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Risk, uncertainty and ambiguity amid Covid-19: A multi-national analysis of international travel intentions

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ABSTRACT

This study analyses how Covid-19 shapes individuals' international tourism intentions in context of bounded rationality. It provides a novel analysis of risk which is disaggregated into tolerance/aversion of and competence to manage risks across three different aspects: general, domain (tourism) and situational (Covid-19). The impacts of risk are also differentiated from uncertainty and ambiguity. The empirical study is based on large samples (total = 8962) collected from the world's top five tourism source markets: China, USA, Germany, UK and France. Various risk factors show significant predictive powers of individual's intentions to defer international tourism plans amid Covid-19. Uncertainty and ambiguity intolerance is shown to lead to intentions to take holidays relatively sooner rather than delaying the holiday plans.

Introduction

Tourism is especially subject to risks and uncertainties because of its intangibility, heterogeneity, time-lags between purchase/booking and participation, significant costs and tourists' lack of tacit knowledge of 'other' places (Boksberger & Craig-Smith, 2006). Unsurprisingly, therefore, the complex and rapidly shifting interactions between the infection, health care responses (especially vaccination) and regulation associated with the Covid-19 pandemic have had a profound impact on tourism risks and uncertainties and, consequently, on tourist intentions (Pappas, 2021). However, almost all research to date has analysed risk rather than uncertainty which is surprising given that the unprecedented global pandemic was characterised above all by uncertainties (Pappas & Glyptou, 2021). Moreover, very few existing studies on the effects of the pandemic have directly measured uncertainty intolerance (Peluso & Pichierri, 2020). In terms of risk, the dominant research framework has been risk perceptions, rather than a broad conceptualisation of willingness to take risks as being dependent on risk intolerance and competence to manage risks (Krueger Jr & Dickson, 1994). Yet, in one of the very few extant studies of risk aversion or tolerance during the pandemic, both risk perception and risk aversion are found to have a significant influence on travel intentions (Yang et al., 2021).

This paper not only addresses this research gap on risk versus uncertainty, but it also provides a fuller and novel elaboration of both risk and uncertainty. First, in terms of risk intolerance versus competence to manage risks, it not only differentiates between general and domain-specific (tourism) risk, previously analysed in Williams and Baláž's (2013) work, but also adds to these the notion of situational (Covid-19) risk. In short, it analyses six different aspects of how willingness to take risks influence travel intentions: general, domain specific (tourism) and situational intolerance of, and competence to manage, risks. In addition, and

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novel to tourism studies, we complement the analysis of uncertainty by drawing on the related notion of ambiguity (Rosen et al., 2014). Both refer to lack of knowledge, but across different time horizons—future versus present, respectively—and both are highly germane to the formation of tourism intentions at any time, but especially during the pandemic. The paper also considers the influence of socio-demographic and socio-economic characteristics.

The research also makes two novel contributions to the methods used to analyse the impacts of Covid-19 on tourist intentions, which have broader application to analysing the impacts of other types of disasters. First, we focus not on perceptions of risks related to particular destinations or types of holidays but on the pervading concern of tourists under Covid-19 which is *when* to engage in tourism. Furthermore, we identify how the pandemic has *changed* holiday intentions by incorporating into our analysis the hypothetical holidays that would have been taken in the absence of Covid-19. Secondly, recognizing the context specificity of knowledge limitations, and therefore of situational risk, we undertake a comparative international analysis in the top five tourism source markets in the world (China, USA, Germany, UK and France): this contrasts with virtually all extant research involving either single country case studies, or surveys involving a generalised international sample (Villacé-Molinero et al., 2021). Additionally, while much of the existing research in this field has involved small and purposive or snowball sampling, this paper utilises a large, specially commissioned sample of 8962 individuals which was selected to reflect the broad age, gender and regional profiles of the population of each of the five countries.

The paper aims to provide a comparative assessment of the determinants of tourist intentions to participate in international travel under conditions of exceptional knowledge limitations during the Covid-19 pandemic. The specific research objectives are to analyse how intentions of when to travel, within or beyond the resident continent, are determined by tolerance of and perceived competence to manage general risk, domain specific risk and Covid-19 situational risk, (in)tolerance of uncertainty and ambiguity, and risk-related socio-demographic and socio-economic characteristics. In particular, this research will examine which among the three levels of risk factors most affects international travel intentions in the context of the Covid-19 pandemic. This research will also reveal national differences among the five surveyed countries in terms of key determinants of their international travel intentions.

Theoretical approach

All trip intentions are formed under conditions of imperfect knowledge and information overload, and these have been exacerbated during the Covid-19 pandemic because of rapid changes in the levels of infection, regulatory and social responses. A starting point for understanding the formation of intentions under these knowledge conditions is the classic distinction between risk and uncertainty (Knight, 1921). Moreover, while there has been considerable research on risk preferences, this paper draws on the broad theoretical framework of bounded rationality (Simon, 1997) and related research in psychology and behavioural economics on willingness to take risks as being the outcome of risk (in)tolerance and perceived competence to manage risks. We build on the limited existing research on general versus domain (tourism) risk (Williams & Baláž, 2013) by adding an additional concept of situational risk (Covid-19). We then examine both tolerance and competences across these three 'levels' - general, domain and situational—to examine six aspects of willingness to take risks. We also investigate the role of uncertainty, noting Savage's (1954) seminal argument that individuals are more intolerant of uncertainty than of risk. Additionally, this paper also introduces to tourism research the related but separate concept of ambiguity. Finally, we also discuss how the culturally-specific nature of willingness to take risks is nationally variable.

Risk (in)tolerance

Risk is commonly understood as 'known risks' to differentiate it from uncertainty (Knight, 1921); more precisely, risk assumes that the distribution of probabilities of outcomes is known. Mainstream (neoclassical) economics traditionally explains risk (in) tolerance via the incorporation of risk into the expected utility model, but this fails to account for individual differences in risk tolerance (Rabin, 2000) and the processing of risk. Especially important is the distinction between a general risk trait versus a domain specific (tourism) risk trait, and we add to this the concept of situational risk.

General risk trait

Research on risk tolerance suggests that there is a large, shared component crossing diverse domains of life (Mata et al., 2018). The 'general risk trait', understood as a disposition to be willing to take risks, has been established in many large-scale surveys and panels (Sahm, 2012). Individuals high on the general risk trait are more likely to report engagement in many specific risky activities, such as smoking, drinking, gambling, doing risky sports, driving fast or investing in risky financial assets. In short, correlations for domain/specific risk (in)tolerances in panel data are positive and medium or large (Schildberg-Hörisch, 2018). So it is reasonable to believe that individuals who are high on the general risk trait have relatively high intentions to travel during the Covid-19 pandemic. The general risk trait is probably innate and is generally assumed to be stable over time.

Domain risk tolerance

In addition to the general risk trait, individuals' risk tolerance may also vary across different domains. Tourism is the specific *domain risk* of interest in this paper. It is distinctive, being particularly subject to risks and uncertainties resulting from the nature of the tourism experience, being intangible, tending to involve long time lags between purchase and consumption, and involving displacement to places that the tourist has limited tacit knowledge of (Boksberger & Craig-Smith, 2006; Williams & Baláž, 2015).

Somewhat surprisingly, behavioural researchers have largely ignored tourism. In one of the few detailed studies of the tourism domain, both risk (in)tolerance in other domains and specifically in the tourism domain are seen to positively influence willingness to take tourism risks, in the form of preferred types of tourism organization and the deterrence effects of different types of hazards (Williams & Baláž, 2013). Therefore, we propose that individuals with high tolerance of risks in the travel domain tend to have relatively high intentions to travel during Covid-19. Because of the intense risks and uncertainties of the Covid-19 pandemic, it is especially important to differentiate between general and tourism domain risk (in)tolerance.

Situational risk tolerance

Because exogenous shocks are known to have temporary effects on risk preferences (Sahm, 2012), we introduce the concept of *situational risk (in)tolerance*. Although earlier qualitative research has examined risk seeking outdoor behaviour in situations posing exceptional risk levels (e.g., Gyimóthy & Mykletun, 2004), it has not sought to quantify this as a distinctive component of risk tolerance. During the pandemic, the interactions between infections, health service and regulatory responses have had a profound impact on knowledge constraints and tourism risks, and therefore on tourism intentions (Pappas, 2021). Research on the impact of major external events (crises, pandemics) on risk preferences has produced inconclusive results. With respect to Covid-19, both the general social science studies of Drichoutis and Nayga (2021) and Guenther et al. (2021), using a range of different methods, found no evidence that the pandemic had an effect on inter-temporal risk preferences. However, in terms of situational risks associated with travel and tourism during the pandemic, Luo and Lam (2020) found that risk intolerance negatively impacted on travel intention, while travel anxiety and risk intolerance moderate the indirect impacts between fear of Covid-19 and travel intentions. These studies do not quantify the role of situational versus other forms of risk tolerance. The present study will quantitatively examine the positive relationships between tolerance of Covid-19 related risks (in comparison to general and domain specific risks) and travel intentions in a regression analysis.

Competence to manage risks

The bounded rationality and related psychology literature distinguish between a general competence to manage risk, and domain specific competences. We also recognize situational (during Covid-19) competence. In general, perceived competence to manage risks tends to have a positive influence on tourism decisions, such as intentions to travel internationally during the pandemic.

General perceived competence to manage risks

Perceived competence to manage risks stems from previous experience of accumulated knowledge, and the heuristics used to process and apply this knowledge (Tversky & Kahneman, 1974). These accumulated experiences, combined with psychological traits, such as varying degrees of over-confidence and over-optimism (Lovallo & Kahneman, 2003), determine the general competence to manage risk, and therefore tend to have a positive impact on travel intentions.

Domain specific competence to manage risks

The reason for the uneven distribution of willingness to take risk across different domains stems in part from the variance in individuals' perceived competence to manage risks across these. In one of the few tourism studies to analyse how competence to manage risk impacts on decision making, Williams and Baláž (2014) demonstrate that acquiring experience in one area of mobility (tourism) can spill-over to perceived competence in a different area (migration). They also demonstrate the inverse relationship, that experience derived from having lived abroad is significantly related to perceived competence to manage tourism risks (Williams & Baláž, 2013).

Competence to manage situational risks

Given that perceived competence to manage risks stems from previous experience and accumulated knowledge (Heath & Tversky, 1991; Tversky & Kahneman, 1974), rare external events, such as Covid-19 pose exceptional challenges: the populations of large parts of the world have no previous experience of dealing with such events. Hence, perceived competence to manage this specific situational risk is important in influencing people's travel intentions. The higher the perceived competence, the greater the travel intentions. However, Sánchez-Cañizares et al. (2021) found that perceived behavioural control, which broadly resonates with the notion of perceived competence to manage risks, does influence the willingness to pay for additional security at destinations.

Uncertainty and ambiguity

Uncertainty

Uncertainty is about unknown risks (Knight, 1921), either those that are known to exist but with unknown probabilities, or those are not even known to exist. (In)tolerance of uncertainty may have multiple sources, such as existence of novel, complex, and unclear situations and events (Budner, 1962) with unpredictable, and potentially negative, future consequences (Carleton et al., 2007; Rosen et al., 2014). Reactions to uncertainty are cognitive (confusion, distrust, aversion), emotional (worry, anxiety, fear) and behavioural (avoidance, paralysis, but also orientation on control and problem-solving). Indicating the complexity of the construct, the original scale for measuring intolerance of uncertainty (Freeston et al., 1994) had five underlying factors: as being

unacceptable and to be avoided, negative social evaluation caused by uncertainty, frustration, stress and inability to act because of uncertainty.

Not all the constituent factors are equally important for tourism decisions. Travel intentions relate to the future and prospective travellers wish to avoid or reduce stress related to tourism-related uncertainties: they are informed by prospective anxiety (Carleton et al., 2007). Individuals may look for ways to control or mediate future outcomes (e.g. via insurance or flexible booking arrangements) and tourism intentions are shaped by these considerations. Money and Crotts (2003), for example, found that those most intolerant of uncertainty were also likely to go on shorter holidays to fewer destinations, and travelled more in organized groups, while Correia et al. (2011) found behavioural differences between those from low versus high uncertainty avoidance cultures. However, the future remains unknowable and a source of stress: there are different possible responses to this, ranging from the intention not to travel, to travelling as soon as possible given that uncertainties are usually greater about the more distant than the more proximate future.

Ambiguity

While there is some research on the role of uncertainty in tourism decision making and intentions (Williams & Baláž, 2013), the related concept of ambiguity has been neglected in this field. (In)tolerance of uncertainty refers to a dispositional trait arising from negative beliefs about uncertainty and its potential negative consequences (Koerner & Dugas, 2008), whereas (in)tolerance of ambiguity refers to cognitive interpretation of uncertain/ambiguous situations (Lauriola et al., 2016). Ambiguity refers to cognitive confusion (information deficit, interpretation of unclear information), while uncertainty is associated with anxiety/frustration about an unknown future. This is encapsulated in terms of different time horizons—with ambiguity being concerned with the information currently available, and uncertainty about the future. Individuals intolerant of ambiguity cannot tolerate 'here and now' ambiguous situations, while individuals intolerant of uncertainty consider future situations as a source of threat and discomfort. Therefore, it can be expected that people intolerant of uncertainty and ambiguity intend to travel sooner rather than later. However, there is lack of strong empirical evidence for the assumption about time scales (Rosen et al., 2014), and this is central to conceptualising tourism intentions. Our research instrument acknowledges substantial overlap between uncertainty and ambiguity (Hillen et al., 2017), and includes concepts of (un)familiarity, information deficits, clarity of information, anxiety, control-seeking and problem-solving.

Domain-specific studies on risk and uncertainty in tourism suggest that perception of risk and perception of uncertainty are correlated, but distinct constructs (Williams & Baláž, 2013, 2014, 2015). Unlike risk, uncertainty is defined by complex, unclear and unpredictable environments. Decisions under uncertainty are therefore much more context and situation specific than those under risk and may result in different outcomes. Tourism intentions formed in context of the Covid-19 pandemic are faced with seemingly intractable issues of complexity, novelty and insolubility.

Cultural (national) differences

While risk and uncertainty/ambiguity intolerance are globally prevalent (Rieger et al., 2015), there are also national differences (Falk et al., 2018). There are two main theoretical perspectives on this issue. First, Becker et al.'s (2020) evolutionary approach notes that some economic preferences are transmissible across generations (Dohmen et al., 2012).

A second—and complementary—perspective stems from Hofstede's (1991, 2011) view that culture is a system of shared values and beliefs, with some cultures being characterised by higher intolerance of risks than others (Rapp et al., 2011). The "cushion hypothesis" proposes that individuals in collectivist societies are more likely to take risks than those in individualistic societies because negative consequences are mitigated by their social networks (Hofstede, 2011; Hsee & Weber, 1999). Studies of individual countries include Statman (2010, p. 4) who argued that "collectivism in the Chinese culture provides people with substantial cushions of family and friends' support if they take risks and fail" and, among individualistic cultures, Fehr et al. (2006) found that Americans are relatively willing to take risk.

Populations living in risky institutional environments with high levels of income inequality and poverty also tend to report higher levels of risk tolerance than those living in developed countries and stable economic environments. Studies utilising the 2012 Gallup World Poll, based on self-reported risk preferences, find substantial macro-regional differences. Countries in Western Europe, and East and South Asia are relatively risk averse compared to the USA, Canada, Australia, North Africa and the Middle East (Falk et al., 2018).

In contrast to risk, there are notable differences in uncertainty avoidance at the national level: participants in the Gallup World Poll from poorer countries are less uncertainty intolerant than those from rich countries. Interestingly, Fehr et al. (2006) also found that Chinese and US respondents exhibit slightly higher intolerance of uncertainty and ambiguity, which implies that risk tolerance and uncertainty/ambiguity tolerance are distinctive and not necessarily-overlapping concepts. Tourism researchers also report some support for Hofstede's assumptions on uncertainty avoidance: tourists from high uncertainty avoidance cultures, for example, exhibit different behaviours to those from low avoidance cultures (Litvin et al., 2004; Money & Crotts, 2003).

Methodology

This study is based on a quantitative analysis of a large-scale online panel survey. The detailed data collection procedure, survey instrument and data analysis methods are explained below.

Data collection

A sampling frame of individuals, who were aged 18 or above, with recent leisure travel experiences before the pandemic, was obtained from specially-commissioned online panels of a leading international market research company (KANTAR). This research chose the top five tourism source markets in the world for the empirical investigation, and they are China, USA, Germany, UK and France, according to the United Nations World Tourism Organization (UNWTO, 2021), in terms of tourism spending. The questionnaire was translated from English into French, German and Chinese, and checked by native speakers, with bilingual individuals being asked to check the accuracy of the translations (via reverse translation). Then all four language versions of the survey were pilot tested by tourism academics and PhD students in the authors' institution and through their collaboration networks, who were native speakers of any of the four languages, and the survey questions were refined accordingly.

The target samples for this study included 1800 respondents in each country. The samples were selected to reflect the broad age and gender profiles of each of the five countries, so each national sample has good representation of the population in terms of age and gender distributions. In addition, each national sample has fairly good regional representativeness at the NUTS1 level for France, Germany and the UK, broad regional level for the USA, and six broad regions for China. Data collection commenced on 15 October 2020 and ended on 20 November 2020. After filtering out a few incomplete and invalid responses, a final sample of 8962 valid responses was obtained.

Survey instrument development

In order to capture the effect of Covid-19 on people's travel intentions, this study measures travel intentions in two scenarios: first, a hypothetical scenario assuming there was no Covid-19 pandemic, and second, the real-world Covid-19 scenario. In each scenario, eight categories of the timing for next intra-continental (i.e., within the residing continent) and inter-continental (i.e., beyond the residing continent) leisure trips are used to measure travel intention (see Table 1). The larger the value the more distant in the future people intended to travel.

The scales used to measure risk, uncertainty and ambiguity in the survey questionnaire (as provided in the Supplementary file) were based on existing tested scales, although these were sometimes based on reduced numbers of questions because of the practical challenges of constraining the length of a research instrument that covered a broad range of issues.

Two key measures of risk tolerance are used in economic and psychological research. The self -reported responses to standardized survey and panel measures elicit stated preferences. Behavioural measures (choices in gambles and lotteries) examine the structural properties of tasks and environments (Mata et al., 2018). Self-reported measures for stated risk preferences show moderate intertemporal stability (Schildberg-Hörisch, 2018), while preferences revealed via behavioural measures do not (Mata et al., 2018).

Both types of measures were utilised here (see Supplementary materials). The general risk and tourism domain risk questions were based on existing, well tested research instruments. For example, tolerance of general risk questions were taken from Dohmen et al. (2005) and Grable and Lytton (1999), competence to manage general risk questions were adopted from Williams and Baláž (2013), tolerance of travel risk questions were selected from Sönmez and Graefe (1998), competence to manage travel risk questions were adopted from Lepp and Gibson (2003). The measures of intolerance of uncertainty were based on Freeston et al. (1994) and Carleton et al. (2007). The intolerance of ambiguity measures were selected from the need for cognitive closure scale by Roets and van Hiel (2011) and Kruglanski et al. (2013). We selected items referring to (un)familiarity, information deficits, clarity of information, anxiety, control-seeking and problem-solving. With respect to the Covid-19 risk context questions, they were necessarily new but were based, as far as possible, on adaptations to existing questions from large-scale national or international studies such as International Air Transport Association (IATA, 2020) and VisitBritain (2020).

Data analysis

This study employed ordinal logistic models to achieve the research objectives for two reasons. First, the observed outcome variable in this study (i.e., the timing of the next intended travel) is an ordinal, non-continuous variable, while the "latent" underlying variable is continuous, assuming the ordinal outcome is "a coarsely categorised measured version of an underlying

Table 1
Measurement of travel intentions.

Category	Time for next intra-/inter-continental leisure
1	Autumn 2020
2	Winter 2020–2021
3	Spring 2021
4	Summer 2021
5	Autumn 2021
6	Winter 2021–2022
7	Later than March 2022
8	No intention at all (*hypothetical scenario*) Not until Covid-19 is no longer a concern or No intention at all (*real-world scenario*)

continuous latent variable" (Bauer & Sterba, 2011, p. 375). Second, an ordinal model is suitable where data are highly skewed, and therefore the normality assumption does not hold, as in this study. An ordinal model accounts for ceiling and floor effects of the ordinal variable, so in the case of this study the values of the travel intention variables do not go below 1 or above 8. To compare and account for potential cultural differences, an ordinal logistic model was estimated for each of the five sampled countries.

Variables

The dependent variable in the ordinal logistic model is the timing of next intended trip in the real situation in light of Covid-19; key independent variables include general, travel (domain-specific) and Covid-related situational risk tolerance and perceived competence to manage these risks, as well as intolerance of uncertainty and ambiguity. In addition, the timing of next intended trip assuming no Covid-19, sociodemographic variables including age, gender, education, and household annual income are included in the model as control variables.

For the variables of intolerance of uncertainty and ambiguity, the two separate scales of intolerance of uncertainty and intolerance of ambiguity are merged due to the high multicollinearity issue caused, confirming the difficulties Rosen et al. (2014) noted in empirically differentiating the two concepts. The combined scale, intolerance of uncertainty and ambiguity, showed high reliability (Cronbach $\alpha = 0.91$) and has the advantage of measuring reactions to more diverse decision making than if only uncertainty was measured: uncertainty-induced anxiety, frustration caused by the information deficits, and potential coping strategy in ambiguous/uncertain situations.

Factor scores are calculated as the values of explanatory variables that are measured with multiple items. The single-item risk-related variable (competence to manage travel risk) is standardized, while the original scales are used for sociodemographic variables in the model. No multicollinearity issues are detected in the diagnostic tests with a corrected variance inflation factor value below 2 for all variables, which also suggests that the model can be considered free of common method bias. Additionally, Harman's single factor approach is used to detect the potential common method bias. The total variances for one factor range from 20.9% to 22.8% across all models, well below the 50% threshold. This further confirms that the common method bias should not be a concern in this study.

Findings and discussion

Descriptive analysis

Table 2 provides a summary of the sample profiles in each of the five survey countries. Overall, the full sample has 50.9% female respondents and 49.1% male respondents. In terms of age, the majority (nearly 60%) of the survey respondents were aged 25–54, and about one-third are aged 55 or above. With regard to educational background, nearly 60% of all respondents received

Table 2
Sample demographics.

Variable	USA	UK	France	Germany	China
Gender					
Female	51.2%	50.1%	52.4%	51.8%	49.2%
Male	48.8%	49.9%	47.6%	48.2%	50.8%
Age					
18–24	4.5%	5.8%	7.1%	5.4%	7.3%
25–34	21.5%	16.5%	17.9%	17.0%	26.2%
35–44	17.4%	21.5%	19.0%	17.4%	20.3%
45–54	16.7%	20.6%	18.7%	20.6%	20.9%
55–64	17.6%	14.5%	17.1%	16.2%	13.2%
65+	22.3%	21.2%	20.2%	23.3%	12.1%
Education					
Primary education or lower	6.9%	1.6%	1.7%	1.6%	0.4%
Secondary education	19.2%	27.6%	29.2%	15.9%	8.7%
Post-secondary non-tertiary education	17.5%	26.7%	17.9%	49.6%	17.9%
First stage of tertiary education	31.3%	28.3%	28.0%	9.2%	67.1%
Second stage of tertiary education	25.1%	15.8%	23.2%	23.7%	5.9%
Household annual pre-tax income (unit: 1000)					
<$15/<£10/<€11/<¥40	5.4%	5.8%	8.2%	5.6%	2.1%
$15–29/£10–19/€11–20/¥40–59	9.3%	17.8%	14.7%	10.1%	1.4%
$30–49/£20–29/€21–30/¥60–79	16.0%	21.1%	23.0%	13.0%	2.5%
$50–64/£30–39/€31–40/¥80–99	11.5%	16.6%	22.5%	21.0%	8.0%
$65–79/£40–49/€41–50/¥100–149	13.0%	15.1%	14.3%	15.8%	28.1%
$80–94/£50–59/€51–60/¥150–249	11.1%	9.8%	8.2%	9.5%	33.6%
$95–109/£60–69/€61–70/¥250–499	10.8%	6.3%	4.6%	10.6%	20.1%
$>110/>£70/>€70/>500	22.9%	7.5%	4.5%	14.4%	4.2%
Sample size	1796	1799	1780	1789	1798

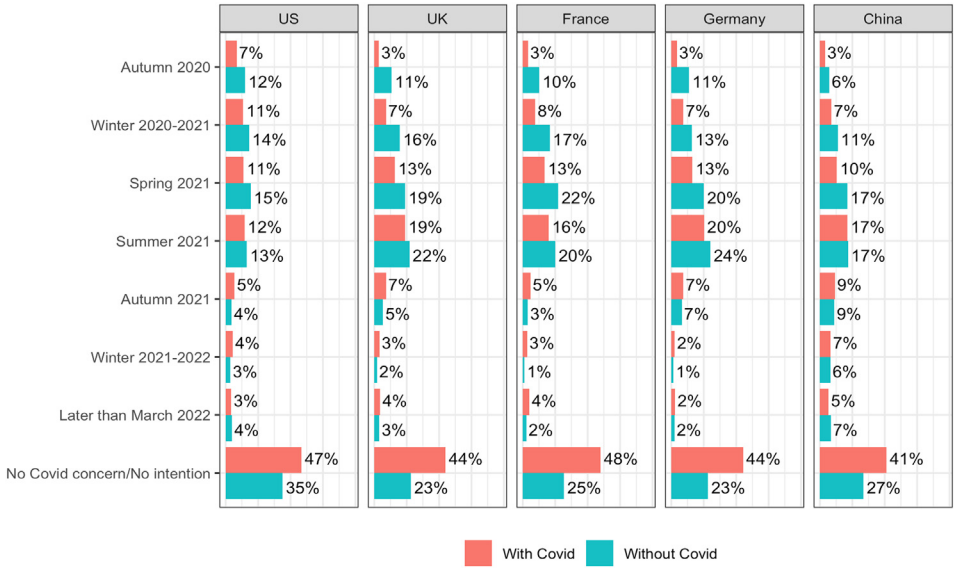

Fig. 1. Intra-continental travel intentions.

post-secondary non-tertiary education or a first degree. With respect to income distribution, two-thirds of all respondents fell into the middle four categories.

Figs. 1 and 2 describe the patterns of five national samples' travel intentions under the hypothetical (without Covid-19) and real-world (with Covid-19) scenarios. With regard to intra-continental travel (see Fig. 1), in light of the pandemic, about 45% of all respondents across the five countries intended to travel abroad only after Covid-19 is not a concern any more or showed no intention to travel abroad at all. While without the pandemic, only 27% of people did not intend to travel abroad, and the share in the US sample is slightly higher (35%) than other national samples. Among the respondents who intended to have an intra-continental leisure trip, Summer 2021 appears to be the most likely time to travel abroad.

Turning to inter-continental travel (see Fig. 2), if there were no Covid-19 pandemic, about 42% of the respondents did not intend to travel beyond their continent, but this percentage rises to nearly 60% given the real pandemic situation. Among the top five tourism source markets, Chinese tourists displayed relatively high intention, with 52% expressing some intentions. As with the timing for next inter-continental travel, Summer 2021 is the most popular time.

The national differences in international travel intentions amid Covid-19 reflect different stages of the pandemic when the survey was conducted. In October and November 2020, only a small number of imported Covid infections were recorded in China,

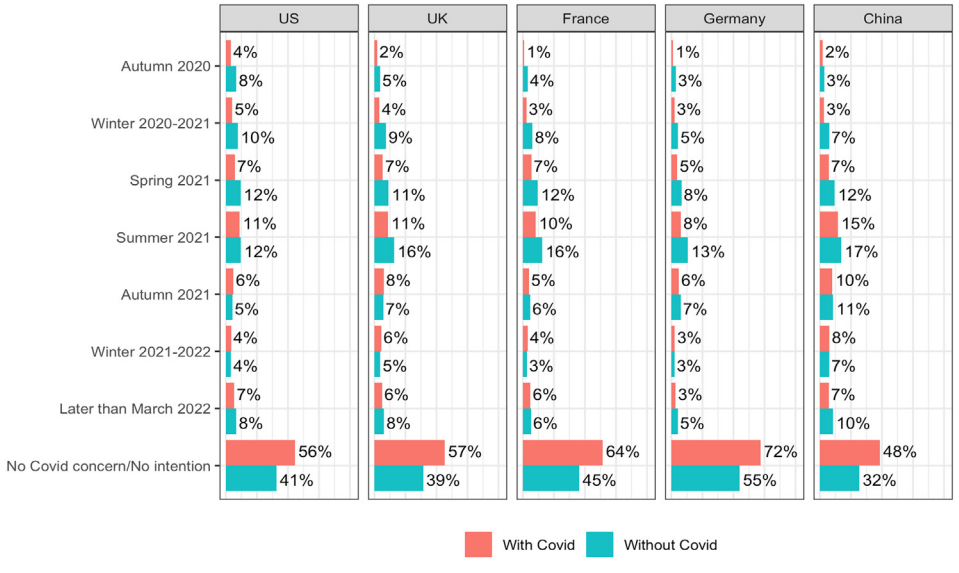

Fig. 2. Inter-continental travel intentions.

Table 3
Mean values of key variables.

Variable	USA	UK	France	Germany	China
Tolerance of general risk (2 items)	0.13	−0.05	−0.16	−0.21	0.28
Competence to manage general risk (2 items)	0.07	−0.12	−0.12	−0.15	0.33
Tolerance of travel risk (3 items)	−0.02	0.12	0.01	−0.10	0.00
Competence to manage travel risk (1 item)	−0.11	−0.30	0.12	−0.17	0.46
Tolerance of Covid situational risk (11 items)	−0.09	0.00	0.11	0.11	−0.13
Competence to manage Covid situational risk (11 items)	0.09	0.04	−0.16	−0.17	0.21
Intolerance of uncertainty and ambiguity (12 items)	0.17	−0.06	−0.07	−0.24	0.20
Grand mean	0.03	−0.05	−0.04	−0.13	0.19

Note: All mean values are calculated from the factor scores, except for the competence to manage travel risk, the values of which are standard scores (z-scores).

while the pandemic was still severe in Europe and the USA. Given the relatively low risk of the pandemic, Chinese respondents were more optimistic about their international holiday plans, particularly within Asia.

Given the focus of this study on risks, uncertainty and ambiguity, Table 3 describes the mean values of each of the focal variables. Some cultural differences can be seen. Consistently Chinese respondents display the highest tolerance of general risks and travel risks, and the most competence in managing these risks, followed by US respondents, and lastly the three European countries. The same order applies to the perceived importance of Covid-related risks and competence to manage Covid risks. These findings are well supported by previous research which commonly reveals that risk perception and tolerance has a cultural dimension (e.g., Hofstede, 1991, 2011). In addition, this study finds that Chinese and US respondents exhibit slightly higher intolerance of uncertainty and ambiguity. This finding is well supported by the general risk literature. For example, Fehr et al. (2006) also found that Chinese and US respondents exhibit slightly higher intolerance of uncertainty and ambiguity. This finding implies that risk tolerance and uncertainty/ambiguity tolerance are distinctive and not necessarily-overlapping concepts, the so-called Ellsberg paradox (Ellsberg, 1961). This finding also supports the theoretical approach to the present study—risk and uncertainty/ambiguity should be treated separately when examining their effects on travel intentions.

Ordinal logistical regression analysis

To serve the primary research purpose of identifying the impacts of risk/uncertainty/ambiguity variables on travel intentions, ordinal logistic regression analysis is employed for each country under study. Tables 4 and 5 show the model estimation results for intra- and inter-continental trips, respectively. Seen from the significant effects (noted by asterisk), Tables 4 and 5 reveal high similarities between the key determinants of intra- and inter-continental trip intentions. Travel intention under the scenario of no Covid-19, tolerance of Covid situational risk, tolerance of general risk, and perceived competence to manage Covid situational risk are the most common and important predictors of international travel intentions; all show statistically significant effects in all 10

Table 4
Ordinal logistic regression results for continental outbound travel intentions.

Variable	Odds ratio				
	US	UK	France	Germany	China
Travel intention under the scenario of no Covid-19	1.646*** (0.037)	1.690*** (0.043)	1.566*** (0.038)	1.561*** (0.038)	1.972*** (0.054)
Tolerance of general risk	0.831** (0.049)	0.846** (0.049)	0.856** (0.052)	0.825** (0.049)	0.730*** (0.043)
Competence to manage general risk	0.974 (0.055)	0.936 (0.051)	0.924 (0.051)	1.065 (0.055)	0.906 (0.063)
Tolerance of travel risk	1.095 (0.066)	1.047 (0.059)	1.097 (0.065)	1.012 (0.058)	0.865** (0.041)
Competence to manage travel risk	0.880* (0.048)	0.858** (0.045)	0.934 (0.049)	0.871** (0.043)	0.880 (0.064)
Tolerance of Covid situational risk	0.759*** (0.044)	0.753*** (0.039)	0.875** (0.045)	0.772*** (0.037)	0.671*** (0.050)
Competence to manage Covid situational risk	0.862** (0.049)	0.803*** (0.043)	0.884* (0.046)	0.804*** (0.041)	0.957 (0.058)
Intolerance of uncertainty and ambiguity	0.831** (0.049)	0.957 (0.053)	0.962 (0.050)	0.960 (0.045)	0.840* (0.066)
Age in years	1.013*** (0.003)	1.007* (0.003)	0.999 (0.003)	1.002 (0.003)	1.007* (0.004)
Gender (0: female; 1: male)	1.028 (0.102)	0.769** (0.074)	0.966 (0.096)	1.003 (0.098)	1.094 (0.103)
Education	1.004 (0.040)	1.031 (0.046)	0.960 (0.041)	0.951 (0.043)	1.019 (0.080)
Household annual income	0.965 (0.022)	1.002 (0.025)	1.018 (0.029)	0.976 (0.023)	0.919* (0.036)
Observations	1796	1799	1780	1789	1798
Nagelkerke's R^2	0.435	0.369	0.270	0.276	0.484
AIC	5111.226	5241.985	5194.571	5276.905	5221.339
log-Likelihood	−2536.613	−2601.992	−2578.285	−2619.452	−2591.670

Note: Values in parentheses are standard errors of odds ratios.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Table 5
Ordinal logistic regression results for inter-continental outbound travel intentions.

Variable	Odds ratio				
	US	UK	France	Germany	China
Travel intention under the scenario of no Covid-19	1.855*** (0.048)	1.954*** (0.053)	1.810*** (0.049)	1.873*** (0.055)	2.172*** (0.065)
Tolerance of general risk	0.754*** (0.050)	0.843* (0.056)	0.851* (0.060)	0.756*** (0.061)	0.668*** (0.043)
Competence to manage general risk	1.021 (0.065)	1.026 (0.063)	0.901 (0.058)	0.959 (0.066)	0.879 (0.066)
Tolerance of travel risk	1.016 (0.068)	1.109 (0.071)	1.136 (0.080)	0.839* (0.063)	0.925 (0.047)
Competence to manage travel risk	0.773*** (0.047)	0.849** (0.051)	0.918 (0.057)	0.885 (0.059)	0.869 (0.070)
Tolerance of Covid situational risk	0.787*** (0.050)	0.703*** (0.041)	0.803*** (0.047)	0.767*** (0.047)	0.547*** (0.043)
Competence to manage Covid situational risk	0.783*** (0.051)	0.786*** (0.048)	0.787*** (0.049)	0.831** (0.058)	0.843** (0.056)
Intolerance of uncertainty and ambiguity	0.841** (0.054)	0.826** (0.052)	0.909 (0.055)	0.832** (0.051)	0.888 (0.073)
Age in years	1.020*** (0.004)	1.018*** (0.004)	1.010* (0.004)	1.006 (0.004)	1.004 (0.004)
Gender (0: Female; 1: Male)	0.924 (0.100)	0.754** (0.083)	0.729** (0.085)	1.123 (0.143)	1.086 (0.108)
Education	0.961 (0.041)	1.046 (0.051)	0.994 (0.050)	0.903 (0.052)	1.095 (0.092)
Household annual income	0.951* (0.024)	0.948 (0.026)	0.954 (0.031)	1.015 (0.031)	0.984 (0.040)
Observations	1796	1799	1780	1789	1798
Nagelkerke's R^2	0.549	0.486	0.399	0.398	0.538
AIC	4184.168	4134.884	3810.726	3214.418	4587.333
log-Likelihood	−2073.084	−2048.442	−1886.363	−1588.209	−2274.666

Note: Values in parentheses are standard errors of odds ratios.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

models with only one exception. Other risk and uncertainty/ambiguity variables, as well as key demographic variables, show significant effects in some but not all countries.

To discuss and compare the directions and sizes of statistically significant effects in Tables 4 and 5, it is necessary to refer to the reported odds ratios in the tables. The odds ratio of each variable discloses the direction of the effect. An odds ratio above (below) one suggests a positive (negative) effect. This can be illustrated by considering the tolerance of Covid situational risk variable in the US intra-continental travel intention model (see Table 4). The odds ratio of 0.759 suggests that, with all other variables being held constant, given an increase of one standard deviation in factor scores of tolerance of Covid situational risk, the odds of US participants having an intra-continental trip at a time later than a given category (e.g., Spring 2021) is 24.1% (= 1–0.759) lower than having the trip at the given time category (i.e., Spring 2021) or earlier. In other words, it is 24.1% less likely that the travel timing will be deferred by a quarter; or equivalently, it is 24.1% more likely that the travel plan would be put forward by a quarter, as a result of a one-unit increase in the tolerance of Covid situational risk.

The above illustration also suggests that an odds ratio reveals the effect size of the explanatory variable and allows direct comparison of effect sizes across different explanatory variables. The calculated effect sizes based on the odds ratios in Tables 4 and 5 suggest that the travel intention under the scenario of no Covid-19 has the highest impact and predictive power on the timing of next intended international trip in light of Covid-19. This hypothetical scenario acts as a reference point to predict people's travel intentions in the real-world situation. With this “original” travel plan or an intention under a “normal” circumstance being controlled for, we can then capture more accurately the effects of various risk and uncertainty factors during the pandemic.

As Tables 4 and 5 show consistently, all statistically significant risk tolerance variables and competence to manage risk variables (including general, travel-domain, and Covid situational risks) show negative impacts on the dependent variable (travel intention deferrals) with only one exception (i.e. tolerance of travel risk in the UK inter-continental travel intention model, but with marginal statistical significance). Negative effects imply that people with lower risk tolerance or less competence to manage risks intend to travel later than the others who are more risk tolerant or more competent to manage risks. These results reveal that people who are more concerned about the pandemic risks during travel tend to travel later than those who are less concerned.

Both tolerance of general risk and tolerance of Covid situational risk show significant effects across all five countries for both types of international trips. The effect sizes of the later are higher than those of the former in seven out of ten models, especially in the UK and China cases, as revealed by the odds ratios. Where the effect of the tolerance of travel risk variable is significant and comparable, its effect size is smaller than that of the other two risk tolerance variables. The significant and high effects of Covid situational risk tolerance as well as general risk tolerance revealed in this study can probably be explained by the exceptional, abnormal context of Covid-19. In comparison to a ‘normal’ travel and tourism context, holiday planning during an ongoing epidemic crisis involves a more fundamental pandemic-related trait consideration beyond a tourism domain-specific trait.

With regard to perceived competence to manage different types of risk, the competence to manage Covid situational risk presents the most widespread significant effects (in nine out of ten models). The competence to manage general risk does not appear relevant to predicting travel intention deferrals in the highly specific pandemic context. Perceived competence to manage travel domain related risk also shows significant effects in half of the cases. Where both the competence to manage Covid situational risk and the competence to manage travel domain risk exhibit significant effects, the former has greater predictive power on travel intention deferrals amid Covid-19 with only one exception, as the effect sizes disclose. These findings are generally supported by the study of Sánchez-Cañizares et al. (2021), who revealed that perceived behavioural control of travelling during

Covid-19, resonating with the notion of perceived competence to manage risks, had the largest effect on travel intention during the pandemic.

Different from risk (in)tolerance, the intolerance of uncertainty and ambiguity shows a negative impact on the likelihood of deferring travel in half of the cases. It means in these cases that people who are less tolerant of uncertainty and ambiguity tend to travel earlier than those who are more tolerant, when tolerance of general and travel risks is controlled for. It is well established in the literature that high intolerance of uncertainty profoundly affects perceptions and desires for predictability and controllability (e.g., Carleton, 2016). People with high intolerance of uncertainty tend to seek prediction and control to minimise aversive consequences. Meanwhile, it is commonly recognized that the more distant future is associated with greater uncertainties. This is particularly true in the context of the Covid-19 pandemic. Before there are clear signs of the pandemic being controlled, the more distant future means greater uncertainties. Therefore, when it comes to international travel planning amid Covid-19, individuals with high intolerance of uncertainty are likely to have a trip in the more predictable near future than in the more unpredictable and more uncontrollable longer future in context of the Covid-19 pandemic.

The findings of different effects of risk and uncertainty/ambiguity (in)tolerance support the theoretical arguments that although similar they are distinctive constructs and affect people's decisions and behaviours through different mechanisms (Williams & Baláž, 2013). In order to distinguish their effects on travel intentions, it is necessary to include them simultaneously so that one effect can be controlled for while analysing the effect of the other.

Among key demographic variables, age shows a statistically significant, positive effect in 60% of cases, and consistently in the UK and USA samples. The age variable in the regression analysis is measured by the age of each respondent rather than an age category, so it is a continuous variable. The result suggests that older people are more likely to defer their international travel than younger people. Covid-19 poses more threat to elderly people's health than to younger people, or at least it is perceived that older people face more health risks than younger people in such an epidemic crisis. In addition, gender shows a positive effect in three out of ten models. This significant effect reveals that males are less likely than females to defer their international travel. The finding is well supported by both the general risk literature (e.g., Byrnes et al., 1999) and the tourism risk literature (e.g., Yang et al., 2017), which commonly suggest that males tend to be more risk tolerant, and more likely to engage in risky behaviour.

Furthermore, household income presents a negative effect in two models. This finding suggests that households with higher income are less likely to defer their international travel than households with lower income. The finding is supported by the past literature. For example, Schroeder et al. (2013) suggest that higher income is associated with more travel experiences and greater confidence in dealing with travel related risks. Moreover, higher income may imply affordability of higher quality tourism facilities such as five-star hotels which tend to be perceived as relatively less risky. Across all models, education does not show any significant effect. This is probably because Covid-19 is so novel and beyond differences in formally acquired knowledge. Therefore, the level of educational background does not necessarily help in dealing with Covid-related travel risks and predicting international travel intentions.

Comparing the intra- and inter-continental travel intention models, we see most of the significant risk/uncertainty/ambiguity related variables have higher effects on the intention (deferrals) of inter-continental travel than intra-continental travel, with only one exception. This reflects potential tourists' lack of tacit knowledge of 'other' places (Boksberger & Craig-Smith, 2006). Understandably, a more distant destination tends to be more unknown than a nearby destination, particularly in relation to the Covid-19 situation in the destination. Therefore, a long-haul destination is perceived riskier than a short-haul destination in Covid-19. Given a one unit decrease in risk tolerance or the competence to manage risks, people are more likely to delay their long-haul than their short-haul holiday plan. Meanwhile, if the intolerance of uncertainty and ambiguity increases by one unit, people are slightly more unlikely to postpone their long-haul than short-haul travel.

Lastly, although this study has identified some common effects of risk tolerance and perceived competence to manage risks across all studied countries, national differences of some risk/uncertainty/ambiguity effects are disclosed, particularly between China, the USA and the three European countries. For example, for inter-continental travel, intolerance of uncertainty and ambiguity shows significant effects in the US and German cases but not the others; tolerance of travel domain risk predicts travel intention deferrals in the UK and Germany cases only. For intra-continental travel, intolerance of uncertainty and ambiguity shows significant effects in the US and Chinese cases but not the European countries; tolerance of travel risk predicts travel intention deferrals only in the Chinese case.

In addition, as noted above, demographic variables including age, gender and household income display significant effects in some countries but not the others (see Tables 4 and 5). These national differences can be partially explained by distinctive national cultures in dealing with risk, uncertainty and ambiguity as commonly recognized by the general risk literature (e.g., Falk et al., 2018; Hofstede, 2011); however, these national differences are most likely to be associated with the different situations and phases of the pandemic.

Conclusion

This study is a timely addition to increasingly important strands of the tourism literature on risk and uncertainty, and crisis and disaster. The paper reveals the importance of risk, uncertainty and ambiguity (in)tolerance, as well as perceived competence in managing risks, in predicting people's intentions for intra- and inter-continental leisure travel during Covid-19, two scenarios with contrasting levels of perceived hazards. It provides empirical evidence that, in the Covid-19 pandemic context, people's travel intentions—sooner or later to take an international holiday—are affected by a range of risk factors, among which tolerance of

Covid situational risk, tolerance of general risk, and perceived competence to manage Covid situational risk are the most important factors.

Although the previous literature argues that domain-specific risk factors tend to be more important than general risk factors in predicting a domain-specific decision or behaviour such as travel intention or destination choice in 'normal' circumstances, the findings of this study are different. They imply that in a global pandemic crisis with unprecedented (in recent decades) global health risks, the formation of a travel decision is more complex: both the general risk tolerance trait and the tolerance of situational risk in relation to the pandemic play more significant roles in predicting individuals' future travel decisions.

In contrast, once the effects of these risk factors are controlled for, this study finds that intolerance of uncertainty and ambiguity shows a significant effect in half of the cases, and the effect on travel intentions is opposite to that of risk intolerance. To avoid more uncertainties and ambiguities about the pandemic and the resulting anxiety in the more distant and even less knowable future, people with lower tolerance of uncertainty and ambiguity are likely to travel sooner compared to people with the same level of risk tolerance but higher tolerance of uncertainty and ambiguity. This finding confirms that risk (in)tolerance and uncertainty/ambiguity (in)tolerance are distinctive concepts, and they affect travel decisions through different mechanisms. Only by incorporating both into the same model and controlling the effects on each other, can their effects be distinguished. This indicates the necessity of extending the tourism risk literature by further incorporating (in)tolerance of uncertainty and ambiguity into the theoretical framework in order to gain further insights into tourists' decision making, particularly in a crisis situation.

In addition, the findings of this study indicate that in a global epidemic crisis, long-haul travel is affected more than short-haul travel by risk, uncertainty and ambiguity factors. In an epidemic crisis such as Covid-19, a more distant destination is associated with more uncertainties and ambiguities and is regarded as being riskier than a nearby destination. Therefore, people are more likely to delay their long-haul than their short-haul travel plans. They may even substitute a short-haul alternative for a long-haul holiday destination. Furthermore, some national differences are revealed in international travel intentions. In addition to differences in national cultures (particularly in dealing with risk, uncertainty and ambiguity), general travel habits and travel patterns, different stages of the pandemic and different travel restriction policies are likely to contribute to the travel intention differences.

This study contributes to the tourism literature in the following ways. First, it expands the theoretical framework of risk/uncertainty's impact on tourism decisions by further introducing the concept of intolerance of ambiguity. The ensuing analysis confirms for the first time in tourism research that while both the uncertainty and ambiguity concepts are important, they are difficult to differentiate empirically, even when focussing on the time horizon. After the intolerance of ambiguity scale is merged with intolerance of uncertainty in the empirical modelling stage, the combined scale captures a broader trait than the intolerance of uncertainty trait alone. The combined scale reflects both temporal dimensions (i.e. present and future) of uncertain/ambiguous situations. This study further shows empirical evidence of a statistically-significant, high-level effect on travel intention.

Second, the findings of this study advance understanding of the roles of risk and uncertainty in travel decision making by differentiating three levels of risk factors: general, domain-specific and context-specific, and incorporating all of these into a crisis context. The findings imply that the roles of risk and uncertainty factors in travel decision making under a global pandemic crisis are somehow different from their roles in a 'normal' tourism context. Third, methodologically, the unique measurement of travel intention amid Covid-19 in terms of the timing of the next intended trip is useful in capturing the delay effect of the pandemic compared to a hypothetical scenario of no Covid-19. To achieve such a research objective, ordinal logistic regression is shown to be effective and suitable for gaining insights in a multiple case study setting.

Lastly, this study is based on a very large-scale survey (nearly 9000 respondents over five countries) with careful sample frame setting; compared to previous tourism risk studies, which were often based on a small sample and a single case study, the findings of this study are more reliable and more likely to be generalised.

The insights offered by this study into the roles of risk, uncertainty and ambiguity in shaping people's travel decisions amid the pandemic have important implications for the tourism industry and destination management organisations. In light of the significant impact of perceived risks of Covid-19 disturbance during international travel, as well as the impact of intolerance of uncertainty and ambiguity, destination management organisations, tour operators and tourism service providers such as airlines and hotels should work closely with both destinations and origin governments: to ensure as much clarity as possible in their communication with tourists across all stages of a travel experience, including travel planning, booking, travelling to and staying in the destination until returning home. This should reference both the current situation and the near and distant futures, given the important and distinctive impacts of uncertainty. Where international travel is permitted, tour operators and tourism service providers may target specific groups of potential tourists in their marketing and promotional campaigns. Such targeting should look beyond socioeconomic and sociodemographic characteristics to those who have relatively high-risk tolerance and high perceived competence to manage risks during travel and, therefore, higher intention to travel.

Due to information asymmetry, especially as far as long-haul destinations are concerned, potential tourists may develop misleading perceptions of high risks in their preferred destinations. Therefore hotels, restaurants and visitor attraction sites should use multiple media channels, especially social media channels, to demonstrate how they can and will address a range of perceived sources of risk and uncertainty. Meanwhile, having customers share their positive experiences on the service providers' social media platforms can reduce poorly informed risk perceptions and increase potential tourists' visit intention.

This research has a few limitations. The empirical study is based on a cross-sectional survey and, while the general risk tolerance trait may be relatively stable, the perceived Covid-related risks are likely to change over the course of the pandemic. It would be useful to repeat the survey at different stages of the pandemic and track the dynamics of people's risk perception and further

estimate the impacts on travel intention. Another limitation is related to the number (five) of case studies. Compared with most extant research on tourism risk which were based on a single case (e.g. a country or region), this study includes the top five tourism source markets in the world, but cultural diversity can be further improved by expanding the number of case countries (e.g. African or Latin American countries), so that an even broader view of the impacts of risk, uncertainty and ambiguity on people's travel intentions could be obtained.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annals.2021.103346.

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