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RESEARCH ARTICLE

Social costs of tourism during the COVID-19 pandemic

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ABSTRACT

The severe acute respiratory syndrome coronavirus 2 is currently spreading across the world at an alarming rate, resulting in the coronavirus disease 2019 pandemic. Amidst this crisis, tourism scholars are directing their attention to communities at tourist destinations, looking at their safety and well-being and the costs that they will bear due to the cessation of tourism activity. This article describes residents' perceptions of the risks posed by tourism activity, and estimates their willingness to pay to reduce public health risks based on hypothetical scenarios, using the triple-bounded dichotomous choice contingent valuation method. The social costs in three urban destinations are assessed and compared. Based on the findings, suggestions are made for appropriate post-pandemic recovery actions by local authorities and tourism organizations.

Introduction

Close attention has been paid in tourism studies to the actual and perceived socio-economic contributions of tourism to destination communities (Lindberg & Johnson, 1997). Inbound tourism has a profound impact on a society, and alongside its positive effects, it can interfere with the social and economic well-being of residents in tourist destinations (Jordan, Moran, & Godwyll, 2019). The negative impacts of inbound tourism may be exacerbated in times of crisis and disaster.

Currently, the world is facing such a crisis in the form of the novel coronavirus disease 2019 (COVID-19) pandemic, which has spread to 206 countries or territories (WHO, April 3, 2020). As COVID-19 swept across the world, travel restrictions and border shutdowns were introduced in many countries and regions to curb its spread (Al Jazeera, 2020). Richter (2003) suggested that the emergence or re-emergence of infectious diseases is one of the corollaries of global tourism and mobility. Urbanization and globalization drive the rapid spread of the virus (Hilsenrath, 2020), but tourism clearly plays a role in exacerbating the resulting public health crises. It is thus critical to identify and quantify the perceived risks and social costs of tourism during the COVID-19 pandemic to minimize the negative effects of tourism on destination cities and regions.

While a number of studies have investigated the effects of crises (including natural disasters) on tourism (Aliperti et al., 2019; Cró & Martins, 2017; Kuo, Chen, Tseng, Ju, & Huang, 2008; Sio-Chong & So, 2020; Song, Livat, & Ye, 2019; Wang, 2009), less attention has been paid to how tourism can amplify crisis events and have negative effects on the public interest and well-being of residents and stakeholder groups at tourist destinations (Ritchie, 2008). As Scott and Laws (2006) indicated, the impact of a crisis should be viewed as occurring among the interconnected system of businesses and other stakeholders that make up a tourist destination. Furthermore, the key stakeholders in responding to a crisis in a tourist destination belong to both the public and private sectors (Ritchie, 2008).

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This network perspective is crucial, as a crisis may reshape the network at a destination site: in particular, new alliances may be forged between stakeholders seeking to minimize or avoid the negative effects of a crisis (Scott & Laws, 2006).

Some empirical studies have examined the social costs and benefits of tourism for destination communities (Lindberg, Andersson, & Dellaert, 2001; Torre & Scarborough, 2017), and it has been found that the costs and benefits may be heterogeneous across stakeholders (Mayer, 2014). However, few studies have quantified the social costs of tourism for destination residents during a crisis. With the concepts of risk perception and crisis management having mainly grown out of from consumer behavior studies, tourism researchers have tended to approach the research problem from the tourists' perspective. Accordingly, they have analyzed the effects of crises on tourism businesses or destinations, while largely ignoring the perspectives of the residents of destination communities (Sharifpour, Walters, & Ritchie, 2014; Song et al., 2019).

In the present study, the social costs borne by residents of tourist destinations amid the COVID-19 pandemic were estimated using the contingent valuation method (CVM). Specifically, local residents' willingness to pay (WTP) to mitigate the risk of COVID-19 was estimated, with a view to minimizing the negative effects or social costs of tourism during the pandemic. Given that inbound tourism increases the spread of COVID-19 and adds to the pressure on the local healthcare system, destination residents are the most affected. Therefore, the study was conducted based on residents' perceptions of risk. When a pandemic occurs, tourists tend to avoid traveling to affected destinations; meanwhile, destination residents try to minimize the risks associated with tourists who do choose to travel and thus potentially spread the virus. The latter scenario was examined in this study to determine how the residents of tourist destinations perceive the risk of tourism during a pandemic and measure how willing they are to sacrifice the economic benefits to avoid its social costs.

To achieve the above research objective, three Chinese urban destinations—Wuhan, Guangzhou, and Hong Kong—were selected to estimate the social costs of tourism during the COVID-19 pandemic. Wuhan (with 50,007 confirmed cases) was the city in which COVID-19 first emerged in China and was thus the most heavily affected. Guangzhou (451 confirmed cases) is the capital of Guangdong province (the second most affected province in China) and, like Wuhan, is a major transportation hub. Hong Kong (803 confirmed cases) shares a border with mainland China, which is the source for more than 80% of its inbound tourism; Hong Kong thus needed to adopt strong measures to mitigate huge public health risks from inbound tourists during the COVID-19 outbreak.

To assess the negative social impacts of tourism amidst a pandemic, three research questions were posed. First, how do residents perceive the negative impact of tourism during a pandemic? Second, are residents willing to pay for the reduction of risk of COVID-19 increased by tourism (and, if so, by how much), and does the WTP vary by city and demographics? Third, what are the social costs of tourism due to a pandemic in the three destinations under study?

The study makes the following theoretical and practical contributions. At the conceptual and methodological levels, the findings contribute to the increasing body of literature on crisis management and the social impacts of tourism. Specifically, the important yet under-researched topic of the social costs borne by residents of tourist destinations during a pandemic is highlighted. A triple-bounded dichotomous choice contingent valuation method (DCCVM) was used to model and quantify residents' WTP to reduce the risks associated with tourism. Importantly, this model can minimize potential biases associated with CVMs. To the best of our knowledge, this is one of the first studies to use a triple-bounded DCCVM-based model, as a double-bounded model has been the standard approach in the previous literature. The social costs of tourism during the COVID-19 pandemic were also quantified and compared between the three study destinations. At a practical level, the study's findings can be used by local authorities and tourism organizations to develop policy responses to crises and design appropriate recovery strategies. The findings could also underpin regulatory and intervention measures for local authorities in destination cities and regions to prevent losses of residents during or after a crisis.

The remained of this paper is organized as follows. The second and third sections identify the research questions via a literature review. The fourth section describes the research methods and the research design of the WTP survey with hypothetical scenarios. The potential determinants of WTP are also discussed. Descriptive statistics of the three cities are also presented in this section. The fifth section discusses the empirical results and the last section concludes the study.

The social cost of tourism

Tourism has direct, indirect and induced impacts on a destination economy and society (Khan, Seng, & Cheong, 1990), and the social and economic costs and benefits of these impacts vary between stakeholders (Mayer, 2014). However, most research effort has been focused on evaluating the economic costs and benefits of tourism (Lindberg & Johnson, 1997), with the societal costs and benefits having only been discussed at the conceptual level (Haralambopoulos & Pizam, 1996; Liu & Var, 1986). Recently, some research has begun into various social costs and benefits related to tourism, focusing on public services and traffic congestion related to public infrastructure (Garau-Vadell, Gutierrez-Taño, & Diaz-Armas, 2018). A growing body of literature is documenting the “touristification” and gentrification risks induced by Airbnb-style rentals, and the discontent and resistance of urban residents who are concerned with the socio-environmental costs of tourism (González-Pérez, 2020; Gurran, Zhang, & Shrestha, 2020; Smith, Sziva, & Olt, 2019). In addition, researchers exploring the economic impact of tourism have recently begun to conduct analyses of the societal costs and benefits of tourism for destination communities (Torre & Scarborough, 2017) and environments (Bella, 2018).

It is possible to measure the societal impacts of tourism, such as the increasing costs of real estate, crime (Smith & Krannich, 1998), availability of housing and land, cultural and heritage representation, employment in the tourism and hospitality industry (Stephenson & Ali-Knight, 2010), overcrowding and social carrying capacity beyond economic and ecological assessments (Gonzalez, Coromina, & Galí, 2018), and harm to individual residents' well-being (Jordan et al., 2019). However, obtaining such measurements is often difficult, as societal impacts are usually indirect (Milman & Pizam, 1988) and chronic (Liu & Var, 1986), and perceptions of

these impacts vary depending on the values of a community (Fredline & Faulkner, 2001).

In line with previous studies on the impact of crises on tourism from the perspective of residents, this study suggests that a crisis event may serve as a point of reference from which to evaluate the social costs of the event. The inherent complexity involved in assessing the social costs and benefits of tourism at the time of crises has previously been demonstrated (Weaver & Lawton, 2013). A crisis may mitigate residents' negative perceptions of tourism. Garau-Vadell et al. (2018) found that an economic crisis increases residents' willingness to support tourism because it significantly decreases their perception of the costs of tourism. Residents become more tolerant of tourism and attach greater value to economic development during an economic crisis (Lindberg & Johnson, 1997). The balance of costs and benefits may differ between groups of residents, and residents' individual levels of engagement with the tourism and hospitality industry can be a determinant of their attitudes (Andereck, Valentine, Knopf, & Vogt, 2005). Conversely, the negative impact of tourism can be amplified by a crisis. In particular, an influx of infected persons to a tourist destination during a pandemic (Bajardi et al., 2011; Epstein et al., 2007) might have serious consequences for public safety.

More recently, Weaver and Lawton (2013) examined the variations in the cost-benefit assessments performed by residents in response to contentious events, and suggested that mass media could amplify residents' perceptions of the negative impact of tourism, while the social dimensions of residents, such as their social circles and ethnic backgrounds, may lead to more considered attitudes to the crisis. In addition, Rittichainuwat and Chakraborty (2009) indicated the importance of measuring the perceived negative impact of tourism in a time of crisis to minimize the damage wrought by negative perceptions.

Risk perception and tourism during a pandemic

Scholarly opinion on tourism and crises falls into two main contexts: risk perception at the individual level (on the demand side) and crisis management at the collective level (on the supply side). Research on the perceived risks associated with tourism has focused on tourists' perspectives rather than on the perspectives of destination communities, with the concept of perceived risk in tourism being associated primarily with studies of consumer behavior (Sharifpour et al., 2014). Risk and safety issues have been generally examined from the tourists' perspective, seeking to determine why tourists perceive risks differently and what factors influence these perceptions (e.g., Gössling, Scott, Hall, Ceron, & Dubois, 2012; Lepp & Gibson, 2003). Tourism-related risks may be those associated with terrorism, war, social instability (political or criminal), or health concerns. Perceived risks (or anxiety) may lead tourists to avoid a particular region, but this may be mitigated by tourists' past experiences, their levels of familiarity with similar events, their novelty-seeking behaviors (Sharifpour et al., 2014), or their cultural orientations compared with those of the destination (Reisinger & Mavondo, 2006).

From a supply-side viewpoint, the impact of crises on the destination or on the tourism industry as a whole has been a dominant theme in previous studies. Research has focused on the impact on tourism demand of various crises, such as the global financial crisis (2007–2008), the swine flu (H1N1) pandemic (2009) (Page, Song, & Wu, 2012), earthquakes, the September 11 attack on the U.S. (2001) and other terrorist activities (Seabra, Reis, & Abrantes, 2020), and the outbreak of severe acute respiratory syndrome (SARS) (2003) (Wang, 2009), and of tourist boycotts (Yu, McManus, Yen, & Li, 2020). Page, Yeoman, Munro, Connell, and Walker (2006) examined the effects of the swine flu pandemic on destination planning, in consideration of the risks presented to the public by the frenzied media coverage of this influenza outbreak. Nonetheless, in the recent review of Ritchie and Jiang (2019), covering 142 published studies on tourism crisis management, response and recovery strategies, and crisis prevention and planning practices, a lack of comprehensive theoretical and methodological assessments of the impacts of crises on the tourism industry was identified.

Some researchers have emphasized that tourism crisis management should consider the welfare of destination residents. The rapid growth of mass tourism, with the associated expansion of tourism infrastructure, has caused ecological crises in some destination regions (Lukashina, Amirkhanov, Anisimov, & Trunev, 1996). It has been shown that the local communities of tourist destinations are aware of both the economic contributions of tourism and also the associated socio-environmental risks affecting their livelihoods (Schmidt, Gomes, Guerreiro, & O'Riordan, 2014). Antunes, March, and Connolly (2020) found that the perceptions and responses to in situ risks, such as tourism-related gentrification, differ among different groups of destination residents. Easterling (2005) paid particular attention to the interests of residents and their representatives in managing a tourist destination, including crisis management. Eitzinger and Wiedemann (2007) stressed the importance of studying the risk perceptions of residents, because their views are shaped by their specific experiences, which differ from those of tourists.

The SARS epidemic of 2003 prompted many researchers to study the impacts of and responses to infectious respiratory diseases (Page et al., 2006). The spread of infectious diseases, such as SARS, swine flu, and viral hemorrhagic fevers (such as that caused by the Ebola virus), via human travel has emerged as the main risk to tourism, as it leads to prohibitions on the international movement of people (Ala'a & Albattat, 2019). For instance, a high risk of influenza infection has been identified among people on cruises, on airplanes, or in tour groups (Freedman & Leder, 2005). This was confirmed by the recent COVID-19 infections on cruise ships in Japan, the U.S., Australia, and France, which resulted in many countries banning cruise ships from docking in their ports (Al Jazeera, 2020). As COVID-19 has now spread to more than 200 countries or territories (WTO, 2020), many countries' governments have imposed unprecedented restrictions on the movements and behavior of their populations, and worldwide economic activity has decreased enormously. In addition to the health risks to tourists, there are obvious concerns that infected tourists may spread the disease to local residents (Gautret, Botelho-Nevers, Brouqui, & Parola, 2012). Richter (2003) highlighted that during a global pandemic, large-scale international travel can spread infectious diseases and bring health threats to crowded urban areas. Moreover, there is a high risk of community transmission of COVID-19 (MacIntyre, 2020) and other respiratory diseases, such as seasonal influenza, being spread by travel within communities.

A few studies have examined residents' WTP for the costs of tourism (Andersson & Lundberg, 2013; Lindberg et al., 2001) but to

the best of our knowledge no research has been conducted to quantify the social costs of pandemics, such as COVID-19, on tourist destinations. To bridge this gap, a triple-bounded DCCVM was used to identify and quantify residents' WTP to mitigate the risk of the pandemic and the social costs it brings to destinations.

Methodology

Description of case cities

The target populations for this study were the residents of Hong Kong, Guangzhou, and Wuhan. These three cities were selected to reflect homogeneity and heterogeneity in urban characteristics, tourism development and its negative impact, and visibly negative social and economic effects and consequences of the COVID-19 pandemic.

As Table 1 shows, Hong Kong has an extremely high population density. This is the case because country parks and special areas cover 44,312 ha, accounting for 40.9% of Hong Kong's total land area. Given that a relatively low population density is one of the indices of subjective well-being for urban residents (Cramer, Torgersen, & Kringlen, 2004), the lower population densities of Guangzhou and Wuhan benefit these cities' residents. However, Hong Kong benefits economically from the enormous revenue generated by the tourism and hospitality industry, especially by visitors from mainland China, who account almost 80% of total arrivals. Stringent administrative measures and personal hygiene requirements have been instigated in Hong Kong in response to the COVID-19 crisis, but there is also the possibility of a "second wave" of infections due to incoming travelers, including people returning home from the U.S. and Europe. Hong Kong's painful experience of the outbreak of SARS in 2003, and its subsequent recovery (Hung, 2003), served as a profound lesson for the Hong Kong government (Lee, 2009; Wan, 2013) and its people on how to respond to a health crisis (Lau, Yang, Tsui, & Kim, 2003). Analogous to the economic effects of the SARS outbreak, the COVID-19 pandemic has already caused a year-on-year 96.4% decline in Hong Kong tourism, equating to a loss of HK$24.437 billion (US$3.15 billion) (see Table 1). Given the multiplier impact of tourism, the overall losses due to the COVID-19 crisis are likely to be even greater.

Hubei and Guangdong are the Chinese provinces hardest hit by the pandemic, with 67,802[1] and 1514[2] confirmed cases of COVID-19, respectively, as of April 3, 2020. The capital cities of these two provinces, Wuhan and Guangzhou, accounted for 50,007 and 451 of these cases, respectively. Importantly, Wuhan was the city in which the first cases of COVID-19 were identified in December 2019. The authorities responded by placing the entire city of approximately 11 million people into lockdown for 76 days. Wuhan and Guangzhou differ from Hong Kong in having larger populations and labor forces, and lower average wages. Similar to Hong Kong, however, Wuhan and Guangzhou are megacities and popular tourist destinations, and the tourism industry is a strategic economic pillar (Wong, 2019), providing annual revenues of US$57 billion and US$40 billion, respectively.

WTP and contingent valuation

A triple-bounded DCCVM was used in this study to ascertain how much residents would be willing to pay to reduce the risk of COVID-19 being amplified by tourism under a hypothetical scenario, and what drives their WTP. Unlike an open-ended CVM, in which respondents are asked to reveal their WTP directly, DCCVM allows the respondents to answer a set of dichotomous choice questions. From a cognitive perspective, binary choices are easier to answer and produce less biased responses (Aizaki, Nakatani, & Sato, 2014, p. 21). The triple-bounded DCCVM extends the double-bounded DCCVM by offering respondents one additional set of choices, which results in more specific range of WTP that provides greater certainty. With an appropriate sampling design, a triple-bounded DCCVM can generate results that are statistically superior to those generated by other DCCVMs (Langford, Bateman, & Langford, 1996). Demand curves and social costs were generated at the city level by aggregating the elicited WTP values.

Analyzing the responses to WTP questions in a contingent valuation survey constitutes an empirical approach to measuring economic concepts by quantifying the value that individuals place on the investigated attribute/activity (Hanemann, 1999). A CVM based on individuals' WTP for public goods (resources or activities) evaluates the benefit (or cost) contingent on hypothetical changes (Lee & Han, 2002). CVMs have been used to ascertain monetary measures of welfare changes, where these result from changes in the availability of public goods or amenities rather than from price changes (Hanemann, 1991). WTP has been widely applied in consumer behavior studies, as it is a robust gauge of people's values or concerns, and can be regarded as a direct antecedent of consumers' purchasing intentions and behaviors (Ayadi & Lapeyre, 2016; Li, Li, & Kambele, 2012). In tourism and hospitality studies, WTP is used to qualify and quantify the concept of "value" in a non-market product or service, including attractions in the natural environment and outdoor recreation (Asafu-Adjaye & Tapsuwan, 2008; Reynisdottir, Song, & Agrusa, 2008), cultural festivals (Herrero, Sanz, & Devesa, 2011), sustainability in luxury hotel brands (Kim, Barber, & Kim, 2019), carbon emission reduction (Seetaram, Song, Ye, & Page, 2018), and green events (Saayman, Krugell, & Saayman, 2016).

In terms of the determinants of WTP, income is widely acknowledged as a positive influence (Broberg, 2010; Hanemann, 1991; Pollicino & Maddison, 2001; Reynisdottir et al., 2008), although the effect remains controversial (Lee & Han, 2002; Seetaram et al., 2018). Other demographic features, such as sex, age, and education level, may also affect an individual's WTP (Kim, Wong, & Cho, 2007; Seetaram et al., 2018). The dependence on tourism of the household income of a tourist destination's residents affects their

[1] Health Commission of Hubei Province, http://wjw.hubei.gov.cn/fbjd/dtyw/202004/t20200403_2204743.shtml.
[2] Health Commission of Guangdong Province, http://wsjkw.gd.gov.cn/zwyw_yqxx/content/post_2964665.html.

Table 1
Description of three case cities.

	Hong Kong[a]	Guangzhou[b]	Wuhan[c]
Population	7.50 million	14.49 million	10.89 million
Labor force	3,925,500	5,729,948	5,425,031
Population density (people per square kilometer)	6940	2005	1271
Urbanization rate	100%	86.14%	80.29%
GDP per capita (2018)	US$ 47,334	US$ 22,086	US$ 19,047
Annual wage (2018)	US$ 28,108	US$ 15,386	US$ 10,834
No. of confirmed cases of COVID-19 infection (April 3, 2020)	803[d] (incl. 1 probable case)	451[e]	50,007[f]
Tourism revenue	US$ 41.92 billion (2018)	US$ 56.13 billion (2018)	US$ 39.38 billion (2017)
International visitor arrivals	5,589,628 (monthly arrivals in Feb. 2019) 199,123[g] (monthly arrivals in Feb. 2020)	9,004,800 (annual arrivals in 2018)	2,570,000 (annual arrivals in 2017)
Average expenditure per tourist (Jan.–Jun. 2019)	US$ 584.48		
Tourism revenue decline	−96.4% in arrivals (−5,390,505 visitor arrivals) Loss of US$ 3.15 billion		

[a] Census and Statistics Department of the Government of the Hong Kong Special Administrative Region (2019). https://www.censtatd.gov.hk/hkstat/sub/sp210.jsp?productCode=B1050009.
[b] Guangzhou Statistics Bureau and Guangzhou Statistical Yearbook (2019), http://tjj.gz.gov.cn/tjgb/qtgb/content/post_2788686.html and http://data.cnki.net/area/yearbook/Single/N2019120168?z=D19.
[c] Wuhan Statistical Yearbook (2018), http://data.cnki.net/area/Yearbook/Single/N2019010181?z=D17.
[d] COVID-19 Thematic Website, Government of the Hong Kong Special Administrative Region, https://www.coronavirus.gov.hk/eng/index.html.
[e] Guangzhou Municipal Health Commission, http://wjw.gz.gov.cn/ztzl/xxfyyqfk/yqtb/content/post_5755681.html.
[f] Wuhan Municipal Health Commission, http://wjw.wuhan.gov.cn/front/web/showDetail/2020040310379.
[g] Hong Kong Tourism Board, Research & Statistics, https://partnernet.hktb.com/en/research_statistics/index.html.

WTP, although the magnitude of this effect is also debated (Lindberg et al., 2001; Liu & Var, 1986).

The triple-bounded DCCVM estimation of WTP in this study extended the double-bounded dichotomous choice (DBDC) model used by Aizaki et al. (2014). Thus, a monetary value (y^*) was associated with the acceptance of a given option, such that the utility of realizing the option and paying y^* was equivalent to the utility of not realizing the option but retaining y^*. In addition, y^* was assumed to be individually specific and associated with a linear combination of individual characteristics and the presented bid:

$$y_i^* = \alpha + \boldsymbol{\beta X}_n + \gamma \ln bid_n + \varepsilon,$$

where $\boldsymbol{X}_n$ represents a matrix of the characteristics of individual n; bid_n is the presented bid; ε is the error term; and α, $\boldsymbol{\beta}$, γ are model parameters. Natural logarithm is employed on the variable bid_n so that the coefficients can be directly referenced as elasticities.

Each respondent was presented with at most three dichotomous choices at sequential bid levels. It was assumed that a respondent would answer "yes" if and only if the presented bid was lower than y^*. Hence, there exist six possibilities, as illustrated by the decision tree in Fig. 1, where bid_0 is the initial bid level in the first choice, whereas bid_{H1} and bid_{H2} (bid_{L1} and bid_{L2}) are the subsequent bid levels in the following choices if the respondent answers "yes" ("no"). The axes show the ascending or descending direction of the bid level, and the labels on the right describe a respondent's answer to each choice (for example, NNY means answering "no" to the first two choices but "yes" to the third choice). It should be noted that in the cases of YN ("yes" to the first choice but "no" to the second choice) and NY ("no" to the first choice but "yes" to the second choice), only two choices are presented.

The probabilities of the six events are given by

$$P^{NNN} = F(bid_{L2});$$

$$P^{NNY} = F(bid_{L1}) - F(bid_{L2});$$

$$P^{NY} = F(bid_0) - F(bid_{L1});$$

$$P^{YN} = F(bid_{H1}) - F(bid_0);$$

$$P^{YYN} = F(bid_{H2}) - F(bid_{H1});$$

$$P^{YYY} = 1 - F(bid_{H2}),$$

with $F()$ being the cumulative density function of error term ε.

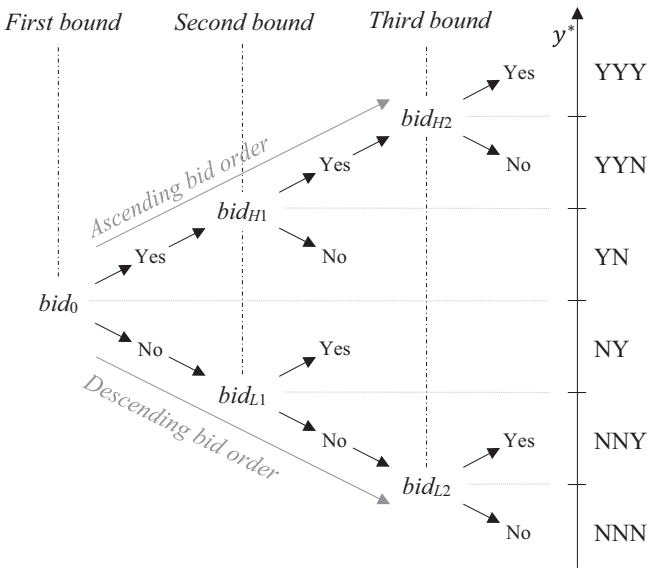

Fig. 1. Possible choices of triple-bounded dichotomous choice contingent valuation method (DCCVM).

The log-likelihood function can be formulated as

$$\ln L = \sum_{n=1}^{N} \left[d_n^{NNN} \ln P^{NNN} + d_n^{NNY} \ln P^{NNY} + d_n^{NY} \ln P^{NY} + d_n^{YN} \ln P^{YN} + d_n^{YYN} \ln P^{YYN} + d_n^{YYY} \ln P^{YYY} \right],$$

where d_n^* are binary-valued indicators of the associated event ($d_n^* = 1$ if the event occurs). In this study, ε was assumed to follow a logistic distribution and the model estimation was performed in R using author-generated code based on the package DCchoice (Nakatani, Aizaki, & Sato, 2020).

Survey design

The survey population comprised the residents of Hong Kong, Guangzhou, and Wuhan. Two professional data companies were appointed to administer the survey electronically to a random sample of this survey population. A pilot survey was first conducted with 305 respondents to test the validity of the questionnaire and initial data. Subsequently, the main survey was conducted during February and March 2020, with 1627 valid samples being collected for the main study, comprising $n = 520$ residents of Hong Kong, $n = 503$ of Guangzhou, and $n = 604$ of Wuhan. The respondents' demographic characteristics are shown in Table 3, and consistent scales were applied across the three cities for all variables except for annual income, which is substantially different between Hong Kong and the two cities in mainland China. Different income ranges were designed to reflect this disparity in annual wages (Table 1), and the data were later recoded into lower and higher groups, based on the average wage of each city (see Table 1), for further analysis.

The survey questionnaire comprised three parts. In the first part, questions covered the risk perceptions of residents toward the negative impact of tourism on their city amid the COVID-19 pandemic. Based on the pilot survey, nine items were selected, covering three elements of health risk (i.e., risk of cross-infection, shortage of medical supplies, the difficulty of prevention and patient tracing), three elements of the negative effects on social life (i.e., social panic and instability, commodity shortage, and environmental degradation), and three elements of the negative effects on tourism (i.e., reputational crisis in tourism, host–guest conflicts, and xenophobia). The results from this part of the survey measuring residents' perceived risks of tourism in the three cities—that is, the negative social impacts of the pandemic on these cities insofar as they are amplified by tourism—are presented in Fig. 2.

In the second part, the respondents' WTP was determined via their response to dichotomous choices, as described in the previous section. The monetary values presented in Table 2 were generated based on a pilot test and previous applications of CVM in the literature (e.g. Asafu-Adjaye & Tapsuwan, 2008; Bateman, Langford, Jones, & Kerr, 2001). Every respondent was randomly allocated to one of the three scenarios and answered at least two bids, and up to a maximum of three bids. This process enabled identification of the respondents' estimated WTP to reduce tourism's negative impact amid the pandemic crisis. To minimize biases in this CVM-based data collection, three scenarios with three biddings (either upper or lower) each were presented for acceptance or rejection by the respondents, as shown in Table 2.

The third part of the survey comprised questions regarding the demographic characteristics of the respondents (sex, age, and education level), as well as two questions on factors potentially influencing WTP, such as tourism employment and COVID-19 infection of the respondent or his/her acquaintances. We assumed that infected individuals and those who were acquainted with an infected person would generally have more proactive attitudes toward compensating for the damage of the pandemic, and would be

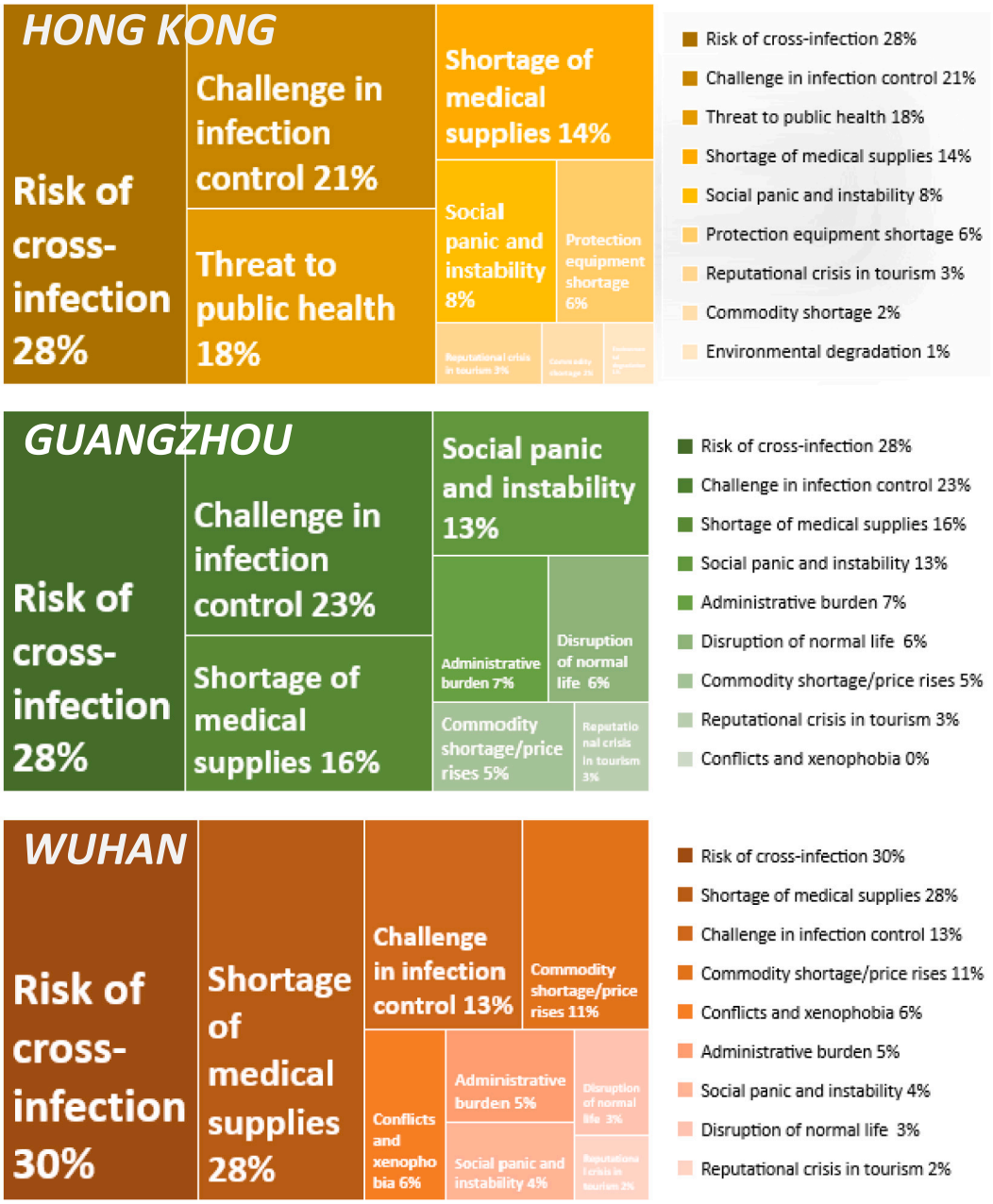

Fig. 2. Residents' perceived negative impact of tourism amid the COVID-19 pandemic crisis.

Table 2
Alternative bid levels for the triple-bounded dichotomous choice CVM survey (unit: RMB or HKD).

	First bid (bid_0)		bid_{H1}	bid_{H2}	bid_{L1}	bid_{L2}
Scenario 1	150	(If yes)	250	350		
		(If no)			75	25
Scenario 2	250	(If yes)	350	450		
		(If no)			150	75
Scenario 3	350	(If yes)	450	550		
		(If no)			250	150

Note: 1 Hong Kong dollar (HKD) = 0.90 Chinese Yuan (RMB).

Table 3
Respondents' sociodemographic characteristics (total sample size = 1627).

Characteristics		Hong Kong		Guangzhou		Wuhan	
Residential origins		***520***	***32.0%***	***503***	***30.9%***	***604***	***37.1%***
Sex	Male	243	46.7%	249	49.5%	292	48.3%
	Female	277	53.3%	254	50.5%	312	51.7%
Age	18–24	92	17.7%	142	28.2%	201	33.3%
	25–34	138	26.5%	256	50.9%	185	30.6%
	35–44	125	24.0%	86	17.1%	128	21.2%
	45–54	109	21.0%	18	3.6%	71	11.8%
	55–64	50	9.6%	1	0.2%	19	3.1%
	65 and above	6	1.2%	0	0%	0	0%
Education	Primary school or below	3	6.0%	11	2.2%	20	3.3%
	Secondary school	153	29.4%	34	6.8%	92	15.2%
	Post-secondary degree	309	59.4%	106	21.1%	139	23.0%
	Bachelor's degree			334	66.4%	304	50.3%
	Master's degree or higher	55	10.6%	18	3.6%	49	8.1%
Employed by tourism industry	Y	29	5.6%	102	20.3%	84	13.9%
	N	491	94.4%	401	79.7%	520	86.1%
Infection with COVID-19	Y	9	1.7%	19	3.8%	81	13.4%
(including family/friends)	N	511	98.3%	484	96.2%	523	86.6%
Income	HK$0	15	2.9%				
(Hong Kong, annual)	HK$1–149,999	105	20.2%				
	HK$150,000–259,999	119	22.9%				
	HK$260,000–349,999	95	18.3%				
	HK$350,000–499,999	96	18.5%				
	HK$500,000–699,999	52	10.0%				
	HK$700,000 and above	38	7.3%				
Income	RMB0			10	2.0%	72	11.9%
(Guangzhou/Wuhan, monthly)	RMB1–18,000			37	7.4%	47	7.8%
	RMB18,001–36,000			32	6.4%	69	11.4%
	RMB36,001–54,000			62	12.3%	113	18.7%
	RMB54,001–72,000			98	19.5%	95	15.7%
	RMB72,001–90,000			73	14.5%	52	8.6%
	RMB90,001–120,000			88	17.5%	85	14.1%
	RMB120,001–180,000			70	13.9%	37	6.1%
	RMB180,001–240,000			27	5.4%	23	3.8%
	RMB240,001 and above			6	1.2%	11	1.9%

Table 4
Estimated WTP and coefficients.

WTP	Model 1 Hong Kong		Model 2 Guangzhou		Model 3 Wuhan	
Mean	305.11		311.60		304.61	
	[276.26, 338.70]		[281.54, 350.62]		[276.28, 336.90]	
Median	207.12		226.15		202.72	
	[187.26, 227.82]		[206.75, 250.81]		[183.53, 222.53]	
Variables						
Middle aged group	−0.5249	**	0.0284		−0.3607	*
(25–54)	(0.2469)		(0.2019)		(0.1871)	
Senior group	−0.5982	*	−7.2769		−0.7114	
(55 or above)	(0.3442)		(23.212)		(0.4407)	
High income group	0.4786	**	0.3820	*	−0.0849	
(Above average)	(0.1906)		(0.2259)		(0.1899)	
Tourism employment	−0.7143	*	0.6504	***	0.4963	**
	(0.3893)		(0.2320)		(0.2295)	
ln(*bid*)	−1.6946	***	−2.0101	***	−1.6175	***
	(0.1005)		(0.1183)		(0.0911)	
Intercept	9.2589	***	10.6812	***	8.8039	***
	(0.5745)		(0.6502)		(0.5068)	
Number of obs.	520		503		604	
Log-likelihood	−582.40		−535.61		−692.98	
AIC	1176.80		1083.23		1397.96	

Notes: 95% confidence interval in brackets; standard error in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

thus willing to pay more to reduce the risks of tourism activity.

Findings

WTP and its determinants

Using the triple-bounded DCCVM, multiple models with different combinations of influencing factors were estimated and the best models were chosen according to the Akaike information criterion (AIC). The model selection process largely followed the general-to-specific procedure (Song, Witt, & Li, 2009, p. 46–69), in which the potential influencing factors (i.e. demographic variables and bids) were included in the initial model and the improvements of the model estimates were made based on AIC by recursively eliminating the insignificant and irrelevant factors from the model. In this process, various combinations of demographic groups were considered. For example, the 11 income groups (seven in the case of Hong Kong) were combined into a "high income" group and a "low income" group according to the average income of each city, and the six age groups were restructured into "young", "middle aged", and "senior" groups. To facilitate comparisons of the influential factors among the three cities under consideration, a factor (or group) was included in the model estimation for all three cities if it was found to be significant/relevant in one of the models. The estimation of WTP and the coefficients of its influencing factors in the chosen model are summarized in Table 4. The estimation of the mean of WTP followed the normalized truncation of WTP by Boyle, Welsh, and Bishop (1988), while the confidence intervals of the mean of WTP and the median of WTP were constructed using the method proposed by Krinsky and Robb (1990).

The mean and median of WTP in each of the three investigated cities were approximately 300 and 200, respectively, in the local currency, with Guangzhou's median slightly higher than those of the other two cities. This indicates that the residents of these three cities were willing to pay an average of 300 in local currency to reduce the risk of negative tourism-generated pandemic effects, and that half of the population were willing to pay at least 200 in local currency for such preventative measures. Although the intensity of the pandemic differed between the three cities, no significant difference was observed in the basic WTP of residents between cities. This can be attributed to the extensive media coverage of COVID-19, which meant that all residents were aware of the severity of the pandemic, even in a city with fewer confirmed cases.

Regarding influencing factors, the estimated coefficient associated with each factor describes the marginal change in the probability of the respondents' answering "yes" to the dichotomous choice. The probability of a respondent answering "yes" was defined by the ratio between the probability of a "yes" answer and the probability of a "no" answer. In the current context, the higher probability of a "yes" answer generally implied a higher WTP to reduce the risk generated by tourism activity. A typical law of demand applied in the WTP for risk reduction: the probability of residents from all three cities answering "yes" decreased when the presented bid increased. In particular, there was a larger coefficient in Guangzhou (-2.0101) than Hong Kong (-1.6946) or Wuhan (-1.6175), indicating a more elastic demand for risk reduction in Guangzhou. Given the extreme severity of the pandemic in Wuhan and the painful memory of SARS in Hong Kong, it is reasonable for the demands for risk reduction made by residents of these two cities to be much less elastic than that of residents of other cities.

There is an interesting relationship between age and WTP for risk reduction: younger residents were willing to pay more for risk reduction than were their parents and grandparents. Specifically, the estimated coefficients for middle-aged and senior respondents were either negative or insignificant, indicating that these groups had a lower WTP than the younger group. This observation is well supported by some anecdotal evidence during the COVID-19 outbreak of younger people needing to persuade their parents and grandparents to stay at home to minimize exposure to the virus. This phenomenon may be linked with the connectivity of the younger generation via the Internet and social media, which have provided extensive information on the pandemic. An alternative explanation of this research finding is that older people may be more philosophical and accepting about threats to their health, and thus prefer to take precautions while preserving their freedom in their daily lives.

The investigation of income groups points to the limits of the expected relationship between income and WTP amid the COVID-19 pandemic. In Hong Kong and Guangzhou, residents with higher incomes were willing to pay more to reduce the risks, but this was not the case in Wuhan. This could reflect the severity of the negative impact of COVID-19 in Wuhan overpowering the income effect.

Of the 1627 respondents from the three cities, 215 (13.2%) were employed in the tourism industry. Complexities in their WTP for risk reduction are to be expected: on the one hand, they should certainly be willing to pay to reduce the risk brought about by the COVID-19 pandemic; on the other hand, the realization of this risk reduction would entail reducing the tourism activities that provide their income. Nonetheless, in Guangzhou and Wuhan, tourism practitioners were found to be willing to pay more than other residents to reduce the risks generated by tourism activities, perhaps reflecting the superior social responsibility of tourism practitioners and their desire to convey a positive image of tourism to both local communities and the outside world. In contrast, Hong Kong tourism practitioners demonstrated a lower WTP than other residents. This observation may have been very specific to the situation in Hong Kong at the time of the survey, as the tourism sector had already experienced a long winter of poor business during the social unrest in the second half of 2019. After nine months of struggle, tourism practitioners in Hong Kong might have felt they were unable to afford further damage to the sector, even if it could improve the image of the tourism sector in the long run.

Demand curve and social cost

We approximated the demand curves from the WTP data to assess the costs of perceived risks due to tourism activities in the three cities. The demand curves were shaped by plotting the aggregate number of respondents who were willing to pay each assigned monetary amount (Seetaram et al., 2018). Random sampling allowed us to extrapolate WTP to the general population of the city. The

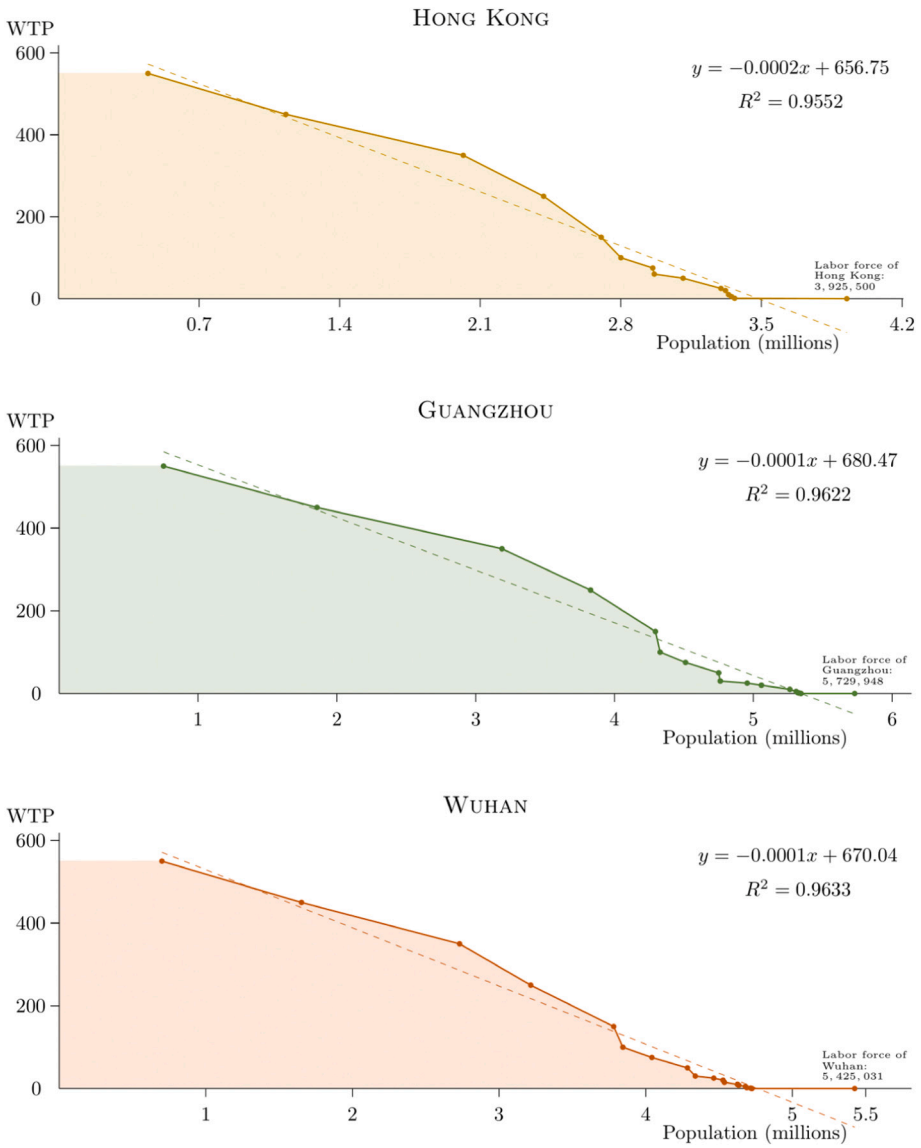

Fig. 3. Demand curves and regression lines for Hong Kong, Guangzhou, and Wuhan.

population for given levels was calculated from the respondents' aggregate number and was representative of the labor force, as the questionnaires were distributed to residents above 18 years of age. Based on the demand curve, we analyzed the social cost by aggregating the changes in individual welfare, which was approximated by the individual surplus from the WTP analysis. A numerical measure of social cost was generated by the integration of the areas of all trapezoids under the empirical demand curves (shaded areas in Fig. 3). It should be acknowledged that the demand curve was approximated by using the mean value of respondents' WTP, as the dichotomous choice approach obliged respondents to reply “yes” or “no” to certain fixed amounts.

Fig. 3 shows downward sloping demand curves for the three cities. The estimated social costs of pandemic risk resulting from tourism activity in the three cities ranged from 825 million RMB (Hong Kong) to 1417 million RMB (Guangzhou). The social cost for the sample in Wuhan amounts to 1215 million RMB when extrapolated to the local population. The extent of curvature is slightly larger for Hong Kong and Guangzhou than it is for Wuhan. The total social costs for Hong Kong, Guangzhou, and Wuhan show a similar tendency, not unlike that of the WTP. This implies that as the pandemic has spread worldwide the social cost to local populations has been generalized.

Conclusions and implications

This study estimated residents' WTP to reduce the risk associated with tourism activities in three Chinese cities amid a pandemic crisis. By applying the DCCVM approach and the elicited WTP values, the demand curves and social costs of tourism were compared

in the three cities. The findings of this study contribute to tourism research and have the following theoretical and practical implications.

First, the residents in the tourism destinations were assessed for their WTP to reduce the negative impact of tourism on their communities during the COVID-19 pandemic. This was a unique approach, as although the role of local residents has been acknowledged in tourism research and practice, their interests remain neglected. In addition, residents play an important role in flattening the curve of new infections during a crisis, while at the same time suffering from a decrease in income from tourism. As local residents are key stakeholders in the response to the crisis and the recovery from it, their WTP for the risk reduction in the pandemic has important implications.

Our analysis shows that most respondents were willing to pay for risk reduction and action in responding to the pandemic crisis, and that there was no significant difference between residents' WTP in the three cities. At a time of crisis or disaster, the stakeholders in a tourist destination become even more (Scott & Laws, 2006), and it appears that residents perceive their individual WTP and the costs borne by the community as a whole as inseparably linked, which makes them more willing to individually pay more to maintain public health and reduce the infection risk from tourism activity. This echoes Lindberg and Johnson (1997), who reported the enlightened attitudes of residents toward tourism during a crisis, and suggested that a crisis invariably brings out the best in residents in terms of values and responsible behavior. Given that the majority of the respondents in the present study were willing to pay for reducing the social costs of tourism when confronted with a pandemic, charities could benefit from setting up specific funds to receive donations for risk reduction.

Second, residents' WTP was significantly affected by age, income, and tourism employment. One specific finding was that younger residents were willing to pay more for risk reduction. This may be attributable to the fact that younger generations are more digitally savvy and more often connected to the Internet than older residents, which allows younger generations to access the most up-to-date information about the pandemic crisis in real time. This implies that local authorities and tourism organizations should involve younger generations, who are likely to be more motivated and knowledgeable, in crisis recovery actions in the aftermath of the pandemic.

Third, the social costs were compared between Hong Kong, Guangzhou, and Wuhan, which differ in the characteristics if their urban and tourism development, and have experiences different COVID-19 infection trajectories. At a conceptual level, it has been widely demonstrated that “the residents' attitudes toward tourism are directly related to the amount of its presence in the destination community” (Smith & Krannich, 1998, p. 784). However, “the amount of its presence” in the local population, especially under the threat posed by a pandemic crisis, has yet to be quantified. In this study, tourism demand curves were created with data obtained by estimating and aggregating the number of respondents at given WTP values and quantifying the social costs of inbound tourism during the pandemic crisis. The demand curves based on WTP for three cities show a relatively similar pattern, which is logical given that COVID-19 has rapidly spread worldwide and adversely affected global public health. This indicates that the response plans of tourism destinations for the pandemic crisis can be conducted within the broader global framework of the destination system. Furthermore, these findings indicate that tourism may generate great social costs to the local community during the COVID-19 pandemic, and residents' involvement in tourism recovery strategies is therefore critical.

Furthermore, the findings of this study provide useful suggestions for the introduction of recovery and stimulus measures during and after the COVID-19 pandemic. In light of the approximation of the social costs, relief packages should be designed to benefit the society at large in tourist destinations suffering significant negative socio-economic impacts due to the pandemic. Conventional policy measures may not be able to overcome this crisis, as it has profoundly changed peoples' perception of the public health risks associated with tourism. The case of China shows that the tourism industry has been gradually and partially regaining its momentum in closer-to-home leisure destinations during weekends, but this is not applicable to major cities (STR, 2020). To satisfy peoples' needs for safety and desires for travel, recovery strategies should be formulated with a holistic and innovative mindset instead of focusing narrowly and directly on tourism recovery, which was the approach taken by many destinations after SARS (EDB, 2015). As Yang, Zhang, and Chen (2020) argued, welfare policies responding to the COVID-19 pandemic should be designed to allocate financial support across all sectors, including tourism, health, and other areas of the public and private sectors, to ensure the balanced recovery of the cities and regions affected.

There are two main limitations to this study that should be considered. First, the survey was conducted at the peak of the COVID-19 pandemic in China to elicit a timely response from the respondents. However, the respondents may have been influenced by a range of strong emotions at the time, meaning that the WTP decisions may have been biased by their affective states. For a similar reason, the survey was only available online during the peak of the pandemic, and this might have generated a sample distribution that was skewed toward individuals with higher education levels. Second, the social costs of tourism amid the COVID-19 crisis were explored rather than the impacts of COVID-19 on tourism. However, this crisis is still unfolding and its impacts on tourism are worthy of examination in future studies. The effects of the pandemic are likely to decrease over time, and there may be some positive impact on the tourism industry and/or on certain tourist destinations, such as ecological improvements from the dramatic drop in carbon emissions during the crisis (An, 2020; Chen, Wang, Huang, Kinney, & Paul, 2020). Future studies are warranted to comprehensively evaluate these impacts.

Statement of contribution

1. ***What is the contribution to knowledge, theory, policy or practice offered by the paper?***

The main contribution of this study is the identification and quantification of the social costs of tourism during the COVID-19

pandemic in three urban destinations in China. Methodologically, hypothetical scenarios and triple-bounded dichotomous choice contingent valuation method are used to quantify the residents' risk perception of the COVID-19 pandemic and their willingness to pay for reducing such risk. The empirical results of the study contributes to the understanding of the attitudes of destination residents toward the mitigation and management of the pandemic crises, which sheds light on the post-pandemic recovery and planning strategies in destinations that suffer from the pandemic.

2. ***How does the paper offer a social science perspective/approach?***

The study's social science perspective is reflected across the research design and discussions of the research findings. Studies of willingness to pay using contingent valuation method have been widely applied in social science research to assess the costs of the public goods or environmental amenities. This study extends the scope to assess the possible social costs of tourism during an unfolding pandemic across the world with far reaching social and economic implications.

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