Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Annals of Tourism Research Empirical Insights 3 (2022) 100055

Contents lists available at ScienceDirect

Annals of Tourism Research Empirical Insights

journal homepage: www.sciencedirect.com/journal/annals-of-tourism-research-empirical-insights

Impact of domestic tourism on economy under COVID-19: The perspective of tourism satellite accounts

Doris Chenguang Wu [a], Chenyu Cao [a], Wei Liu [b], Jason Li Chen [c,*]

[a] School of Business, Sun Yat-sen University, Xinguang West road, Guangzhou, 510275, China
[b] Essex Business School, University of Essex, Southend-on-Sea, SS1 1LW, UK
[c] School of Hospitality and Tourism Management, University of Surrey, Guildford, GU2 7XH, UK

ARTICLE INFO

Editor: Dr. Kirilova Ksenia

Keywords:
Tourism satellite account
COVID-19 pandemic
Economic impact
Domestic tourism
Tourism statistics

ABSTRACT

The unprecedented COVID-19 pandemic reversed the ongoing upsurge in the global tourism industry. Yet compared with still-stagnant international tourism, domestic tourism has shown signs of recovery. This study takes Guangdong Province, China as a case for regional domestic tourism and adopts the tourism satellite account (TSA) method to assess domestic tourism's status. A pre- and post-pandemic comparison is conducted to map the impacts of the COVID-19 outbreak on domestic tourism's economic contribution. The TSA results show that the direct contribution of domestic tourism to Guangdong's economy fell from 2.53% to 1.20% across these timeframes. Findings also reveal changes in visitor composition by places of origin and in industries' proportional contributions to tourism.

1. Introduction

Despite being vulnerable to myriad environmental, political, and socio-economic factors (Sigala, 2020), tourism has enjoyed a decades-long upsurge worldwide. This sector has also displayed strong resilience against an array of crises, including the severe acute respiratory syndrome outbreak in 2003 and the global economic crisis in 2008 (Gossling, Scott, & Hall, 2021; Pham, Dwyer, Su, & Ngo, 2021). Yet the unprecedented COVID-19 outbreak, in conjunction with responsive governmental policies of mobility bans, lockdowns, and social distancing worldwide, has profoundly obstructed tourism (Sigala, 2020). The United Nations World Tourism Organization (UNWTO, 2021) reported that global international tourist arrivals have fallen by 74%—US$1.3 trillion lost in international tourism receipts. International tourism has effectively reverted to the 1990s as a result.

As international tourism nearly stopped entirely during the COVID-19 pandemic, the domestic tourism market presented a target for recovery of both the tourism sector and the overall economy. A randomized experiment by Volgger, Taplin, and Aebli (2021) revealed that an increase in COVID-19 cases weakened tourists' hotel booking intentions. Results of an online survey highlighted safety and security as key factors affecting individuals' travel decisions (Moya Calderón, Chavarría Esquivel, Arrieta García, & Lozano, 2021). People have thus tended to travel shorter distances amid COVID-19 versus before. This propensity has led to encouraging signs in domestic tourism markets (UNWTO, 2021) as the pandemic comes under local control and travel bans are lifted in some countries and regions. It is therefore sensible to train attention on expanding domestic tourism demand and promoting the conversion of outbound visitors into domestic ones. These aims also align with the idea of "dual circulating" economic patterns proposed by the Chinese government.

The premise of "dual circulation" is that domestic and foreign markets boost one another, with the domestic market occupying a dominant position. Cultivating domestic demand is thought to strengthen the effect of final consumption on national GDP. The notion of dual circulation originated from a thorough investigation of China's developmental context, including the COVID-19 pandemic. Given this idea, coupled with the fact that tourism—especially domestic tourism—plays a core role in stimulating consumption and economic recovery, we argue that a precise measurement of the economic impact of domestic tourism in the COVID-19 era is urgently needed.

The tourism satellite account (TSA) is consistent with the System of National Accounts (SNA) and several other international statistical frameworks. TSA is also an internationally approved method for measuring tourism's direct contributions to the economy; its application is not limited to national or sub-national tourism impact measurement.

* Corresponding author.
E-mail addresses: wucheng@mail.sysu.edu.cn (D.C. Wu), caochy8@mail2.sysu.edu.cn (C. Cao), w.liu@essex.ac.uk (W. Liu), l.chen@surrey.ac.uk (J.L. Chen).

https://doi.org/10.1016/j.annale.2022.100055
Received 3 February 2022; Received in revised form 28 May 2022; Accepted 31 May 2022
Available online 13 June 2022

With TSA as a foundation, interindustry linkage analysis (Beynon, Jones, & Munday, 2009), computable general equilibrium (CGE) modelling (Pratt, 2015), social accounting matrix modelling (Gul & Cagatay, 2015), and tourism forecasting (Ahlert, 2008) can each be reinforced. Direct or extensional use of TSA additionally facilitates analyses of the impacts of specific tourism activities (Beynon, Jones, Munday, & Roche, 2018; Diakomihalis, 2008; Diakomihalis & Lagos, 2011; Jones & Li, 2015; Sauer & Repik, 2014; Zhang, 2014) as well as tourism's ecological effects (Collins, Jones, & Munday, 2009; Dwyer, Forsyth, Spurr, & Hoque, 2010; Jones, 2013; Li, Li, Tang, & Wang, 2019; Meng, Xu, Hu, Zhou, & Wang, 2017; Munday, Turner, & Jones, 2013; Perch-Nielsen, Sesartic, & Stucki, 2010; Ragab & Meis, 2016). It remains necessary to assess the impact of the COVID-19 outbreak on the tourism industry, and TSA offers a suitable approach.

In the present study, we seek to measure the economic impact of domestic tourism amid the COVID-19 pandemic by establishing a TSA for Guangdong Province, China. This work is guided by three objectives: 1) to compile TSAs for Guangdong for 2019 and 2020, respectively; 2) to examine the structure of Guangdong's tourism industry and how the industry has evolved after the outbreak by comparing the two TSAs; and 3) to calibrate the impact of COVID-19 on Guangdong's tourism industry and, in turn, on the economy based on the established TSAs. The economic impact of the pandemic on Guangdong's domestic tourism has two facets, namely changes in scale (i.e., the plunge in domestic tourist arrivals, tourism consumption, and tourism's contribution rates to the overall economy) and structure (e.g., the composition of visitors, expenditure, output, and direct value added). Addressing these aims can generate a comprehensive understanding of the status of domestic tourism in Guangdong. The resultant implications are practically and theoretically helpful for rebooting the tourism sector given that domestic tourism has recovered earlier and more readily than international tourism.

The above-mentioned objectives are realized through three steps. First, we use the TSA method to estimate and organize statistical data on tourism demand for a range of goods and services along with the output of these goods and services from various industries. This process generates a useful overview of the scale and composition of regional domestic tourism. Second, we integrate data from the demand side and supply side and identify their intersections, thus discerning the direct contributions of domestic tourism activities. As such, we develop a TSA for Guangdong using a "bottom-up" approach, which has superior accuracy (Jones, Munday, & Roberts, 2009). Third, we compare the regional TSAs of 2019 and 2020 to identify shifts in the scale and structure of domestic tourism in Guangdong.

The rest of this paper is organized as follows. Section 2 introduces the TSA method and reviews its applications in evaluating the tourism-related consequences of COVID-19. Methodological details are provided in Section 3. Section 4 presents our results and analyses of TSAs for Guangdong. Section 5 concludes this study and suggests future research directions.

2. Literature review

2.1. TSA and its applications

Tourism is not an industry with distinct boundaries but rather represents a "sector" comprising multiple industries with complicated interactions (Meng et al., 2017; Odunga, Manyara, & Yobesia, 2020). This complexity renders it challenging to measure tourism's economic impact via SNA, especially given tourists' characteristics which differentiate them from other consumers (OECD et al., 2017. TSA has emerged to address this issue and has become an internationally approved and standard means of tourism measurement (Diakomihalis, 2008; Frechtling, 2010; Frent, 2018). As Frechtling (2010) noted, a complete TSA describes tourism's direct contribution to an economy, tourism consumption, tourism industry production, and other non-monetary information about the sector. TSA hence offers rich insight into all aspects of demand related to tourism, the interface of said demand with tourism industry supply, and the interaction of said supply with other industries. This method enables practitioners to separate the impacts of tourism from the overall economy. TSA compilation is consistent with other statistical frameworks, including SNA and *International Recommendations for Tourism Statistics* (*IRTS*). This approach has thus been extensively and successfully applied.

TSA measurement has been carried out at both national and regional levels. Nationally, TSA has been implemented in countries including the United Kingdom (Bryan, Jones, & Munday, 2006), India (Munjal, 2013), Iceland (Frent, 2018), Ireland (Kenneally & Jakee, 2012), Rwanda (Odunga et al., 2020), and elsewhere. In developing a TSA for Tanzania, Sharma and Olsen (2005) compensated for a lack of statistical resources to adhere to UNWTO's bottom-up method, which was deemed more accurate than the "top-down" method, to provide guidance for developing countries. Using TSAs from countries whose TSA data were available, Figini and Patuelli (2021) compared the tourism share in GDP among European Union economies and discovered a high degree of heterogeneity. TSA has also been adopted on a sub-national or regional basis, such as in China's Guangdong Province (Wu, Liu, Song, Liu, & Fu, 2019), Caribbean islands (McArthur, 2015; Steenge & Van De Steeg, 2010), an Australian coastal town (Williams, 2016), and several federal states in Austria (Smeral, 2015).

With its descriptive nature (OECD et al., 2017) and the ability to separate tourism from industries in national accounts (Meng et al., 2017), TSA can promote further research. It serves as a framework for impact measurement and supports tourism economic modelling, policy analysis, tourism growth analysis, and other analytic procedures (Bryan et al., 2006; Diakomihalis, 2008). For instance, improvements in regional tourism data and sub-national TSAs have enabled tourism interindustry linkage analysis (Beynon et al., 2009). Xu, Jones, and Munday (2020) used TSA to identify variation in the attributes of regionally and externally owned tourism sectors. Hadjikakou, Chenoweth, Miller, Druckman, and Li (2014) focused on disparities in numerous tourism market segments' contributions based on TSA data. Their findings provided insight to enhance tourism contributions in Cyprus. Tourism demand data in TSAs can also be modelled using a CGE model, which is a routine practice as mentioned by Pratt (2015); he examined the economic impact of tourism in Small Island Developing States using the abovementioned method. Gul and Cagatay (2015) combined TSA with a social accounting matrix to evaluate the impacts of demand-driven shocks on the Turkish tourism industry. Ahlert (2008) integrated TSAs with a macroeconomic forecasting and simulation model to more precisely depict the impacts of future inbound tourism on GDP and employment in Germany. Others have leveraged TSA to address leakages in international tourism receipts (Unluonen, Kiliclar, & Yueksel, 2011).

The TSA method can also unearth the contributions of specific tourism activities. For instance, scholars have estimated the contributions of Greek yachting and coastal leisure shipping to the local economy (Diakomihalis, 2008; Diakomihalis & Lagos, 2011). Researchers have further investigated the contributions of landmark historical sites' heritage assets (Beynon et al., 2018), meetings and conferences (Jones & Li, 2015; Zhang, 2014), wine tourism (Sauer & Repik, 2014), and additional topics. A number of studies have measured the ecological consequences of tourism (e.g., greenhouse gas emissions, energy consumption, and water consumption). In such cases, TSA is often used for boundary setting (i.e., determining whether a proportion of ecological impacts is due to tourism consumption) (Dwyer et al., 2010; Jones, 2013; Li et al., 2019; Meng et al., 2017; Perch-Nielsen et al., 2010; Ragab & Meis, 2016). In two studies concerning carbon emissions, an environmentally extended input–output model (Sun, 2014) and an environmental input–output framework (Munday et al., 2013) were applied along with TSA-based tourism consumption data to delineate the environmental consequences of various types of tourism

consumption. In exploring the environmental externalities of mega sport events, Collins et al. (2009) adopted an environmental input–output framework refined by satellite accounts.

The TSA framework presents an ideal approach for measuring the economic impact of tourism. Yet among the bevy of studies regarding COVID-19's effects on tourism, few have assumed a TSA perspective to contemplate either the pandemic's impact on tourism or tourism's impact on the economy in the pandemic era. The present study endeavors to bridge this gap by uncovering how the economic role of tourism has changed after the outbreak so as to detect COVID-19's economic impact on the tourism sector.

2.2. Economic impact of tourism during the COVID-19 pandemic

The sudden outbreak of COVID-19 and consequent travel restrictions, quarantine policies, and social distancing have halted almost all tourism activities (Gossling et al., 2021). Scholars have used a variety of modelling approaches to estimate the pandemic's economic impact on tourism. These efforts have provided meaningful insight. To map the stochastic characteristics of the length and severity of epidemic outbreaks, Yang, Zhang, and Chen (2020) applied a dynamic stochastic general equilibrium model to examine the economic effects of infectious diseases on tourism. Two parallel studies later pertained to inbound tourism in Australia. By incorporating the full TSA into CGE modelling, Pham et al. (2021) projected short-term epidemic impacts on Australian inbound tourism in terms of tourism's direct contributions and its indirect effects via interindustry linkages. Ghosh (2021) leveraged a novel panel model to determine the long-term impacts of multiple factors on Australian inbound tourism. This model was also augmented to address panel heterogeneity and cross-sectional dependence, reinforcing the study's robustness. For Greece, whose economy heavily depends on international travel income, a multisectoral model framework using data from the Supply and Use Table was employed to estimate the multiplier effects of tourism on GDP in a COVID-19 context (Mariolis, Rodousakis, & Soklis, 2021). Slovakia is a unique nation featuring spa tourism; the Box–Jenkins method was used to forecast spa facility performance (Senkova et al., 2021). The forecast results differed greatly from reality and thus verified the pandemic's significant impact on this branch of tourism.

A study in Japan described the influence of COVID-19 in terms of tourist consumption, carbon footprint, and employment using a lifecycle approach and input–output tables (Kitamura, Karkour, Ichisugi, & Itsubo, 2020). Regional research was carried out in Andalusia using a social accounting matrix linear model (Cardenete, Delgado, & Villegas, 2021). Additionally, a series of methods were adopted to study how the pandemic has influenced Macao; examples included the autoregressive integrated moving average model, correlation analysis, and regression. Findings revealed the effects of COVID-19 on Macao's tourism sector, the impact of tourism on Macao's economy, and the local tourism industry's dependence on gambling as a revenue source (Lim & To, 2021).

The body of knowledge on tourism-related economic impacts stands to be updated since the COVID-19 outbreak. The most appropriate economic methods vary situationally. TSA, as a statistical approach, should be further applied to generate methodological and theoretical insights. This study aims to expand TSA studies in the pandemic era.

3. Methodology

3.1. Case selection

The sudden outbreak of COVID-19 in early 2020 resulted in lockdowns and bans on gatherings across China. These measures were intended to curb transmission of the virus while also halting tourism activities. Through the collective effort of Chinese people, the pandemic came under control in March 2020, after which work and production gradually resumed. The domestic tourism sector also entered a recovery phase.

To determine how the pandemic has affected domestic tourism, and to estimate how much the sector's economic contribution has diminished, we choose Guangdong Province, China as the focal destination. This location has been selected as the study case for several reasons (DCTGD, 2021). First, tourism is of great scale and importance in Guangdong Province; the province's total tourism earnings and foreign exchange earnings from international tourism have ranked first in the country for several successive years. Second, the tourism industry is one of the province's primary growth sources. Third, domestic tourism in Guangdong has shown strong signs of recovery. According to statistical data from the Department of Culture and Tourism of Guangdong Province, the number of inbound tourists arriving in Guangdong declined by 87.45% in 2020 compared with 2019, suggesting that international tourism remained stagnant. Therefore, domestic tourism in Guangdong is taken as the research setting.

3.2. Compilation of TSA

To maintain consistency with the definitions in *IRTS* (UNDESA, 2008), we use same-day visitors to denote excursionists and tourists to denote overnight visitors. Greek numbers are used to index tables that constitute the TSA; Arabic numbers are used to index the tables shown in this study.

The conceptual framework of TSA was initially constructed in 2000 by the United Nations Statistics Division, the Statistical Office of the European Communities (Eurostat), the Organization for Economic Cooperation and Development (OECD), and UNWTO. The framework was later updated in 2008, resulting in the publication of *Tourism Satellite Account: Recommended Methodological Framework 2008* (OECD et al., 2017). TSA was built to provide a holistic view of all aspects of visitor demand, the proportion of the supply of all goods and services that meet said demand, and how said supply interacts with other economic activities. To accomplish these goals, an array of six interconnected tables was established to provide TSA macroeconomic aggregates, with the sixth table being the core of TSA (Frechtling, 2010). TSA Tables I–III concern visitors' tourism expenditure as reflected in different forms of tourism on different goods and services: Table I focuses on inbound tourism, Table II focuses on domestic tourism, and Table III focuses on outbound tourism. TSA Table IV records internal tourism consumption by goods and services, combining inbound expenditure from Table I and domestic expenditure from Table II with other components of tourism consumption. TSA Table V indicates the tourism production of tourism industries and other industries. TSA Table VI integrates supply (Table V) and tourism consumption (Table IV), identifying the total output and direct value added contributed by tourism activities.

Demand-side data for these TSA tables are mainly derived from the Visitor Survey of Guangdong Province for 2019 and 2020. The Department of Culture and Tourism of Guangdong Province, China conducts this survey regularly. Supply-side data are generally obtained from Guangdong Statistical Yearbook 2020 and 2021, Guangdong Input–Output Table 2017, and Guangdong Economic Census Yearbook 2018. Because the Input–Output survey and economic census are performed in China on a five-year basis, we only borrow the proportions in 2017 and 2018 to infer and approximate values for 2019 and 2020 given that the economic structure does not change significantly within a few years (Bryan et al., 2006; Jones, Munday, & Roberts, 2003; Munjal, 2013).

Considering our research purpose, we adopt a flexible compilation strategy which does not require assembling all six TSA tables. To measure the impact of COVID-19 on domestic tourism in Guangdong, we construct a regional TSA for the province. We specifically compile tourism expenditure in Guangdong, based on international visitors and Chinese visitors living outside Guangdong, in TSA Table I; all visitors are

divided into same-day visitors and tourists. For TSA Table II, we compile the tourism expenditure by Guangdong residents. TSA Table III, which records the expenditure of Guangdong residents travelling outside Guangdong, is omitted. TSA Table IV is a summation of Tables I and II and tourism social transfers in kind, without vacation homes on own account or other composition considered. For TSA Table V, we compile total output and direct value added for each tourism-related industry. TSA Table VI is a summation of Tables IV and V to bridge supply and demand: regional total consumption and its proportion to regional total output for each tourism product are first computed and then used to estimate tourism-related output for each product in each industry. The sum of all tourism-related output per industry is next divided by the total output to obtain a ratio capturing tourism's contribution. Then, by multiplying the ratio by the total value added in each industry, the direct value added attributable to tourism is obtained. Adding all direct value added attributable to tourism across industries and dividing the sum by the regional GDP indicates tourism's contribution to the overall regional economy.

4. Case study of Guangdong province

4.1. An overview of tourism in Guangdong during COVID-19

As a result of the COVID-19 outbreak and ensuing health restrictions, pervasive fear, and decreased household income, tourism activity around the globe has witnessed a steep decline. Guangdong Statistics Bureau and China's National Bureau of Statistics have documented that the pandemic has severely influenced domestic tourism in both the province and the country. As depicted in Figs. 1 and 2, before the outbreak, domestic tourism underwent a swift and steady climb. The unexpected shock of COVID-19 then placed tourism into a marked retrogression. Parallels in these two figures reflect the consistency in regional and national data and verify the generalizability of this study to some extent. Nationally, the number of domestic visitors decreased by 52.06% and total domestic tourism expenditure decreased by 61.07% in 2020 versus 2019. In Guangdong Province, the number of tourists and domestic tourism earnings dropped by 54.28% and 67.04%, respectively. The results in Section 4.3 compare tourism contribution rates in 2019 and 2020 to provide a more precise estimate of the degree to which COVID-19 ravaged domestic tourism.

4.2. Composition of tourism expenditure

Data from two sources—a sampling survey of visitors in Guangdong Province conducted by the Department of Culture and Tourism of Guangdong Province and accommodation facility data provided by Guangdong Statistics Bureau—are referenced here. Domestic visitors in Guangdong can be divided into two groups: those from Guangdong and those from other provinces. The number of visitors hailing from Guangdong is estimated to be 394.17 million, composing 66.19% of all domestic visitors in 2019. For 2020, the number shrinks to 202.89 million to equal a proportion of 74.13% (Fig. 3). The regional expenditure of visitors from Guangdong is RMB 535.05 billion and RMB 227.40 billion, respectively (Fig. 4). Inter-provincial tourism is found to decrease by a higher ratio than intra-provincial tourism; this phenomenon offers additional evidence for people's preference for shorter-distance travel in light of the pandemic.

For 2019 and 2020, respectively, the number of tourists staying at hospitality facilities across the province is 494.10 million and 225.91 million (Fig. 5). Tourists' average length of stay is 2.61 days and 2.16 days, respectively. In 2019, 82.97% of domestic visitors stayed overnight. The average expenditure in a day is RMB 531.59 and RMB 780.97, respectively, for same-day visitors and tourists. Tourists' estimated expenditure is RMB 1,007.13 billion, accounting for 94.92% of all expenditure (Fig. 6). For 2020, tourists represent 82.54% of all visitors to Guangdong (Fig. 5). Average expenditure in a day is RMB 499.81 for same-day visitors and RMB 767.66 for tourists. Tourists' estimated expenditure is RMB 374.59 billion—94.01% of overall expenditure (Fig. 6). Although the ratio of same-day visitors to tourists does not vary substantially, tourists' length of stay declines significantly, as does the per-day expenditure for all visitors. In the absence of restrictions and given the ability to travel, tourists may have opted against staying longer and spending more due to pronounced uncertainty and weaker purchasing power.

The sampling survey also provides the proportion of various goods and services visitors consume, from which we can extract the composition of domestic visitors' tourism expenditure (Table 1 and Fig. 7). The types of goods and services with the greatest proportions in both years are accommodation services, food and beverage, and shopping, followed by passenger transport and transport equipment rental services. The proportion of expenditure on shopping is shown to decline significantly between 2019 and 2020. The proportion of expenditure on food and beverage increases; the expenditure on accommodation services and passenger transport and transport rental decreases overall by a small

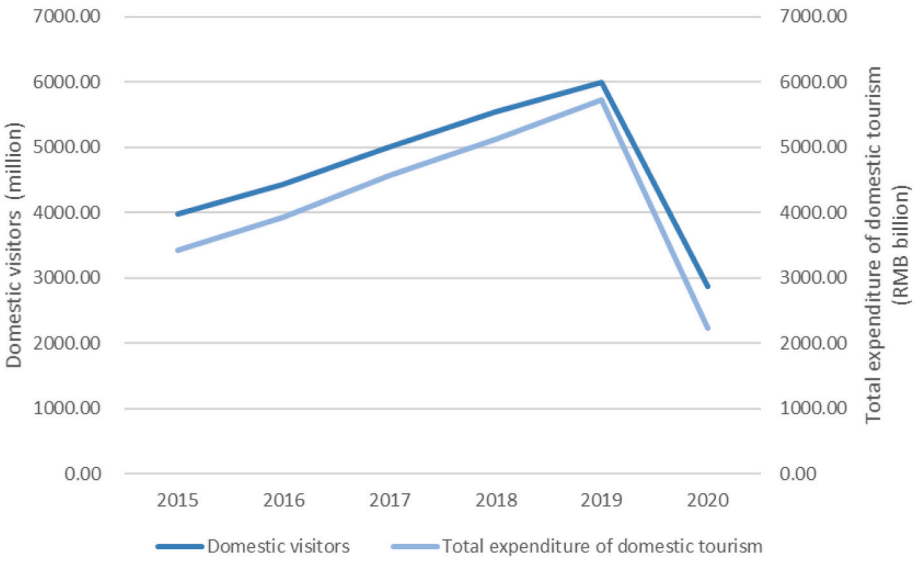

Fig. 1. Number of domestic visitors and total expenditure nationwide.

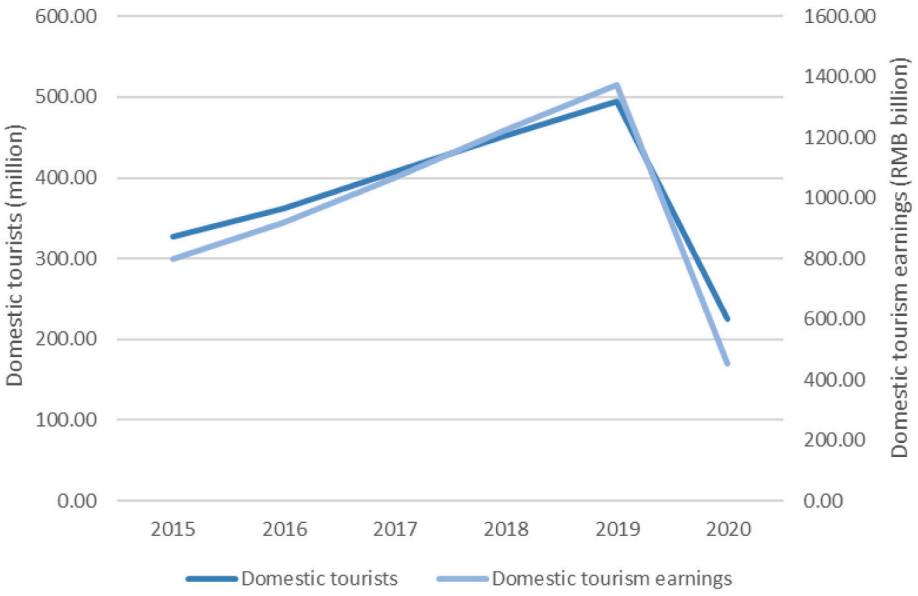

Fig. 2. Number of domestic tourists and tourism earnings in Guangdong.

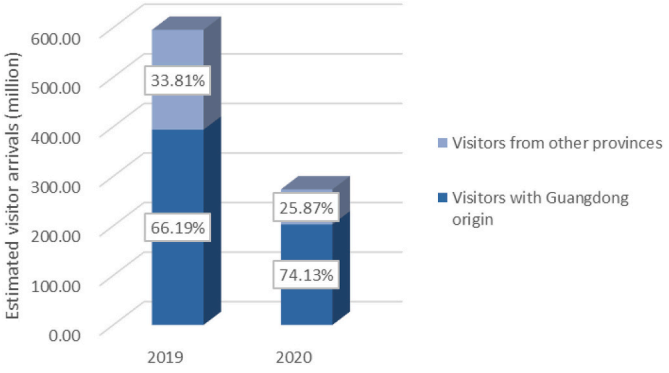

Fig. 3. Estimated visitor arrivals by visitors' places of origin.

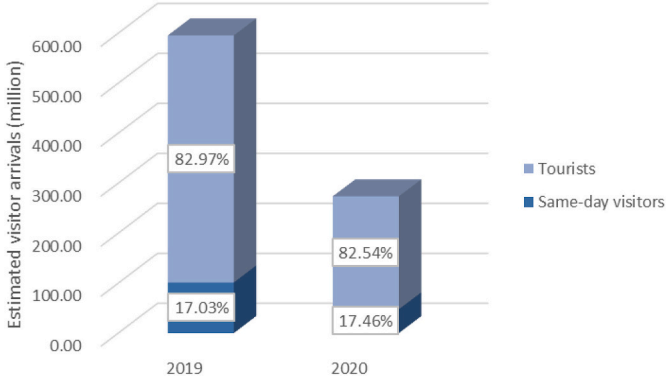

Fig. 5. Estimated visitor arrivals by length of stay.

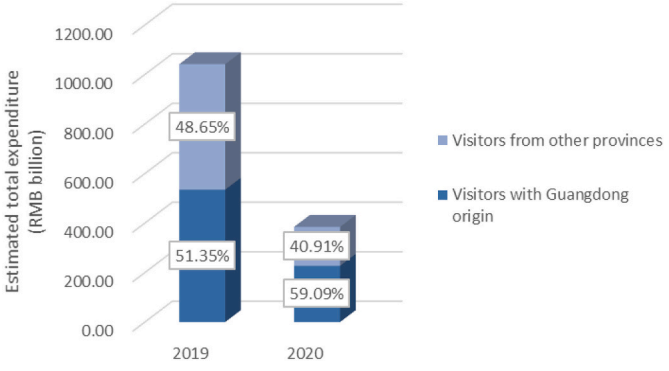

Fig. 4. Estimated tourism total expenditure by visitors' places of origin.

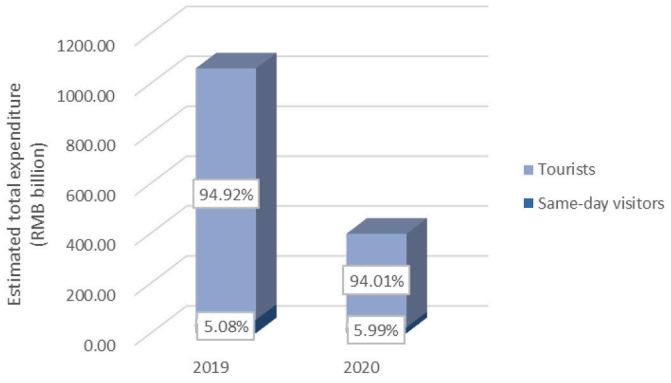

Fig. 6. Estimated tourism total expenditure by length of stay.

margin, confirming their rigidity. However, when solely considering expenditure on air and road passenger transport services, visitors' propensity to use more private transport modes becomes clear.

4.3. Direct value added from domestic tourism and its composition

As displayed in Table 2, for 2019, the direct value added from domestic tourism is RMB 272.75 billion. This figure accounts for 2.53% of the province's regional GDP and 4.56% of the added value of tertiary industry. In 2020, the direct value added from tourism falls to RMB 132.40 billion, only totaling 1.20% of total regional GDP and 2.12% of the added value of tertiary industry in Guangdong. These patterns reflect the impacts of COVID-19 on industries engaged in domestic tourism and substantiate the tourism industry's sensitivity to external crises. Tourism direct value added from tourism-related industries is RMB 261.34 billion

Table 1
Composition of domestic visitors' tourism expenditure.

		2019 expenditure (RMB million)	2019 proportion (%)	2020 expenditure (RMB million)	2020 proportion (%)
1	Accommodation services for tourists	236,718.83	22.31	86,876.57	21.8
2	Food- and beverage-serving services	211,996.51	19.98	89,905.29	22.56
3	Passenger transport services				
3.1	Railway passenger transport services	30,209.61	2.85	9580.37	2.40
3.2	Road passenger transport services	70591.06	6.65	34,271.96	8.60
3.3	Water passenger transport services	1453.12	0.14	623.00	0.16
3.4	Air passenger transport services	85,714.99	8.08	23,930.15	6.01
4	Transport equipment rental services	3231.28	0.3	809.90	0.20
5	Travel agencies and other reservation services				
5.1	Services provided by travel agencies	35,014.44	3.3	7372.55	1.85
5.2	Ecological conservation and scenic spot administration services	74,237.06	7	29,201.78	7.33
6	Cultural services				
6.1	Artistic performance	2615.26	0.25	893.57	0.22
6.2	Museums and other cultural services	5553.42	0.52	1683.23	0.42
7	Sports and recreational services	47,678.21	4.49	24,491.92	6.15
8	Other services related to tourism				
8.1	Banking services	1017.58	0.1	127.07	0.03
8.2	Insurance services	1703.82	0.16	783.75	0.2
8.3	Postal, telecommunications, and other information services	1187.18	0.11	294.22	0.07
8.4	Services provided by local residents	4597.97	0.43	1696.27	0.43
8.5	Conference and exhibition services	7196.89	0.68	5626.94	1.41
9	Shopping	240,326.38	22.65	80,301.05	20.15
	Total expenditure	10,61,043.60	100	398,469.59	100

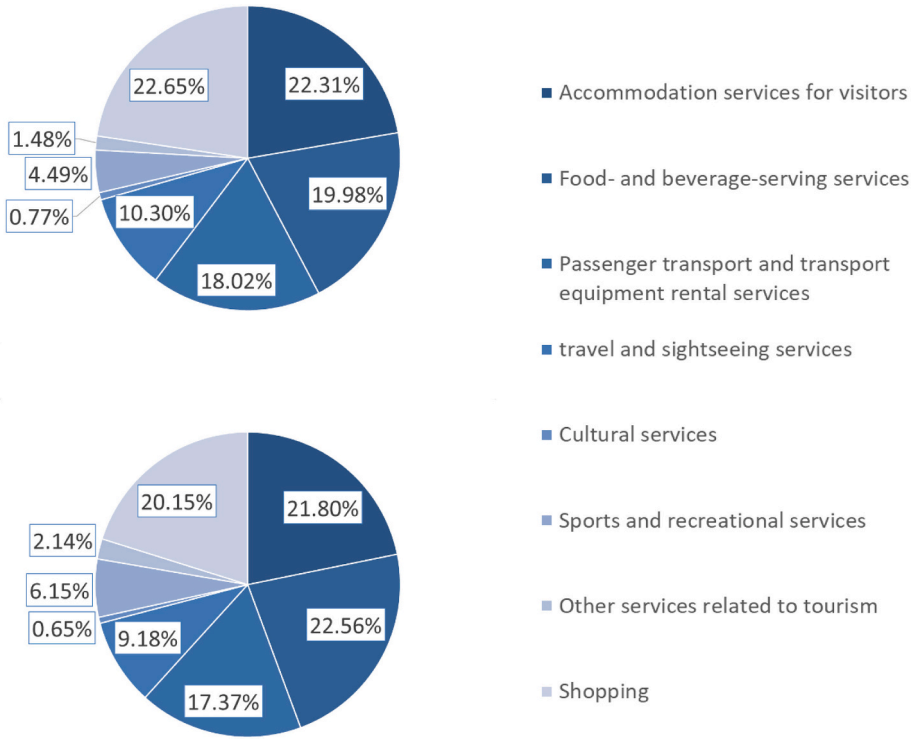

Fig. 7. Composition of expenditure by types of goods and services in 2019 (upper) and 2020.

Table 2
Direct value added from domestic tourism and regional GDP.

(RMB billion)	2019	2020
Tourism direct value added	272.75	132.40
Regional GDP	10,767.11	11,076.09
Proportion in GDP (%)	2.53	1.20
GDP of tertiary industry	5977.34	6254.08
Proportion in tertiary GDP (%)	4.56	2.12

for 2019, equal to 95.81% of all tourism direct value added. The corresponding number and proportion are RMB 123.18 billion and 93.03% in 2020. The composition of tourism direct value added is summarized in Table 3 and Fig. 8.

To further clarify various industries' contributions to tourism direct value added, tourism-related value added in each industry is estimated and used to investigate the composition of industry-specific tourism direct value added as elaborated in Table 4 and Fig. 9. Industries with the three highest contribution rates are food and beverage,

Table 3
Composition of tourism direct value added.

(%)	2019	2020
Compensation of employees	63.07	61.97
Net taxes on production	8.66	8.86
Depreciation of fixed assets	16.07	17.05
Operating surplus	12.21	12.11

accommodation for tourists, and road passenger transport in both years. It is worth noting that the proportions of contributions to direct value added by ecological conservation and the scenic spot administration industry double during this time frame. This circumstance partly mirrors visitors' preferences for natural and ecological destinations in the same period.

5. Conclusions and future directions

In this study, we adopt the TSA framework to measure the impact of domestic tourism on Guangdong's regional economy during the COVID-19 pandemic. TSAs for 2019 and 2020 are compiled and compared. These TSAs comprise data on tourism expenditure, representing the demand side; tourism social transfers in kind and tourism output across relevant industries, representing the supply side; and the interface of demand and supply to measure tourism's contribution to the regional economy. The results inform several conclusions regarding the province's domestic tourism sector.

The COVID-19 pandemic is found to have negative and substantial effects on tourism, with the number of visitors and tourism earnings decreasing by more than half. These declines can be attributed to visitors' risk perceptions (Donaire, Gali, & Camprubi, 2021; Dryhurst et al., 2020; Kozak, Crotts, & Law, 2007; Li, Zhang, Liu, Kozak, & Wen, 2020; Williams, Chen, Li, & Baláž, 2022) as well as travel bans. Yet the proportion of visits from Guangdong residents appears to increase despite an overall decrease in the total number of visitors. The pandemic has led people to favor travel that is closer to home (Bratic et al., 2021; Donaire et al., 2021; Hall, Scott, & Gössling, 2020; Qiu, Park, Li, & Song, 2020; Renaud, 2020), spurring the earlier recovery of domestic tourism (UNWTO, 2021) and provincial tourism over international tourism. The structure of visitors and tourism expenditure (i.e., the proportions of the number and the expenditure of same-day visitors to tourists) has barely changed after the onset of the pandemic. However, the average stay has significantly shortened, and the average daily expenditure for all visitors has declined. Donaire et al. (2021) pointed out that shorter lengths of stay may be due to visitors' efforts to reduce the risk of infection along with lower purchasing power. The documented decrease in average daily expenditure supports the latter point.

From a product perspective, domestic visitors have spent the most on accommodation services, food and beverage, shopping, passenger transport, and transport equipment rental services. The drop in the proportion of shopping further exemplifies that visitors have tended to be more conservative in their tourism expenditure (Bratic et al., 2021) due to reduced purchasing power and consumption patterns characterized by an unprecedented circumstance and general uncertainty (Li et al., 2020). However, the proportional increase in food and beverage expenditure and the meagre decrease in accommodation- and passenger transport-related expenditure highlight these three aspects as concrete demand sources during a trip. Although the expenditure proportion of transport has not changed much overall, two of its components—road and air transport—warrant attention. Flight reductions tied to civil aviation policies and infection risk have caused visitors to shift their travel preferences: they have turned to road trips rather than air travel to reduce interpersonal touch (Donaire et al., 2021).

Despite the pandemic, both Guangdong's regional GDP and the province's value added of tertiary industry are found to increase slightly in 2020 over 2019. However, the direct value added from tourism falls by about half, as does the tourism contribution rate. These outcomes corroborate that tourism, as an economic sector, has been arguably hit

Table 4
Composition of tourism direct value added by industry.

	2019		2020	
	Tourism-related value added in each industry (RMB billion)	Contribution to tourism direct value added (%)	Tourism-related value added in each industry (RMB billion)	Contribution to tourism direct value added (%)
Accommodation for tourists	31.80	11.66	24.68	18.64
Food- and beverage-serving industry	80.75	29.61	34.46	26.03
Railway passenger transport	14.31	5.25	4.54	3.43
Road passenger transport	33.06	12.12	16.81	12.70
Water passenger transport	0.63	0.23	0.27	0.20
Air passenger transport	26.26	9.63	7.39	5.58
Transport equipment rental	0.70	0.26	0.18	0.13
Travel agencies	17.90	6.56	8.31	6.27
Ecological conservation and scenic spot administration	2.68	0.98	2.66	2.01
Cultural industry	2.23	0.82	1.49	1.12
Sports and recreational industry	18.95	6.95	10.39	7.85
Retail industry	29.02	10.64	9.70	7.32
Conference and exhibition industry	3.03	1.11	2.31	1.74
Non-tourism industries	11.42	4.19	9.22	6.97
Total	272.75	100.00	132.40	100.00

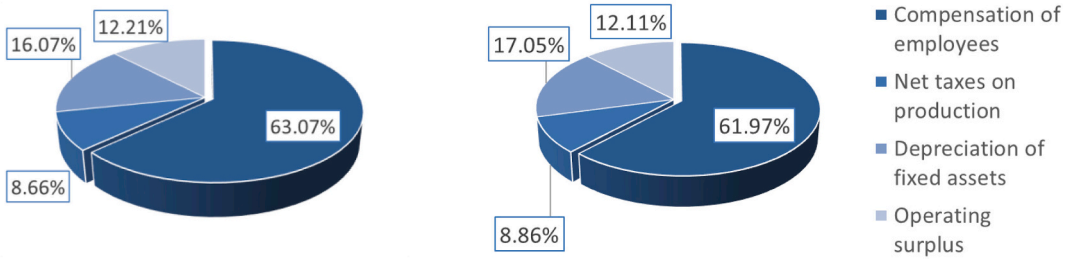

Fig. 8. Composition of tourism direct value added in 2019 (left) and 2020.

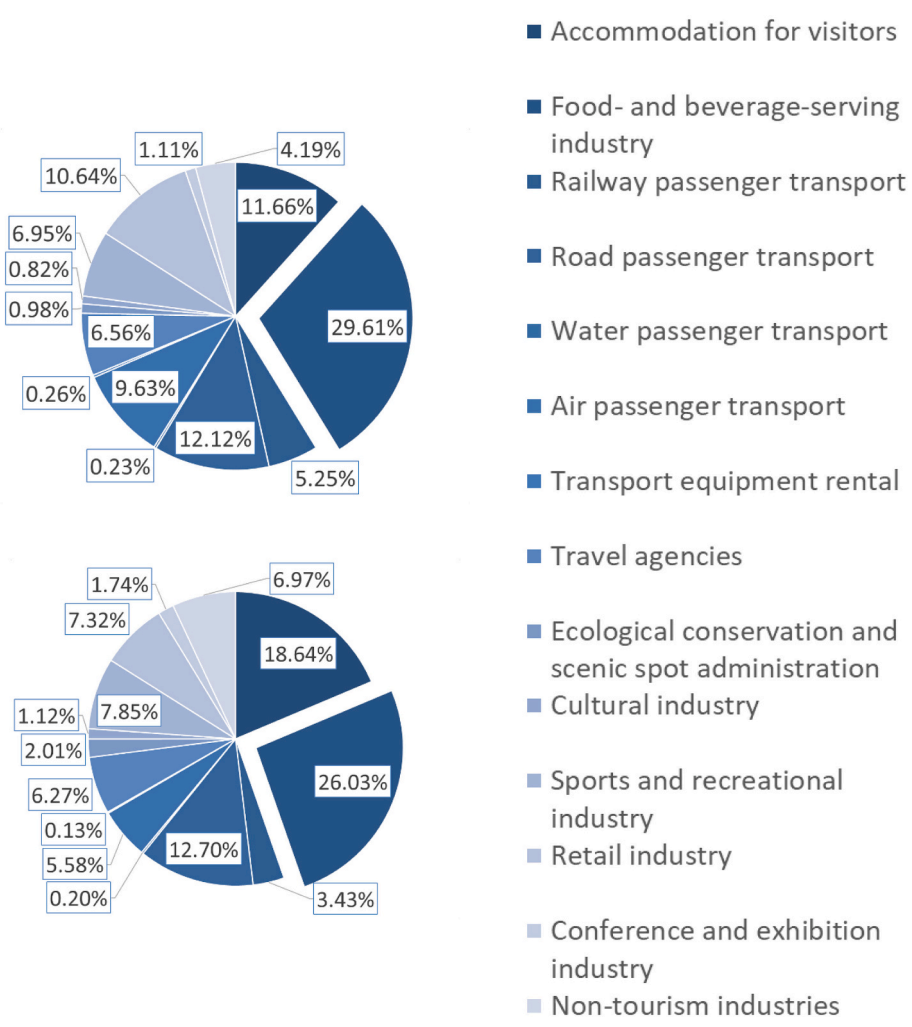

Fig. 9. Composition of tourism direct value added by industry in 2019 (upper) and 2020.

the worst by COVID-19 (Munawar, Khan, Ullah, Kouzani, & Mahmud, 2021; Nicola et al., 2020). The evaluation of tourism direct value added in terms of employee compensation, net taxes on production, depreciation of fixed assets, and operating surplus is nearly identical across the two years. However, some proportions of industrial contributions to tourism direct value added have changed: the contributions from accommodation, non-tourism industries, and ecological conservation and scenic spot administration have increased by 6.98%, 2.78%, and 1.02%, respectively. Contributions of air passenger transport, food and beverage services, the retail industry, and railway passenger transport respectively have decreased by 4.05%, 3.58%, 3.31%, and 1.82%. These changes in proportions point to a structural shift in the tourism sector amid the pandemic. In particular, the proportion of value added by ecological conservation and the scenic spot administration industry has doubled. This distinction echoes previous studies showing that tourists tend to favor ecological tourism (Li, Ding, Zheng, & Sui, 2021) or natural areas (Donaire et al., 2021) and are apt to avoid urban destinations and crowded spaces. Hall et al. (2020) also pointed out visitors' preferences for less congested destinations.

As the present study demonstrates, perceived risk is a major travel impediment (Dryhurst et al., 2020). Safety and health represent key concerns when tourists plan trips (Donaire et al., 2021; Higgins-Desbiolles, 2020; Li et al., 2021). These considerations carry valuable implications for destination marketing organizations (DMOs) and tourism enterprises. For instance, destinations should be motivated to strengthen hygiene measures (Li et al., 2021) and enhance pandemic-related informational transparency. Businesses such as hotels have been forced to implement stricter hygiene management (Hao, Xiao, & Chon, 2020) and to adopt mechanical and digital service systems to reduce human interaction (Bae & Chang, 2021). Proximity to home is another factor influencing visitors' travel behavior (Donaire et al., 2021). The marketing efforts of DMOs and tourism enterprises should therefore concentrate on source markets proximal to the focal destination or domestic market. At the same time, a decline in tourism activities helps to alleviate the negative environmental and social effects of tourism (Bratic et al., 2021). Juvan and Dolnicar (2016) noted the persistence of non-sustainable tourism behavior before the pandemic. The outbreak has afforded DMOs and enterprises an opportunity to reshape visitors' behavior.

The contributions of this study are threefold. First, to the best of our knowledge, this research represents a pioneering attempt to apply the TSA framework to investigate how the COVID-19 pandemic has affected tourism. Our established TSAs offer a detailed view of domestic tourism in Guangdong Province, including its scale, structure, and pandemic-induced changes. Second, with a focus on a regional domestic tourism market, this analysis is theoretically meaningful for regions and countries seeking to restore their tourism industries. Third, our work builds a foundation for subsequent studies of tourism's economic impact during the pandemic. For example, researchers could calculate direct and induced contributions throughout this period in history.

This study, as with any other, has limitations. First, the Input–Output Table and Economic Census Yearbook are updated on a five-year basis.

No considerable structural change has occurred in the economy; as such, we acquire proportions for the outputs of various goods and services across industries using the data at hand. Tourism data availability is a common problem when compiling TSAs (Bryan et al., 2006; Jones et al., 2003; Jones & Munday, 2010), and plausible proportions are often used (Munjal, 2013). Further verification based on more recent data will be required. Second, TSAs do not measure indirect or induced effects of tourism activities; other methods should be employed to discern overall impacts. Third, this study creates a regional TSA for Guangdong, China. TSAs from other countries or regions under the pandemic remain necessary.

Funding source

This work was supported by Guangdong Basic and Applied Basic Research Foundation (2020B1515020031).

References

Ahlert, G. (2008). Estimating the economic impact of an increase in inbound tourism on the German economy using TSA results. *Journal of Travel Research, 47*(2), 225–234. https://doi.org/10.1177/0047287508321197

Bae, S. Y., & Chang, P.-J. (2021). The effect of coronavirus disease-19 (COVID-19) risk perception on behavioural intention towards 'untact' tourism in South Korea during the first wave of the pandemic (March 2020). *Current Issues in Tourism, 24*(7), 1017–1035. https://doi.org/10.1080/13683500.2020.1798895

Beynon, M., Jones, C., & Munday, M. (2009). The embeddedness of tourism-related activity: A regional analysis of sectoral linkages. *Urban Studies, 46*(10), 2123–2141. https://doi.org/10.1177/0042098009339428

Beynon, M. J., Jones, C., Munday, M., & Roche, N. (2018). Investigating value added from heritage assets: An analysis of landmark historical sites in Wales. *International Journal of Tourism Research, 20*(6), 756–767. https://doi.org/10.1002/jtr.2228

Bratic, M., Radivojevic, A., Stojiljkovic, N., Simovic, O., Juvan, E., Lesjak, M., & Podovsovnik, E. (2021). Should I stay or should I go? Tourists' COVID-19 risk perception and vacation behavior shift. *Sustainability, 13*(6). https://doi.org/10.3390/su13063573. Article 3573.

Bryan, J., Jones, C., & Munday, M. (2006). The contribution of tourism to the UK economy: Satellite account perspectives. *Service Industries Journal, 26*(5), 493–511. https://doi.org/10.1080/02642060600722809

Cardenete, M. A., Delgado, M., & Villegas, P. (2021). Impact assessment of Covid-19 on the tourism sector in Andalusia: An economic approach. *Current Issues in Tourism, 1-7*. https://doi.org/10.1080/13683500.2021.1937073

Collins, A., Jones, C., & Munday, M. (2009). Assessing the environmental impacts of mega sporting events: Two options? *Tourism Management, 30*(6), 828–837. https://doi.org/10.1016/j.tourman.2008.12.006

DCTGD. (2021). A summary of culture and tourism development in Guangdong Province. http://whly.gd.gov.cn/open_newgdswhhlygk/content/post_2721139.html.

Diakomihalis, M. N. (2008). Estimation of the economic impacts of yachting in Greece via the tourism satellite account. *Tourism Economics, 14*(4), 871–887. https://doi.org/10.5367/000000008786440139

Diakomihalis, M. N., & Lagos, D. G. (2011). An empirical approach to coastal leisure shipping in Greece and an assessment of its economic contribution. *Tourism Economics, 17*(2), 437–456. https://doi.org/10.5367/te.2011.0038

Donaire, J. A., Gali, N., & Camprubi, R. (2021). Empty summer: international tourist behavior in Spain during COVID-19. *Sustainability, 13*(8). https://doi.org/10.3390/su13084356. Article 4356.

Dryhurst, S., Schneider, C. R., Kerr, J., Freeman, A. L. J., Recchia, G., van der Bles, A. M., … van der Linden, S. (2020). Risk perceptions of COVID-19 around the world. *Journal of Risk Research, 23*(7–8), 994–1006. https://doi.org/10.1080/13669877.2020.1758193

Dwyer, L., Forsyth, P., Spurr, R., & Hoque, S. (2010). Estimating the carbon footprint of Australian tourism. *Journal of Sustainable Tourism, 18*(3), 355–376. Article Pii 919028692 https://doi.org/10.1080/09669580903513061.

Figini, P., & Patuelli, R. (2021). Estimating the economic impact of tourism in the European Union: Review and computation. *Journal of Travel Research*. https://doi.org/10.1177/00472875211028322, 00472875211028322.

Frechtling, D. C. (2010). The tourism satellite account: A primer. *Annals of Tourism Research, 37*(1), 136–153. https://doi.org/10.1016/j.annals.2009.08.003

Frent, C. (2018). Informing tourism policy with statistical data: The case of the Icelandic tourism satellite account. *Current Issues in Tourism, 21*(9), 1033–1051. https://doi.org/10.1080/13683500.2015.1126237

Ghosh, S. (2021). Modelling inbound international tourism demand in Australia: Lessons from the pandemics. *International Journal of Tourism Research*. https://doi.org/10.1002/jtr.2483

Gossling, S., Scott, D., & Hall, C. M. (2021). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism, 29*(1), 1–20. https://doi.org/10.1080/09669582.2020.1758708

Gul, H., & Cagatay, S. (2015). Impact analysis of demand-driven shocks in Turkey's tourism industry within the framework of the social accounting matrix. *Tourism Economics, 21*(1), 33–48. https://doi.org/10.5367/te.2014.0435

Hadjikakou, M., Chenoweth, J., Miller, G., Druckman, A., & Li, G. (2014). Rethinking the economic contribution of tourism: Case study from a Mediterranean island. *Journal of Travel Research, 53*(5), 610–624. https://doi.org/10.1177/0047287513513166

Hall, C. M., Scott, D., & Gössling, S. (2020). Pandemics, transformations and tourism: Be careful what you wish for. *Tourism Geographies, 22*(3), 577–598. https://doi.org/10.1080/14616688.2020.1759131

Hao, F., Xiao, Q., & Chon, K. (2020). COVID-19 and China's hotel industry: Impacts, a disaster management framework, and post-pandemic agenda. *International Journal of Hospitality Management, 90*, Article 102636. https://doi.org/10.1016/j.ijhm.2020.102636

Higgins-Desbiolles, F. (2020). Socialising tourism for social and ecological justice after COVID-19. *Tourism Geographies, 22*(3), 610–623. https://doi.org/10.1080/14616688.2020.1757748

Jones, C. (2013). Scenarios for greenhouse gas emissions reduction from tourism: An extended tourism satellite account approach in a regional setting. *Journal of Sustainable Tourism, 21*(3), 458–472. https://doi.org/10.1080/09669582.2012.708039

Jones, C., & Li, S. N. (2015). The economic importance of meetings and conferences: A satellite account approach. *Annals of Tourism Research, 52*, 117–133. https://doi.org/10.1016/j.annals.2015.03.004

Jones, C., & Munday, M. (2010). Tourism satellite accounts for regions? A review of development issues and an alternative. *Economic Systems Research, 22*(4), 341–358. Article Pii 930674718 https://doi.org/10.1080/09535314.2010.526594.

Jones, C., Munday, M., & Roberts, A. (2003). Regional tourism satellite accounts: A useful policy tool? *Urban Studies, 40*(13), 2777–2794. https://doi.org/10.1080/0042098032000146894

Jones, C., Munday, M., & Roberts, A. (2009). Top down or bottom up? Issues in the development of sub-national tourism satellite accounts. *Current Issues in Tourism, 12*(4), 301–313. https://doi.org/10.1080/13683500802346177

Juvan, E., & Dolnicar, S. (2016). Measuring environmentally sustainable tourist behaviour. *Annals of Tourism Research, 59*, 30–44. https://doi.org/10.1016/j.annals.2016.03.006

Kenneally, M., & Jakee, K. (2012). Satellite accounts for the tourism industry: Structure, representation and estimates for Ireland. *Tourism Economics, 18*(5), 971–997. https://doi.org/10.5367/te.2012.0156

Kitamura, Y., Karkour, S., Ichisugi, Y., & Itsubo, N. (2020). Evaluation of the economic, environmental, and social impacts of the COVID-19 pandemic on the Japanese tourism industry. *Sustainability, 12*(24). https://doi.org/10.3390/su122410302. Article 10302.

Kozak, M., Crotts, J. C., & Law, R. (2007). The impact of the perception of risk on international travellers [doi:10.1002/jtr.607]. *International Journal of Tourism Research, 9*(4), 233–242. https://doi.org/10.1002/jtr.607

Li, L., Li, J. J., Tang, L., & Wang, S. Y. (2019). Balancing tourism's economic benefit and CO2 emissions: An insight from input-output and tourism satellite account analysis. *Sustainability, 11*(4). https://doi.org/10.3390/su11041052. Article 1052.

Li, S. J., Ding, J. Q., Zheng, X., & Sui, Y. Z. (2021). Beach tourists behavior and beach management strategy under the ongoing prevention and control of the COVID-19 pandemic: A case study of Qingdao, China. *Ocean and Coastal Management, 215*. https://doi.org/10.1016/j.ocecoaman.2021.105974. Article 105974.

Li, Z., Zhang, S., Liu, X., Kozak, M., & Wen, J. (2020). Seeing the invisible hand: Underlying effects of COVID-19 on tourists' behavioral patterns. *Journal of Destination Marketing & Management, 18*, Article 100502. https://doi.org/10.1016/j.jdmm.2020.100502

Lim, W. M., & To, W.-M. (2021). The economic impact of a global pandemic on the tourism economy: The case of COVID-19 and Macao's destination- and gambling-dependent economy. *Current Issues in Tourism*, 1–12. https://doi.org/10.1080/13683500.2021.1910218

Mariolis, T., Rodousakis, N., & Soklis, G. (2021). The COVID-19 multiplier effects of tourism on the Greek economy. *Tourism Economics, 27*(8), 1848–1855. Article 1354816620946547 https://doi.org/10.1177/1354816620946547.

McArthur, D. B. (2015). The tourism satellite account: Possibilities and potential benefits for the eastern Caribbean islands tourism development. *Almatourism-Journal of Tourism Culture and Territorial Development, 6*(12), 101–119. https://doi.org/10.6092/issn.2036-5195/5379

Meng, W. Q., Xu, L. Y., Hu, B. B., Zhou, J., & Wang, Z. L. (2017). Quantifying direct and indirect carbon dioxide emissions of the Chinese tourism industry (reprinted from journal of cleaner production, vol 126, pg 586-594, 2016). *Journal of Cleaner Production, 163*, S401–S409. https://doi.org/10.1016/j.jclepro.2016.03.177

Moya Calderón, M., Chavarría Esquivel, K., Arrieta García, M. M., & Lozano, C. B. (2021). Tourist behaviour and dynamics of domestic tourism in times of COVID-19. *Current Issues in Tourism, 1-5*. https://doi.org/10.1080/13683500.2021.1947993

Munawar, H. S., Khan, S. I., Ullah, F., Kouzani, A. Z., & Mahmud, M. A. P. (2021). Effects of COVID-19 on the Australian economy: Insights into the mobility and unemployment rates in education and tourism sectors. *Sustainability, 13*(20). https://doi.org/10.3390/su132011300. Article 11300.

Munday, M., Turner, K., & Jones, C. (2013). Accounting for the carbon associated with regional tourism consumption. *Tourism Management, 36*, 35–44. https://doi.org/10.1016/j.tourman.2012.11.005

Munjal, P. (2013). Measuring the economic impact of the tourism industry in India using the tourism satellite account and input-output analysis. *Tourism Economics, 19*(6), 1345–1359. https://doi.org/10.5367/te.2013.0239

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., … Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery, 78*, 185–193. https://doi.org/10.1016/j.ijsu.2020.04.018

Odunga, P. O., Manyara, G., & Yobesia, M. (2020). Estimating the direct contribution of tourism to Rwanda's economy: Tourism satellite account methodology. *Tourism and Hospitality Research, 20*(3), 259–271. Article 1467358419857786 https://doi.org/10.1177/1467358419857786.

OECD, Union, E., Nations, U., & Organization, W. T. (2017). *Tourism Satellite Account: Recommended Methodological Framework 2008*. https://doi.org/10.1787/9789264274105-en

Perch-Nielsen, S., Sesartic, A., & Stucki, M. (2010). The greenhouse gas intensity of the tourism sector: The case of Switzerland. *Environmental Science & Policy, 13*(2), 131–140. https://doi.org/10.1016/j.envsci.2009.12.002

Pham, T. D., Dwyer, L., Su, J. J., & Ngo, T. (2021). COVID-19 impacts of inbound tourism on Australian economy. *Annals of Tourism Research, 88*. https://doi.org/10.1016/j.annals.2021.103179. Article 103179.

Pratt, S. (2015). The economic impact of tourism in SIDS. *Annals of Tourism Research, 52*, 148–160. https://doi.org/10.1016/j.annals.2015.03.005

Qiu, R. T. R., Park, J., Li, S., & Song, H. (2020). Social costs of tourism during the COVID-19 pandemic. *Annals of Tourism Research, 84*, Article 102994. https://doi.org/10.1016/j.annals.2020.102994

Ragab, A. M., & Meis, S. (2016). Developing environmental performance measures for tourism using a tourism satellite accounts approach: A pilot study of the accommodation industry in Egypt. *Journal of Sustainable Tourism, 24*(7), 1007–1023. https://doi.org/10.1080/09669582.2015.1107078

Renaud, L. (2020). Reconsidering global mobility – Distancing from mass cruise tourism in the aftermath of COVID-19. *Tourism Geographies, 22*(3), 679–689. https://doi.org/10.1080/14616688.2020.1762116

Sauer, M., & Repik, O. (2014). Economic impacts of wine tourism in the tourist area of Lednice-Valtice area. [17th international colloquium on regional sciences]. In *17th International Colloquium on Regional Sciences, Hustopece, Czech Republic*.

Senkova, A., Kosikova, M., Matusikova, D., Sambronska, K., Vozarova, I. K., & Kotulic, R. (2021). Time series modeling analysis of the development and impact of the COVID-19 pandemic on SPA tourism in Slovakia. *Sustainability, 13*(20). https://doi.org/10.3390/su132011476. Article 11476.

Sharma, A., & Olsen, M. D. (2005). Tourism satellite accounts - implementation in Tanzania. *Annals of Tourism Research, 32*(2), 367–385. https://doi.org/10.1016/j.annals.2004.08.002

Sigala, M. (2020). Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research. *Journal of Business Research, 117*, 312–321. https://doi.org/10.1016/j.jbusres.2020.06.015

Smeral, E. (2015). Measuring the economic impact of tourism: The case of Lower and Upper Austria. *Tourism Review, 70*(4), 289–297. https://doi.org/10.1108/tr-01-2015-0002

Steenge, A. E., & Van De Steeg, A. M. (2010). Tourism multipliers for a small Caribbean island state: The case of Aruba. *Economic Systems Research, 22*(4), 359–384. Article Pii 930702905 https://doi.org/10.1080/09535314.2010.526926.

Sun, Y. Y. (2014). A framework to account for the tourism carbon footprint at island destinations. *Tourism Management, 45*, 16–27. https://doi.org/10.1016/j.tourman.2014.03.015

UNDESA. (2008). *International Recommendations for Tourism Statistics 2008. United Nations*. https://doi.org/10.18356/791169b3-en

Unluonen, K., Kiliclar, A., & Yueksel, S. (2011). The calculation approach for leakages of international tourism receipts: The Turkish case. *Tourism Economics, 17*(4), 785–802. https://doi.org/10.5367/te.2011.0071

UNWTO. (2021). 2020: A year in review. https://www.unwto.org/covid-19-and-tourism-2020.

Volgger, M., Taplin, R., & Aebli, A. (2021). Recovery of domestic tourism during the COVID-19 pandemic: An experimental comparison of interventions. *Journal of Hospitality and Tourism Management, 48*, 428–440. https://doi.org/10.1016/j.jhtm.2021.07.015

Williams, A. M., Chen, J. L., Li, G., & Baláž, V. (2022). Risk, uncertainty and ambiguity amid Covid-19: A multi-national analysis of international travel intentions. *Annals of Tourism Research, 92*, Article 103346. https://doi.org/10.1016/j.annals.2021.103346

Williams, G. (2016). Economic impacts from development of the coastal town in Queensland on tourism and regional economy. *Resources-Basel, 5*(4). https://doi.org/10.3390/resources5040048. Article 48.

Wu, D. C. G., Liu, J. Y., Song, H. Y., Liu, A. Y., & Fu, H. (2019). Developing a web-based regional tourism satellite account (TSA) information system. *Tourism Economics, 25*(1), 67–84. https://doi.org/10.1177/1354816618792446

Xu, C., Jones, C., & Munday, M. (2020). Tourism inward investment and regional economic development effects: Perspectives from tourism satellite accounts. *Regional Studies, 54*(9), 1226–1237. https://doi.org/10.1080/00343404.2019.1696954

Yang, Y., Zhang, H. R., & Chen, X. (2020). Coronavirus pandemic and tourism: Dynamic stochastic general equilibrium modeling of infectious disease outbreak. *Annals of Tourism Research, 83*. https://doi.org/10.1016/j.annals.2020.102913. Article 102913.

Zhang, J. (2014). Assessing the economic importance of meetings activities in Denmark. *Scandinavian Journal of Hospitality and Tourism, 14*(3), 192–210. https://doi.org/10.1080/15022250.2014.946225

Doris Chenguang Wu, Professor, School of Business, Sun Yat-sen University. Research interests: tourism big data analytics and forecasting.

Chenyu Cao, PhD candidate, School of Business, Sun Yat-sen University. Research interests: tourism big data analytics.

Wei Liu, Lecturer, Essex Business School, University of Essex. Research interests: operations management in tourism, hospitality and events.

Jason Li Chen, Senior Lecturer, School of Hospitality and Tourism Management, University of Surrey. Research interests: tourism economics and tourist behavior.