Chapter

The Long-Term Impact of COVID-19 on Inbound Tourism from China: Using 2020/2022 Web-Based Survey Data

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Abstract

This study discusses the long-term impact of the COVID-19 pandemic on inbound tourism from China, aiming to investigate its prospects during the post-pandemic period. After briefly reviewing trends concerning COVID-19 impact studies at home and abroad, basic results from two cross-sections of web-based data in 2020 and 2022 are introduced to identify how the pandemic impacted not only daily activity and travel patterns but also the intentions of visiting Japan in the post-pandemic period. Finally, we summarize the challenges that we should verify to support inbound tourism restoration policies.

Keywords: COVID-19's long-term impact, inbound tourism from China, post-pandemic tourism policy, visit intention, cross-sectional survey data

1. Introduction

In Japan, since the state of emergency due to the COVID-19 pandemic was declared on April 16, 2020, we have experienced several pandemic waves due to the emergence of new types of coronaviruses. The eighth wave of the pandemic caused by the XBB.1.5 subvariant in November 2022 is heading to a conclusion by mid-March 2023 [1]. The impact of the COVID-19 pandemic over a period of more than three years on socioeconomic activities is evidently significant enough to trigger not only changes in the attitude toward the risk of being infected in daily activities and travels in the short term, but also those in both their intentions and their real behavior patterns and lifestyles in the long term, that is, in the post-pandemic period [2]. Many analytical studies are attempting to quantitatively understand the actual conditions of changes in daily activity patterns during the pandemic period.

In the case of overseas COVID-19 impact studies, data collection and surveys on people's attitudes toward the risk of infection and changes in their activity and travel

behaviors have been successively conducted since the WHO declared the COVID-19 pandemic on March 11, 2020. Following this data collection, many empirical results from studies on the relatively short-term impact of the COVID-19 pandemic were reported at several workshops and conferences, such as the ERSA Workshop [3] and TRB Annual Meeting [4]. These studies were mainly concerned with behavioral changes, comparing data from the pre-pandemic period with those after the first pandemic peak (i.e., from June to August 2020).

Against this background, this study aims to examine the prospects for a post-pandemic recovery in tourism demand for visiting Japan from China and to clearly identify the challenges of achieving sustainable and resilient inbound tourism destinations in Japan. While COVID-19's long-term impact is of particular concern in our study, let us explain that such a dynamic process would be founded on the hypothesis that both the repeated appearance of a new type of coronavirus and the related preventative policies trigger changes in activity and travel patterns, which would be partially established throughout the pandemic period with multiple waves, and become common as a lifestyle called the New Normal in the post-pandemic period. It is also hypothesized that such a shift to the New Normal should be evaluated as an inclusive and long-term impact, taking into consideration the effects of socioeconomic circumstances such as an aging society with fewer children, digital communication innovation (called DX [Digital Transformation]), and a low-carbon society with the GX [Green Transformation]). To examine the long-term impact on tourism demand for visitors to Japan (abbreviated as VTJ) from China, our study quantitatively identifies relationships among various kinds of factors related to COVID-19 impacts over time. Specifically, we empirically analyze both changes in attitudes toward COVID-19 risks and those in daily activity and travel behaviors in response to governance measures over the past three years. Based on the results of the 2020/2022 web-based survey data analysis, we intend to specify the factors and preconditions that determine the long-term impact of COVID-19 on VTJ demand from China and summarize the challenges toward sustainable tourism destination management in the post-pandemic period.

Since 2019, we have addressed the demand for integrated mobility services, targeting VTJ tourists from China (see refs. [5, 6]). This preceding study motivated us to our current COVID-19 impact analysis. As the COVID-19 pandemic occurred in China at the end of December 2019, we decided to add COVID-19-related items to the 2020 web-based survey and judged the timing of the survey implementation considering the actual conditions of the pandemic in the three targeted cities (Beijing, Zhejiang province, and Jiangsu province). The 2020 web-based survey was conducted at the end of November 2020, when the first wave of the pandemic was settled and these cities were released from severe behavioral restrictions, such as lockdowns in the district [7, 8]. In this study, as mentioned in the following section, the second web-based survey conducted in mid-April 2022 targeted seven cities, adding four cities (Shanghai, Guangdong, Shandong, and Liaoning provinces) to the three previous ones [8]. The 2022 data used for our COVID-19 impact analysis were compared with those of the 2020 web-based survey. Therefore, this study intends to explore the actual changes in not only people's daily activity and mobility patterns and their intentions of domestic and overseas tourism travel at two points in time, but also their intentions of VTJ travel under the condition that overseas travel restriction measures such as entry/exit visa restriction and quarantine would be lifted due to the reduction in the risk of COVID-19 infection.

2. Literature review

2.1 Review of COVID-19 impact studies in Japan

Various COVID-19 studies in Japan have been triggered by the "arrival of the corona disaster" in which the government made an emergency declaration for the first pandemic and decided to promote preventative measures, such as behavior restriction, self-restraint from going out and the three Cs, "Closed spaces, Crowded places, and Close contact," in April 2020 [9].

They launched a data collection and survey in three sectors, industry, public, and university. For example, the infrastructure planning division of the Japan Society of Civil Engineering (JSCE) established a special COVID-19 committee to conduct a consecutive survey by getting a private surveying-expert company (Survey Research Center Co., Ltd.) to cooperate nine times from April 2020 to December 2022 almost every three to five months [10]. These efforts include a fundamental report on the actual changes in activity and travel patterns due to the first pandemic, focusing on the causality between perceived risks, attitudes toward governance/self-restraint measures, and real behavioral changes [11]. Okamoto, a SRC researcher, addressed the effects of repeated pandemic waves on travel demand and mobility patterns using not only consecutive data but also other mobile spatial statistics data [12].

In addition, we can find a few detailed analyses of the influence of psychological factors such as individuals' perceived risks/attitudes toward the pandemic on actual behavioral changes in their daily lives using the survey data (see refs. [13, 14]). There are several studies on the long-term impact of the pandemic focusing on the WFH (working from home) and WFA (working from anywhere) practices. For example, in Hirose et al. [15] and Isaka et al. [16], the authors attempted to examine the behavioral characteristics of the WFH/WFA practices during the pandemic by applying their developed simulation models. The scenario-analytic approach is also applied to identify such long-term impacts in the post-pandemic period, although it is unclear how the term 'post-pandemic' would be defined in this paper [17].

COVID-19's impact on individuals' daily activity patterns can be characterized by changes in their attitudes toward the risk of the spatial and temporal spread of the pandemic waves and changes in actual behavioral patterns due to the spread of the novel coronavirus infection. Such an impact is peculiar not only to the targeted city/country but also to the point of time during the pandemic. Therefore, there is a significant difference in actual behavioral patterns, such as activity and mobility frequencies, time use, and time allocation by city/country by point of time during the pandemic. Moreover, as public preventative measures tend to be implemented in response to the extent of COVID-19 infection on a spatial scale by point of time, these governance measures would partly motivate individuals to change their attitudes/intentions toward the pandemic.

It should be noted that, in the case of Japan, they do not include such a drastic measure as the 'lockdown' applied in the US and European countries but consist of relatively moderate ones such as the government's request to restrict being out, shortened business hours, and various types of public policies, (for example, regulation, incentives, and enlightenment). A variety of changes in both attitudes toward these governance measures and actual activity and travel behaviors can be seen as short-term impacts of the pandemic in Japan. Additionally, it becomes more essential to identify how these moderate governance measures affect individuals' attitudes/

preferences, and how they would result in actual changes in their preventative behaviors (for example, self-restraint). Furthermore, it is an important challenge for us to obtain findings from the analysis on how consecutive changes in activity and travel patterns would remain in the post-pandemic era.

The emergency declaration for the first wave in Japan, in which the government requested self-restraint and promoted the introduction of telecommuting such as WFH and WFA as part of the three Cs measures, had a great effect on people's daily activity patterns, covering most trips in commuting, shopping, and eating. Particularly, the introduction of teleworking in the central core of a metropolitan area caused a decrease in the number of passengers by urban rails and in the number of visitors near terminal stations in the city center.

This effort was reported at a symposium held by the Japan Transport and Tourism Research Institute (JTTRI) in October 2020. Morichi had a keynote entitled 'The COVID impact on the demand for urban rails and the trend of urban structure," which led them to exchange their opinions at the panel discussion [18]. The agenda was to identify how we should share information on the actual situation of urban rail transport demand during the pandemic in Tokyo and discuss the impact on the urban structure in the ongoing—/post-pandemic era. Other members of the JTTRI also intended to empirically analyze the actual conditions of the number of passengers getting on and off at the gate of the targeted station using gate-tracking data during the pandemic (see refs. [19, 20]). There are several current studies on the long-term impact of commuters' teleworking on the urban structure and related changes in residential location choice behaviors [21–23]. Accessing the data on passengers passing through railway station ticket gates may not be easy; however, if possible, it would be expected to advance policy studies on office-space relocation and commercial service innovation near rail terminal stations in the post-pandemic period.

2.2 Review of COVID-19 impact studies abroad

The Organization for Economic Co-operation and Development (OECD) organized the International Transportation Forum, titled "COVID-19 TRANSPORT BRIEF," in May 2020 [24]. The forum discussed the basis of re-spacing cities for resilience: Three keywords, "react," "reboot," and "rethink" were proposed as the triple challenge that cities must meet to continue as catalysts for creating socioeconomic activity despite new health imperatives.

Palma et al. reviewed the effects of COVID-19 on mobility and lifestyle 18 months after the outbreak [25]. Short-term effects are mainly the direct ones, such as teleshopping, teleworking, air pollution, road transportation, and air travel, due to restricted mobility. On the other hand, the medium and long-term effects are regarded as indirect ones such as car ownership, employment rate, poverty, inequality, house price, relocation, and the necessity of re-designing urban spaces. They concluded that recognizing the negative effects of COVID-19 is a significant determinant of reducing the negative changes in mobility and lifestyle that affect the evaluation of individuals' psychological and social well-being.

They also discussed the challenges in simultaneously addressing the effects of COVID-19 on mobility and lifestyle. The first is the requirement of appropriate data and methodology to measure and monitor trends in changes during and after the pandemic. Second, societies would have to learn how to cope with these new structural dimensions under the remaining uncertainty, even if these changes could be measured using appropriate data and statistical modeling. During the COVID-19

pandemic, we faced not only risks but also uncertainty. The attacks of the different variants of COVID-19 showed that global changes varied to some extent under each variant. This made it difficult to assess the long-term effects. In this situation, governments are confused and cannot decide whether schools and universities should remain open and/or whether teleworking should be permanent.

Tevetkove et al. discussed the implications of the pandemic on the governance of passenger mobility innovations, such as MaaS (Mobility as a Service) in Europe [26]. They explored the challenges, barriers, and risks that the new regulatory framework must address to deploy disruptive mobility innovations. The authors' view is that, while MaaS has recently disrupted the passenger transportation sector and led requiring new and improved governance models, the COVID-19 pandemic can be seen as another disruption, stressing the need for more proactive and inclusive governance. The ongoing COVID-19 pandemic and corresponding mobility restrictions have apparently added an additional "unknown" into the already challenging mix of what the governance of disruptive mobility innovations needs to address and prioritize.

They also addressed the triggering of improved mobility service innovations by COVID-19 to progress public efficiency in the use of urban transport infrastructure, and the provision of an experimental platform, thanks to COVID-19, for the development of a new governance model essential for achieving a sustainable urban society in the future.

Hensher deliberated the role that MaaS may play post-pandemic by introducing the results of a COVID-19 impact study in Australia [27]. He aimed to explore how to reboot MaaS and rethink the overall picture of public transport by adopting the contextual approach, in which the following two scenarios were proposed: (1) business as usual, and (2) a significant change in the mobility framework. The latter is that, in a post-pandemic society, shared modes are less attractive, and WFH takes on an increasingly popular status among both employees and employers. He argued that the "new normal" offers opportunities never before achievable in terms of taming congestion on roads and crowding on public transport and that this opportunity should not be frittered away.

The primary results indicate that many sectors, such as the technology sector, have supported WFH since the pre-COVID-19 period. They also showed that WFH is expected to be a new policy lever that benefits the transport network.

These debates about the long-term impact of COVID-19 on MaaS were based on the results from the contextual approach; however, these results can indicate the preconditions with which MaaS should be equipped in response to social structure transformation, such as social distancing and WFH expansion, post-pandemic.

Mohammadi et al. focused on the long-term impacts of COVID-19 on telecommuting behaviors in the United States [28]. They implemented a comprehensive multi-wave nationwide panel survey, mainly collecting activity-based time-use data for 2020 and 2021. A panel Generalized Structural Equation Model (GSEM) was used to investigate the effects of two perceptual factors on telecommuting behavior: (1) perceived risk of COVID-19 and (2) perceived telecommuting productivity. They revealed the significant and positive impacts of productivity and COVID-risk perception on these WFH types of telecommuting behaviors. Moreover, the findings indicate that telecommuting frequency is expected to increase in the post-pandemic era, with differences across socioeconomic groups.

International collaborative studies on COVID-19 impacts supported by the World Conference on Transport Research- Special Interest Group; WCTR-SIG (organized by Zhang and Hayashi [29]) have successively produced the results of their efforts, and

Ma et al. reported their empirical analysis of the short-term impact of the first pandemic worldwide [30].

2.3 Review of COVID-19 impact studies in China

Many studies have been conducted on the effects of the COVID-19 pandemic on mobility in China. Pan et al. examined how COVID-19 changed residents' mobility using cellular signaling data from the Greater Bay Area in China [31]. The findings revealed that the COVID-19 effect on core cities was larger than that in peripheral areas and that the frequency of non-commuting travel displayed a downward tendency. Liu et al. focused on how elderly people adapted their mobility patterns and travel behaviors in Kunming, China, during the COVID-19 pandemic [32]. The results indicated that individuals older than 60 years faced challenges in riding public transport. Another study Tan et al. [33] found that Chinese mobility in 2020 was a tale of four phases, with different levels and patterns of mobility shifts. The cellular signaling dataset was used to analyze the specific properties of imparity in response and adaptation to the pandemic across cities. Zhang et al. applied a weighted stochastic block modeling approach to analyze the intercity mobility network in China in early 2020 [34]. Four types of network blocks were identified based on the mobility patterns and geographic locations of the cities. Both the COVID-19 outbreak and travel restrictions significantly disrupted the original hierarchy of the intercity mobility network in China, resulting in more local or regional fragmentation of the network, even in the recovery stage.

As for tourist mobility impact studies, Yu et al. depicted the actual changes in mobility after two waves of the COVID-19 outbreak in China using three years of cell phone data [35]. The article revealed that the number of domestic tourists in Beijing after the outbreak was higher than the pre-pandemic level, indicating a strong recovery in tourism demand. It was concluded that female and older tourists were more vulnerable to the attack in the early stages of COVID-19 but reversed their behaviors one year later, suggesting a dynamic adaptation of tourists' preferences and risk perceptions.

Zhong et al. reviewed the existing literature on tourism crisis management, focusing on the impact and implications of COVID-19 on the global tourism industry [36]. This study found that COVID-19 created opportunities for tourism stakeholders to rethink and reshape their tourism practices, such as enhancing health and safety standards, adopting digital technologies, and strengthening collaboration and coordination. Li et al. explored tourism destination management after the COVID-19 pandemic in a case study of reopened tourism destinations in China [37]. This study proposed a four-stage framework for managing tourist destinations during and after a crisis. In terms of people's willingness to travel, Hao et al. probed how COVID-19 affected people's willingness to travel for tourism based on a survey of Chinese residents in 2020 [38]. A structural equation model (SEM) was used to examine the relationships between environmental and personal factors, perceived risk and value, and willingness to travel. Perceived risk mediated the effects of environmental and personal factors on both perceived value and willingness to travel. Hong et al. applied an importance-performance analysis to evaluate the impact of bed-and-breakfasts on tourist satisfaction in Zhejiang [39].

Since the outbreak, the recovery of the tourism industry has received increasing attention. Shao et al. conducted a co-word analysis to map the topics of 140 tourism recovery policies in China [40]. Chinese tourism preferences were reflected in two

rounds of nationwide online surveys in 2020 by Huang et al. [41]. The COVID-19 pandemic significantly affected tourists' travel motivations, destination choices, travel modes, information sources, and health concerns. Related implications of these shifts toward tourism recovery are also discussed. Research conducted in the literature [42] examined urban and rural tourism in China at different stages of the pandemic based on a content analysis of news reports. COVID-19 caused a sharp decline in urban and rural tourism activities but stimulated some new trends and opportunities, such as online tourism, self-driving tourism, rural revitalization, and smart tourism. They suggested that tourism stakeholders adopt a holistic, collaborative, and innovative approach to promote recovery. McCartney identified challenges and opportunities for Macao's tourism industry during and after the lockdown, such as the loss of revenue the need for innovation, and the potential for diversification [43]. Wen et al. predicted the potential effects of COVID-19 on the lifestyles and travel of Chinese citizens through a scenario analysis [44]. First, travelers' consumption patterns, such as the growing popularity of independent travel and wellness tourism, may vary. Second, new forms of tourism including slow tourism may drive future tourism activities.

3. Basic results from the 2020 and 2022 data

3.1 The outline of used 2020/2022 WEB-based data

Table 1 shows the distributions of individual attributes in the web-based datasets for 2020 and 2022. These datasets were not adaptive enough to prepare common designs and implementations in advance but resulted in the ad hoc addition of targeted cities in response to the spread of the pandemic in China. The questionnaires contained in the 2022 survey sheets were partly modified based on lessons from those of 2020, and the number of targeted cities increased from three in 2020 to seven in 2022. In addition, the web-based sampling in 2020 was different from that in 2022; significantly different patterns of sample distributions by gender, age, and whether students or not, between these two datasets, respectively, are shown in **Table 1**.

Individual attributes	**2020 DATA**		**2022 DATA**
Number of samples Targeted cities	Total: 1050 individuals [=350per city × 3 cities] Zhejiang, Beijing, Jiangsu		Total: 2450 individuals [=350per city × 7 cities] Zhejiang, Beijing, Jiangsu, Shanghai, Guangdong, Sangdong, Liaoning
Gender	male	50.3%	60.3%
	female	49.7%	39.7%
Age (6 classes)	less than 25 yrs. old	15.7%	1.8%
	25–34 yrs. old	28.1%	41.8%
	35–44 yrs. old	25.4%	33.2%
	45–54 yrs. old	30.8%	16.9%
	55–64 yrs. old	0.0%	5.0%
	over 65 yrs. old	0% (not applicable)	1.3%

Individual attributes	2020 DATA		2022 DATA
Age (3 classes)	less than 35 yrs. old	43.8%	43.6%
	35–65 yrs. old	56.2%	55.1%
	over 65 yrs. old	0.0%	1.3%
Yearly income	average (CNY/JPY)	121,800 CNY	180,600 CNY
		1,957,000 JPY	2,901,800 JPY
Household size	single-person	1.5%	1.4%
	two-persons	7.7%	13.5%
	three-persons	75.0%	65.4%
	four-persons	14.1%	15.8%
	five or more persons	1.7%	3.9%
LCS (Life Cycle Stage)	1. Younger single (younger person <50)	1.3%	1.4%
	2. Younger childless couple. (younger person <50)	5.8%	12.8%
	3. Three-generation family (youngest child <18 and living with grandparents)	7.0%	5.1%
	4. Pre-school nuclear family (youngest child <6)	18.6%	25.8%
	5. Young school nuclear family (youngest child ≥6 and < 12)	18.8%	20.9%
	6. Older school nuclear family (youngest child ≥12 and < 18)	17.1%	12.5%
	7. All adults (all ≥18)	27.9%	20.8%
	8. Single-parent and youngest child <18	0.8%	1.0%
Career (current state of individuals career, in Oct. 2020/April 2022)	company employee, government employee, and part-time job worker	79.8%	84.2%
	self-employee business	16.7%	12.6%
	Students	3.4%	0.0% (not applicable)
	others (full-time homemaker and retiree)	0.1%	3.2%

Table 1.
Sample profiles of the web-based survey datasets for 2020 and 2022.

3.2 The impact on commuters' mobility and activity patterns

We begin by introducing the trends in commuters' activities and travel behaviors by comparing the 2020 data with the 2022 data. The result from the 2020 web-based survey indicates that the average number of WFH days per week is only 0.95 days per week since the percentage without WFH (zero time per week) accounts for 57.6% and

the other two types are twice a week (15.1%) and once a week (13.6%). It also shows that there was no significant difference in trends among the cities targeted in the 2020 web-based survey. On the other hand, as shown in **Table 2**, the 2022 web-based survey indicated an increasing tendency (1.39 WFH days per week). We also found that the average number of WFH days per week in Shanghai is outstanding, accounting for 3.31 days per week. It is presumed that in the case of Shanghai, because the large-scale lockdown measures were applied in response to the spread of the pandemic by the appearance of the omicron-type variation in the survey period (in April 2022), such a specific situation of the pandemic would lead to that trend in the WFH practice in the city.

Table 3 shows the distribution of the commuting modes mostly used in the latest week of the 2022 data. The results show that the ratio of cars used for commuting exceeds 60% for both employees and the self-employed. Comparing these mode-use patterns by the target city in the 2020 data with the 2022 data, they tend to depend on the level of improvement in the transportation network system in the city. Particularly, in the case of the 2022 data, the car-use ratio reached 73% in both Guangdong and Liaoning. However, in the case of Shanghai, the car-use ratio was relatively low (51.2%), but the ratio of busses, including BRT (30.1%), was much higher than that of the other modes.

Next, focusing on the changes over the years in the COVID-19 pandemic impact on commuters' behaviors, we introduce the results from comparisons of 2020 and 2019, with the ratio of 2022 to 2021 regarding the changing patterns (decrease/unchanged/increase) of frequencies of WFH, business meetings, and public transport−/car-use.

Figure 1 shows the comparisons of the ratio of 2020 to 2019, with the ratio of 2022 to 2021 regarding the changing patterns of frequencies of WFH and business meetings. In the case of WFH, both "increase" and "decrease" changing patterns exist, depending on the pandemic situation and related restriction measures in the city. This means that, in the short-term range, the percentage of "the decreasing patterns of the WFH-frequency" (from the ratio of 2020/2019 to that of 2022/2021) would be higher if the pandemic situation improved, but on the other hand, the percentage of "the increasing patterns of the WFH frequency" would be higher if the pandemic situation

No. of days working home	Beijing	Shanghai	Guangdong	Zhejiang	Jiangsu	Sangdong	Liaoning	SUM
0 day	40.2%	9.3%	58.8%	46.0%	63.4%	68.0%	56.9%	50.0%
1 day	9.5%	4.1%	11.5%	16.1%	3.6%	10.2%	10.3%	9.5%
2 days	20.8%	14.9%	13.4%	17.9%	13.4%	12.9%	15.0%	15.5%
3 days	15.5%	30.1%	7.7%	10.6%	10.1%	4.2%	9.7%	12.1%
4 days	6.0%	4.5%	2.2%	6.5%	4.5%	1.8%	3.2%	4.1%
5 days	6.3%	34.9%	3.2%	2.9%	5.1%	2.4%	4.1%	7.7%
6 days	1.8%	1.1%	3.2%	0.0%	0.0%	0.6%	0.6%	1.0%
7 days	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
SUM	100%	100%	100%	100%	100%	100%	100%	100%
AVERAGE	**1.63**	**3.31**	**1.05**	**1.24**	**1.04**	**0.71**	**1.07**	**1.39**

≥40%, 30%≤ *<40%, 20%≤* *<30%, 15%≤* *<20%, 10%≤* *<15%.*

Table 2.
Distribution of WFH-days per week (2022 DATA).

Mostly used travel modes	Employees	Self-employed	Total
Walk(only)	0.8%	1.4%	0.9%
Bicycle	9.7%	9.0%	9.6%
Busses (BRT)	12.0%	3.5%	10.8%
Carterd busses	0.2%	0.3%	0.2%
Subways	10.0%	6.6%	9.6%
Rails	1.2%	0.0%	1.1%
Streetcars/LRT	1.0%	0.7%	1.0%
Taxi	1.4%	2.4%	1.6%
Cars	63.6%	76.1%	65.3%
Others	0.0%	0.0%	0.0%
SUM	100%	100%	100%
No. of individuals	1773	289	2062

≥15%, 10%≤ <15%, 7%≤ <10%.

Table 3.
Distribution of most-used modes for commuting (2022 DATA).

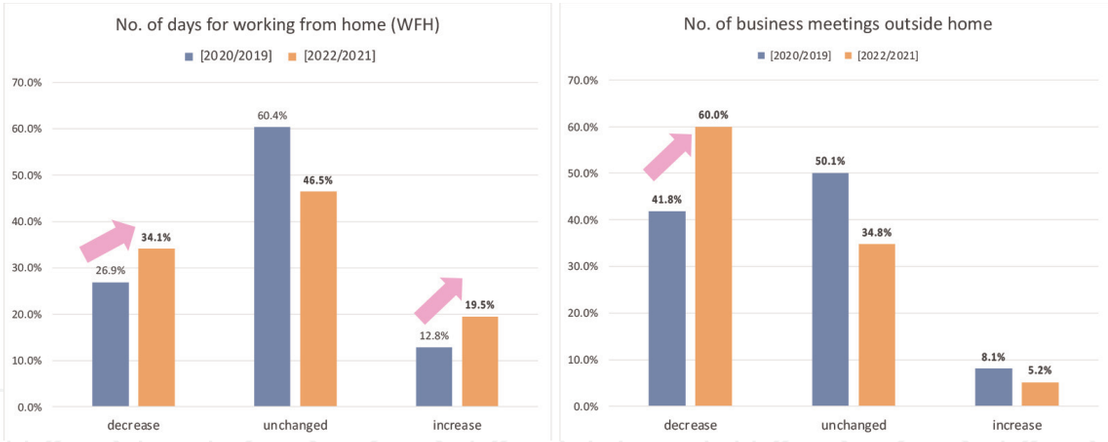

Figure 1.
The ratio of 2020/2019 and that of 2022/2021 regarding the changing patterns of frequencies of WFH and business meetings.

worsened. However, in the case of business meetings, the decreasing pattern from the ratio of 2020/2019 to that of 2022/2021 becomes higher over the years. This implies that these self-restrictive behaviors have gradually spread to working styles to reduce the risk of contagion. However, with the spread of the pandemic and related restrictive behavioral measures, many workers were deprived of going out for business meetings. In any case, it is not easy for us to reach a decision to forecast future trends in working styles, that is, how the WFH and business meeting frequencies per week would remain in China in the post-pandemic era. Therefore, it is essential to collect data on the changes in working styles in relation to the spread of the pandemic. In addition, we should turn our attention to other sociodemographic factors, such as ICT innovations and what types of industry can

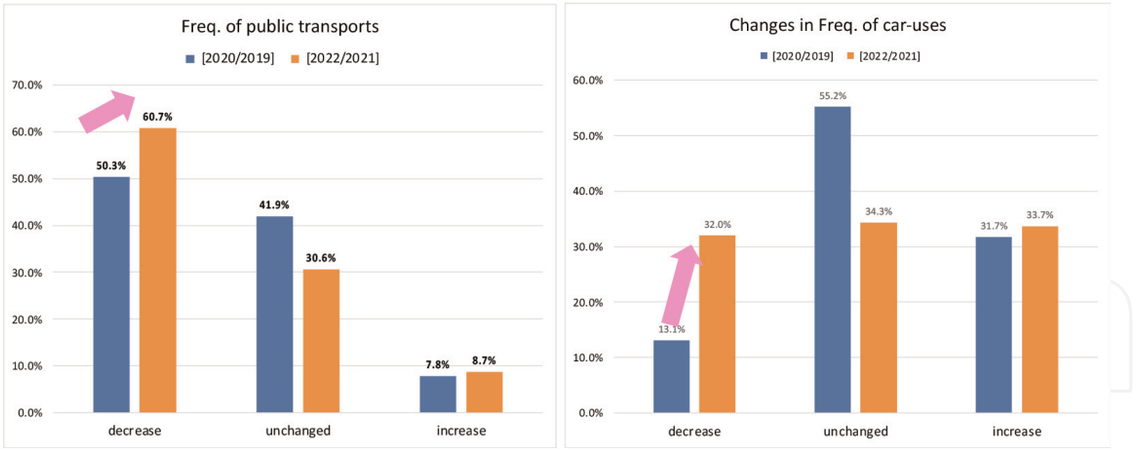

Figure 2.
The ratio of 2020/2019 and that of 2022/2021 regarding the changing patterns of frequencies of public transport- and car use in commuting.

allow high productivity of WFH, because they would clearly determine the future trend toward a post-pandemic society.

Figure 2 shows a comparison of the ratio of 2020/2019 with that of 2022/2021 regarding the changing patterns of frequencies of public transport- and car use in commuting. In the case of public transport use, we found the same changing pattern in the targeted cities in China as in European cities, as previously mentioned. People have shifted their commuting modes from public transport to their own cars. **Figure 2** also indicates that in the case of car use, the decreasing patterns from the ratio of 2020/2019 to that of 2022/2021 become higher over time. This suggests that other reasons as to why they decreased car use may exist; for example, the decrease in the total number of commuting trips by car due to the penetration of WFH over the years, and the shift from cars to other modes such as e-scooters and e-bikes.

3.3 The COVID-19 impact on daily shopping behavior

Table 4 presents a comparison of the basic characteristics of shopping behavior during the last week between two points of time: 2020 and 2022. The table indicates that the average net value of shopping behavior frequencies in 2022 increases to 2.37 in three cities, compared with the value of 1.93 in 2020. This implies that the COVID-19 impact had been slightly relieved, showing signs of returning to previous shopping patterns.

No. of days /week for shopping	3 cities: 2020 DATA	3 cities: 2022 DATA	3 cities: 2022 DATA
The percent of '0 day in a week'	8.8%	4.6%	14.4%
AVERAGE [Gross]	1.76	2.26	1.98
AVERAGE [Net]	1.93	2.37	2.32

Note: 3 cities: Beijing, Zhejiang, and Jiangsu (targeted cities in 2020 DATA).
7 cities: Shanghai, Guangdong, Shandong, and the above 3 cities.

Table 4.
Frequency of days going out for shopping in the latest week.

On the other hand, **Figures 3** and **4** show the comparisons of the ratio of 2020/2019 with that of 2022/2021 regarding the changing patterns of both frequencies of shopping trips per week and those of public transport- and car use, respectively. **Figure 3** indicates that in the case of shopping trips per week, the percentage of the decreasing pattern from the ratio of 2020/2019 to that of 2022/2021 increases by 22 points over the years. This may pose a question to us: How can we explain why the average number of days per week going out for shopping would increase, although the decreasing pattern increases over the years? We cannot definitely state anything at this moment, because we lack an understanding of shoppers' state dependencies under the different situations of the pandemic over the years.

Figure 4 shows a comparison of the ratio of 2020/2019 with that of 2022/2021 regarding the changing patterns of frequencies of public transport- and car use in shopping trips. **Figure 4** indicates that the result of the mode-use pattern for shopping trips has a similar tendency to that of commuting trips, as shown in **Figure 2**. When focusing on the extent to which the decreasing pattern of public transport use has changed over the years, the percentage of shopping trips increased by 17 points, but that of commuting trips increased by 10 points. This implies that the changing pattern in shopping trip frequency is more sensitive than the commuting trip frequency.

Next, we introduce the results of the COVID-19 impact on the attitude and perception of the risk of coronavirus infection in daily shopping activities and travel patterns, using the datasets of the web-based survey at two points in time. **Table 5**

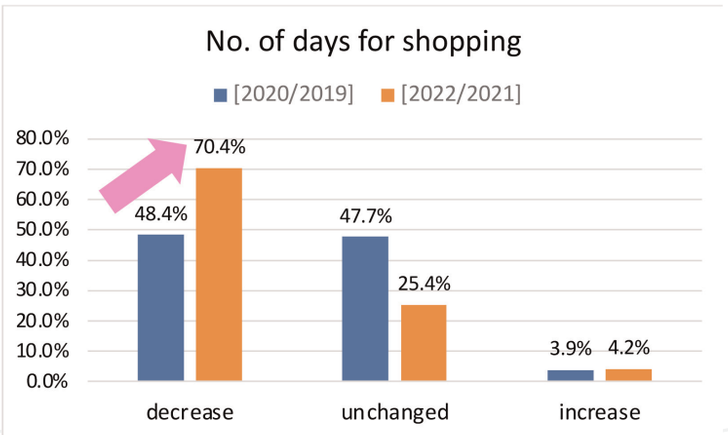

Figure 3.
The ratio of 2020/2019 and that of 2022/2021 regarding the changing patterns of frequencies of shopping trips per week.

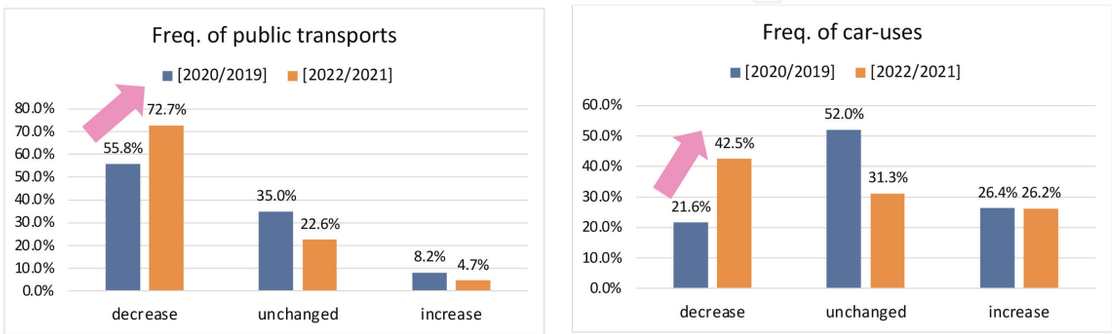

Figure 4.
The ratio of 2020/2019 and that of 2022/2021 regarding the changing patterns of frequencies of public transport- and car use in shopping trips.

Reason for 0 day for shopping	Beijing	Shanghai	Guangdong	Zhejiang	Jiangsu	Sangdong	Liaoning	SUM
abstain from going out	75.9%	69.2%	40.5%	42.9%	58.3%	42.1%	58.5%	60.2%
take delivery services	17.2%	27.3%	31.1%	42.9%	33.3%	31.6%	26.8%	28.0%
not necessary to go out	6.9%	3.5%	28.4%	14.3%	8.3%	26.3%	14.6%	11.9%
SUM	100%	100%	100%	100%	100%	100%	100%	100%

Table 5.
Distribution of the primary reasons for respondents not going shopping in the latest week (2020 DATA and 2022 DATA).

shows a comparison of the distribution of the primary reasons why each individual did not go shopping in the last week of 2020 and 2022. In the case of the 2020 data, the top-ranking reason is, "'I happened to not need to go shopping by myself or I asked my family member to do it," accounting for 42.4%. The second reason is "I use delivery services instead of going out for shopping as much as possible" (30.4%), and the third is "I abstain from going out for shopping with the intention of avoiding the COVID-19 infection risk" (27.2%). On the other hand, in the case of the 2022 data, the top-ranking reason is "I abstain from going out shopping" and the percentage jumped to 60.2%; on the contrary, the percentage of the reason "I happened to not need to go shopping by myself" dropped to 11.9%.

Our surveys asked respondents to answer the question of how they mitigated COVID-19 risks during their daily shopping activities and travel behaviors in the last week. **Figure 5** shows the distribution of behavioral attitudes toward COVID-19 in daily shopping activities and mobility, choosing the corresponding alternative from the following six options:

Alternative 1: I try to abstain from going out for shopping with the intention of avoiding COVID-19 infection risk and/or I take delivery services instead of going out for shopping as much as possible.

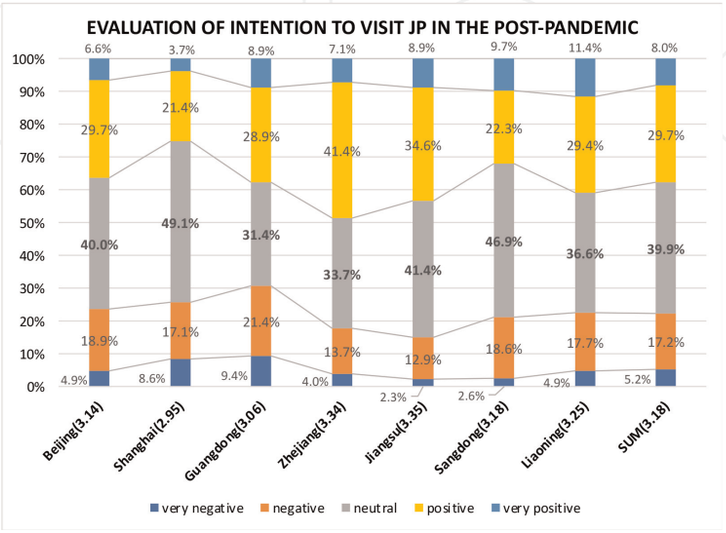

Figure 5.
Distribution of the intention of visiting Japan and the average of evaluated scores under the improved situation of the COVID-19 pandemic by targeted city (2022 DATA).

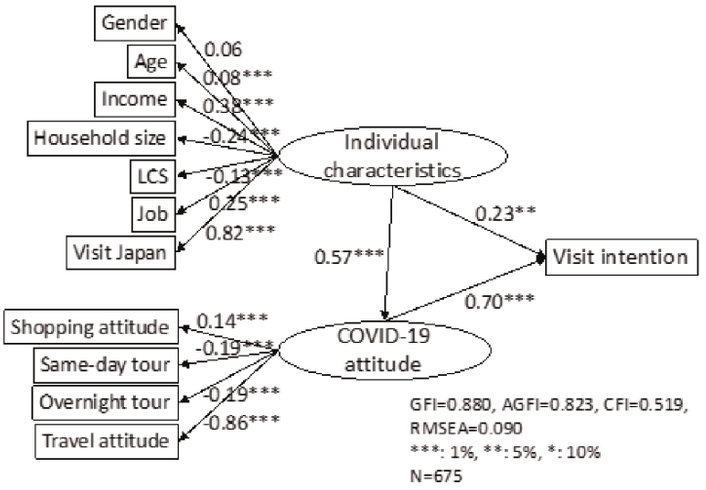

Figure 6.
Result of the standardized parameter estimates of the SEM-model (in case of the 2020 DATA).

Alternative 2: I try to avoid using congested public transport (busses and subways) to access shopping places.

Alternative 3: I avoid shopping at congested supermarkets and shops.

Alternative 4: I try to reduce the duration of staying in shopping places.

Alternative 5: I try to maintain social distancing between people and wear a mask.

Alternative 6: Others (other reactions/behavioral attitudes toward COVID-19 infection risk).

Figure 6 indicates that these behavioral attitudes in both the 2020 and 2022 data were distributed equally, except for the sixth alternative (others). The percentage of Alternative 5, "I try to keep social distancing between persons and wear a mask," increases from 12.5% in 2020 to 25.8% in 2022, and the percentage of Alternative 1, "I try to abstain from going out for shopping," does from 13.1% to 17.9% as well. This implies that attitudes toward COVID-19 infection risk in relation to daily shopping behaviors vary widely; however, it takes a long time for individuals to respond to the spread of the pandemic and related governance measures in China (**Table 6**).

How to care for COVID-19?	2020 DATA	2022 DATA
abstain from going out shopping	13.1%	17.9%
avoid using public transit	22.5%	18.0%
avoid the congested	26.9%	19.2%
diminish the duration	25.0%	19.1%
put on mask	12.5%	25.8%
other reactions of COVID-19	0.0%	0.0%
SUM	100%	100%

Table 6.
Distribution of behavioral attitudes toward COVID-19 in daily shopping activity and related mobility (2020 DATA and 2022 DATA) (multiple answers).

4. Discussion: the long-term impact of COVID-19 on the intention of visiting Japan

4.1 The pandemic risk and intention of overseas travel (including visit-to-Japan tours)

Our web-based surveys in 2020 and 2022 matched the timing of implementation with the spread of the pandemic and corresponding governance measures in China, respectively. The 2020 web-based survey was conducted in November 2020. This timing was chosen because the government declared a victory over the first wave of the COVID-19 pandemic at the National People's Congress in May 2020 and celebrated the containment of the pandemic in July 2020 through governance measures (such as gate-checks by introducing health care app and an automatic tracking system) were successively led to relieve behavioral restrictions in the targeted cities of China until the end of October 2020.

However, when we started to design questionnaires for the 2022 web-based survey, they experienced the rapid spread of COVID-19 owing to the appearance of new types of coronaviruses in China. Under the circumstances of the return of the pandemic to China, the Chinese government had been maintaining the zero-coronavirus measure, that is, the perfect lockdown in the infected districts/cities, including traffic restriction/prohibition and quarantine/isolation rules. As a result, many cities in China are diversifying both the inhabitants' attitudes toward infection risks and actual behavioral changes.

In the 2022 WEB-based survey, respondents answered questions about the perceived level of COVID-19 infection in their residential areas. The perceived level was classified into seven categories: Level 1 (no restriction but social distancing) to Level 7 (lockdown in the whole city). **Table 7** shows the distribution of the levels of respondents' perceptions of the spread of COVID-19 infection in the whole of 7 targeted cities. **Table 8** presents the city distributions.

Table 7 indicates that the percentage of relatively low levels of perceived infection (from Level 1 to Level 3) only accounts for 50%, and the remaining half of the respondents perceived more severe levels of COVID-19 infection in their residential districts/cities. **Table 8** indicates that in Shanghai, the percentage of such low levels of infection is only 25%, but that of the middle levels (levels 4 and 5) accounts for

Level (4 classes)	Level (7 classes)	Level of restriction for COVID-19 in surveyed point in time {2022DATA}	SUM
Lowest	Level 1	no restriction but social distances	3.4%
Low	Level 2	health-coding identification required	27.0%
	Level 3	restrictive to use facilities	19.2%
Middle	Level 4	promoting remote-work and stay-home	29.2%
	Level 5	restriction on the movement (permission required)	13.2%
High	Level 6	prohibition on the movement in a specific district	4.8%
	Level 7	lock-down in the whole city	3.1%
		SUM	100%

Table 7.
Distribution of levels of behavioral restrictions as an indicator of the perceived COVID-19 infection.

	Level	Beijing	Shanghai	Guangdong	Zhejiang	Jiangsu	Sangdong	Liaoning
1	Level 1	5.4%	2.3%	3.4%	5.7%	2.9%	3.1%	1.1%
2	Level 2	25.7%	12.9%	27.4%	38.6%	19.7%	39.7%	25.1%
3	Level 3	15.1%	12.0%	26.9%	15.1%	22.6%	22.0%	20.9%
4	Level 4	34.0%	44.3%	33.7%	22.0%	26.9%	19.7%	23.7%
5	Level 5	11.7%	14.6%	6.6%	10.6%	18.9%	10.3%	20.0%
6	Level 6	5.4%	7.4%	1.7%	4.0%	5.7%	2.9%	6.6%
7	Level 7	2.6%	6.6%	0.3%	4.0%	3.4%	2.3%	2.6%
		100%	100%	100%	100%	100%	100%	100%
	average	3.47	4.05	3.19	3.21	3.70	3.12	3.66

≥40%, 30%≤ *<40%, 20%≤* *<30%, 10%≤* *<20%, 5%≤* *<10%.*

Table 8.
Distribution of levels of behavioral restrictions as an indicator of the perceived COVID-19 infection by targeted city.

approximately 60%. The table also indicates that the perceived levels of infection were widely distributed in other targeted cities.

In China, the government tends to invoke strong-arm political tactics to achieve complete prevention against the pandemic, but at the same time, the people have often suffered from lack of information about the actual spread of the pandemic and a tight situation for beds in hospitals. Such problems, although specific to China, maybe one of the causes of diversification in the perception of the COVID-19 pandemic and attitudes toward infection risk.

Next, we introduce results on how Chinese individuals intend to travel overseas during the current situation of COVID-19, that is, at the surveyed point in time (November 2020 in the case of the 2020 data and March 2022 in the case of the 2022 data). The question was 'How do you think your overseas travel is in the current situation?' A single answer was selected from the following five alternatives:

Alternative 1: '1. cannot think of my overseas travel for a while.'
Alternative 2: '2. it is difficult to think about my overseas travel'.
Alternative 3: '3. unwilling to think my overseas travel'.
Alternative 4: '4. would reduce overseas travel opportunities'.
Alternative 5: '5. would like to positively think my overseas travel'.

How do you think your overseas travel under the current situation of COVID-19?	2020 DATA	2022 DATA
(1) can not think about my overseas travel	18.6%	18.3%
(2) difficult to think about my overseas travel	37.7%	32.2%
(3) not willing to think about my overseas travel	10.2%	9.2%
(4) reduce overseas travel opportunity	10.9%	14.2%
(5) would like to enjoy my visit to Japan	22.7%	26.1%
SUM	100%	100%

Table 9.
Distribution of the intention of overseas travel during the current situation of the pandemic (2020 DATA and 2022 DATA).

How do you think overseas travel?	Beijing	Shanghai	Guangdong	Zhejiang	Jiangsu	Sangdong	Liaoning
(1) can not think overseas travel	17.4%	20.3%	13.7%	15.7%	18.3%	23.7%	19.1%
(2) difficult to think overseas travel	28.0%	32.3%	32.9%	38.9%	28.0%	37.7%	27.7%
(3) unwilling to think overseas travel	10.9%	9.4%	15.4%	8.6%	6.0%	5.7%	8.3%
(4) reduce overseas travel opportunity	21.4%	12.3%	15.7%	15.4%	12.3%	10.9%	11.4%
(5) would like to enjoy visiting Japan	22.3%	25.7%	22.3%	21.4%	35.4%	22.0%	33.4%
	100%	100%	100%	100%	100%	100%	100%

≥35%, 30%≤ <35%, 25%≤ <30%, 20%≤ <25%, 15%≤ <20%, 10%≤ <15%, 5%≤ <10%.

Table 10.
Distribution of the intention of overseas travel during the current situation of the pandemic by targeted city (2022 DATA).

Table 9 shows distributions of the intention of overseas travel under the current situation of the pandemic at two points of time; 2020 data and 2022 data. **Table 10** indicates the result of such distribution by city in the 2022 data. **Table 9** results that those intentions of overseas travel in the current situation in China vary widely between alternatives and that there is little difference in distribution and ordering between the two points of time.

It is however noted that when our dividing such distribution of the intentions into two parts; 'negative' (Alternative 1 and 2) and 'positive' (Alternative 3, 4, and 5), the percentage of 'negative' versus the one of 'positive' in 2020 is 56.3% versus 44.7%, but on the other hand, 50.5% versus 49.5% in 2022 and that the percentage of 'positive' in 2022 increases with 5 points comparing with that in 2020. **Table 10** also indicates that in the case of the 2022 data, the distributions of such intentions by target city differ significantly from each other. These results may partly reflect the heterogeneity of individuals' behavioral attitudes toward COVID-19, assuming that such heterogeneity could be created through various changes in socioeconomic circumstances due to COVID-19 infection in the city.

In both our web-based surveys in 2020 and 2022, we asked a question about the intention to visit Japan under the precondition that the COVID-19 situation would improve and overseas travel restrictions would be lifted. Each respondent answered this question on a five-point Likert scale ranging from 1 (very negative) to 5 (very positive).

Let us denote three groups; "negative group," "neutral group," and "positive group." The negative group is here defined as those who select "1. very negative" and "2. negative." On the other hand, the positive group contains those who select "4. Positive" and "5. very positive" and the neutral group is equal to "3. neutral."

Table 11 shows a comparison of the distribution of the intention to visit Japan and the average of the evaluated scores under the improved situation between the 2020 and 2022 data. **Figure 5** shows the distribution of these intentions and the average for the targeted city. Each respondent answered the question under the hypothesized situation of the pandemic, that is, under the condition that the situation surrounding the COVID-19

Evaluation of intention to visit JP	2020 DATA	2022 DATA
1 very negative	6.4%	5.2%
2 negative	13.0%	17.2%
3 neutral	27.8%	39.9%
4 positive	40.9%	29.7%
5 very positive	12.0%	8.0%
SUM	100%	100%
AVERAGE	3.39	3.18

Table 11.
Distribution of the intention of visiting Japan and the average of evaluated scores under the improved situation of the COVID-19 pandemic (2020 DATA and 2022 DATA).

pandemic could be improved. The results indicate that the percentage of positive intention to visit Japan in the 2022 data decreases by 15.2 points, but that of neutral intention increases by 12.1 points. This implies that such negative changes in attitudes toward overseas travel occurred partly because of the prolonged impact of the pandemic.

Figure 5 indicates that, in the case of Shanghai, the average evaluated score of intention to visit Japan under the improved situation is 2.95 in 2022 data and it was the lowest among all the targeted cities. We may say that the seriousness of the pandemic in many districts of Shanghai in those days may be one of the causes of such a low intention to visit Japan, even in an improved situation. On the other hand, in the case of Zhejiang and Jiangsu, the average scores are highly regarded; 3.34 in Zhejiang and 3.35 in Jiangsu. The results suggest that the actual situation of the pandemic had relatively gone into remission in those days, and the attitudinal factors regarding the risk of uncertainty of COVID-19 could have restrained its performance. In addition, the negative factors determining the intention to visit Japan under the improved situation were also controlled.

Selecting the subsamples from our pooled 2020 and 2022 datasets, the SEM-model (SEM; Structural Equation Modeling) is here applied to identifying the causal structure underlying the intention of visiting Japan in anticipation of the post-pandemic. SEM studies have recently spread the range of fields applied not only to travel behavioral data but also to tourism marketing data. This is partly because statistical software packages, such as IBM SPSS Amos [45], have become more popular in these fields [46–47]. Kurihara et al. also developed an SEM model to explore the causal relationship between integrated mobility services and the intention to revisit Japan using 2019 interview survey data from Chinese tourists who visited Japan and left Osaka International Airport (KIX) for China [48]. Basically, the causal structure of our developed SEM model is similar to that of the previous model, which is featured with simplification for the purpose of verifying the basic causality between the COVID-19 impact and the intention of visiting Japan in the post-pandemic period.

In our developed SEM model, there are two latent variables: One is called "Individual characteristics" and the other is "COVID-19 attitudes." These two variables play the role of latent factors that represent causality among the observed variables, such as the intention to visit Japan, the attitude and perception of the COVID-19 risk, and the experience of visiting Japan, including individual attributes. **Table 12** presents the definitions of the variables used in this study.

Figures 6 and **7** show the diagrams representing causal paths between "Intention of visiting Japan" and two latent variables revealing the estimation result of

Variable	Definition
Gender	l = male, 0 = female
Age	1 = 40, 50, 60's, 0 = 20, 30's
Income	1 = 1, 2 = 3,3 = 5, 4 = 7,5 = 9,6 = 12.5, 7 = 17.5,8 = 22.5,9 = 27.5,10 = 60 (thousand yuan)
Household size	l = single, 2 = two, 3 = three, 4 = four, 5 = more than five
LCS	l = family with children, 0 = others
Job	l = self-employee, 0 = others
Shopping attitude	l = abstain from going out for shopping, 0 = others
Same-day tour	l = decreased, 0 = other
Overnight tour	l = decreased, 0 = other
Visit intention	l = very negative to 5 = very positive
Travel attitude	l = abstain from travel abroad, 0 = others
Visit Japan	l = have been to Japan, 0 = have not been to Japan

Table 12.
Definition of used variables in the SEM model.

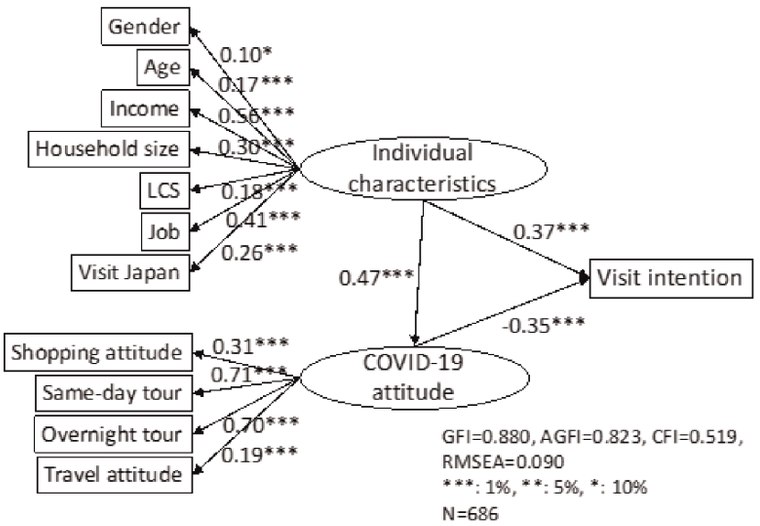

Figure 7.
Result of the standardized parameter estimates of the SEM-model (in case of the 2022 DATA).

standardized parameters of causal paths in the SEM- model in the case of the 2020/2022 pooled data set in which the individuals who live in Beijing and Zhejiang are targeted. Note that all observed variables and estimated parameters of causal paths are distinguished between two points in time, although the values of the indicators of goodness of fit, such as GFI, AGFI, CFI, and RMSEA, are the same in both figures.

The following are the results from the parameter estimates.

- The goodness of fit indicators for the model (GFI = 0.880, AGFI = 0.823, CFI = 0.519, RMSEA = 0.093) met the standard level under the assumption of a

simple model structure. Almost of the null hypotheses are rejected with a 1% significant level except for the parameter estimate of 'Gender.'

- When focusing on the causal path from COVID-19 attitudes to intention to visit Japan, the sign of the parameter estimate in 2020 is positive, but that in 2022 is negative. It is however noted that the sign of the causal paths related to the observed variables except "shopping attitude" are reversed between two points of time. This implies that the direct effect of 'COVID-19 attitude' on 'Visit intention' tend to weaken over the years.

- Also, the values of the indirect effect of 'Travel attitude' on 'Visit intention' are −0.602 in 2020 and − 0.067 in 2022. This result suggests that the risk of overseas travel tends to weaken rapidly over time.

- On the other hand, the values of indirect effect of 'Overnight tour' on 'Visit intention' are −0,133 in 2020 and − 0.245 in 2022. This means that those who had a tendency to abstain from overnight tours during the pandemic would intend not to visit Japan, even in the post-pandemic era.

4.2 Perspective and challenges of inbound tourism demand in the post-pandemic era

Our analytical hypothesis is that the intention to visit Japan in the post-pandemic era could be formed as an extension of the changes in both the behavioral attitude and perception toward the COVID-19 infection risk and substantive mobility and lifestyle during these three years, that is, during the pandemic period. This study aimed to identify the challenges in verifying the hypothesized causal structures underlying the intention to visit Japan during the post-pandemic era.

Here, we discuss inbound tourism demand from China during the post-pandemic era. Many tourism marketing researchers, including airlines, travel agencies, and tourism-related industries, have vigorously discussed the impact of COVID-19 on international tourism demand from the perspective of "disruptive innovation in the economy." However, we are aware that most of their discussions started and ended with the COVID-19 impact on manageable issues, such as the decreased level of services with a reduction in the number of flights, cutbacks of airline workers, and serious financial troubles in hotels and tourism retailing and services industries. Many scenario analyses for predicting the future trend of tourism demand from the marketer-oriented approach tend to lead to a certain type of optimistic prospect that international tourism demand will come around soon if only the level of services on the supply side, such as the number of carriers, returns to normal. Focusing on the long-term impact on the inbound tourism market in the post-pandemic era, it is essential to examine how factors relating to both the marketers' supply side and tourists' demand side would determine the tourism market rebuilt in a post-pandemic society. Moreover, the supply-side-oriented approach would lead us to misunderstand our perspective of future demand if changes in lifestyles and values are assumed to be significant demand-side factors under the disruptive market mechanism.

While we reviewed COVID-19 impact studies in European cities, the basis of their tone was that COVID-19 has led to an innovative urban transport system such as MaaS to the newly disruptive innovation (see [26]). Such a tone seems to reflect a sense of crisis and may be exaggerated too much, but their raised challenges regarding the

long-term impact of the COVID-19 pandemic should be shared with our discussion from the perspective of inbound tourism demand from China. One of the most important challenges is the successive collection of longitudinal tracking data to monitor dynamic changes in individual activity and mobility patterns during repeated waves of the pandemic. These longitudinal tracking data, including repeated cross-sectional survey data, are useful for adopting an activity and travel behavior approach. In particular, they are expected to contribute to an accurate representation of the causal structure underlying tourists' needs to travel overseas, as well as their intention to visit Japan.

On the other hand, several macroscopic econometric modeling approaches, such as System Dynamics and advanced urban simulation techniques, including the Machine Learning (ML) model and AI-based models, have already been applied to the scenario analysis of the future trend of travel demand post-pandemic. As another promising quantitative approach, we would like to add the model, which we have applied to forecast the long-term trend of the Tourism Area Life Cycle (denoted TALC) in targeted tourism destinations. Butler (1980) developed a prototype describing the evolution of tourism destinations. Nishii et al. developed the TALC model to analyze the trend in the number of tourists visiting Hokkaido in Japan, focusing on the effect of external factors determining the carrying capacity, such as natural disasters, infrastructure projects for improving the level of transport services in airlines, expressways, Hokkaido Shinkansen (Japan's Bullet Train), and events and campaign performance for promoting tourism marketing in Hokkaido [49]. The TALC modeling approach makes the most of the benefits of incorporating a variety of factors relating to both supply and demand into the relatively simplified time-series model structure.

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References

[1] NHK-Internet News-Special: COVID-19, News on Nov. 16, 2022. Beyond one million new-cases per day, need to strengthen medical services toward the eighth wave of the pandemic. Available from: https://www3.nhk.or.jp.news.special.coronavirus.eightwave [Accessed: 31 March 2023]

[2] Nishii K. Perspective of our research topics in the post pandemic era, a note presented at International Session in the 40th Anniversary KST Conference Joined up to the 11th International Seminar on Urban Transport, Tourism and Travel Behavior Analysis, Seoul. [Accessed: 28 September 2022]

[3] ERSA Web conference 2020: Spatial Challenges for the New World. Available from: https://ersa.eventstar.com [Accessed: 1 August 2020]

[4] TRB 102nd Annual Meeting 2023. https://www.trb.org.AnnualMeeting.program [Accessed: 1 April 2023]

[5] Nishii K, Kurihara T, Hibino N, Kishino K. A structural equation modeling of the intention of revisits by Chinese tourists to Japan conditioned upon an integration of mobility services in urban tourism destination: Using an empirical data set from the interview survey at Osaka International Airport, Report on 2019 Research grant by Kansai Airport Research Institute (KAR), 2020.3 (in Japanese/English)

[6] Nishii K, Kurihara T, Hibino N, Kishino K. Mobility services integrations in tourism destination and their effect on intention of visit to Japan: Using the 2020 Web-based survey data targeted at Chinese residents, Report on 2020 Research Grant by Kansai Airport Research Institute (KAR), 2021.3 (58p. in Japanese version/68p. in English version.), 2021.3

[7] Nishii K, Kurihara T, Hibino N, Kishino K. A Basic analysis of Chinese tourists' intention of visiting Japan relating to attitudinal changes in their activity and travel patterns under the with−/post-COVID-19: Using the WEB-based survey data in three major cities (Zhejiang, Beijing, and Jiangsu), Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 63, CD-ROM, pp. 1-7, 2021. 6 (in Japanese)

[8] Kurihara T, Nishii K, Hibino N, Kishino K. The impact of preference for integrated mobility services on visit intention-A case study of Chinese traveling to Japan, presented at International Session in the 40th Anniversary KST Conference, 2022. 9

[9] Ministry of Land, Infrastructure, Transport and Tourism (denoted MLIT): Discussion on how changes in the future urban renovation and compact cities would be triggered by the COVID-19, Press release, 21p., 2020.8

[10] The JSCE Committee of Infrastructural Planning and Transportation Division: The survey of the impact of the COVID-19 on mobility and attitudes (instantly reported version); adding the 9th survey data. Available from: https://jsce-ip.org.2022/09/16.COVID-19-survey, 2023.1(in Japanese) [Accessed: 24 May 2023]

[11] Hyodo T, Fujii S. Recent advances on the COVID-19 related studies in the academic field of the infrastructural planning and transportation. Proceedings of the JSCE, D3-division. Vol. 77(2):110-112, 2021.1 (in Japanese)

[12] Okamoto T. The changes in urban travel demand caused by the COVID-19 with using the actual surveyed data. Journal of Transportation Sciences. 2021; **52**(2):13-20 (in Japanese)

[13] Takeda M, Ishibashi S, Taniguchi M. Behavior elasticity chart showing behavioral changes caused by the COVID-19 pandemic: Quantification of return and non-return to pre-pandemic state, Proceedings of the JSCE, D3-division, Vol. 78, No.6, II_95-II_107, 2022.5 (in Japanese)

[14] Ishibashi T, Taniguchi A, Parady G Takami K. Time-series analysis of behavioral changes and psychological state of citizens in the Kanto region during the COVID-19 pandemic: Using a five-wave Panel survey from April 2020 to July 2021, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 64, CD-ROM, pp1-8, 2021. 12 (in Japanese)

[15] Hirose K, Sasaki K, Kikuchi A, Onoda K, Asano R, Suzuki T. Activity simulation under COVID-19 situation considering the spread of remote work, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 63, CD-ROM, 1-7, 2021. 6 (in Japanese)

[16] Isaka R, Sasaki K, Kikuchi A. Research on reproduction of individual behavior using activity simulators and observed data: Recreation of telecommuting for the corona disaster, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 65, CD-ROM, 1-7, 2022. 6 (in Japanese)

[17] Muto T, Kaneko Y. Analysis of COVID-19 expansion and telework implementation using mobile spatial statistics in the Tokyo metropolitan area, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 64, CD-ROM, 1-6, 2021. 12 (in Japanese)

[18] JTTRI (Japan Transport and Tourism Research Institute): Symposium on Effect of the COVID-19 on Rail Transportation and Urban Infrastructure, 2020.10.26

[19] Suzuki W, Nakamura F, Tanaka S Ariyoshi A, Matsuyuki M. Aggregation analysis of changes in habitual use patterns of railways using the data from passengers counted at the ticket gate, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 66, CD-ROM, 1-8, 2022. 11 (in Japanese)

[20] Hashimoto M, Hibino N, Morichi S. The actual conditions of changes in railway commuting behaviors using the data from passengers counted at the ticket gate, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 66, CD-ROM, 1-8, 2022. 11 (in Japanese)

[21] Muroi T, Tsuchiya T, Itoh M, Morichi S. A study on a location choice model focusing on the residential area along a railway line in Tokyo metropolitan areas, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 66, CD-ROM, 1-8, 2022. 11 (in Japanese)

[22] Takeda M, Kobayashi T, Taniguchi M. The actual conditions of blunt distribution typed urban time-spaces: Focusing on time-allocation and residential area choice behavior in daily activity patterns, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 66, CD-ROM, 1-7, 2022. 6 (in Japanese)

[23] Miura U, Mimaki H, Nakamura F, Kitazaki M, Oumori H, Yukawa S. The

future vision of Tokyo downtown based on possibility of transformation of working style: Challenges about working-styles related to the New Normal in the post-pandemic, Proceedings of the JSCE Infrastructural Planning and Transportation Division, No. 66, CD-ROM, 1-7, 2022. 11 (in Japanese)

[24] OECD: COVID-19 TRANSPORT BREIEF; Re-spacing our cities for resilience, International Transport Forum, 2020, Available from: https://www.itf-oecd.org.covid-19 [Accessed: 1 May 2022]

[25] de Palma A, Vosough S, Liao F. An overview of effects of COVID-19 on mobility and lifestyle: 18 months since the outbreak. Transportation Research Part A. 2022;**159**:372-397

[26] Tsvetkova A, Kulkov I, Busquet C, Kao PJ, Kamargianni M. Implications of COVID-19 pandemic on the governance of passenger mobility innovations in Europe. Transportation Research Interdisciplinary Perspectives. 2022;**14**: 100581

[27] Hensher DA. What might COVID-19 mean for mobility as a service (MaaS)? Transport Reviews. 2020;**40**(5): 551-556

[28] Mohammadi M, Rahimi E, Davatgari A, Javadinasr M, Mohammadian A, Bhagat-Conway MW, et al. Examining the persistence of telecommuting after the COVID-19 pandemic. Transportation Letters. 2022: 1-14. DOI: 10.1080/19427867.2022.2077582

[29] Zhang J, Hayashi Y. Transportation Amid Pandemics - Lessons Learned from COVID-19, World Conference on Transport Research Society. 1st ed. Elsevier; 2023. 490 p. eBook ISBN: 9780323997713

[30] Ma S, Li S, Zhang J. Diverse and nonlinear influences of built environment factors on COVID-19 spread across townships in China at its initial stage. Scientific Reports (Springer Nature Publishing Group). 2021. DOI: 10.1038/s41598-021-91849-1

[31] Pan Y, He SY. Analyzing COVID-19's impact on the travel mobility of various social groups in China's Greater Bay Area via mobile phone big data. Transportation Research Part A: Policy and Practice. 2022;**159**:263-281

[32] Liu Q, Liu Y, Zhang C, An Z, Zhao P. Elderly mobility during the COVID-19 pandemic: A qualitative exploration in Kunming, China. Journal of Transport Geography. 2021;**96**:103176

[33] Tan S, Lai S, Fang F, Cao Z, Sai B, Song B, et al. Mobility in China, 2020: A tale of four phases. National Science Review. 2021;**8**(11):nwab148

[34] Zhang W, Gong Z, Niu C, Zhao P, Ma Q, Zhao P. Structural changes in intercity mobility networks of China during the COVID-19 outbreak: A weighted stochastic block modeling analysis. Computers, Environment and Urban Systems. 2022;**96**:101846

[35] Yu L, Zhao P, Tang J, Pang L. Changes in tourist mobility after COVID-19 outbreaks. Annals of Tourism Research. 2023;**98**:103522

[36] Zhong L, Sun S, Law R, Li X. Tourism crisis management: Evidence from COVID-19. Current Issues in Tourism. 2021;**24**(19):2671-2682

[37] Li Z, Zhao Q, Huo T, Shao Y, Hu Z. COVID-19: Management focus of reopened tourist destinations.

Current Issues in Tourism. 2022;**25**(1): 14-20

[38] Hao Y, Bai H, Sun S. How does COVID-19 affect tourism in terms of people's willingness to travel? Empirical evidence from China. Tourism Review. 2021;**76**(4):892-909

[39] Hong Y, Cai G, Mo Z, Gao W, Xu L, Jiang Y, et al. The impact of COVID-19 on tourist satisfaction with B&B in Zhejiang, China: An importance–performance analysis. International Journal of Environmental Research and Public Health. 2020;**17**(10):3747

[40] Shao Y, Hu Z, Luo M, Huo T, Zhao Q. What is the policy focus for tourism recovery after the outbreak of COVID-19? A co-word analysis. Current Issues in Tourism. 2021;**24**(7): 899-904

[41] Huang SS, Shao Y, Zeng Y, Liu X, Li Z. Impacts of COVID-19 on Chinese nationals' tourism preferences. Tourism Management Perspectives. 2021;**40**: 100895

[42] Li Z, Zhang X, Yang K, Singer R, Cui R. Urban and rural tourism under COVID-19 in China: Research on the recovery measures and tourism development. Tourism Review. 2021; **76**(4):718-736

[43] McCartney G. The impact of the coronavirus outbreak on Macao. From tourism lockdown to tourism recovery. Current Issues in Tourism. 2021;**24**(19): 2683-2692

[44] Wen J, Kozak M, Yang S, Liu F. COVID-19: Potential effects on Chinese citizens' lifestyle and travel. Tourism Review. 2021;**76**(1):74-87

[45] IBM SPSS Amos. Available from: http.www.ibm.com/jp-ja/marketplace/structural-equation-modeling-sem [Accessed: 11 May, 2023]

[46] Sasaki K. In: Kitamura R, Morikawa T, editors. Modeling Travel Behavior, Gihodo-Shuppan Publishing, the Third Part: Modeling, in Chapter 8. Gihodo-Shuppan Publishing Co Ltd.; 2002. pp. 159-176

[47] Nishii K, Sasaki K, Tanabe J. Empirical analysis of leisure driver decision structure underlying SA/PA choice behaviors on expressways in Japan. In: Paper Presented at the Ordinary Oral Session in the 53rd ERSA Congress in Palermo. Italy; 2013

[48] Kurihara T, Nishii K, Hibino N, Kishino K. A structural equation modelling (SEM) of the causal relationships between mobility services integration in tourism destinations and the intention of revisits to Japan by Chinese tourists, Proceedings of the JSCE, Special issue-D, 76/5, I_747-I_756, 2021 (in Japanese)

[49] Nishii K, Morisawa T, Mitsuishi T: A Quantitative Analysis of Tourism Area Life Cycle (TALC): From viewpoint of the AMMA (Area Marketing and Management Approach), Proceedings of the 34th JITR (Japan Institute Tourism Research) Annual Conference, 1-4, CD-ROM, 2019.12 (in Japanese)