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Economic losses in tourism during the COVID-19 pandemic. The case of Sorrento

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ABSTRACT

The tourism sector is facing its most severe crisis under the COVID-19 pandemic. Social distancing measures, global travel restrictions, stay-at-home orders, and other lockdown measures brought tourism to a halt in 2020. We estimate the potential economic losses thereof in terms of added value and number of tourists by nationality. By using the city of Sorrento as prominent and representative case study, we implement time-series analysis with autoregressive-integrated moving average models on monthly data from January 2013 to December 2019. We thus forecast the loss of tourists and added value in 2020. The results reveal that the pandemic has significantly affected the tourism sector, the added value of tourism in Sorrento might decrease by over 70%, and tourist arrivals might similarly fall or even reach zero foreign arrivals. The local government should reassess the sustainability of tourism proposals by factoring in the lack of tourist arrivals and focusing on loyal tourists and proximity tourists, two fundamental target audiences.

Highlights

- We analyse the potential economic effect of COVID-19 on tourism in 2020
- A forecast analysis estimates the changes in added value and number of tourists
- An ARIMA model is employed on monthly data
- COVID-19 might negatively and severely affect the tourism economy
- Foreign tourism risks attracting zero travellers in the post-pandemic period

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1. Introduction

December 2019 ushered in a new and unprecedented health crisis: The World Health Organization (WHO) reported the first case of the novel severe acute respiratory syndrome coronavirus 2 in Wuhan, Hubei Province of China on 31 December 2019. The virus spread rapidly in the Wuhan region. To contain the infection, Wuhan was placed under lockdown through mandated regional and individual quarantine measures (Huang et al., 2020). These measures were proven to be inadequate in avoiding the contagion from spreading globally. By January 2020, COVID-19, the disease caused by the novel virus, swept across the world. By the end of 2020, the WHO declared that the pandemic had reached over 200 countries, with over 90 million confirmed cases and over 2 million reported deaths.

The lack of a standardized, proven medical treatment and the absence of a vaccine to ease the severity and infectiousness of the disease has forced national governments to resort to lockdowns. Schools and universities have been closed; non-essential businesses and offices have been shutdown; measure of social distancing, home isolation, and quarantining have been enforced; and social events such as conferences, concerts, festivals, and sport events continue to be postponed or cancelled. Strong restrictions have been placed on movement and travel at locally, regionally, and internationally. International travel has also become complex because of travel bans, closed borders, or compulsory screening, testing, or quarantining at international airports.

The COVID-19 health crisis has rapidly become an economic crisis. The European Commission predicted the economy of the European Union to shrink by over 10% in 2020. The intensity of economic decline is even more evident in the tourism sector, which relies on travel, socializing, culture, and entertainment. This effect is further amplified in economies that rely heavily on tourism, such as in Italy. Between June 2019 and early 2020, the Italian labour market suffered a collapse, which affected 841,000 employees (−3.6%) (ISTAT – National Italian Institute of Statistics – online dataset¹). The tourism sector – hotels and restaurants, in particular – in the second quarter recorded a decline in employment of 246,000 units (−16.1%) (ISTAT online dataset). Though the summer months registered a marginal uptick in trends, the severity of the economic effects, especially in the hospitality sector, makes short- to medium-term employment recovery unlikely. The high seasonality of tourism and hospitality employment has also led to the termination of many fixed-term contracts and a reduced hiring. The crisis in the sector has contributed to a fall of 29.3% in job losses between June 2019 and 2020 (ISTAT online dataset).

The health crisis caused by the COVID-19 pandemic calls for scholars worldwide to conduct scientifically reliable research. In a relatively short time, the literature on COVID-19 has grown considerably and the phenomenon has been analysed from different perspectives. Some studies have linked COVID-19 to social costs (Qiu et al., 2020), consumer behaviour (Sánchez-Pérez et al., 2021), mental health problems (Karatepe et al., 2021), and employment (Khan et al., 2021). However, the literature on the economic impact of COVID-19 on tourism is *in statu nascendi*. One of the first attempts was by Škare et al. (2021), who explored the potential effects of the COVID-19 pandemic on the tourism industry by using the annual data (1995–2019) of 185 countries. By using the PSVAR model, the authors estimated how the COVID-19 shocks on tourism (e.g. arrivals and spending) propagated across the world. The present work fits into this research stream with relevant differences in respect to the work done by Škare et al. (2021). The aim of this paper is to forecast and quantify economic losses (in terms of value added and the number of tourists) in the tourism sector owing to the COVID-19 pandemic. To this end, we resort to monthly data for 2013–2019. Monthly data present several advantages. First, the higher number of observations allow for greater statistical accuracy and more robust estimations. Second, unlike the annual data, the detail of the monthly data makes it possible to control for seasonality, which is a fundamental aspect to consider in tourism-related studies. Another important advantage of this study is that we quantify the economic losses by distinguishing between domestic and foreign tourists. Moreover, in the foreign tourist category we also capture the impact of the pandemic on tourist flows by nationality, highlighting which countries have suffered most from the pandemic in terms of travel behaviours. Finally, we test the impact of the pandemic on a deeply tourism-based economy. For this perspective, we perform the analysis on Sorrento, a city in southern Italy, which has an economy that is almost totally dependent on the tourism sector since just under 90% of households have tourism-related income (Carli, 2012; IlMegliodiSorrento.com²). Moreover, we chose the city of Sorrento as our case study because it is an internationally renowned tourist destination and thus an excellent benchmark for tourist destinations. To this end, we use a time-series analysis and forecast the added value and number of tourists by nationality in 2020, the year fully characterized by the pandemic.

The remaining paper is organized as follows: Sections 2 presents the literature review. Section 3 introduces the case study of Sorrento. Sections 4 and 5 present the method and data, respectively. In Section 6, we present the empirical results. Section 7 discusses and concludes the paper.

2. Literature review

The COVID-19 pandemic is not the first large-scale health crisis with economic shock that has been studied in the literature on tourism. Page et al.'s (2006) case study analysed the response of tourism managers to Avian Influenza in Scotland. The Scottish National Tourism Organisation's response to the crisis is considered a stellar case of best practice – for its pandemic containment plan and knowledge-sharing with the World Tourism Organisation. Later, Page et al. (2012) studied 14 source markets to determine the effects of the 2009 swine flu pandemic on the demand for UK inbound tourism. Their empirical results suggest that the swine flu pandemic had a significantly negative effect on tourism demand. The largest recorded declines in visitor arrivals were from the United States, Germany, Ireland, Spain, China, and Russia, whereas the smallest were from Asia, France, Canada, and Australia.

Chien and Law (2003) studied the economic effects of the deadly 2003 Severe Acute Respiratory Syndrome (SARS) pandemic. They used the hotel industry in Hong Kong as case study to evaluate the magnitude of decline in number of hotel guests. The hotel guests decreased to levels that Hong Kong had never experienced before 2003. Chien and Law recommended the national government to financially support the tourism industry in order to avoid large-scale business closures. Cooper (2006) analysed the reactions of the Japanese tourist sector and tourists toward SARS in 2003. At the pandemic's peak in May 2003, the economic damages to the tune of billions were recorded as Japanese and foreign tourists avoided destinations with reported cases of SARS infections. Gu and Wall (2006) examined these effects for tourism in Beijing and elsewhere in China, as well as the initiatives taken to revive the tourism economy. Their research contends that, although severe, the effect of SARS was short-lived. The actions of Chinese authorities effectively addressed the crisis, particularly through product repackaging and new marketing initiatives. Similar conclusions on the effects of SARS in China were found by Zeng et al. (2005), who discussed the high resilience of the Chinese tourism industry to crises. Zeng et al. (2005) further stated that this crisis only caused short-term perturbation for tourism and the entire economy. More recently, Novelli et al. (2018) shined a light on the Gambia, where the Ebola Virus Disease Epidemic had devastating consequences. They highlighted the importance of consumer perception in increasing the negative effect of epidemics on tourism in developing countries.

Ritchie and Jiang (2019) reviewed 142 articles published between 1960 and 2018 on tourism risk, crisis, and disaster management: they considered not only health-related crises, but a wide range of emergencies such as global financial crises, natural disasters, and terrorist activities such as the 9/11. They identified a lack of comprehensive theoretical and methodological assessments of the effects of crises on the tourism industry. The vast of corpus of literature on this issue shows that most global events despite being adverse did not lead to lasting, large-scale economic decline in tourism. Indeed, Gössling et al. (2020) offer us empirical evidence of low negative effects of past crises on the global development of tourism. They analysed the level of global international tourism arrivals between 1995 and 2018 by accounting for major crises occurring during this timespan, such as 9/11, the 2003 SARS outbreak, the 2009 global financial crisis, and the Middle East Respiratory Syndrome outbreak in 2015. They found no long-term decline in arrivals; even more interestingly, only SARS and the global financial crisis led to declines in international arrivals (−0.4%, and −4.0%, respectively).

The tourism industry seems to be resilient to external shocks. However, the effect of the COVID-19 pandemic may be unprecedented because of its severe infectiousness, fatality to vulnerable groups such as the sick and elderly, and the strict lockdown measures imposed by governments. In over a year of the pandemic, a rich corpus of literature has emerged on the effects of COVID-19 on tourism. For instance, Dinarto et al. (2020) analysed the effect of the virus on Bintan Island, the fourth most

visited tourist destination of Indonesia. They found declining demand for tourism-related businesses such as hotels, gift shops, and local fisheries. Gössling et al. (2020) evaluated the effects of global travel restrictions and stay-at-home behaviours on tourism by comparing the damage caused by COVID-19 to other global crises. Niewiadomski (2020) commented on the opportunity for a re-boot of the tourism industry for the post-COVID-19 era. They discussed 'tourism de-globalisation', offering a view of a new and more sustainable path that allows governments to overcome the *dark sides* of tourism growth, such as environmental degradation, economic exploitation, and overcrowding. Galvani et al. (2020) also explored the sustainability of tourism by hypothesizing that COVID-19 has increased the awareness of humankind towards global problems. Along these lines, Uğur and Akbıyık (2020) conducted a cross-regional comparison on the effects of the virus on the global tourism industry. They used a text mining technique to analyse tourists' reaction to virus-related news: a significant number of travellers decided to cancel or delay their trips because of the crisis. Qiu et al. (2020) explored residents' perception of the risk posed by tourism during peak COVID-19 transmission. They proposed three hypothetical scenarios to show residents were willing to individually pay more to maintain public health and reduce the infection risk arising from tourism activities. Hall et al. (2020) contextualized the responses of the government, industry, and consumers to COVID-19 by overviewing other pandemics and their effects on tourism. They concluded that, in the post-COVID-19 era, the possibility of a shift towards a sustainable sector is limited, albeit, in some cases, a reorientation of tourism policies may be possible.

A case study on Malaysia was proposed by Foo et al. (2020). They highlight how tourists' concerns about the virus have hugely and adversely impacted Malaysia's tourism industry because of booking cancellations and travel delays. Moreover, this study also highlights the key role of the travel restrictions imposed by the Malaysian government in the decline of the sector. Lim and To (2021) focused on Macao. They found that Macao's economy could experience an unprecedented decline because of plummeting tourist arrivals. The Macao case has attracted the attention of other authors because it is the world's largest destination-dependent gambling hub. For example, McCartney (2021) have pointed out that the Government's measures (e.g. over 10% of Macao's hotel rooms were converted into quarantine areas, and the region's borders were closed to foreign arrivals) to face the health crisis led to dramatic economic consequences. Khalid et al. (2021) explored the relationship between the relative size of the tourism sector and policy responses to the pandemic. By using data on 136 countries, the authors found that countries with larger tourism sectors adopted more aggressive economic policies to mitigate the impact of the pandemic and to reinvigorate floundering economies. Sánchez-Pérez et al. (2021) explored the changes in behavioural intentions of a sample of 1,000 Spanish travellers. Their analysis showed that conventional tourism was severely affected by COVID-19 and resulted in the reorganization of consumer planning based on more local and individual holidays, more insurance contracts, and less use of public transport and shared services.

In summary, although the literature on the impact of COVID-19 on tourism is growing rapidly it still shows wide margins for development to evaluate the effects of this unprecedented situation on several aspects of society worldwide. In particular, works on the economic impact of the pandemic on the tourism sector are still rather scarce. Our study is thus a novel attempt, to the best of our knowledge, to quantify the potential economic losses induced by COVID-19 to the tourism sector in terms of added value and the number of tourists by nationality.

3. Case study: Sorrento between history and tourism

Sorrento is one of the most famous Italian destinations in international tourism. The city is at a distance of about 46 km from Naples, the capital of the Campania Region, and is located on the north-western part of the Sorrento peninsula (see [Figure 1](#)).

Owing to its geographical conformation, the town is a natural terrace overlooking the sea, lying on the Gulf of Naples at a height of 47 metres above sea level; it has very rich vegetation of Mediterranean scrub.



Figure 1. Geographical position of Sorrento.

Sorrento is recognized for many special features that make it an enchanting location for a holiday to remember: the hospitality and kindness of the inhabitants; diverse natural forms and breathtaking views; the birthplace of the legendary Sirens, mythological creatures, half woman and half fish, who bewitched Ulysses through son in Homer's *Odyssey*; and its splendid thousand citrus gardens. Sorrento is a scenic heritage town known for its welcoming culture. Its famous natural views include sunsets at Punta del Capo, Ischia, or Procida and the seaside tuff ridges. The region is steeped in ancient Greek and Roman history and legend.

After a long period of stagnation, at the beginning of the eighteenth century, a period of cultural, economic, and social rebirth began for the entire Sorrento peninsula. It reached its peak during the nineteenth century, when the region became an established tourist locality. In this period, Sorrento was included in the so-called *Grand Tour*, a trip to the most significant places in Italy that every noble European scion of the time had to make to complete their cultural, historical, and literary training. Thus, illustrious guests, now considered historical greats, such as Byron, Keats, Scott, Dickens, Goethe, Wagner, Ibsen, and Nietzsche graced Sorrento in search of sun and inspiration.

In the same period, more traditional work activities intensified, such as agriculture, maritime, trade, and finally the tourist industry that currently represents the backbone of the Sorrento economy.

4. Method

To study the pattern and trend of the returns of the tourism sector and arrivals in the city of Sorrento, we implement time-series analysis with autoregressive-integrated moving average (ARIMA) models, using monthly data from January 2013 to December 2019. Time series models explain a variable with regard to its own past and a random disturbance term; these models are the most popular methods used in forecasting research (see Song & Li, 2008). The ARIMA models will help us forecast added value in the tourism sector and arrivals of European and non-European tourists in Sorrento in 2020. This result will allow us to quantify the potential loss of tourism revenues and the loss in terms of number of tourists caused by COVID-19.

Following Ma et al. (2016), we build on the Box–Jenkins seasonal ARIMA approach, as it is useful in capturing the behaviour of seasonal time series and generating accurate forecasts for such series (Coshall, 2006; Chu, 2009; Kim & Moosa, 2005; Lim & McAleer, 2005; Ma et al., 2016; Oh & Morzuch, 2005). To this end, we must start with the general forms of additive and multiplicative Box–Jenkins seasonal ARIMA models which can be formalized as follows:

$$\text{additive model: } \Phi_p(B^s)\phi_p(B)(1-B)^d(1-B^s)^D\dot{Z}_t = \theta_q(B) + \Theta_Q(B^s)\varepsilon_t \quad (1)$$

$$\text{multiplicative model: } \Phi_p(B^s)\phi_p(B)(1-B)^d(1-B^s)^D\dot{Z}_t = \theta_q(B)*\Theta_Q(B^s)\varepsilon_t, \quad (2)$$

where

$$\dot{Z}_t = \begin{cases} Z_t - \mu, & \text{if } d = D = 0 \\ Z_t, & \text{otherwise} \end{cases}$$

$\varepsilon_t \sim N(0, \sigma^2)$, $\Phi_p(B^s)$ is the seasonal autoregressive term, $\phi_p(B)$ is the non-seasonal autoregressive term, $\Theta_Q(B^s)$ is the seasonal moving average term, and $\theta_q(B)$ is the non-seasonal moving average term (for more details, see Song & Li, 2008).

To apply the Box–Jenkins approach and identify the specification of the best model, it is necessary to proceed step-by-step: identify and estimate the model, employ diagnostics to test the adequacy of the model and model selection, and validate and forecast.

4.1. Model identification

To implement an ARIMA analysis, the time series must be stationary. As our series are monthly, they most likely will be characterized by seasonality. To make the time series stationary, we must take the first-order differences, and then the seasonal differences with a 12-month lag. To verify the stationarity of the series, we apply the augmented Dickey–Fuller test for unit roots. So that a series is stationary, it is necessary to reject the null hypothesis of unit root.

After our time series have been stationarised by differencing, the next step in fitting an ARIMA model is to determine whether the AR or MA terms are needed to correct any autocorrelation that remains in the differenced series. The autocorrelation function (ACF) and partial autocorrelation (PACF) plots of the differenced series allow us to tentatively identify the numbers (lags) of AR and/or MA terms that are needed.

Finally, by observing the original series (see Figures 2–4 in section 4) we can determine whether to implement an additive or multiplicative model. In particular, if the series shows an increasing or decreasing trend, a multiplicative model will be applied; conversely, if the series show a constant trend, then we will apply an additive model (see Song & Li, 2008). In general, time series with seasonality will lead to a preference for a multiplicative model rather than an additive one (Box et al., 2008), although it will be possible, through the application of logarithms to time series, to switch from a multiplicative to an additive model (Chatfield, 2004). In our case, we apply the logarithm to the time series, which does not eliminate the trend in the series, thus confirming that the ideal ARIMA model is the multiplicative model, but it allows us to normalize them.

4.2. Diagnostic and model selection

To examine the adequacy of the ARIMA models estimated, we first inspect the ACF of the residuals. In case of absence of autocorrelation of the residuals, the asymptotic distribution of the estimate of the autocorrelation coefficient will be normal, and we obtain the following confidence band: $[-(z_{(1-\alpha)/2})/(\sqrt{n}); +(z_{(1-\alpha)/2})/(\sqrt{n})]$. Values outside this range indicate the presence of significant autocorrelation and, therefore, the lack of goodness of the estimated model.

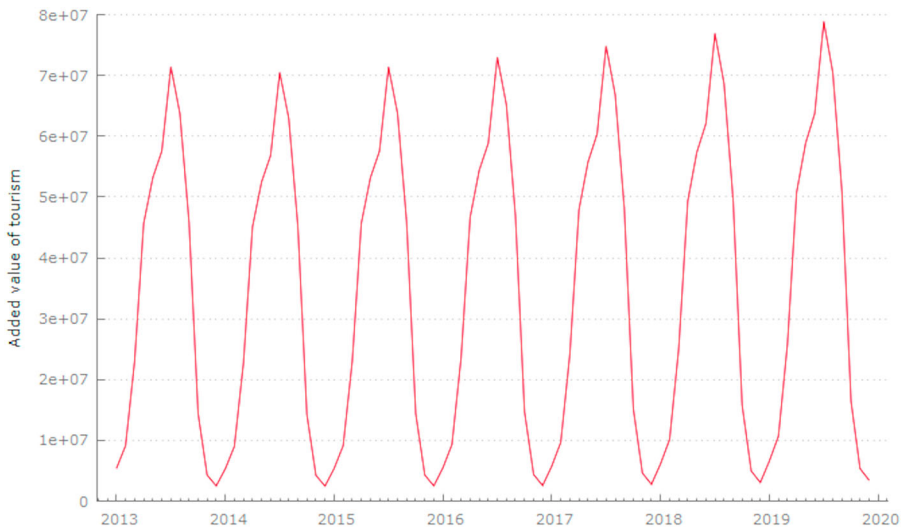


Figure 2. Added value of Sorrento's tourism sector, 2013–2019. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed on 28 April 2020). Value added is expressed in millions of euros.

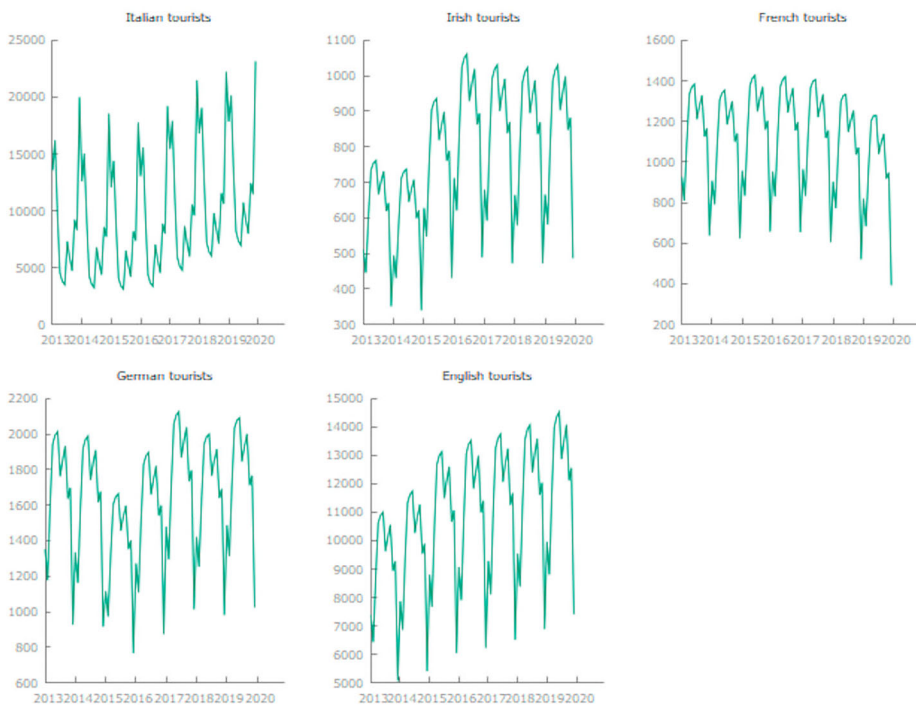


Figure 3. Number of arrivals of European tourists in Sorrento, 2013–2019. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

There are many statistical tests used for diagnostic checking of randomness. In this study, the Ljung–Box Q (LBQ) statistic is used as alternative approaches for the diagnostic checking of residuals for independence. Under the null hypothesis, the LBQ test allows us to conclude that the residuals



Figure 4. Number of arrivals of non-European tourists in Sorrento, 2013–2019. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

are independently distributed. For the diagnostic checking of residuals in terms of homoscedasticity, we implement the Breusch and Pagan (B–P) Test. This test is similar to the Goldfeld–Quandt test, except that the central residuals from the ranked residuals are not omitted. Under the null hypothesis, the B–P test allows us to conclude that the residuals are homoscedastic.

Wei (1990) expressed the need to select the model that fulfils all the diagnostic checks and has as few parameters as possible in terms of parsimony. The Akaike’s information criteria (AIC) and the Schwarz’s Bayesian information criterion (BIC) can measure the parsimony of model building. An ARIMA model that has the smallest AIC and BIC values among the competing models fit to time series is preferred.

4.3. Validation and forecast analysis

Many times, the AIC and BIC criteria provide conflicting results and do not allow to prefer one ARIMA model over another. In this case, in addition to using the criterion of parsimony (i.e. discarding the model with the greatest number of non-significant parameters), we rely on error statistics of in-sample predictions. We consider the mean absolute error (MAE), root mean squared error (RMSE), and mean absolute percentage error (MAPE). The ARIMA model that shows, in addition to the smallest AIC and BIC, the lowest prediction errors (MAE, RMSE, and MAPE) is the best-fitting model. It follows that the forecasts made with the latter model will be commented upon and used for policy implications.

5. Data

We analyse the monthly data on the added value of the tourism sector of the city of Sorrento and the number of tourist arrivals in the period from January 2013 to December 2019. The data on tourist

arrivals are broken down by nationality. We consider European tourists (Italian, Irish, French, German, and English) and non-European tourists (Canadian, Australian, and American) only. The source of the data is our elaboration on Carli (2012) and Il MegliodiSorrento.com.³

Tourism is the main productive sector of the city of Sorrento; in particular, tourism in 2014 granted employment to 86% of the workers in the town of Sorrento, with an increase in employment of 3% that was expected for 2020. That is, an anticipated employment rate in the tourism sector of 89%⁴ was expected (obviously, these predictions are no longer reliable owing to Covid-19⁵). Tourism contributes to 90% of the total added value in Sorrento, followed by other substantially marginal productive activities (0.7% agriculture, 5% industry, and 3% construction).

Figure 2 shows the monthly series of the added value of tourism. In general, a slightly increasing trend emerges, with higher values in the summer and spring months (from April to September) and a positive spike in July. In this case, the value increases from approximately €77 million in July 2018 to approximately €79 million in the same month in 2020, an increase of €2 million.

Sorrento has always been a tourist destination, especially for foreign tourists. In this regard, ISTAT noted that foreigners constituted 89.1% of the tourists in Sorrento in 2018. This figure ranks Sorrento among the top 20 Italian municipalities with the largest numbers of foreign tourists (ISTAT, 2019). Figure 3 shows the number of arrivals of European tourists. In particular, a growing trend emerges for Italian and English tourists, with peaks in the winter months (December–February) for Italian tourists and peaks in the warmer months (April–October) for English tourists. This result allows us to grasp the non-seasonal nature of the phenomenon of tourism in the city of Sorrento. In other words, tourism represents for Sorrento a year-round economic phenomenon, allowing the different months of the year to be associated with segments of consumers of different nationality. With regard to Irish and German tourists, in the first years of the analysis, a reduction in arrivals emerges, and subsequently a recovery that takes the form of a rather constant trend for the rest of the years considered. Instead, French tourists show in the first years a constant trend which turns into a decreasing trend from 2016 onwards; this shows a loss of interest in the city of Sorrento by tourists of French nationality. Figure 4 shows the number of non-European tourists. In this case, we observe that Australian and American tourists present a constant trend; confirming itself as a core of tourism in the city of Sorrento, showing a high presence in most of the months of the year (April–October). On the contrary, Canadian tourists, with a decreasing trend, show a decline in interest.

We use box-and-whisker plots to grasp the size of tourist arrivals by nationality. Figure 5 shows that British tourists have the highest median value, followed by Italian tourists. The latter show a greater variability – almost three times that of British tourists. Irish, French, and German tourists show very low variability, with a higher median value for German tourists, followed by French and Irish tourists. Finally, regarding non-European tourists, Figure 6 shows that American tourists have the highest median value, followed by Australian and Canadian tourists. It clearly emerges that American tourists are characterized by high variability over the years considered, while Canadian and Australian tourists show very little variability.

6. Results

Before proceeding to estimate the most appropriate ARIMA model for our time series, we verify that they are stationary. Table 1 shows that all the series are not stationary either in levels or in first-order differences (we do not reject the null hypothesis of unit root of augmented the Dickey–Fuller test); on the contrary, only the first-order difference and seasonal differences with a 12-month lag of the time series makes them stationary (we reject the null hypothesis of unit root of the augmented Dickey–Fuller test).

After obtaining the stationarity of the series, we use the ACF and the PACF plot in order to identify the potential seasonal ARIMA models. Figure 7 shows that, in the case of added value, the alternation of the bars between positive and negative values in both the ACF and PACF charts may suggest an ARIMA model. The seasonal lag (the coefficient in 12) is significant, suggesting a seasonal structure.

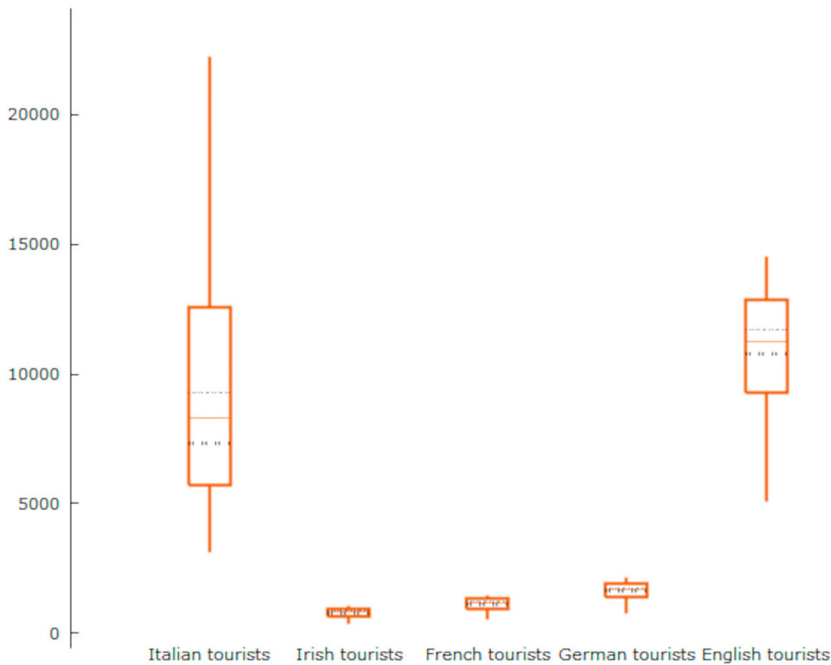


Figure 5. Box-and-whisker plots of number of arrivals of European tourists in Sorrento, 2013–2019. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

Similar results also emerge for the ACF and PACF plots of the stationary series of arrivals of European and non-European tourists (see Figures 8 and 9). Unfortunately, the ACF and PACF graphs are not sufficient for the choice of the ideal ARIMA model, and for this reason, we proceed with the estimation of different ARIMA models until we obtain the one that minimizes the AIC and BIC criteria;

Table 1. Augmented Dickey–Fuller test for unit roots.

Variables	Level	First-order differences	First-order difference and seasonal differences with a 12-month lag
<i>Added Value</i>	0.160 (0.997)	−1.857 (0.676)	−3.580** (0.031)
<i>Italian tourists</i>	0.150 (0.879)	−2.439 (0.358)	−8.603*** (0.002)
<i>Irish tourists</i>	0.283 (0.998)	−1.344 (0.610)	−8.241*** (0.000)
<i>Canadian tourists</i>	0.324 (0.887)	−1.191 (0.214)	−2.140** (0.031)
<i>French tourists</i>	0.416 (0.704)	0.617 (0.849)	−3.608** (0.025)
<i>German tourists</i>	0.485 (0.82)	−1.395 (0.151)	−8.566*** (0.000)
<i>Australian tourists</i>	0.600 (0.989)	−1.406 (0.148)	−8.527*** (0.000)
<i>USA tourists</i>	2.794 (0.998)	−1.364 (0.160)	−6.480*** (0.000)
<i>English tourists</i>	0.043 (0.842)	−0.666 (0.428)	−8.698*** (0.000)

Note: ***, **, and *: significant at 1%, 5%, and 10%, respectively; (): *p*-value.

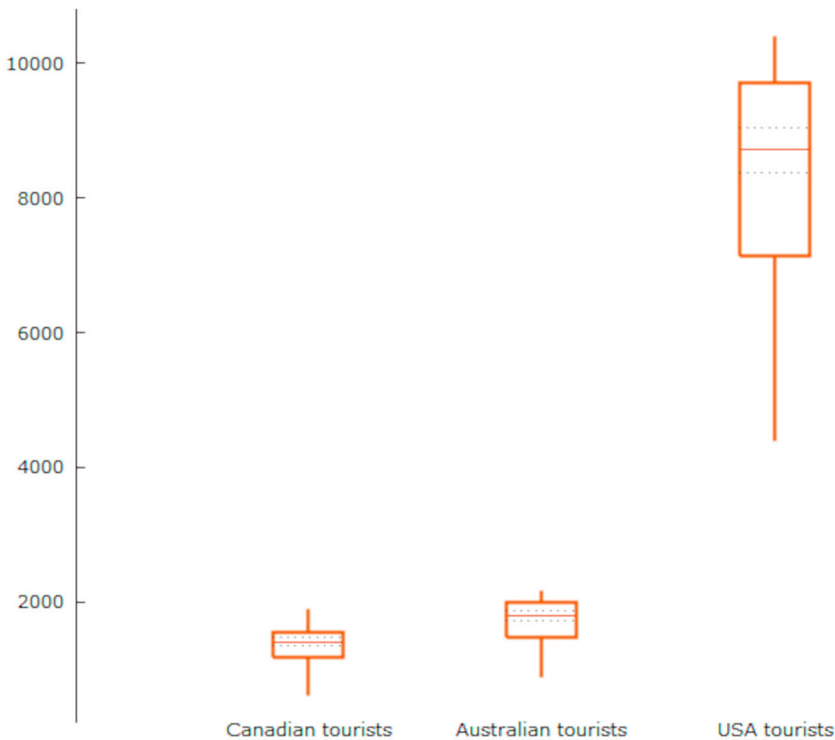


Figure 6. Box-and-whisker plots of number of arrivals of non-European tourists in Sorrento, 2013–2019. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

this respects the criterion of parsimony (only parameters statistically significant) and ensures the lowest prediction errors.

Table 2 shows the ARIMA best model results estimated for each variable. This result is supported by the fact that the models chosen are those with the lowest AIC and BIC criteria and with the lowest prediction errors (MAE, RMSE, and MAPE) (see Table 3).⁶ To examine the adequacy of the estimated ARIMA models, we first checked the assumptions of the white noise term ε_t . The diagnostic tests in Table 3 support the assumption of a normality distributed homoscedastic random noise term. In particular, the Ljung–Box Q test confirms that the residual series are white noise (we do not reject the null hypothesis of normality of residues), and the Breusch–Pagan test not rejecting the null hypothesis allows us to conclude that the residuals are homoscedastic. Furthermore, the ACF graphs on the residuals allow us to exclude the presence of correlation among residues (the bars are contained in the confidence interval), confirming the goodness of our estimates (see the graphs on the left of Figures 10–12).

The results of the ARIMA models (see Table 2) are not interesting to comment upon, but are important for forecasting analysis. Figures 10–12 show in the graphs on the right the results of the forecast analysis with the respective confidence intervals (grey interval). The forecast was conducted for all 12 months of 2020, when COVID-19 rapidly spread throughout the world. These forecasts were used to verify, compared with the months of the previous year, whether growth in terms of added value and European and non-European tourists was expected in the individual months of 2020. In this regard, Figure 13a shows the monthly growth rates of the value added of the tourism sector. The figure shows positive growth rates in all months of the year with a probable greater

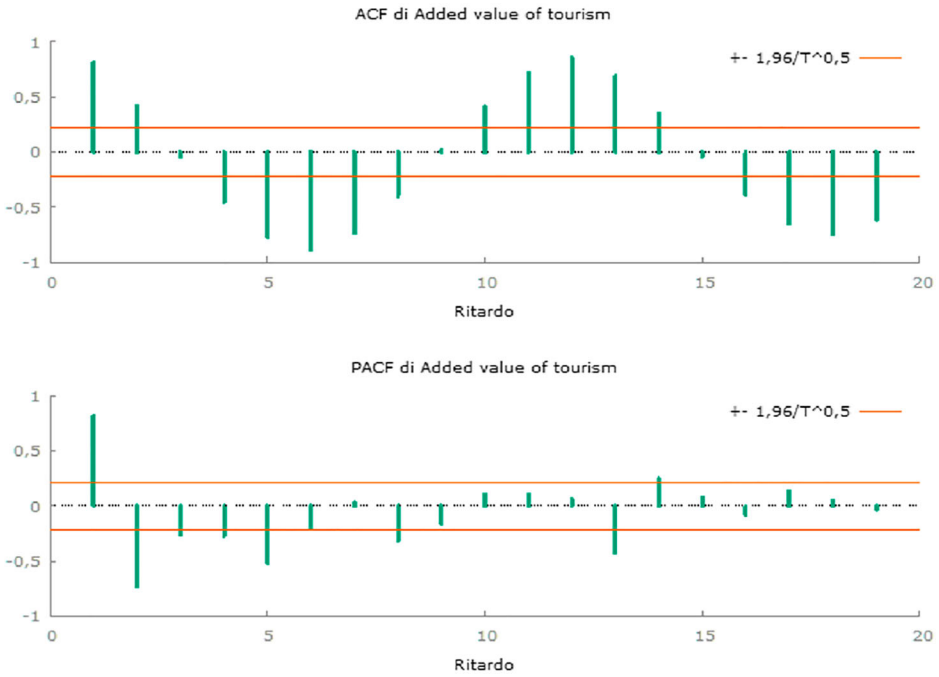


Figure 7. ACF and PACF of the stationary time series of added value of Sorrento's tourism sector. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 April 2020). Value added is expressed in millions of euros.

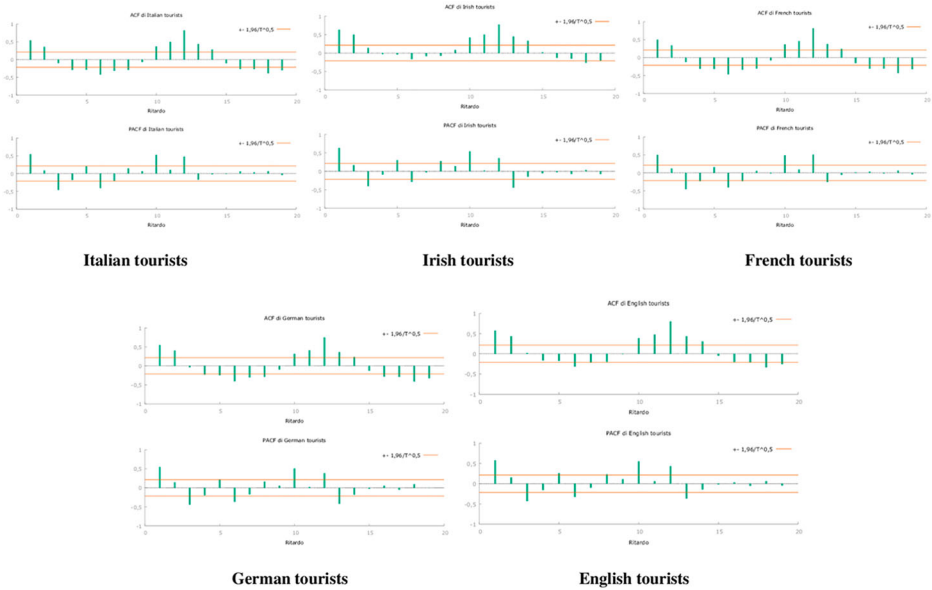


Figure 8. ACF and PACF of the stationary time series of European tourists in Sorrento. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

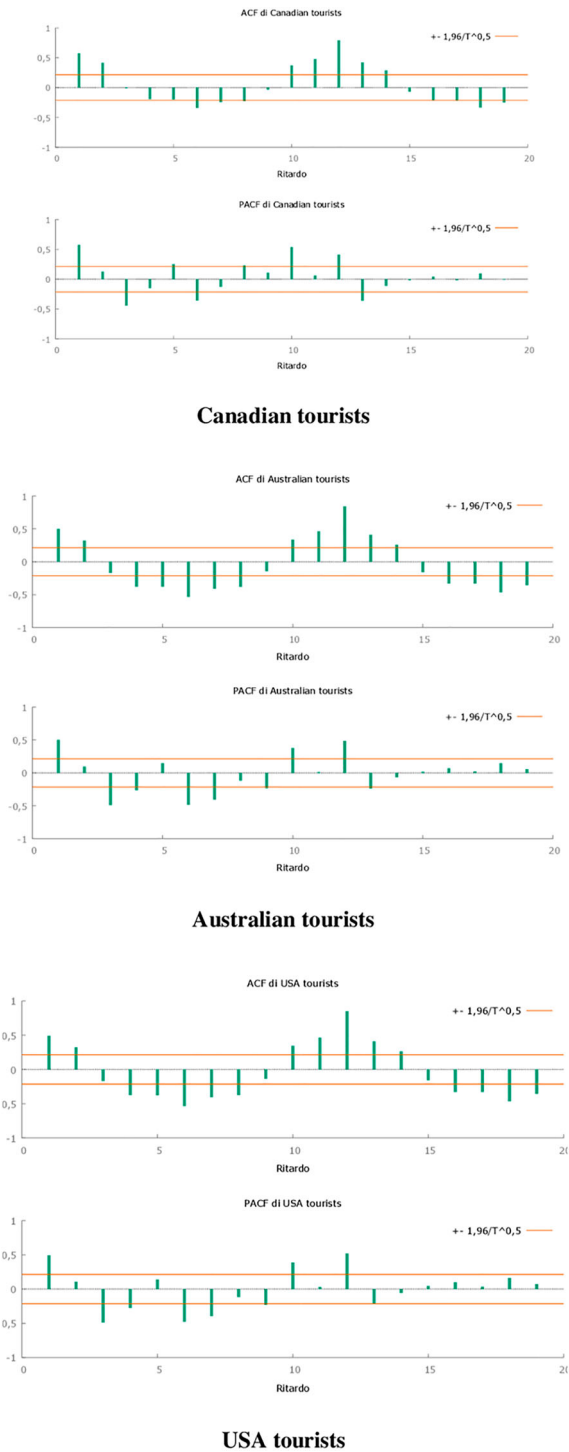


Figure 9. ACF and PACF of the stationary time series of non-European tourists in Sorrento. Source: Our elaboration on data from Carli (2012) and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed 28 December 2020).

Note: We consider the arrivals (the number of tourists who have a place as their destination) and not the presences (the number of arrivals multiplied by the number of stays).

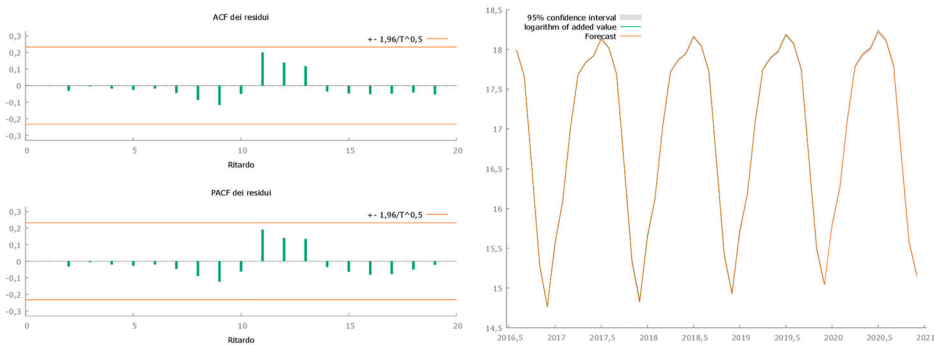
Table 2. Parameter estimates of the ARIMA models.

Variables	Model specification	Parameter estimates									
		Non-seasonal terms				Seasonal terms					
		ϕ_{t-1}	ϕ_{t-2}	θ_{t-1}	θ_{t-2}	Φ_{t-1}	Φ_{t-2}	Θ_{t-1}	Θ_{t-2}	Θ_{t-3}	Θ_{t-4}
<i>Addue Value</i>	$(2,1,1) \times (1,1,0)_{12}$	0.214*** (0.100)	-0.336*** (0.125)	-0,270** (0.123)		0.744*** (0.091)					
<i>Italian tourists</i>	$(1,1,1,1) \times (2,1,0)_{12}$	0.765*** (0.080)		-0.799*** (0.055)		0.407*** (0.104)	-0.541*** (0.105)				
<i>Irish tourists</i>	$(0,1,0) \times (1,1,1)_{12}$					0.304*** (0.136)		-0.406*** (0.204)			
<i>Canadian tourists</i>	$(0,1,2) \times (0,1,4)_{12}$	0.857*** (0.056)			0.759*** (0.238)			0.495*** (0.178)	0.431*** (0.147)	0.408*** (0.165)	0.870*** (0.403)
<i>French tourists</i>	$(0,1,0) \times (1,1,0)_{12}$					0.561*** (0.138)					
<i>German tourists</i>	$(1,1,1) \times (0,1,1)_{12}$	0.911*** (0.064)		-0,699*** (0.074)				-0.879** (0.435)			
<i>Australian tourists</i>	$(0,1,0) \times (0,1,1)_{12}$							-0.811** (0.460)			
<i>USA tourists</i>	$(1,1,1) \times (1,1,0)_{12}$	0.874*** (0.067)		-0.679*** (0.044)		-0.771*** (0.061)					
<i>English tourists</i>	$(2,1,2) \times (0,1,0)_{12}$	-0.235*** (0.131)	-0.251** (0.130)	0.212*** (0,130)	0.361*** (0.122)						

Notes: ***, **, and *: significant at 1%, 5%, and 10%, respectively; () : standard errors.

Table 3. Diagnostic and selection criteria.

Variables	Criteria					Tests	
	AIC	BIC	MAE	RMSE	MAPE	LBQ test Q ₁₉	B-P test
Addue Value	-484.175	-470.599	0.004	0.007	3%	7.345	7.809
Italian tourists	-268.298	-256.985	0.018	0.033	19%	9.888	4.652
Irish tourists	-262.869	-253.818	0.008	0.032	13%	15.386	3.567
Canadian tourists	-495.254	-486.204	0.003	0.006	4%	20.351	5.586
French tourists	-321.180	-314.399	0.010	0.023	15%	12.416	0.952
German tourists	-246.847	-235.534	0.014	0.033	19%	14.342	5.607
Australian tourists	-386.497	-379.709	0.006	0.013	8%	10.346	6.445
USA tourists	-468.886	-457.573	0.003	0.008	3%	12.194	3.378
English tourists	-405.065	-391.489	0.006	0.013	6%	16.432	4.789

Added value of Sorrento's tourism sector**Figure 10.** ACF of the residuals (graph on the left) and forecast of Added Value (graph on the right).

growth in revenues in the months of January and December, with an increase of about 10% and 12%, respectively. This result confirms the non-seasonality of tourism in Sorrento and the importance of the tourism sector for this city. Most likely this result is characterized by the growth of European tourists in these two months of the year. In particular, Figure 13b shows an increase in German and British tourists in December. The spring and summer months remain central, showing high growth compared with the other months of the year; this is especially true for Italian and German tourists. Among European tourists, there is reduced interest in the city of Sorrento among French tourists, who show negative growth rates for all months of the year, with a reduction of 30% in December. Finally, Figure 13c shows the growth rates for non-European tourists. The figure shows little comforting results, as the growth rates are negative for all months of the year and for all non-European tourists; in particular, Australian tourists have the most negative growth rates, with only a slight recovery in December.

These results, although interesting, do not consider the effects of COVID-19. In the first eight months of 2020, Eurostat estimated that the number of nights spent in accommodation facilities in the European Union (EU) at 27 is approximately 1.1 billion: a decrease of over 50% compared with the same period in 2019. Italy's provisional data for the first nine months of 2020 are in line with the European trend (-50.9% compared with the same period of 2019, with nearly 192 million attendances less), and thus highlight the extent of the crisis internal tourism generated by the health emergency, especially after years of constant growth in the tourism sector. The year 2019 had, in fact, recorded another record flow of tourists in the Italian resort accommodations, with 131 million arrivals and 436 million visitors, and an increase, respectively, of 2.6% and 1.8% in comparison with last year.



Figure 11. ACF of the residuals (*graph on the left*) and forecast of European tourists in Sorrento (*graph on the right*).

The expansion of tourism flows seemed confirmed by the data of January of 2020 (+5.5% arrivals and +3.3% the presence of tourists in the Italian resort accommodations compared with the same month last year). However, already in February the effects of the pandemic and the consequent

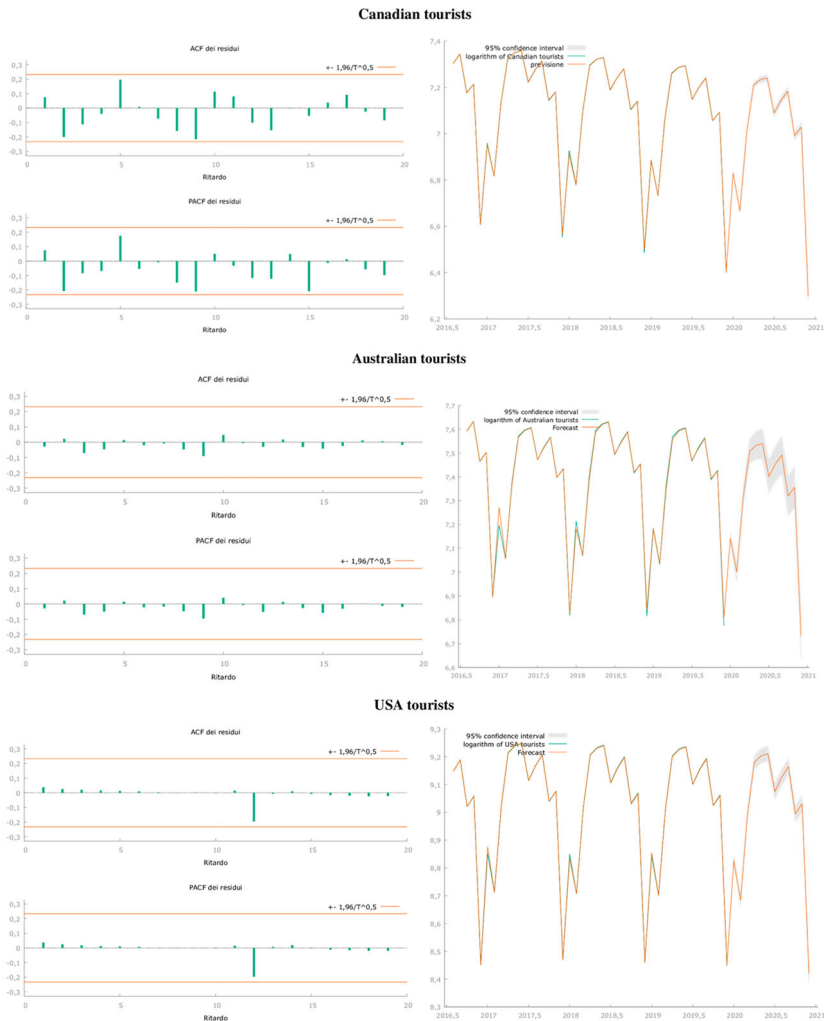


Figure 12. ACF of the residuals (*graph on the left*) and forecast of non-European tourists in Sorrento (*graph on the right*).

containment measures become visible (−12.0% in arrivals and −5.8% in presences). In the months of the lockdown (in particular, from 11 March to 4 May) the tourist demand is almost zero, and the presences in the accommodation facilities are just 9% of those registered in the same period of 2019. Foreign customers are almost absent (−98.0% in both April and May). Overall, in the months of the lockdown, the change compared to the same period of the previous year is equal to −91%, with a loss of almost 74 million visitors, of which 43 million were foreign tourists and 30 million were Italian tourists.

In June 2020, following the possibility of a resumption of inter-regional travel, tourist flows began to rise timidly. However, the total attendances represent just 21% of those registered in the same month of 2019: The loss of attendance remained particularly high for the foreign component (−93.1%) compared with the domestic one (−63.3%). The summer quarter (July, August, and September) saw a partial recovery, particularly in the month of August. The recovery was decidedly more robust for the domestic component, but limited, even in August, for the foreign component. In fact, in the July–September quarter, the total presences were equal to about 64% of those

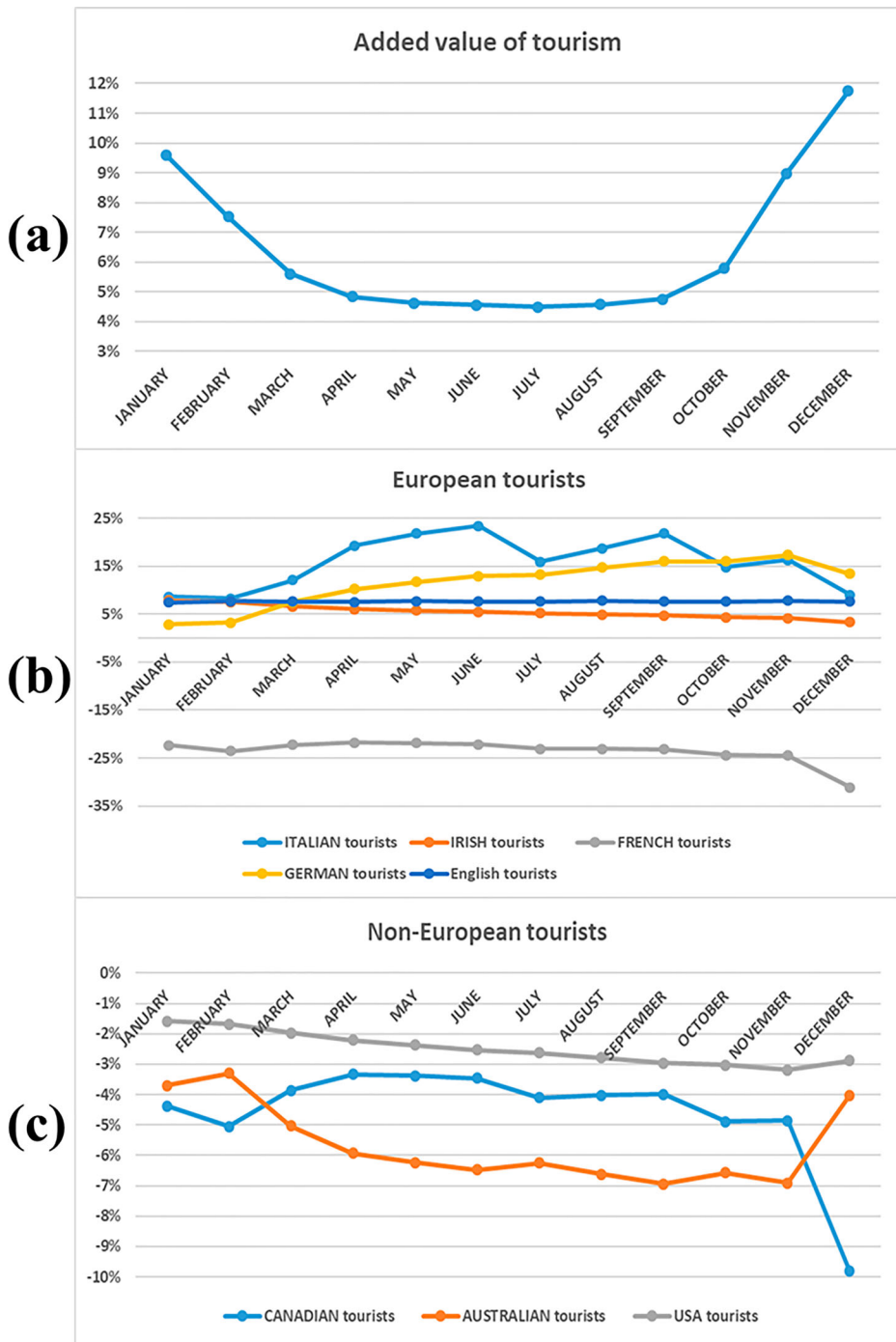


Figure 13. monthly growth rates (2020–2019) in value added (a) and in the number of tourist arrivals by nationality (b, c).

recorded the previous year: the overnight stays of Italian tourists reached just over 86% of those recorded last year, with those relating to foreign tourists being just 40%. We use these last values (national and non-specific data of Sorrento city) to obtain an approximate idea of the losses recorded in the tourism sector in Sorrento.

Table 4. Potential gains and losses owing to COVID-19.

Months	Added value of tourism forecasted for 2020	Number of tourists by nationality forecasted for 2020								Added value		Number of tourists	
		Italian tourists	Irish tourists	Canadian tourists	French tourists	German tourists	Australian tourists	USA tourists	English tourists	Gains	Losses	Gains	Losses
JANUARY	7237526.049	19358.38	717.5926	934.758	636.7385	1530.897	1265,005	6812.906	10702.87	7237526.049	–	41959.14	–
FEBRUARY	11509001.2	21826.6	624.5391	796.734	521.2694	1353.769	1096,4	5908.404	9476.544	11509001.2	–	41604.26	–
MARCH	27334221.23	15063.92	860.2611	1121.983	756.3188	1844.678	1502.885	8032.684	12591.19	–	27334221.23	–	41773.92
APRIL	53145287.78	9750.7	1046.014	1377.449	941.2832	2242.635	1821.455	9700.794	15050,51	–	53145287.78	–	41930.84
MAY	61606010.7	8901.34	1075.103	1411.225	959.6619	2320.964	1866.593	9934.681	15485.79	–	61606010.7	–	41955.36
JUNE	66602322.02	8565.28	1086.343	1419.829	957.3672	2362.161	1880.688	10007.5	15632.09	32902136.43	33700185.59	20704.53	21206.72
JULY	82429175.19	12439.38	949.8784	1218.653	799.3101	2089.019	1638.389	873.671	13835.55	44282178.77	38146996.41	22402.86	19299
AUGUST	73667331.82	10909.69	1003.22	1287.164	843.1779	2217.41	1725.89	9193.169	1459.5	38317225.1	35350106.72	21727.35	20044.88
SEPTEMBER	53339089.14	9699.37	1045.341	1339.824	875.6032	2322.527	1793.749	9552.336	15153.09	–	53339089.14	–	41781.84
OCTOBER	17407992.54	14289.47	884.3315	1103.284	693.4665	1985.333	1510.263	8059.421	13037.13	–	17407992.54	–	41562.7
NOVEMBER	5848875.626	13303.59	918.8685	1145.089	716.6811	2072.106	1565.203	8351.12	13536.74	–	5848875.626	–	41609.4
DECEMBER	3838798.558	25239,22	501.886	542.8	269.9587	1159.546	841.4907	4532.917	7970.097	–	3838798.558	–	41057.92
total	463965631.8	169346.9	10713.38	13698.79	8970.836	23501.05	18508.01	98817.6	15706.1	134248067.5	329717564.3	148398.1	352222.6
Total loss										71%		70%	

Table 4 – starting from the hypothesis that, in the months of January and February, both the added value and the number of tourist arrivals were identical to that of the forecasts, as months not characterized by the lockdown – reports the potential monthly gains and losses for the year 2020. It is assumed that, in the months of July, August, and September the number of foreign tourists is equal to 86% of those expected, and that of Italian tourists is equal to 40% of those expected. Finally, given the surge in the contagion curve, a zeroing of added value and tourist arrivals is assumed in the months of October, November, and December. The simulation analysis shows a potential loss of added value of 71% and a loss of tourism flow of 70% (last row of **Table 4**).

This result reflects the deep economic crisis experienced in Sorrento, where 87% of the families live on the proceeds of tourism. The 2020 season had a promising start, even better than 2019; however, the Municipality of Sorrento was forced to cancel all events planned for the summer. Tour operators were faced with numerous uncertainties caused by the lack of security that influenced not only the international tourist flow, but also the national one. Moreover, the Italian market was not able to compensate for the loss of foreign tourists. The United States (US) market was completely lost in 2020, as the US was locked in a health emergency all year. This also applied to England, the primary market for the Sorrento peninsula.

Based on the above, it is clear that the unprecedented nature of the COVID-19 crisis calls for increasing evidence on the economic impact of a pandemic on the tourism sector. The context of an analysis plays a central role in empirical studies since economic losses could significantly change based on the share of tourism's contribution to local output. This work clarifies how the impact of a virus on a tourism-centric economy (like Sorrento) could be devastating. To clarify, Škare et al. (2021) forecast an average global decline in GDP of -12.72% . According to the authors, the drop in GDP in more tourism-oriented economies range from -14.97% in Oceania to -23.69% in the Caribbean. Albeit huge, these declines are very far from the -71% in the case of Sorrento, highlighting the low resilience of an economy that is broadly based on a single sector that cannot mitigate the impact by, for instance, the relocation of economic activities (Krueger et al., 2020). Moreover, the peculiarities of the tourism sector (e.g. on-site experiences) have made it impossible to resort to 'smart working' that has been fundamental in many other economic sectors to avoid layoffs.⁷ Federalberghi (2021) explored the impact of the pandemic on the tourism sector in Italy. The study shows clear evidence of the crisis: -42.4% of accommodation, -32.5% of restaurants, and a huge employment drop between 2019 and 2021.⁸ In Sorrento, the scenario is even worse since many structures have been closed for the entire emergency period and almost all bookings cancelled.⁹ Unfortunately, detailed data on Sorrento are not available, neither on how many hotels, restaurants, or tourism-related businesses have closed, nor on the magnitude of the impact on the several categories of local tourism operators (e.g. B&B, budget hotels, luxury hotels, or the different categories of restaurants). The latter represents a noteworthy aspect because operators have adopted different measures to face the pandemic depending on their size. In other words, the countermeasures differ based on the operators' size/category, where bigger businesses are able to take measures of their own to deal with the pandemic. An example is the large investment and development plan promoted by a group of Sorrento's hoteliers and Invitalia.¹⁰ The aim of the plan is to unlock millions of Euros in loans for major hotel operators (12 luxury hotels, including the Hilton Sorrento Palace) in order to increase the quality standards of hotel facilities. On the other side of the spectrum, smaller operators are excluded from this kind of countermeasure and are exclusively dependent on political actions for overcoming the crisis. Research is called for to provide policymakers with the right tools to deal with the pandemic.

Our model shows and quantifies the significant economic decline in the tourism sector in 2020 and provides new evidence on the impact of the pandemic on an economy fully based on tourism. The competitiveness and resilience of the sector require meaningful public and private efforts that, on the one hand, will allow it to recover from the COVID-19 crisis and, on the other

hand, allow it to activate a crisis-readiness mechanism to face any future crisis. In this view, to gain empirical knowledge on the nature and actual extent of the COVID-related economic crisis plays a pivotal role in preparing policymakers and practitioners to rethink the foundations of the tourism sector.

7. Conclusions

COVID-19 has ushered an era of extreme uncertainty and an expansive economic crises touching every sector and industry. Its advent was completely unexpected, and once it was detected in Wuhan, even underestimated, leaving even advanced economies unprepared. Once the health disaster was imminent, governments around the world imposed tight constraints on people's social life. Owing to these political actions, all economic sectors were penalized, albeit to varying degrees. The tourism sector was one of (whether or not the most) penalized industry. In fact, one of the most immediate economic effects of the crisis associated with COVID-19 was the blocking of tourist flows. The first effects already emerged in February 2020, with the spread of the epidemic in many countries. However, it was in the beginning of March 2020 that all activity was brought to a halt in an extreme social distancing measure and amidst rising fatalities, especially in Italy.

We forecasted and quantified the economic losses in the tourism sector owing to the COVID-19 pandemic. Sorrento, the case study analysed, is historically characterized by the presence of tourists – not only from Italy, but globally – allowing us to provide a significant estimate of the expected added value in 2020 as well as to estimate the expected number of tourists in 2020 by nationality. Our results confirm the fears of a crisis with very few precedents. In fact, the added value of Sorrento may decrease by over 70%, while tourist arrivals may decrease by the same percentage.

An unprecedented and unexpected health/economic crisis calls for appropriate policy measures. Even if analysed in the perspective of a specific tourism destination, the economic consequences of a health emergency on tourism are not easy to overcome and requires the joint action of decision-makers at the several levels of government hierarchy, that is, European, national, and local. It is of primary importance to act on three main points: *(i)* to provide economic support to operators in the tourism sector; *(ii)* re-establish the confidence of tourists on the safety of travels and overnight stays; and *(iii)* to rethink the characteristics of the tourist offers of destinations.

The economic support of tourist sector mainly depends on the policies and directives of the European Union and the capability of the national government to properly employ them. The European Union can recur financial support through the European Regional Development Fund or the Fund European Social to safeguard the firms' survival and sectoral employment. In other words, it is necessary to support firm recovery to cover labour costs, operating and supplying costs, overheads, rents, and other expenses necessary to comply with health protocols. However, considering the staggering decline in tourism demand, sectoral employment could be supported through the activation of a financial contribution of reduced working hours. Without re-establishing confidence of people to travel, these measures are largely useless in supporting tourism sector.

To date, many safety measures have been taken to ensure the safety of people during travel as well as during stay in accommodation: the density of passengers in mass transports or in waiting areas has been reduced; workers wear individual protection gadgets (masks and gloves); the different flows of passengers in transport hubs have been separated through separate lanes. Clear guidelines are also being implemented in at accommodations – for example, setting a guest limit in common areas (restaurants, cafes, bars, and atriums); regulating access to dining areas, swimming pools, or gyms; ensuring pre-assigned time slots and bookings.

However, the epidemiological trend shows that these measures are not enough to decrease the contagion rates and to increase the people's confidence in travelling. An important tool in the hand of the governments and decision makers, which is not fully used yet, is the screening of tourists through a COVID-19 swab. This will ensure COVID-19 negativity of tourists (albeit with the known limit of this diagnostic instrument) since their departure from home. It will help increase the

people's confidence in using mass transports as well. This measure also eliminates forced quarantining of international travellers, as is the case with Italy in 2020, which is both expensive and time-consuming for tourists, who often limit stays to three days or a weekend.

While these measures are needed to trigger the recovery of tourism, to imagine a full recovery (in terms of number of arrivals and days of accommodation) is a difficult task. Given the health uncertainty, vaccine delay, and lack of effective COVID-19 medical treatments, the tourism destinations could not return to pre-pandemic levels for a while. It is necessary that local governments, and decision-makers implement a local valorization approach. Sorrento, the case study of this paper, provides a representative example at the international level. The current economic crisis can help us rethink tourism in Sorrento. The old model of tourism – that has caused crowding, a decline in the quality of services, and pollution – should be revised. It would be advisable to opt for a more sustainable and high-quality system.

For the mayor of the city of Sorrento, past overcrowding can be attributed to immeasurable and haphazard growth in non-hotel accommodations, favoured by excessively permissive regional legislation. According to tourism sector experts, a natural selection should require the reorganization of the Sorrento tourism sector in order to accommodate a smaller number of tourists. Thus, it will be possible to try to support tourism in the less-crowded months (December and January). The commercial policy must also be reviewed; it should be more selective, especially in the historic centres of the region. The structures, the cultural offer, and the services managed in a district logic, together with the other municipalities of the peninsula, must be improved. In other words, the Sorrento government should aim to receive less tourists, but offer them better and 'premium' services based on the valorization of local cultural and natural heritage. A marketing-based valorization should reinforce the 'brand awareness' of the region, even re-associating Sorrento with the *Gran Tour*.

Furthermore, it seems important to encourage the return of loyal tourists who are a resource and asset, as they have a greater willingness to overcome the unscientific and irrational prejudices borne out of the fear of contracting COVID-19. A familiarity and relationship should be built between loyal tourists and accommodations that allows overcoming the health-, and safety-related diffidence. These tourists could represent the ideal target to reactivate the tourism circuits of a locality. Further, their emotional engagement and sense of belonging to Sorrento may make them embrace the region as their own. In addition to stimulating loyal tourists, Sorrento operators should also attract new customer segments. As international travel risk reduces, a focus on proximal tourists (potential tourists residing in Italy and specifically in Campania, a region to which it belongs Sorrento; or in the closest regions) is appropriate. The aim should not be to replace international and remote tourists with proximal ones, but it is necessary to rethink the offerings model and adapt it to current needs. Likely, proximal tourists have different expectations, since they are driven by the desire for leisure than interest in discovering the territory; they can manage their time with greater flexibility and, therefore, may appreciate the availability of open packages with few constraints. In some cases, the proximal tourist moves more easily with the family, and may also involve relatives residing in places distant from Sorrento (e.g. other Italian regions). The same 'Visiting Friends and Relatives' category can represent a high potential segment in the transition period immediately following the pandemic. To summarize, our analysis points to zero incoming foreign tourists, forcing us to shift our focus to loyal tourists and proximal tourist, two fundamental target audiences, to revive the economy.

Much remains to be discovered is the magnitude of the COVID-19 pandemic's effect on economies and tourism in general. In this paper, we have illustrated the economic losses in a tourism-based economy through a short-term analysis. The short-term focus of the analysis is also an assumption that limits our model's ability to portray the effects of the pandemic on the tourism sector. To date, it is still difficult to predict how long the pandemic will last. The model presented in this paper could be extended to study the long-term policies that may be required to reorganize the whole tourism sector. In addition, expanding the availability of monthly data is another future development that

will enable the use of other time series modelling techniques to improve empirical knowledge overall. Finally, we encourage further studies on a very wide range of research questions, such as whether COVID-19 can transform the tourism sector and align it with the principles of sustainability; what long- and short-term changes, and thus demands, a pandemic creates in tourists' behaviours; and the role of domestic and foreign tourism in the economic recovery of the sector.

Notes

1. <http://dati.istat.it/>
2. <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (accessed on 12 June 2021).
3. <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> and <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed on 28 December 2020).
4. <http://www.ilmegliodisorrento.com/banco-di-napoli-e-turismo-sorrentino/> (last accessed on 28 December 2020).
5. The COVID-19 pandemic that spread globally in 2020 forced governments across the world to enforce lockdowns, an emergency protocol that prevented people from entering or leaving a particular place for their safety. This policy adversely affected all sectors of production, and particularly that of tourism, by completely resetting the economic effects.
6. For each variable, we estimated different ARIMA models, with different lags of the seasonal and non-seasonal terms. For reasons of space, we have only reported the most important results. Interested readers can make a request to the authors for the complete data.
7. More details here: <https://www.avvenire.it/economia/pagine/indagine-coronavirus-e-impatto-con-le-aziende-italiane>
8. Due to the lack of data on the impact of COVID-19 on tourism in Sorrento, we present the Italian scenario. The official data on employment in the Italian tourism sector highlights a drop in accommodation employment of -46.4% (March 2020–March 2021), and -77.4% in hiring firms between April 2019 and April 2021 (Federalberghi, 2021).
9. More details here: <https://www.positanonews.it/2021/02/positano-sorrento-operatori-turistici-prenotazioni-cancellate-per-la-primavera/3470065/> and <https://www.positanonews.it/2021/02/turismo-e-covid-sorrento-disegna-il-piano-salvezza/3468265/>
10. Invalitalia is the National Development Agency, owned by the Ministry of Economy. More details on this plan can be found here: <https://www.ilsole24ore.com/art/partite-ristrutturazioni-dodici-grandi-alberghi-ADgv2iLB>

Disclosure statement

No potential conflict of interest was reported by the author(s).

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