Revista Brasileira de Estudos Regionais e Urbanos
v. 19, n. 4, p. 586-606, 2025
DOI: 10.54766/rberu.v19i4.1212

Tourism and COVID-19: Regional economic impacts of cancelling carnival celebrations in Brazil

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ABSTRACT
This paper estimates the economic impacts of no Carnival in Brazil in 2021. Its contribution is twofold: it explores the interplay between COVID-19 and event tourism in Brazil from a crisis management perspective and quantifies the magnitude of the effects using the input-output approach. Results show that the cancellation of Carnival for sanitary purposes led to economic losses for the hosting states, given the drop in the number of tourists, the loss of R$650 million in tax, and the loss of 200 thousand employment opportunities. Furthermore, tourism activities were directly affected and incurred the largest impacts, especially the "Accommodation and food services" sector. Among the hosting states, Pernambuco experienced the greatest negative economic impacts, highlighting the importance of Carnival for its local economy.

KEYWORDS
Carnival tourism, Input–Output analysis, Crisis management

Turismo e COVID-19: Impactos econômicos regionais do cancelamento das celebrações de carnaval no Brasil

RESUMO
Este artigo estima os impactos econômicos da não realização do Carnaval no Brasil em 2021. Sua contribuição é dupla: por um lado, analisa a relação entre a COVID-19 e o turismo de eventos no Brasil sob a ótica da gestão de crises; por outro, quantifica a magnitude desses efeitos por meio da metodologia de insumo–produto. Os resultados indicam que o cancelamento do Carnaval, motivado por razões sanitárias, gerou perdas econômicas para os estados anfitriões, decorrentes da redução no fluxo de turistas, da perda de R$ 650 milhões em arrecadação tributária e da eliminação de 200 mil oportunidades de trabalho. As atividades turísticas foram diretamente afetadas e concentraram os maiores impactos, com destaque para o setor de "Alojamento e serviços de alimentação". Entre os estados analisados, Pernambuco apresentou os impactos econômicos negativos mais expressivos, evidenciando a relevância do Carnaval para sua economia local.

PALAVRAS-CHAVE
Turismo de Carnaval, Análise de Insumo–Produto, Gestão de crises

JEL CLASSIFICATION
C67, L83, R15, R58

Recebido: 09/07/2025. Aceito: 12/08/2025
e-ISSN: 2447-7990 | https://revistaaber.org.br/rberu

1. Introduction

The emergence and rapid spread of Coronavirus disease (COVID-19) has posed major public health and governance challenges worldwide. After reaching a global pandemic status in March 2020 due to its high transmissibility, the COVID-19 pandemic led to numerous sanitary restrictions that affected both the economy and individuals. The primary measure commonly adopted to prevent the transmission of the virus involved restricted global mobility alongside social distancing (Gössling et al., 2020).

As a non-essential industry, the tourism sector was by far the hardest hit, with negative impacts spreading to both tourism activities' demand and supply (Mohanty and Choudhury, 2022). This was due to postponements and cancellations of previously scheduled trips and public events to avoid large gatherings of people and the spread of the virus. The sector lost approximately US$ 4.5 trillion in 2020, translating into a 49.1% drop in its contribution to the global Gross Domestic Product (GDP) compared to 2019 (WTTC, 2021b), a fall from 10.4% to 5.5% of the global economy GDP.

The tourism sector is predominantly a labour-intensive service activity, with a high potential for creating formal and informal jobs, especially in developing countries (Rabahy, 2020). According to Haddad et al. (2013), employment in tourism is relatively low paid besides being often seasonal. By triggering a drop in tourism flows, the COVID-19 pandemic generated a loss of 62 million jobs throughout the global sector in 2020 (WTTC, 2021b). This highlights the substantial implications of crises on employment, with significant consequences for different supply chains, which undermine the economic growth of regions where conditions to develop tourism exists.

Developing economies perceive the expansion of the tourism sector as an opportunity to improve the economic conditions of the population. In these regions, the income generated usually results from a mix of formal and informal activities and workers and helps protect important economic and social indicators. This is the case in Brazil, where tourism activities represented 8.2% of the total domestic employment and 7.7% of GDP (WTTC, 2021a) before the COVID-19 pandemic. Compared to 2019, an economic loss of 32.6% and a 19% reduction in employment were estimated in 2020 (WTTC, 2021a). The study carried out by FGV (2020) indicated that the negative effects propagated to 2021 when revenues from the tourism sector decreased by approximately 39%. Using the method of partial hypothetical extraction, Ribeiro et al. (2021) showed a potential 31% decline in GDP from tourist activities due to the COVID-19 pandemic in 2020. This shrunken tourism sector reflects a decline in both domestic and international tourism.

Events play an important role in the development of the tourism industry by attracting tourists from across the globe and being a great motivation for travel. Instead of being linked to the value nature offers (sun, beaches, mountains, landscapes etc.), the search for culture is the basis of event tourism. Planned events in tourism are

also created for business, entertainment, and sports (Getz and Page, 2016). On the other hand, events are among the largest sources of the transmission of infectious diseases such as COVID-19 (Ishola and Phin, 2011). This explains why cancelling or postponing were necessary measures to face the pandemic. Examples of postponement during the pandemic include the Summer Olympics in Tokyo and the Cannes Film Festival or the cancellation of Wimbledon in the UK and the Metropolitan Opera in New York.

Another example is Carnival in Brazil, which was cancelled for the first time in its history in 2021. Carnival is one of the most important and well-known tourism and cultural events in Brazil. This popular 5-day cultural celebration occurs annually, bringing together people from different Brazilian regions and several parts of the world. Carnival adapts regionally to express the local history and culture and is multifaceted since it consists of different types of events such as samba school parades, masquerade balls and street parades.

This research aims to estimate the regional macroeconomic and sectoral impacts of cancelling the Brazilian Carnival due to COVID-19 in 2021. This was the only year when all Carnival events were cancelled throughout the country. In 2022, many municipalities suspended celebrations in their traditional mode but allowed private parties to occur, attracting more residents than tourists. The last Carnival before the first case of COVID-19 generated approximately US$ 1.5 billion from tourism activities (CNC, 2020), such as restaurants, accommodation, transportation, artistic and leisure activities, and travel agencies. These are the activities directly affected but there are also indirect effects linked to the trade relations of tourism-related sectors.

The analysis focuses on the six most important states when it comes to organising Carnival, namely Rio de Janeiro, São Paulo, Bahia, Minas Gerais, Pernambuco and Ceará, located in the Southeast and Northeast regions of Brazil. The literature identifies these regions for the most diverse tourism attractiveness and the greatest potential to absorb Carnival-related labour (Guimarães and Silva, 2017). Considering the total spending on tourism in the Northeast region, Bahia, Ceará and Pernambuco stand out (Silva, 2015).

Given the nature of the phenomenon to be simulated, a pandemic which, as highlighted by Santos et al. (2020) and Ribeiro et al. (2023), simultaneously affected both demand and supply in the economy, in addition to impacting sectors and regions in a heterogeneous manner, multisectoral general equilibrium models, such as input–output and computable general equilibrium (CGE) models, are more suitable for conducting the simulations. The main advantage of the input–output model lies in its straightforward operationalization and the clarity with which it allows for an understanding of the distribution of sectoral and regional impacts. Moreover, its application is more appropriate for short-term impact estimates.

In this analysis, the effect of cancelling Carnival in each of the above-mentioned

states is quantified by simulating the COVID-driven contraction in touristic domestic demand. The exercise uses an unprecedented interregional input–output modelling of each state calibrated for 2015 (Haddad et al., 2020). This is the most recent available data, which is used in the lack of official publicly available interregional input–output matrices.

Previous studies have focused on understanding the economic relevance of the tourism sector, whether from a nationwide perspective (Haddad et al., 2013; Rabahy, 2020; Ribeiro and Andrade, 2015), a regional perspective (Cabral et al., 2020; Ribeiro et al., 2017; Silva, 2015), emphasising tourism and employment (Guimarães and Silva, 2017; Ribeiro et al., 2018), or the economic impacts of Carnival (Cruvinel, 2019). The literature concerning the effects of the COVID-19 pandemic on domestic tourism in Brazil is also plentiful (Leite et al., 2020; Neves et al., 2021; Ribeiro et al., 2021). However, the implications of COVID-19 on various events have been understudied (Mohanty and Choudhury, 2022), and the economic impact is not yet known (Gössling et al., 2020). Hence, more research is needed to assess these effects at different geographic scales (Assaf et al., 2022).

At least to our knowledge, the literature to date has not yet explored the interplay between COVID-19 and event tourism from the perspective of Carnival and employment based on input–output analysis and from a crisis management perspective. This is the gap this paper aims to fill. Furthermore, our regional analysis could be applied to any other country in the world.

2. Tourism economics, vulnerabilities, and resilience capacity

Tourism economics is a growing research area. Most of the existing literature is dedicated to understanding the channels through which tourism influences the economy. Many studies have found a positive link between tourism and economic growth (Cannonier and Burke, 2019; Hye and Khan, 2013).

The literature has been exploring the benefits of using tourism as a strategy for local economic development, particularly in developing regions (Fang et al., 2021; Ribeiro et al., 2017). Among the positive impacts of tourism activities on local economies are the increase in income and revenues as well as tax collection, the diversification of productive structure (Cabral et al., 2020) and other multiplier effects through supply chain linkages to other productive sectors.

According to Vanegas et al. (2015), tourism plays an important role in generating employment for unskilled workers in developing countries, usually self-employed workers. Since tourism is a service consumed in the host region, it also strengthens backward linkages with the agriculture and manufacturing industries (Jeyacheya and Hampton, 2020).

Given the contact-heavy nature of service industries, the tourism sector is susceptible and vulnerable to disruptive events such as natural disasters and economic crises, as the one driven by the COVID-19 pandemic (Aldao et al., 2021; Dube et al., 2021). The vulnerability of regions to unforeseen circumstances is determined by the level of their dependency on tourism activities, especially in poorly diversified economies. During the crisis of COVID-19, tourism-related services such as accommodation and food were among the most economically and socially vulnerable sectors (Al-Mughairi et al., 2022).

The vulnerabilities of tourism to different types of disruptions call for greater resilience capacity (Scott et al., 2019), which is highly connected to crisis management techniques (Aldao et al., 2021). An extensive body of literature has described the phases of crisis management in tourism. Using this approach, Ritchie and Jiang (2019) argue that disruptive events can be addressed following three stages: preparedness and planning, response and recovery, and resolution and feedback. Whilst the first phase highlights the importance of a proactive approach, the second focuses on government financial assistance, communication among stakeholders and marketing strategies. The third stage relates to the development of a long-term plan based on past experiences to prepare for future crises. For Martens et al. (2016), there is a distinction between active and reactive crisis management, being the former associated with the adherence to crisis precautions and avoidance measures while the latter only copes with the negative effects of an already occurring crisis.

A long-term plan involves creating a more resilient tourism system based on the past crisis. Despite the increasing interest in understanding tourism resilience, there is no consensus regarding its definition. Overall, resilience is defined as the ability of a system to recover from a destabilizing event, with a focus on adaptive capacity (Cochrane, 2010). In the context of regional economic resilience, Martins et al. (2020) suggests that regional economies respond to exogenous shocks according to four dimensions: resistance (the vulnerability to disruptions), recovery (the speed and level), reorientation (the adaptation capacity) and renewal (the capacity to resume prerecession growth path).

This four-stage resilience cycle is also framed in the context of the tourism sector (Aldao et al., 2021), and can be used in the specific case of the event tourism sector. As a sub-system of the tourism sector, event tourism shares the same characteristics but with a unique distinction: the limited response time to disruptions (Ziakas et al., 2021). This increases the importance of crisis management for the sector since it needs to optimise the levels of preparedness and be able to rapidly respond to contingencies. On the other hand, the COVID-19 pandemic pressured event organizations to adapt to new conditions, identifying and leveraging new opportunities to recover.

In a progressively disaster-prone world, event tourism should develop an adaptive structure able to ensure resilience and effective crisis management while taking a pro-equity agenda (Benjamin et al., 2020). In terms of workforce resilience, Martins

et al. (2020) suggest a model that prioritises diverse skills and flexibility, focusing on sector-transferable skills since it allows workers to move between service sectors to find alternative employment opportunities and increase income security. Promoting cross-training and teaching different skills are key for this strategy to succeed, particularly digital skills given the digitalisation process the tourism sector is facing (Al-Mughairi et al., 2022). Indeed, technological solutions were massively adopted among tourism activities during the COVID-19 pandemic.

From a business perspective, Ziakas et al. (2021) propose portfolio management, permanent in its nature but flexible, with coordinated actions for adaptation strategies, redesign, and operations. For Assaf and Scuderi (2020), both the industry and government have a role to play in post-pandemic recovery strategies. Scaling-up action on disaster risk reduction requires a well-developed and jointly coordinated recovery plan which boosts national and regional tourism capabilities and promotes innovation in the sector (Mulder, 2020). Governments can create special taxes and use tourism revenue for conservation and fund allocation measures (Njoya and Seetaram, 2018), but also support and promote event tourism.

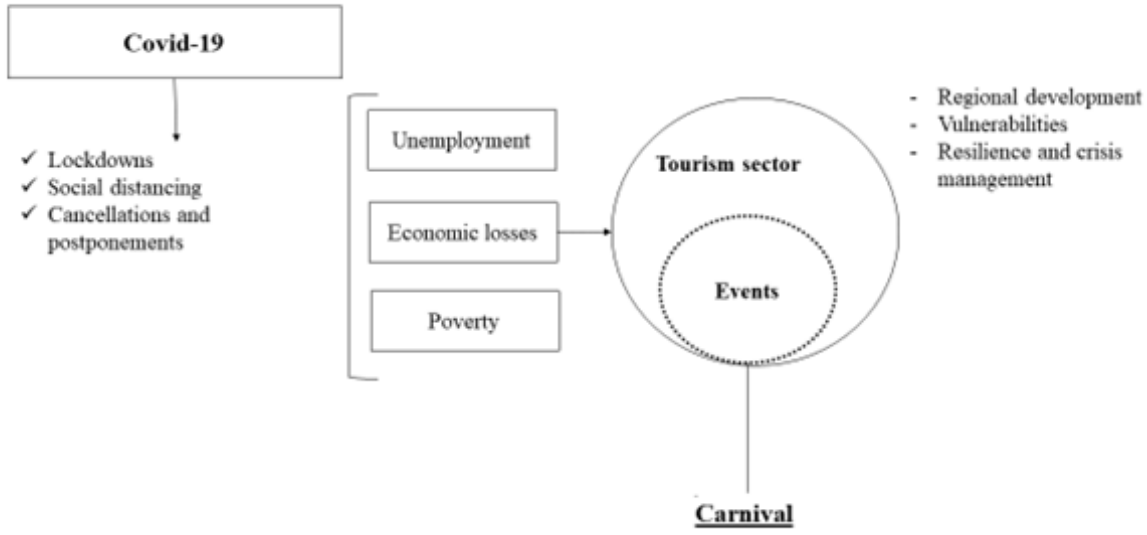
3. Conceptual framework

The conceptual framework for this study is summarised in Figure 1. . It assumes that the COVID-19 pandemic has negatively affected the Brazilian economy, leading to reduced employment opportunities and poverty. This disaster affected the performance of the tourism sector and its subsectors, such as event tourism, and more specifically, Carnival tourism. The framework recognises the role of tourism in driving regional development. On the other hand, it sheds light on potential vulnerabilities that arise from being highly dependent on the tourism sector and given the exposure to the global sanitary crisis. The framework also seeks to develop resilience in event tourism by understanding the managerial implications of cancelling Carnival to propose policies to help protect the sector against future uncontrollable and exogenous shocks. This is framed in the context of a crisis management approach for the event sector.

Those aspects have not yet been investigated in previous studies on event tourism. While the economic aspects have been addressed in impact assessments of tourist events, those are mostly framed under usual circumstances and lack the application of the crisis management theory. For example, using the regional social accounting matrix analysis approach, Pedauga et al. (2022) analyse the impacts of sport tourism events taking place in Castile and Leon. In smaller-scale local events, as in the case of the Canfield fair (Kim and Dombrosky, 2016), there is a large positive impact on the local community that incentivises pursuing hosting similar events for economic and development purposes.

This literature reveals a significant gap in the discussion relating to the impact of

Figure 1. Conceptual framework



Source: developed by the authors.

the crisis on event tourism. It is therefore pertinent to adopt an empirical approach to estimate how economic performance indicators responded to COVID-19 sanitary restrictions in the hosting regions of Carnival.

4. Methodological framework

Several methods are available to quantify the increase in economic activity due to an event. The impacts of Carnival tourism on regional employment in the context of its cancellation are quantified using input-output analysis. This method allows for tracking interrelationships between sectors and can assist policymakers in developing the tourism sector (Haddad et al., 2013).

4.1 Impact analysis and database

Among the input–output applications to national and international real-world problems, there is impact analysis. This analysis is relevant to understanding how the economy and its productive sectors respond to policy-driven or behaviour-driven changes. It involves an ex-ante and ex-post comparison of the input–output matrix results which evidence the impacts of those changes.

Following Miller and Blair (2009), the model solution is represented through Equation (1) and the impact analysis is described in Equation (2).

$$x = (I - A)^{-1} y \tag{1}$$

$$\Delta x = (I - A)^{-1} \Delta y \tag{2}$$

Where x is the sectoral output; I is the identity matrix; $(I - A)^{-1}$ is the Leontief inverse matrix; A is the technological coefficient matrix defined as $a_{ij} = z_{ij}/x_j$; z_{ij} is the trade relationship between sectors i and j; and y is the final demand vector.

According to Equation (2), the increase in output (x) is due to the exogenous variation in final demand (y), which, in this paper, is based on the spending of Brazilian tourists on Carnival. Through Equation (3) we can derive the sectoral impact on other economic variables such as GDP, employment and taxes.

$$\Delta v = \hat{v}\, \Delta x \tag{3}$$

Where $\hat{v}$ is a diagonal matrix formed by coefficients of the selected variable.

It is the basis of an economic impact study to estimate the magnitude of tourist spending that is added to the economy due to hosting the event. In general, these are implemented through survey methods, which enable the identification of the flow of money from tourists to the local economy (the source and the destination of event-related expenditures) (Tyrrell and Johnston, 2001).

Direct impacts are linked to the initial spending stimulus whereas indirect impacts are due to intersectoral transactions flowing from tourist expenditure. In this paper, we use information obtained from multiple sources given the limited data availability and the lack of a public and integrated database on Carnival. Unlike previous studies, this study uses the data to simulate a demand contraction that took place for a specific period due to the cancellation of the event. The accuracy of this impact assessment is highly dependent on the quality of the collected data.

For instance, we use the Carnival data for São Paulo collected through the survey of the Tourism Observatory and provided by the municipality of São Paulo (Capital, 2020). This is a proxy for the state as it is the main city that hosts the Carnival festivities, but similar proxies have also been adopted for all states under scrutiny. The state of São Paulo concentrates 32.6% of the national GDP, and the tourism sector represents 12.3% of its GDP. Rio de Janeiro is the state where the tourism sector plays the most important economic role; it accounts for 13.2% of the state's GDP. For the other states, the contribution of tourism to the national GDP varies between 9.9% (Minas Gerais and Pernambuco) and 11.2% (Bahia). From an economic perspective, the chosen states are altogether responsible for 60.15% of the GDP, as can be seen in Table 1.

Table 1. Contribution to Brazilian GDP and the relative share of services in the value-added of each state (%)

State	Regional GDP/Brazilian GDP	Services/Value added
Ceará	2.23	53
Pernambuco	2.66	50
Bahia	4.09	50
Minas Gerais	8.78	51
Rio de Janeiro	10.83	56
São Paulo	31.56	67

Source: Developed by the authors based on Haddad et al. (2020).

To calculate the average expenditure of tourists during the Carnival we collected information on the number of tourists, the average permanence in days and the average daily expenditure by region. In 2020, the number of tourists at the Carnival of São Paulo was estimated at approximately 4 million and 2 million in Rio de Janeiro and Pernambuco. Residents have notable participation in the Carnival of Bahia, Minas Gerais and Ceará, thus a lower number of tourists from elsewhere. Differences in purchasing power across states may influence the average spending per day. This Carnival-related tourist characterization is shown in Table 2.

Table 2. Carnival-related tourism characterization in 2020

Region	Average permanence (days)	Average daily expenditure (R$)
São Paulo	2.0	324
Rio de Janeiro	6.6	280
Bahia	5.7	344
Pernambuco	8.0	293
Minas Gerais	3.7	200
Ceará	6.0	431

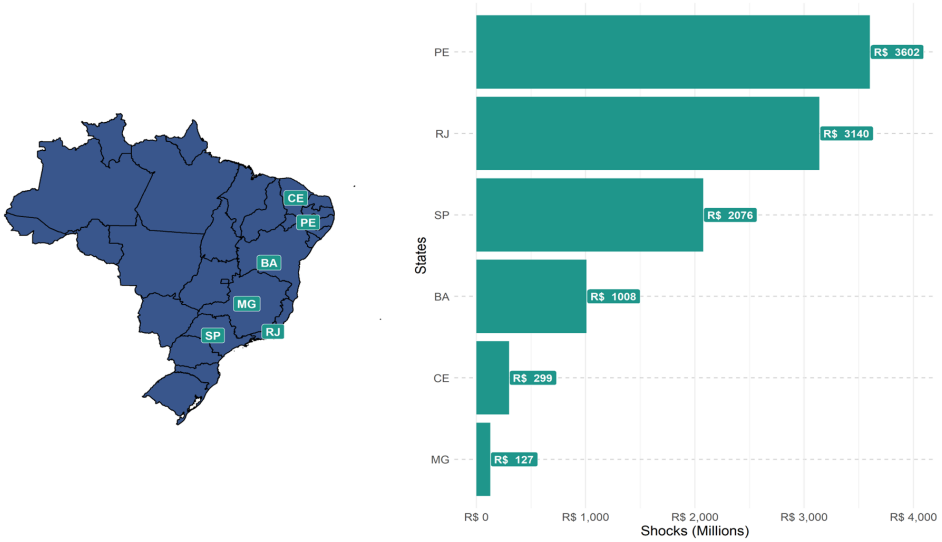
Source: Based on Capital (2020); Maciel (2020); FGV (2021); Oliveira (2020); Bahia (2020); Prefeitura de Fortaleza (2020).

This quantitative analysis applies an exogenous (negative) shock in the final demand, which starts with the average tourist expenditure during the average number of days spent celebrating Carnival in 2020. Figure 2 describes how the shock was designed. To distribute the calculated tourist expenditure with Carnival across characteristic tourism activities, we used a share of employment specific to the tourism sector. This has been calculated from data from the tourism labour market information system, publicly available in the IPEA extractor (IPEA, 2022); and aggregated to match the sectors of the input-output matrix. The regional and sectoral distribution of the amount adopted here in the impact analysis is shown in Figure 3 and Figure 4, respectively. They have been deflated to express 2015 values, homogenised with the input-output matrix . The total values range from R$ 127 million to R$ 3,602 million.

Figure 2. Shock description

Source: Developed by the authors.

Figure 3. Regional distribution of the average Carnival expenditures in 2015 (in R$ million)



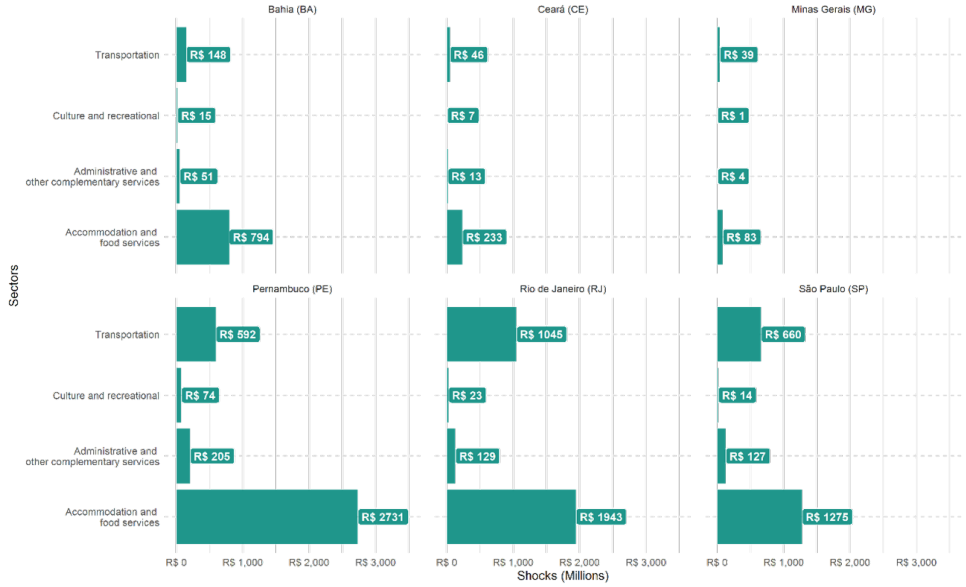
Source: Developed by the authors.

The impact analysis represents the cancellation of Carnival which directly affects the following tourism activities: i) restaurants, ii) accommodation, iii) transportation, iv) artistic and leisure activities, and v) travel agencies, which belong to different sectors in the input-output matrix. For instance, travel agencies are classified into "Administrative activities and complementary services". As observed in Figure 4, when compared to the magnitude of the shock on other tourism activities, cultural and recreational activities are the least affected, although this differs across states. On the other hand, the imposed sanitary restrictions of COVID-19 forced hotels and restaurants within the "Accommodation and food services" sector to drastically reduce or stop their activities. In the Carnival tourism chain, this sector ranks at the top, which is reflected in the implemented shock. Transportation ranks second, with prominent relevance in São Paulo, Rio de Janeiro, and Minas Gerais.

This economic analysis uses interregional input-output matrices separately for each state with the interpretation state-specific. These interregional matrices are originally aggregated into 22 productive sectors and four regions, where three of them refer to the population arrangements of the corresponding Brazilian state for the year

2015 (Haddad et al., 2020). In this study, however, the matrices have been modified to display two regions, that is, the state itself and the rest of Brazil to better frame the effects of the cancellation of Carnival at the state level.

Figure 4. Sectoral distribution of the shock across tourism activity



Source: Developed by the authors.

We explore some economic variables in this analysis, such as formal and informal employment and taxes, in addition to output and GDP. These are relevant given the tourism-driven economic dynamics and their capacity to generate jobs and public revenues. For that purpose, the variable of total employment has been disaggregated into formal and informal occupations across the 22 productive sectors based on the Continuous National Household Sample Survey ("PNADC" in Portuguese) of 2015 (IBGE, 2021), which maintains the original data for the states and the rest of Brazil.

The PNADC is useful to obtain the relative share of formal and informal occupations by economic activity in the total employment that is being applied to the input-output matrix. As for formal employment, this refers to workers who had worked in the reference week with wage and labour rights. In contrast, informal employment corresponds to jobs undertaken with a lack of any formal contract. Concerning the labour market, the following aspects are considered: i) people aged between 18 and 70 years old, inclusive; ii) individuals with a positive income, who had worked during the reference week; iii) only the person responsible for the household and the respective spouse; iv) exclusion of those with more than one job in the reference week (the only main job is prioritised); v) exclusion of military personnel, public servants, self-employed workers and unpaid workers; and vi) the sectors are classified according to the CNAE 2.0 code[1]. The resulting impacts of this input-output impact analysis are

[1]National Classification of Economic Activities, version 2.0.

provided in the next section.

5. Regional economic impacts of a Brazil without the Carnival

Due to the COVID-19 pandemic, 2021 was the first year in the history of Carnival not to see its traditional festivities take place across Brazilian regions. Recognising the importance of the festival for celebrants and also the regional economies, this study assumes that the cancellation of Carnival negatively affects tourism activities. Table 3 shows the regional impact of the cancellation on economic variables among Brazilian states. These results should be interpreted as the percentage change compared to the input-output baseline.

Table 3. Carnival cancellation impacts on economic variables, 2015 (%)

Regions	Output	GDP	Formal employment	Informal employment	Taxes
SP	-0.05	-0.09	-0.01	-0.17	-0.11
RJ	-0.20	-0.37	-0.72	-0.72	-0.47
BA	-0.17	-0.27	-0.42	-0.27	-0.40
PE	-1.15	-1.78	-2.84	-2.60	-2.65
MG	-0.01	-0.02	-0.03	-0.02	-0.02
CE	-0.13	-0.18	-0.28	-0.19	-0.26

Source: Developed by the authors.

The economic impacts on a given hosting state depend upon its productive structure and the spending of a determined number of tourists participating in the event. This is captured in our results. From a regional perspective, suspending Carnival had an immediate effect on GDP, with losses that ranged from 0.02% to 1.78%. Among the six regions analysed, the negative economic impacts are the largest in Pernambuco (PE) and Rio de Janeiro (RJ). In the context of COVID-19, the reduction in tax collection has had substantial implications for pandemic management. In Pernambuco (PE), for instance, it fell by 2.65%.

Despite having one of the biggest Carnivals in the country, São Paulo shows a drop of only 0.09% in GDP and total employment remained virtually unchanged. This can be explained, in part, by having one of the most diversified economies in the country. Rio de Janeiro (RJ), on the other hand, among the analysed states, has the largest share of tourism in GDP terms (14.2%) and Minas Gerais (MG) has the lowest share (9.9%). In Minas Gerais, GDP losses are virtually null. Since Carnival celebrations in the countryside of Minas Gerais are also popular, these were disregarded in the data collected and this result may underestimate the real magnitude of the negative effects. In Pernambuco, a drop in the monetary inflow from Carnival represents a 1.2% fall in output. This is the largest economic loss observed among the states evaluated. This number should be interpreted with caution, while it seems small but considering the temporary status (i.e., its short duration) of Carnival, it is significant.

The negative economic effects of COVID-19 have been found in previous studies within different scopes of analysis and geographical coverage (Gierczak-Korzeniowska et al., 2021; Škare et al., 2021). The direct impact of cancelling the Carnival of 2021 was to reduce the spending of tourists, which also led to a decline in job and income creation. More than 200 thousand direct jobs (formal and informal) would have been created if Carnival had not been cancelled in the hosting states. Comparatively, the one-day Comrades Marathon in Pietermaritzburg (South Africa) creates approximately 630 job opportunities (Saayman and Saayman, 2012), demonstrating the importance of Carnival in terms of employment generation. The region experiencing the most significant drop, in absolute terms, is Pernambuco, with a total of approximately 110 thousand and 14 thousand formal and informal jobs lost, respectively. Carnival-driven tourist expenditure in Pernambuco is greater than in the other states. As a result, losses in local financial revenues accruing to the local economy of Pernambuco are substantial, especially considering existing levels of regional development.

Considering differences in formal and informal employment, the case of São Paulo is unique as informal employment is the most affected by the cancelling of Carnival, falling 0.2% compared to the baseline. In February 2021, COVID-19 data reported an average of 230 deaths per day, and several non-essential activities had been suspended in the state. The necessary sanitary measures imposed an economic loss on informal workers who usually monetize their activities during Carnival. Additionally, tax collection fell by R$140 million in São Paulo. In contrast, formal jobs account for the largest share of job opportunities related to Carnival (85%) that were cancelled in Rio de Janeiro. The samba school parades of Rio de Janeiro are well-known worldwide. There is an established infrastructure to receive tourists and the Carnival labour market has been increasingly following this formalisation.

According to Škare et al. (2021), in the case of the global tourism sector, changes in employment occur directly in the local touristic activities but also in other sectors and regions. Spillover employment effects are found in the rest of Brazil, and between 557 and 13,798 jobs could have been created. This effect is associated with the pre-existing sectoral inter-regional flows as a demand contraction driven by the cancellation of Carnival during the COVID-19 pandemic negatively affected other productive sectors across the country. This translated into a drop in sectoral GDP, particularly for “Other manufacturing industries”, “Agriculture” and “Food manufacturing”. There are interlinkages between those sectors and Carnival-related tourism activities of the input-output framework. In the absence of Carnival, a decrease in the production levels of hosting states prompted a decrease in the demand for inputs from other sectors located in the rest of Brazil.

The economic losses of cancelling Carnival in 2021 are the largest in the tourism-related sectors of the analysis, as indicated in Table 4. The impacts on these sectors are in line with the findings of other studies that quantified the economic impacts of event tourism. For example, Pedauga et al. (2022) quantified the economic impacts

of the disappearance of sports tourism events. This is considered a hypothetical scenario that could only occur under certain circumstances such as pandemics. This would cause a fall in GDP, and the most significantly impacted sector would be accommodation services.

Table 4. Sectoral GDP effects by state (%)

Sectors	BA	CE	MG	PE	RJ	SP
Agriculture	-0.05	-0.03	0.00	-0.39	-0.13	-0.04
Extractive industry	-0.06	-0.05	0.00	-0.12	-0.07	-0.02
Food manufacturing	-0.19	-0.11	-0.01	-0.80	-0.30	-0.06
Machinery and equipment manufacturing	-0.02	-0.02	0.00	-0.13	-0.05	-0.01
Other manufacturing industries	-0.10	-0.09	0.00	-0.91	-0.17	-0.05
Electricity and gas supply	-0.11	-0.08	-0.01	-0.44	-0.14	-0.03
Water supply and waste management activities	-0.15	-0.08	-0.01	-0.66	-0.14	-0.03
Construction	-0.01	-0.01	0.00	-0.09	-0.02	-0.01
Trade	-0.10	-0.05	0.00	-0.44	-0.09	-0.04
Transportation and post	-0.83	-0.71	-0.10	-6.44	-1.98	-0.49
Accommodation and food services	-5.00	-3.69	-0.25	-23.19	-5.78	-1.68
Telecommunications	-0.06	-0.04	0.00	-0.31	-0.13	-0.02
Financial and related services activities	-0.16	-0.13	0.00	-0.58	-0.13	-0.05
Real estate activities	-0.10	-0.06	0.00	-0.33	-0.07	-0.03
Scientific and technical activities	-0.17	-0.19	0.00	-0.83	-0.14	-0.04
Administrative and other complementary services	-0.83	-0.49	0.00	-5.09	-0.49	-0.29
Public services	0.00	0.00	0.00	0.00	0.00	0.00
Education	0.00	0.00	0.00	0.00	0.00	0.00
Health and social work	0.00	0.00	0.00	0.00	0.00	0.00
Artistic, creative and entertainment activities	-1.54	-1.10	-0.02	-10.51	-4.44	-0.12
Other services activities	-0.03	-0.01	0.00	-0.08	-0.02	0.00
Domestic services	0.00	0.00	0.00	0.00	0.00	0.00

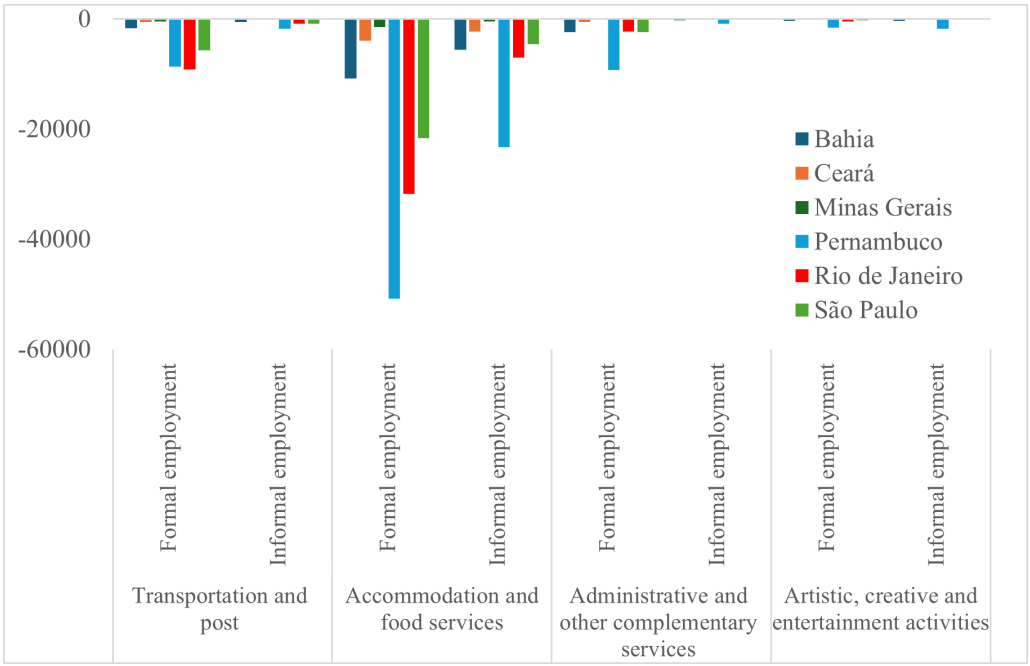
Source: developed by the authors.

A similar impact is observed in the case of Carnival, albeit with varying magnitudes across its hosting states. In Pernambuco, the sector suffered a 35% decrease in GDP while artistic and entertainment activities and transportation reported an 11% and 6% loss, respectively. While investigating the inflow to the economy from a small-scale event, Kim and Dombrosky (2016) found that recreational activities rank second in terms of direct impacts. For Lu et al. (2019), tourism events hosted in capital cities tend to generate stronger impacts on the economic development of the hosting cities, with greater implications for the tertiary economy. Although Carnival celebrations mostly occur in the state capitals, for this simulation we assume that tourist expenditures with Carnival take place at the state level. From this perspective, COVID-19 may have hindered efforts to promote local economic development.

The economy of Pernambuco is particularly sensitive to the cancelling of Carnival celebrations since the negative effects on GDP propagate significantly to non-Carnival sectors, which also produce to meet the Carnival tourism demand. It is worth noting that the production of a given sector is set up to meet the demand of the whole economy, therefore it is not limited to the Carnival value chain. Other sectors absorb the

effects differently. There are important productive linkages between "Accommodation and food services" being reflected in the indirect effects of the "Food manufacturing" sector in all hosting states.

Figure 5. Sectoral direct effects on employment in tourism activities related to Carnival, 2015 (absolute values)



Source: Developed by the authors.

Considering the tourism activities associated with the Carnival festivities, Figure 5 displays the sectoral direct effects on employment expressed in absolute terms. These are mostly concentrated in the "Accommodation and food services", with losses in job opportunities being particularly high in the case of formal employment. Similar results have been found in the existing literature on the impacts of COVID-19, such as in (Dube et al., 2021) for the case of restaurants. In this study, for Pernambuco, Rio de Janeiro, and São Paulo, this loss corresponds to approximately 50 thousand, 31 thousand and 21 thousand, respectively. The number of formal jobs that would have been created in the transportation sector of Rio de Janeiro exceeds that of the other states. In Minas Gerais and Ceará, the employment effects are relatively lower given the size of their Carnival celebration. This is also reflected in the amount of taxes the government would have collected had the Carnival occurred in 2021, R$4.5 million in Minas Gerais and R$11 million in Ceará. Ultimately, the benefits of recycling the tourist expenditure on Carnival through the local economy were not reaped in the hosting states, limiting the potential for helping protect important economic and social indicators in that year.

Based on the crisis management theory, it is observed that before the COVID-19 pandemic, the Carnival sector had not considered preparing a plan with actions to

prevent or cope with potential disruptive events. During the pandemic, it has undergone a phase of reaction which led to negative impacts due to the cancelling of Carnival. The results reinforce that among the key lessons for the sector there is the need to develop a new approach to face upcoming crises. As employment tends to take longer than output to recover from a crisis (Martins et al., 2020), and the decline in employment is detrimental to the local labour market and development, this is arguably the most critical variable to target within a crisis management plan for Carnival. This is of paramount importance for the tourism sector due to the potential crisis-related impacts it may face the more frequent disastrous events become, as Hall (2010) points out.

Conclusions

This paper quantifies the negative economic impact of cancelling Carnival during the COVID-19 pandemic. Its results constitute the first attempt to combine event tourism and economics in Brazil in the context of a global pandemic. Brazilian Carnival tourism is a social phenomenon of high economic relevance for the states where it is culturally more vibrant. However, the COVID-19 pandemic disrupted the annual celebrations and for the first time, silence echoed in the streets.

The cancellation of Carnival in 2021 led to economic losses for the hosting states given the reduced number of tourists, tax income and employment opportunities generated for the Carnival celebration. The implications of this contraction in the touristic demand are derived from an input-output impact analysis. Each hosting state responds to the reduction in the average expenditure of tourists differently, following its pre-existing productive structure. The estimations indicate that Pernambuco was by far the hardest hit, with negative impacts spread over Carnival-related sectors and across the supply chain linkages to other productive sectors. Overall, the GDP loss amounted to R$ 6.8 million for an event that usually lasts 5 days per year. More than 200 thousand direct jobs (formal and informal) would have been created if Carnival had not been cancelled in the hosting states. For most of the states, these employment opportunities are largely attributed to formal positions, except for in São Paulo, where informal job losses predominate.

The evidence suggests that tourism activities are the most affected, even if the impacts are relatively small. The “Accommodation and food services” sector experiences the largest reduction in terms of GDP, employment and tax generation. This is in line with previous studies in the literature on event tourism. The government could have collected approximately R$ 650 million in taxes. A decline in Carnival-related tax generation is problematic from an economic and social perspective as taxes can be recycled and used for regional development purposes. In 2021, it could have supported the management of the COVID-19 crisis. Other sectors in the indirect Carnival chain were also undermined by the cancellation of Carnival in 2021, such as the “Other manufacturing industries” but the scale of the effects varies across sectors. This

effect propagated to sectors with productive activities in other regions of Brazil.

Given the substantial economic relevance of tourism and Carnival as well, public policies could be used as tools to promote a multitude of tourism events thereby encouraging the tourism value chain. This would protect states more dependent on the tourism sector and where Carnival plays a more significant role.

In the absence of official input–output tables at the regional level, the main limitation of this study lies in the use of estimated tables for the year 2015, which may not accurately reflect the economic reality. Accordingly, the exercise presented in this article may be updated as new tables become available. As a suggestion for future research, conducting comparative analyses of other mega-events, as well as evaluating specific policies aimed at mitigating the adverse effects of similar shocks, could enrich the debate in the field of tourism.

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