher availability of data that may improve the relevance of our results.

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Availability of data and material: Data sources are the Spanish Statistical Office - INE, the Croatian Bureau of Statistics and the National Statistics Office of Malta. The data that support the findings of this study is provided as part of the replication package. They will be uploaded to the Journal Repository once the paper has been conditionally accepted.

Declarations

Conflict of interest: The author(s) declare(s) that he/she/they has/have no conflict of interest.

Code availability: The STATA code for data cleaning and analysis is provided as part of the replication package. It will be uploaded to the Journal Repository once the paper has been conditionally accepted.

Appendix: Countries data

Table 6 Spain - Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Arrivals	1447906.22	1610504.949	158109	10604684	624
Overnight stays	5205577.026	9755712.697	266519	59375940	624
Real GDP per capita	21478.996	4339.717	14568	37413	528
Population	716191.098	512649.702	89700	2560000	528

Table 7 Croatia - Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Arrivals	647871.462	971255.891	4753	4481698	273
Overnight stays	3277596.187	5644144.493	12370	26388645	273
Real GDP per capita	8872.996	3064.434	5541.29	20849.711	231
Population	201798.075	162637.597	45184	804507	252

Table 8 Malta - Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Arrivals	750787	710212.411	65161	1923838	26
Overnight stays	4257474	4092254.581	230169	9765558	26
Real GDP per capita	13773.308	4985.883	1979.464	24476.953	22
Population	218204.833	191390.256	31036	460171	24

Table 9 Treatment group, border counties and non-border counties

Treated	Border	Non-border
Almería	Araba/Álava	Albacete
Cáceres	Ávila	Alicante/Alacant
Castellón/Castelló	Badajoz	Baleares
Córdoba	Burgos	La Coruña
Girona	Cádiz	León
Guadalajara	Ciudad Real	Lugo
Gipuzkoa	Cuenca	Ourense
Navarra	Granada	Asturias
Sevilla	Huelva	Palencia
Bizkaia	Huesca	Las Palmas
Dubrovnik-Neretva	Jaén	Pontevedra
Split-Dalmatia	Lleida	Santa Cruz de Tenerife
Malta	La Rioja	Valladolid
Gozo	Málaga	Zamora
	Murcia	Bjelovar-Bilogora
	Salamanca	City of Zagreb
	Cantabria	Istria

Table 9 continued

Treated	Border	Non-border
	Segovia	Karlovac
	Soria	Koprivnica-Križevci
	Tarragona	Krapina-Zagorje
	Teruel	Lika-Senj
	Toledo	Međimurje
	Valencia/Valéncia	Osijek-Baranja
	Zaragoza	Požega-Slavonia
	Šibenik-Knin	Primorje-Gorski kotar
		Sisak-Moslavina
		Slavonski Brod-Posavina
		Varaždin
		Virovitica-Podravina
		Vukovar-Sirmium
		Zadar
		Zagreb

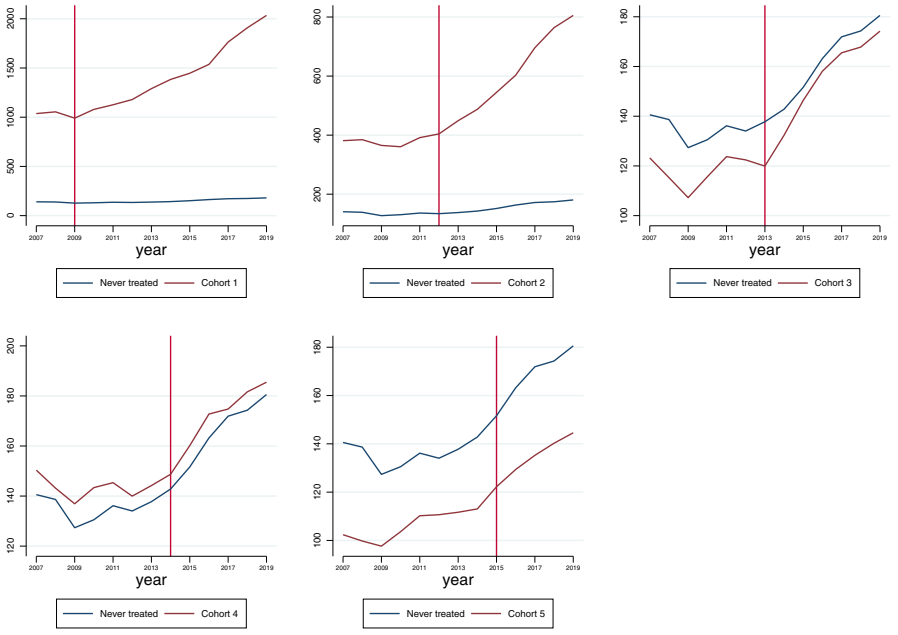

Fig. 6 Graphical analysis of the common trends assumption - Arrivals per Km^2. *Source*: Own elaborations

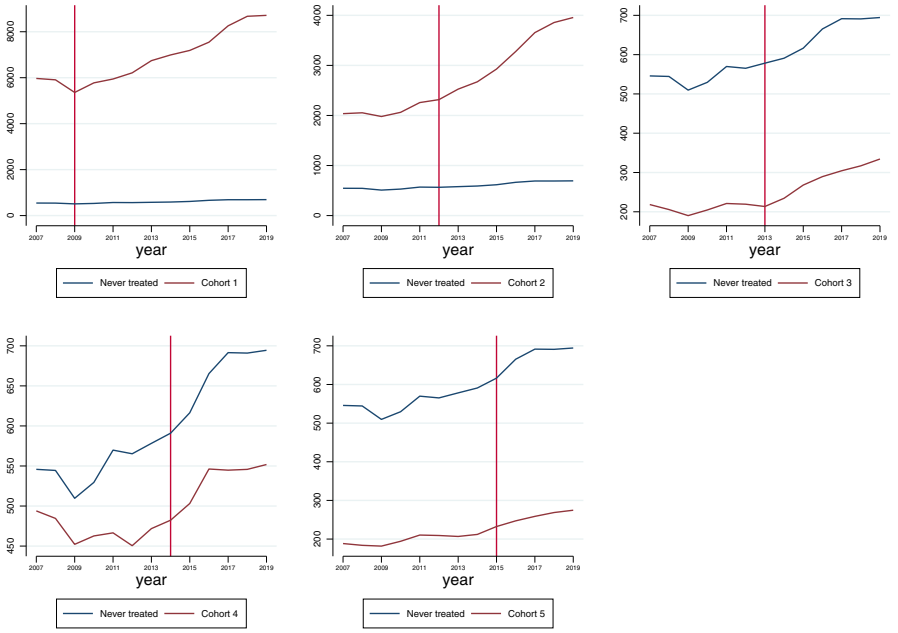

Fig. 7 Graphical analysis of the common trends assumption - Overnight stays per Km^2. *Source*: Own elaborations

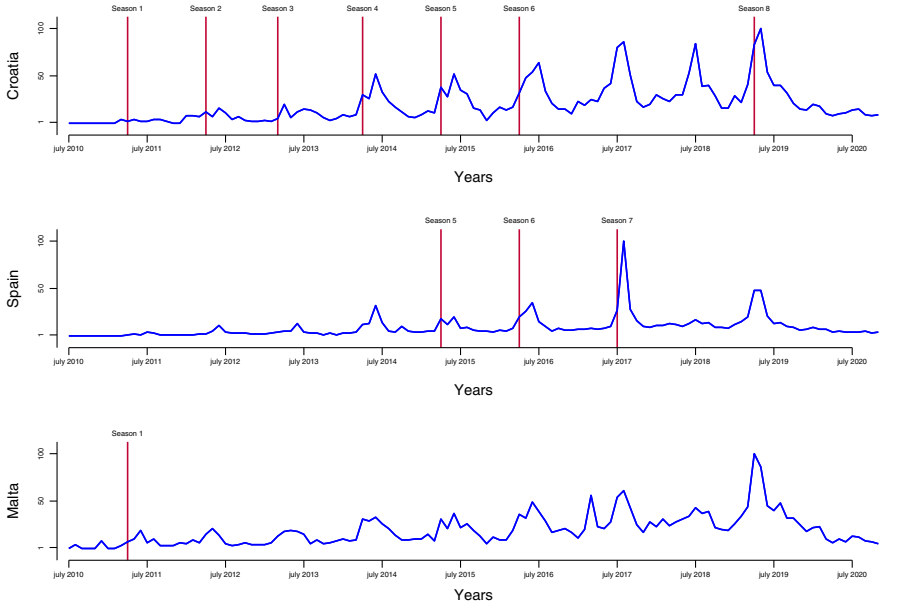

Fig. 8 Google Trends for GoT countries. *Source*: Own elaborations

Table 10 Spillover analysis - Tourist arrivals

	(1) Treated vs. non-border	(2) Treated vs. border	(3) Border vs. non-border
7 years plus before filming	−0.047	−0.019	0.009
	(0.036)	(0.034)	(0.027)
2-6 years before filming	0.008	0.001	0.020
	(0.017)	(0.018)	(0.016)
1 year before filming	OMITTED	OMITTED	OMITTED
year of filming	0.031*	0.023	−0.003
	(0.016)	(0.015)	(0.014)
year of broadcasting	0.035	0.029	−0.007
	(0.027)	(0.026)	(0.024)
1 year after broadcasting	0.036	0.036	−0.009
	(0.033)	(0.033)	(0.029)
2 years after broadcasting	0.038*	0.037**	0.000
	(0.019)	(0.018)	(0.023)
3 years plus after broadcasting	0.157**	0.114*	0.031***
	(0.055)	(0.057)	(0.005)

The stars correspond to a significance level of, respectively, less than 0.1% (***), from 0.1% to 1% (***), from 1% to 5% (**), and from 5% to 10% (*). The coefficients are weighted estimates at the cohort level of parameters of equation 2 on the county sample observed in period 2007-2017. The dependent variable is the natural logarithm of tourist arrivals. Model 1 compares treated counties with non-border untreated counties. Model 2 shows treated counties against border untreated counties. Model 3 presents the comparison between the border untreated counties and the non-border untreated counties. All regressions include county and year fixed effects, controls and county-specific linear trends. Standard errors are reported in parentheses and are clustered at the county level in the first step of the estimation procedure

Table 11 Spillover analysis - Tourist overnight stays

	(1) Treated vs. non-border	(2) Treated vs. border	(3) Border vs. non-border
7 years plus before filming	−0.036	−0.006	0.004
	(0.031)	(0.028)	(0.031)
2-6 years before filming	0.012	0.011	0.010
	(0.012)	(0.012)	(0.018)
1 year before filming	OMITTED	OMITTED	OMITTED
year of filming	0.024	0.012	0.000
	(0.016)	(0.015)	(0.018)
year of broadcasting	0.029	0.016	0.002
	(0.026)	(0.025)	(0.029)
1 year after broadcasting	0.032	0.025	0.001
	(0.031)	(0.030)	(0.037)
2 years after broadcasting	0.057***	0.051**	−0.008
	(0.023)	(0.021)	(0.023)
3 years plus after broadcasting	0.209****	0.166**	−0.013*
	(0.072)	(0.072)	(0.007)

The stars correspond to a significance level of, respectively, less than 0.1% (∗∗∗∗), from 0.1% to 1% (∗∗∗), from 1% to 5% (∗∗), and from 5% to 10% (∗). The coefficients are weighted estimates at the cohort level of parameters of equation 2 on the county sample observed in period 2007-2017. The dependent variable is the natural logarithm of tourist overnight stays. Model 1 compares treated counties with non-border untreated counties. Model 2 shows treated counties against border untreated counties. Model 3 presents the comparison between the border untreated counties and the non-border untreated counties. All regressions include county and year fixed effects, controls and county-specific linear trends. Standard errors are reported in parentheses and are clustered at the county level in the first step of the estimation procedure

Table 12 Weights used in the (ii) step of estimation procedure

Cohort	7 years plus before filming		2-6 years before filming		Year of filming		Year of **broadcasting**		**1 year after** broadcasting		**2 years after** broadcasting		3 years plus after broadcasting	
	N	W	N	W	N	W	N	W	N	W	N	W	N	W
1	0	0	6	0.098	3	0.214	3	0.214	3	0.273	3	0.500	12	0.923
2	0	0	5	0.082	1	0.071	1	0.071	1	0.091	1	0.167	1	0.077
3	2	0.095	10	0.164	2	0.143	2	0.143	2	0.182	2	0.333	0	0
4	10	0.476	25	0.410	5	0.357	5	0.357	5	0.455	0	0	0	0
5	9	0.429	15	0.246	3	0.214	3	0.214	0	0	0	0	0	0
				0		0		0		0		0		0
Total	21	1	61	1	14	1	14	1	11	1	6	1	13	1

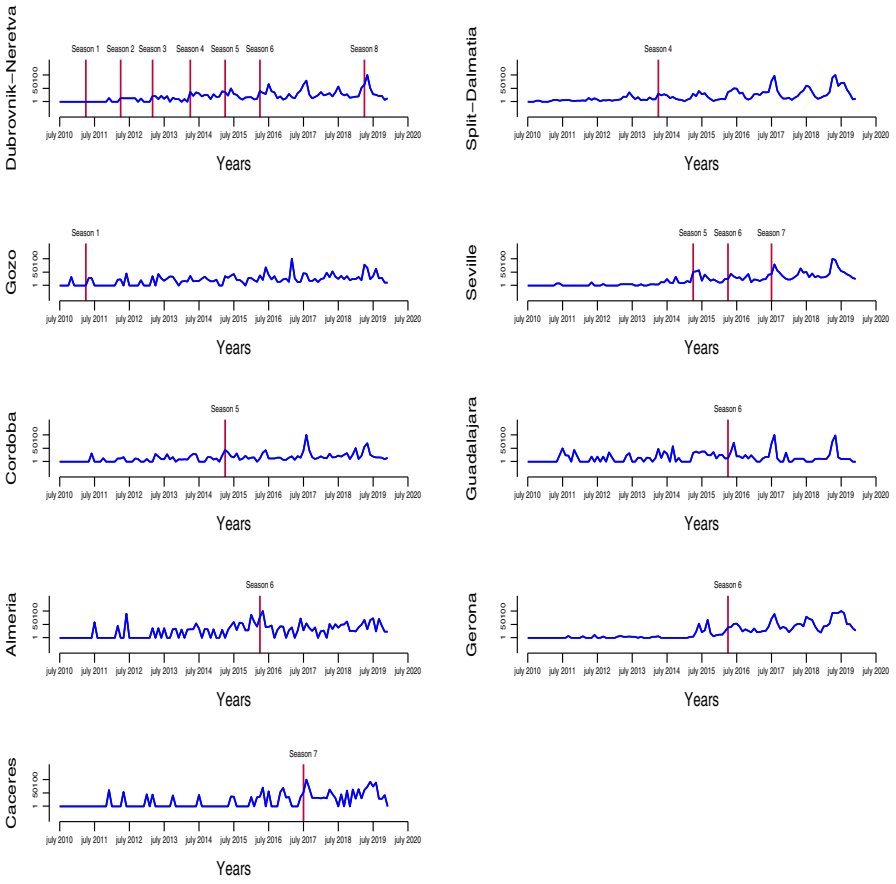

Fig. 9 Google Trends for GoT counties. *Source*: Own elaborations

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