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The COVID-19 pandemic and domestic travel subsidies

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A B S T R A C T
The spread of the coronavirus disease 2019 (COVID-19) has significantly reduced tourism demands worldwide. Employing weekly data on tourist flows between Japanese prefectures, we examine the cost-effectiveness of domestic travel subsidies. Our results provide two implications for the literature. First, we identify the underlying mechanism of tourist flows during the pandemic. In contrast to infectious diseases that have only local effects, the COVID-19 pandemic has decreased tourism demand not only to, but also from, severely affected regions, deteriorating tourism businesses even in areas not severely affected by the disease. Second, we confirm the effectiveness of a price-discount strategy in mitigating economic damage to the accommodation sector caused by the pandemic.

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Introduction

Tourism demand disappeared significantly after the worldwide spread of the coronavirus disease 2019 (COVID-19). International arrivals dropped by 74% in 2020, reducing export revenue by USD 1.3 trillion and putting 100 to 120 million tourism jobs at risk (UNWTO, 2021). Several measures such as tax exemption and provision of loans at reduced rates of interest have been implemented to sustain tourism businesses and jobs (OECD, 2020; UNWTO, 2020a). Thereby, government spending has increased, especially in countries greatly relying on the tourism industry (Khalid et al., 2021). However, since the current situation is expected to remain unchanged for years (UNWTO, 2021), the cost-effectiveness of respective policies matters.

In general, cost-effective tourism policies are those directed toward the sector most severely affected by a crisis (Blake and Sinclair, 2003), hence subsidies for domestic travel should be appropriate. Domestic tourism has yielded much greater revenue than international tourism at the regular period in developed countries. Although the COVID-19 pandemic has significantly reduced domestic tourism demand, it shows signs of recovery faster than international tourism demand (UNWTO, 2020b). Therefore, as long as domestic travel subsidies can create sufficient tourism demand during the pandemic, the governments can cost-effectively support tourism and related businesses because they subsidize tourists with only a fraction of their travel expenses.

However, travel subsidies during the pandemic may not yield adequate income for tourism businesses if the concern about the infectious disease considerably reduces consumers’ willingness to travel. For example, Rittichainuwat and Chakraborty (2009) explain that discounts on airfares and marketing promotions during and after the SARS crisis did not work in Thailand. Matsushita (2019) examines the impact of a temporal travel subsidy on tourist inflow after a huge earthquake in Japan. The study finds a weaker impact in a more severely damaged area. Yet, previous studies have not addressed the cost-effectiveness of travel subsidies during the COVID-19 pandemic effectively.

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Another concern is the bias in the cost-effectiveness estimate of a subsidy. The number of travelers using a subsidy is usually referred to in evaluating its cost-effectiveness. However, the following two threats to internal validity make it difficult to count the exact number of travelers induced by the subsidy. First, the number of travelers tends to rise following the ease of travel restrictions (UNWTO, 2020c). If the subsidy is provided just after the ease of travel restrictions, it is difficult to disentangle the impact of the subsidy from the upward trend in tourism demand.

Second, the observed number of travelers may include tourists who would travel even without the subsidy. Risk perception serves an important role in consumers’ decision to travel and destination choice during a crisis (Neuburger and Egger, 2021). A tourist’s risk perception is situation-specific; tourists evaluate a situation, paying particular attention to several risk dimensions (Roehl and Fesenmaier, 1992; Slovic, 1987). For instance, they may consider physical and/or social risks during the pandemic. The former is the possibility that a trip will result in sickness while the latter is the possibility that a trip will affect others’ opinion of the tourists. Those who do not regard traveling during the pandemic as a risk are likely to travel even without a subsidy. Counting them as travelers induced by the subsidy overestimates its cost-effectiveness.

This study employs a gravity model to discuss the cost-effectiveness of domestic travel subsidies during the pandemic. The gravity model has been widely used in tourism literature to identify the determinants of tourist flows between countries/regions (Álvarez-Díaz et al., 2017; Álvarez-Díaz et al., 2020; Morley et al., 2014; Santeramo, 2015; Santeramo and Morelli, 2016). In this study, we apply the model to the weekly tourist flow between Japanese prefectures. Japan provides an interesting case to study the effects of domestic travel subsidies. The Japanese government declared a state of emergency from April 7 to May 25, 2020 but did not impose strict restrictions on domestic travel. Moreover, to stimulate domestic travel after the lifting of the state of emergency, the government decided to implement a nationwide travel subsidy named the “Go to Travel Campaign” (hereafter, campaign) starting on July 22. The campaign was initially designed as an ad valorem type of subsidy, offering a 35% discount on travel expenses for any domestic travel. However, travel to/from Tokyo was excluded from the campaign on July 16 due to the sharp increase in the number of confirmed COVID-19 cases in Tokyo at that time. Many cancelations of travel to/from Tokyo were observed after the announcement of the exclusion, suggesting that it was unexpected by consumers.

Drawing on this case as a natural experiment, this study applies a difference-in-difference (DID) analysis to the gravity model to reduce the aforementioned two threats. Both the number of tourists traveling to/from Tokyo and traveling between prefectures other than Tokyo increased after the lifting of the state of emergency, but the number of tourists traveling to/from Tokyo after July 22 only included those who traveled without the subsidy. Therefore, we can infer the number of tourists induced by the campaign by evaluating the extent to which tourist flow between prefectures other than Tokyo increased compared to that to/from Tokyo after the implementation of the campaign. Funashima and Hiraga (2020) also evaluated the impact of the campaign, but their dependent variable includes tourists from Tokyo, who were not subject to the campaign during the estimation period, thereby biasing their estimated impact of the campaign.

In summary, our main contribution is the rigorous examination of the cost-effectiveness of domestic travel subsidies after the ease of travel restrictions. According to the Japan Tourism Agency, the Japanese government spent JPY 110 billion (approximately USD 1.1 billion) by September 30, 2020. Even after controlling for the upward trend in tourism demand after the ease of travel restrictions and the number of tourists who would have traveled even without the subsidy, we still find that the campaign increased tourist flow by nearly 50%, creating a tourism demand of JPY 255 billion. In addition, our results provide two implications for the literature. First, by estimating the gravity model, we identify the underlying mechanism of tourist flows during the pandemic. Second, by examining the effectiveness of an ad valorem type of subsidy, we confirm the validity of a price-discount strategy in alleviating the economic damage of the pandemic to the accommodation sector.

Related literature

This study is related to two strands of the literature. First, it is related to those that examine the impact of infectious diseases on tourist flow. Infectious diseases, such as COVID-19, have historically caused severe damage to the tourism industry; hence, empirical studies that attempt to evaluate their impact on tourist flow are abundant (e.g., Cooper, 2005; Karabulut et al., 2020; Kuo et al., 2008). For instance, Rosselló et al. (2017) employ a gravity equation to quantify the extent to which travel-related disease risk in the destination country reduces the number of international tourist arrivals. The COVID-19 pandemic differs from these diseases in that the former spreads nationwide in many countries whereas the latter, only locally. The nationwide spread of the disease affects the willingness to accept tourists at the destination. During the pandemic, there is a strong concern among residents that tourists bring the virus to their neighborhood (Neuburger and Egger, 2021). Indeed, the number of confirmed COVID-19 cases in the destination increases with the number of inbound tourists (Farzanegan et al., 2021; Liu et al., 2021). We suppose that a social concern that travelers may spread the virus at the destination likely reduces the willingness to travel to other areas, particularly among individuals in severely affected regions, yielding the following hypothesis:

**Hypothesis 1.** The COVID-19 pandemic decreases tourist flow. The number of confirmed cases in the origin (destination) reduces tourism demand to (from) other regions.

Given that an infectious disease spreads only locally, the affected region can recover the tourism demand to that region by controlling its spread. However, in the present situation, keeping the number of infected people under control in the destination
alone will be insufficient to boost tourism demand. Without controlling the spread of the disease within a nation, the declining tourism demand to other parts of the country may negatively affect tourism businesses, even in areas not severely affected by COVID-19.

This study is also related to those investigating hotels’ pricing strategy during a crisis and its impact on their performance (Chen, 2011). For example, reduced room rates have been observed in Hong Kong during the COVID-19 pandemic, particularly in hotels with high-star ratings (Wu et al., 2020). To what extent room-price discounts increase hotel sales depends on price elasticity. Vives et al. (2019) summarize the price elasticity estimates of hotel demand in previous studies and conclude that the demand is price inelastic, implying that the reduction in room rates decreases hotel sales (Peng et al., 2015). This finding is consistent with Kim et al. (2019), who conclude that room-price discounts after the 2007 financial shocks in the United States increased room occupancy but decreased revenue per available room. However, price elasticity shows considerable temporal variation depending on social and economic conditions (Fleissig, 2020). During the pandemic, many governments have requested that their residents avoid unnecessary outings. Reduced opportunities to travel likely yield a higher price elasticity of tourism demand than in the regular period. To illustrate this point, consider a linear demand function, which shows that price elasticity increases as the quantity demanded declines. Thus, quantifying the level of price elasticity is indispensable for predicting the effectiveness of a pricing strategy during a crisis.

In this study, we consider the impact of the two types of travel subsidies—the campaign and those by local governments—on the number of tourists and hotel sales. Travel subsidies are not exactly equivalent to room-price discounts. However, these two types of subsidies are similar in that travelers face reduced accommodation fees in either case. Hence, quantifying the impact of travel subsidies on tourist flow allows us to infer the level of price elasticity during the pandemic. More interestingly, these two types of travel subsidies are supposed to increase the number of overnight stays in different ways; the campaign is an ad valorem subsidy, while the local travel subsidies are specific. Hence, the campaign likely encourages tourists to stay in greater luxury accommodation than they usually do, but local travel subsidies are less likely to do so.

To illustrate this point, let us assume that there are two hotels: luxury hotel A and economy hotel B. Since the campaign is an ad valorem subsidy, the room prices of both hotels will be reduced by 35%. Hence, it does not affect the relative prices between them. In contrast, because local travel subsidies provide a specific amount of money to travelers, hotel B becomes relatively cheaper than hotel A. The substitution effect implies that the campaign does not affect the relative demand between hotels, but local travel subsidies do by increasing the relative demand for hotel B. A reduction in room prices also causes an income effect. Generally, luxury hotels have a higher income elasticity of demand than do economy hotels (Canina and Carvell, 2005). Therefore, the income effect suggests that both the campaign and local travel subsidies increase the relative demand for hotel A. The net effect of the substitution and income effects on the relative demand of hotels A to B is positive for the campaign but ambiguous for local travel subsidies. Consequently, we developed the following hypothesis:

**Hypothesis 2.** Both the campaign and travel subsidies by local governments increase tourist flows. Moreover, the campaign induces the average tourist to stay in higher-class accommodation.

This hypothesis implies that ad valorem subsidies are effective in supporting higher-class accommodation, which is more severely affected by the pandemic (Wu et al., 2020).

We make two additional contributions to the literature. In general, business travelers are less sensitive to a change in room prices than leisure travelers (Abrate et al., 2012; Schamel, 2012). By distinguishing these two types of travelers in the estimation, we examine whether the difference in price sensitivity leads to a different impact of travel subsidies between them. This study also contributes to the studies that examine tourists’ transport mode choice (e.g., Vergori and Arima, 2020). To avoid close contact with others, consumers’ preference toward public transportation has been declining during the pandemic (Neuburger and Egger, 2021). The government’s request for self-restraint on long-distance travel further strengthens this trend. However, since the discount also applies to transportation expenses, we expect that the campaign encourages long-distance travel. We investigate how the distance between the origin and the destination affects the impact of the pandemic and the campaign on tourist flow.

**Data**

The primary data source is the *Tourism Forecast Platform* published by the Japan Travel and Tourism Association. The association collects accommodation records and reservation data from over-the-counter sales of travel agencies and domestic and overseas online sales. The association combines these data with the figures in the *Overnight Travel Statistics Survey* published by the Japan Tourism Agency to estimate the daily number of overnight stays for each origin–destination prefecture pair to aid the marketing strategies of hotels, restaurants, and tourism agencies and for policymaking by local governments. Most previous studies have employed annual or monthly data on tourist flows. However, as the COVID-19 situation changes frequently, travel-related policies vary accordingly. Our data allow us to precisely control for such frequent changes in the COVID-19 situation and travel-related policies. The period from January 1, 2017, to September 30, 2020, is utilized for analysis. Since any domestic travel after October 1, including that to/from Tokyo, was subject to the campaign, its impact is captured by time-fixed effects (see Empirical methodology section). Therefore, extending the estimation period does not necessarily improve the evaluation of the effectiveness of travel subsidies.

The *Tourism Forecast Platform* also provides cross-tabulation data by guest attributes, such as the existence of accompanying travelers (traveling with family members, as a couple, or solo) and the price ranges of hotel rooms per person per night.
within the prefecture. Fig. 1 suggests that both the campaign and travel subsidies by local governments were effective in
ments differed in terms of their coverages and rates. A typical subsidy was equivalent to JPY 5000 for every resident traveling
discounted. However, consumers could use the discount repeatedly during the campaign period. Travel subsidies by local govern-
JPY 14,000 per person per night. In other words, travel expenses that exceeded JPY 40,000 per person per night were not
other travel expenses for any domestic travel, except for that to/from Tokyo. The maximum subsidy that could be received was
in each prefecture was obtained from the Basic Resident Registration published by the Ministry of Internal Affairs and
Below, we aggregate both the daily data on tourist flow and the number of infected cases to the weekly level to smooth out daily fluctua-
ions. In this study, a week refers to a consecutive period from Monday to Sunday. Weekends refer to three consecutive days starting
from Friday. Note that national holidays, even isolated ones not consecutive to a weekend, are included in weekends.

Spread of COVID-19, tourist flows, and policy responses

To grasp the situation of tourism demand in Japan before the COVID-19 pandemic, Table 1 summarizes the annual tourism demand in 2019. The average number of overnight stays in prefectures was more than 11 million. Travelers from their own prefectures, Tokyo, and foreign countries account for 6.0%, 14.8%, and 10.1% of overnight stays, respectively, suggesting that Tokyo constitutes a major source of tourism demand in Japan.

Fig. 1 shows the average number of overnight stays and the number of infected cases in prefectures from January 6 to September 27, 2020. The box plots show the quartiles of confirmed cases in the prefectures. Since a large variation is observed in the number of confirmed cases across prefectures, we classify prefectures into two groups according to the median cumulative number of confirmed cases at the end of September. Then, the ratio of the number of overnight stays in 2020 to the number of overnight stays in the same week of 2019 for each prefecture is averaged for each group. The dashed (solid) line indicates the average across prefectures with a large (small) number of confirmed cases. Overall, the changes in the number of overnight stays and infected cases are closely related to each other. Curiously, the solid and dashed lines are located close to and move parallel to each other throughout the period, indicating that the spread of the COVID-19 has a similar impact on tourism demand regardless of the number of confirmed cases in the destination.

Table 2 summarizes the representative travel policies related to the COVID-19 pandemic in Japan. The Japanese government declared a state of emergency from early April to the end of May; during this time, the government requested that citizens avoid unnecessary outings and voluntarily close businesses, including tourist attractions, hotels, and restaurants. However, the government neither implemented a hard lockdown nor imposed strict restrictions on domestic travel. Regarding the state of emergency, Prime Minister Shinzo Abe stated in a press conference on April 7, 2020, that “This declaration of a state of emergency does not in any way intend to close cities or to be a lockdown as we are seeing take place overseas. Trains, buses, and other forms of public transportation will continue to operate” (Cabinet Public Relations Office, 2020). Indeed, public transportation, including airlines and high-speed rail, continued to operate during that period, but at a slightly reduced frequency due to declines in tourism demands. For instance, 80% of the regular high-speed train services between Tokyo and Osaka continued to operate in April and May according to a news release by the Central Japan Railway Company. Hence, it can be concluded that changes in travel patterns observed in Fig. 1 reflected changes in the preferences of tourists.

To stimulate domestic travel after the state of emergency, the national and local governments implemented travel subsidies. The campaign was a nationwide travel subsidy by the Japanese government, offering a 35% discount on accommodation and other travel expenses for any domestic travel, except for that to/from Tokyo. The maximum subsidy that could be received was JPY 14,000 per person per night. In other words, travel expenses that exceeded JPY 40,000 per person per night were not discounted. However, consumers could use the discount repeatedly during the campaign period. Travel subsidies by local governments differed in terms of their coverages and rates. A typical subsidy was equivalent to JPY 5000 for every resident traveling within the prefecture. Fig. 1 suggests that both the campaign and travel subsidies by local governments were effective in

| Variable | Mean | Std. dev. | p5 | p95 |
|----------|------|-----------|----|-----|
| Number of overnight stays in 2019 | 11,302,972 | 11,916,446 | 2,592,714 | 36,056,732 |
| Travelers’ origin | | | |
| Own prefecture | 6.0% | 4.2% | 1.3% | 13.1% |
| Tokyo | 14.8% | 5.3% | 8.2% | 24.7% |
| Foreign countries | 10.1% | 8.4% | 2.1% | 32.5% |

Unit: Overnight stays and %.
increasing the number of overnight stays. For example, two peaks at the end of June and July exactly match the initiation of the local travel subsidies and the campaign, respectively.

**Empirical methodology**

**Gravity model of tourist flow**

Consider the following utility maximization problem of consumer \( j \) for a time period \( t \):

\[
\max_{N_{jodt}, Q_{jot}} \sum_{d} \left( N_{jodt}, Q_{jot}, Z_{ot}, Z_{dt} \right) s.t. \sum_{d} p_{odt} N_{jodt} + Q_{jot} = M_{jot} 
\]

where, \( N_{jodt} \) is the number of overnight stays by an individual \( j \) from the origin prefecture \( o \) to the destination prefecture \( d \); \( p_{odt} \) represents the cost of a visit from \( o \) to \( d \); \( Q_{jot} \) denotes consumption of a composite good whose price is set to one; \( Z_{ot} \) and \( Z_{dt} \) are vectors of regional characteristics in prefectures \( o \) and \( d \), respectively; and \( M_{jot} \) is the individual \( j \)'s income. The utility maximization problem (1) indicates that given the cost of a visit, income, and regional characteristics, consumers choose the number of visits to each destination during a period of \( t \). However, typically, they do not visit any region during that period. Morley et al. (2014) show that solving (1) while allowing for corner solutions (i.e., \( N_{jodt} = 0 \)) yields the following aggregate tourism demand from \( o \) to \( d \) (\( F_{odt} \)):

\[
F_{odt} = \sum_{j} N_{jodt} = F(p_{odt}, M_{jot}, Z_{ot}, Z_{dt}) 
\]

Table 2

| Date               | Content                                                                 |
|--------------------|-------------------------------------------------------------------------|
| State of emergency | Declared in 7 prefectures                                              |
| April 7            | Declared in all prefectures                                             |
| April 16           | Lifted in all except 8 prefectures                                      |
| May 14             | Lifted in all except 3 prefectures                                      |
| May 21             | Lifted in all prefectures                                               |
| May 25             |                                                                         |
| Go to Travel Campaign | A 35% discount on travel expenses except for travel to/from Tokyo   |
| July 22–September 30, 2020 | A 35% discount on travel expenses except for travel to/from Tokyo |

Travel subsidies by local governments

| Implemented in     | Implemented by | Content                                                                 |
|--------------------|----------------|-------------------------------------------------------------------------|
| May                | 1 prefecture   | Subsidy of JPY 2000–15,000 (mode: 5000) per person for residents traveling within own prefecture (23 prefectures), for residents traveling within own or from neighboring prefectures (17 prefectures), or for domestic travelers (5 prefectures) |
| June               | 20 prefectures |                                                                         |
| July               | 20 prefectures |                                                                         |
| August             | 4 prefectures  |                                                                         |
| September          | 0 prefecture   |                                                                         |

Source: Web pages of the Cabinet Secretariat and local governments.
Eq. (2) is called a gravity model and is frequently used in the literature to identify the determinants of tourist flow between regions. In this study, we apply the log-linear form of Eq. (2) to weekly tourist flows between Japanese prefectures:

\[ F_{odwy} = \exp \left( \beta_0 + \beta_1 GTC_{odwy} + \beta_2 SUB_{odwy} + \sum_{i=0}^{3} \beta_3 \frac{CVD_{odwy-1y}}{POP_{oy}} \times d_i + \sum_{i=1}^{3} \beta_4 \frac{CVD_{odwy-1y}}{POP_{dy}} \times d_i + \delta_{od} + \delta_{wy} + \delta_{dy} \right) F_{odwy} \] (3)

\( GTC_{odwy} \) and \( SUB_{odwy} \), representing the campaign and travel subsidies by local governments, respectively, are included in Eq. (3) to evaluate the impact of the cost of a visit \( (p_{od}) \) on tourist flow. \( GTC_{odwy} \) is a dummy variable valued at one for any travel except for that to/from Tokyo after the implementation of the campaign while \( SUB_{odwy} \) measures the amount of subsidies paid to each eligible traveler. The first part of Hypothesis 2 indicates that both \( GTC_{odwy} \) and \( SUB_{odwy} \) increase tourist flow.

\( CVD_{odwy-1y}/POP_{oy} \), corresponding to regional characteristics \( (Z_r) \) in prefecture \( r \), \( r = o, d, \) denotes the average number of confirmed cases per 1000 residents per day in the past week \( w-1 \) of year \( y \) in prefecture \( r \). Hypothesis 1 indicates that an increase in the number of confirmed cases in the origin (destination) will reduce the number of tourists from (to) that region. Note that the number of cases per 1000 residents interacts with \( d_i, i = 0, 1, 2, 3. d_0 \) is a dummy variable valued at one if travel from \( o \) to \( d \) is intra-prefectural (i.e., \( o = d \)). \( d_i \) is a dummy variable valued at one if travel is inter-prefectural (i.e., \( o \neq d \)) and the distance between prefectures is less than 250 km; \( d_2 = 1 \) if the distance is between 250 and 500 km; and \( d_3 = 1 \) if the distance is over 500 km. The distance between prefectures is calculated as the great-circle distance between prefectural capitals. The categorization reflects the most frequent range of distance traveled by automobiles (<250 km) and high-speed rail or air (>500 km) according to the Travel Mode Survey by the Ministry of Land, Infrastructure, Transport and Tourism. This specification allows the impact of the number of confirmed cases to differ depending on the distance between the origin and the destination. For example, as the number of infected cases increases in a prefecture, residents in that region may travel more within their own prefecture and avoid inter-prefectural travel, particularly to areas that can be reached by public transportation.

We introduce a number of fixed effects in Eq. (3). \( \delta_{od} \) are origin-destination fixed effects, capturing the push force for tourists from the origin such as the average income (destination) will reduce the number of tourists from (to) that region. Note that the number of cases per 1000 residents interacts with \( d_i, i = 0, 1, 2, 3. d_0 \) is a dummy variable valued at one if travel from \( o \) to \( d \) is intra-prefectural (i.e., \( o = d \)). \( d_i \) is a dummy variable valued at one if travel is inter-prefectural (i.e., \( o \neq d \)) and the distance between prefectures is less than 250 km; \( d_2 = 1 \) if the distance is between 250 and 500 km; and \( d_3 = 1 \) if the distance is over 500 km. The distance between prefectures is calculated as the great-circle distance between prefectural capitals. The categorization reflects the most frequent range of distance traveled by automobiles (<250 km) and high-speed rail or air (>500 km) according to the Travel Mode Survey by the Ministry of Land, Infrastructure, Transport and Tourism. This specification allows the impact of the number of confirmed cases to differ depending on the distance between the origin and the destination. For example, as the number of infected cases increases in a prefecture, residents in that region may travel more within their own prefecture and avoid inter-prefectural travel, particularly to areas that can be reached by public transportation.

As discussed in the Introduction, we examine the impact of the campaign by employing the DID approach in which travel between prefectures other than Tokyo belongs to a treatment group while travel to/from Tokyo belongs to a control group. Any travel in a treatment group is subject to the campaign during the post-treatment period beginning from the week of July 20, 2020 (i.e., \( GTC_{odwy} = 1 \)). Moreover, the time-fixed effects in Eq. (3) capture the upward trend in tourism demand after the lifting of the state of emergency. Consequently, the number of tourists who would travel even without the campaign can be obtained by setting \( GTC_{odwy} = 0 \). In other words, by subtracting the number of tourists who would travel even without the campaign from the total number of tourists, \( \beta_1 \) in Eq. (3) shows the percent increase in the number of travelers induced by the campaign.

The log of Eq. (3) is generally estimated using ordinary least squares (OLS). However, \( F_{odwy} \) frequently takes zero value. Omitting observations with a zero-valued dependent variable can seriously bias the estimates. Thus, we follow Santos Silva and Tenreyro (2006) and estimate Eq. (3) utilizing the Poisson pseudo-maximum-likelihood (PPML) estimator. Since COVID-19 has an incubation period of approximately 5 to 10 days, an increase in the number of travelers does not affect the number of COVID-19 cases in week \( w-1 \), suggesting that reverse causality is not an issue when estimating Eq. (3).

Impact of travel subsidies on hotel sales

Next, we evaluate the extent to which the campaign contributed to the recovery of hotel sales compared to those during the pre-COVID-19 period. The sale of hotels from tourists originating from prefecture \( o \) to \( d \) \( (V_{odwy}) \) is obtained by multiplying the average price of hotel rooms per person per night \( (P_{odwy}) \) and the number of overnight stays \( (F_{odwy}) \):

\[ V_{odwy} = P_{odwy}F_{odwy} \] (4)

Eq. (4) shows that the campaign can increase hotel sales by inducing consumers to spend more nights in a hotel. However, the utility maximization problem (1) indicates that consumers cannot increase the number of overnight stays above their budget.
constraint. To examine the impact of the campaign on the average price of hotel rooms, we suppose that the same specification as in Eq. (3) holds for the determinants of the average room price:

$$\ln P_{\text{odwy}} = \alpha_0 + \alpha_1 GTC_{\text{odwy}} + \alpha_2 \text{SUB}_{\text{odwy}} + \sum_{i=0}^{3} \frac{CVD_{\text{ow} - 1y}}{POP_{\text{ay}}} \times d_i + \sum_{i=1}^{3} \frac{CVD_{\text{dw} - 1y}}{POP_{\text{dy}}} \times d_i + \delta_{\text{od}} + \delta_{\text{ow}} + \delta_{\text{dw}} + \xi_{\text{odwy}}$$  \hspace{1cm} (5)

where, $\xi_{\text{odwy}}$ are disturbances.

Note that the average price of hotel rooms may not be precise as it is estimated using the number of tourists staying in each of the three price ranges of hotel rooms. Hence, we check the robustness of our results by analyzing whether the campaign shifts the demand of hotels from economy (room price per person per night is below JPY 10,000) to middle class (JPY 10,000–30,000) or luxury (above JPY 30,000):

$$S_{\text{odwy}} = \gamma_0 + \gamma_1 GTC_{\text{odwy}} + \gamma_2 \text{SUB}_{\text{odwy}} + \sum_{i=0}^{3} \frac{CVD_{\text{ow} - 1y}}{POP_{\text{ay}}} \times d_i + \sum_{i=1}^{3} \frac{CVD_{\text{dw} - 1y}}{POP_{\text{dy}}} \times d_i + \xi_{\text{od}} + \xi_{\text{ow}} + \xi_{\text{dw}} + \epsilon_{\text{odwy}}$$  \hspace{1cm} (6)

where, $S_{\text{odwy}}$ is the share of overnight stays of tourists from prefecture $o$ in category $c$ hotels in prefecture $d$; $c = 1, 2, 3$ for the economy, middle class, and luxury hotels, respectively; and $\epsilon_{\text{odwy}}$ are disturbances. The second part of Hypothesis 2 indicates that $GTC_{\text{odwy}}$ increases the average price of hotel rooms (Eq. (5)) and the share of overnight stays in middle or luxury hotels (Eq. (6)). We employ OLS to estimate Eqs. (5) and (6). The presence of zero-valued dependent variables does not matter here because room prices cannot be defined without tourist flow.

To evaluate how much hotel sales increased due to the campaign, we differentiate Eq. (4) with respect to $GTC_{\text{odwy}}$:

$$\frac{\partial V_{\text{odwy}}}{\partial GTC_{\text{odwy}}} = (\beta_1 + \alpha_1) V_{\text{odwy}} \bigg|_{GTC=0}$$  \hspace{1cm} (7)

where, $V_{\text{odwy}}|_{GTC=0} = P_{\text{odwy}}|_{GTC=0} - P_{\text{odwy}}|_{GTC=0}$ is the predicted sales of hotels if travel from $o$ to $d$ is not the subject of the campaign, which is obtained as the product of the predicted values of Eqs. (3) and (5) while setting $GTC_{\text{odwy}} = 0$.

The total sales of hotels in Japan during the campaign period ($V_f$) is obtained by aggregating $V_{\text{odwy}}$ over prefectures $o$ and $d$ and weeks in the campaign period:

$$V_f = \sum_{o \in W} \sum_{d} \sum_{w} V_{\text{odwy}}$$  \hspace{1cm} (8)

### Table 3

| Variable | Mean | Std. dev. | Min | Max |
|----------|------|-----------|-----|-----|
| Continuous variable | | | | |
| Average number of overnight stays per day ($F$) | 489.67 | 1333.99 | 0.00 | 90,228 |
| Average number of overnight stays by family travelers per day ($F$) | 326.64 | 997.38 | 0.00 | 84,141 |
| Average number of overnight stays by single travelers per day ($F$) | 60.43 | 192.47 | 0.00 | 7056 |
| The average price of hotel rooms per person per night in JPY 10,000 ($P$) | 1.35 | 0.78 | 0.70 | 29.55 |
| Share of overnight stays in economy hotels ($S^1$) | 0.47 | 0.33 | 0.00 | 1.00 |
| Share of overnight stays in middle-class hotels ($S^2$) | 0.44 | 0.32 | 0.00 | 1.00 |
| Share of overnight stays in luxury hotels ($S^3$) | 0.09 | 0.19 | 0.00 | 1.00 |
| Log of distance between the origin and the destination (LogDist) | 5.93 | 0.88 | 2.35 | 7.72 |
| Average number of confirmed COVID-19 cases per 1000 residents per day at the national level ($CVD_{\text{n}}, POP_{\text{y}}$) | 0.00 | 0.00 | 0.00 | 0.01 |
| Average number of confirmed COVID-19 cases per 1000 residents per day in the origin ($CVD_{\text{d}}, POP_{\text{y}}$) | 0.00 | 0.00 | 0.00 | 0.06 |
| Average number of confirmed COVID-19 cases per 1000 residents per day in the destination ($CVD_{\text{o}}, POP_{\text{y}}$) | 0.00 | 0.00 | 0.00 | 0.06 |
| Amount of travel subsidy by local governments in JPY 10,000 ($SUB$) | 0.00 | 0.04 | 0.00 | 1.50 |
| Dummy variable | | | | |
| Travel within own prefecture ($d_0$) | 0.02 | 0.14 | 0.00 | 1.00 |
| Travel between prefectures that are <250 km apart ($d_1$) | 0.25 | 0.44 | 0.00 | 1.00 |
| Travel between prefectures that are 250–500 km apart ($d_2$) | 0.29 | 0.45 | 0.00 | 1.00 |
| Travel between prefectures that are >500 km apart ($d_3$) | 0.43 | 0.50 | 0.00 | 1.00 |
| State of emergency in the origin ($EMG_0$) | 0.02 | 0.15 | 0.00 | 1.00 |
| State of emergency in the destination ($EMG_0$) | 0.02 | 0.15 | 0.00 | 1.00 |
| Go to Travel Campaign ($GTC$) | 0.05 | 0.22 | 0.00 | 1.00 |

Note: Family travelers include individuals traveling with family members or couples. The economy, middle class, and luxury hotels are hotels whose room price per person per night is below JPY 10,000, JPY 10,000–30,000, and above JPY 30,000, respectively.
where, \( W \) denotes the weeks during which the campaign was implemented (i.e., the weeks between July 20 and September 27). Therefore, the increase in hotel sales due to the campaign is obtained as follows:

\[
\frac{dV_y}{V_{y-1}} = \frac{1}{V_{y-1}} \sum_{w \in W} \sum_{d} \sum_{o} \frac{\partial V_{o_{\text{ady}}} \partial V_{o_{\text{ady}}}}{\partial GTC_{o_{\text{ady}}} dGTC_{o_{\text{ady}}}}
\]

where \( dGTC_{o_{\text{ady}}} \) is valued at one for any travel that is subject to the campaign and zero otherwise. Note that both sides of (9) are divided by \( V_{y-1} \)—the total sales of hotels in the corresponding weeks in 2019—so that we can evaluate how much the campaign contributed to the recovery of hotel sales compared to those during the pre-COVID-19 period.

By substituting Eqs. (7) into (9) and rearranging it, we have:

\[
\frac{dV_y}{V_{y-1}} = \beta_1 + \alpha_1 \sum_{w \in W} \left( \sum_{o \neq \text{TYO}} V_{o_{\text{ady}}} \mid GTC=0 + \sum_{d \neq \text{TYO} o d \neq \text{TYO}} V_{o_{\text{ady}}} \mid GTC=0 + \sum_{o \neq \text{TYO}} V_{o_{\text{ady}}} \mid GTC=0 + \sum_{o} V_{o_{\text{ady}}} \mid GTC=0 \right)
\]

where \( \text{TYO} \) stands for Tokyo. The first and second terms in the parentheses measure how much the campaign increased hotel sales from intra- and inter-prefectural travel, respectively. Since travel to/from Tokyo was not the subject of the campaign, it is excluded when evaluating the first and second terms. Contrastingly, the third and fourth terms consider a counterfactual case where travel from/to Tokyo had been the subject of the campaign. In other words, the first two terms show how much the campaign actually created the total tourism demand in Japan while the last two terms measure the extent to which the campaign would have created tourism demand if travel from/to Tokyo had been the subject of the campaign.

**Estimation results**

The determinants of tourist flows

Table 4 presents our baseline results. Column (1) shows that both the campaign and local travel subsidies significantly increased the number of overnight stays. In the Appendix A, we confirm that the parallel trend assumption is satisfied before the implementation of the campaign. Therefore, we can interpret the parameter on the campaign as its net impact on tourist flows, excluding those who would have traveled even without the campaign. Quantitatively, the campaign increased the number of overnight stays by 50%. As the campaign reduces the price of hotel rooms by a maximum of 35%, this figure suggests that tourism demand is price elastic during the pandemic. The number of confirmed cases in the destination decreased the number of tourists to that region, especially in regions far from the origin. Contrastingly, the number of confirmed cases in the origin encouraged intra-prefectural travel. In summary, the spread of COVID-19 caused travelers to shift their destination from distant areas that can be reached by high-speed public transportation systems to neighboring regions within driving distance.

The fixed effects in column (1) are able to control for unobserved factors that affect tourist flow. However, they obscure the impact of important policy variables such as the state of emergency. Hence, in column (2), we replace time-fixed effects with dummy variables representing the state of emergency in the origin or the destination and the number of confirmed cases per 1000 residents at the national level. We also substitute the log of distance between the origin and the destination for origin—destination fixed effects. The distance between prefectures is calculated as the great-circle distance as described above. The distance for intra-prefectural travel is obtained as \( 2/3 \sqrt{\text{area}/\pi} \) (Head and Mayer, 2004). The results indicate that the state of emergency, particularly in the destination, reduced tourist flow. Consumers considered the spread of the virus nationwide as well as the spread within their own prefecture and the destination when they made travel plans. Finally, tourist flow decreased by 0.4% as the distance between the origin and the destination increased by 1%.

Column (3) considers the inertia in tourist flow. We introduce the lagged tourist flow in the model. Since tourist flow takes a zero value, although it does not have any theoretical basis, one needs to be added to it before we can calculate the log. To address the endogeneity of the lagged dependent variable, we employ a dynamic Poisson estimator (Gashi et al., 2017; Wooldridge, 2005). Because its nonlinear estimation failed to converge upon including a large number of fixed effects, we excluded destination—week fixed effects. Consistent with previous studies (e.g., Adeola and Evans, 2020; Balli et al., 2016; Khadaroo and Seetanah, 2008; Santeram, 2015), the results suggest that tourist flow in the previous period positively affects tourist flow today. However, the long-run impact of the campaign and local travel subsidies is 0.528 (\( =0.335/(1 - 0.365) \)) and 0.707 (\( =0.449/(1 - 0.365) \)), respectively, and is very similar to the corresponding impact in column (1). Consequently, the relationship between tourist flow and domestic travel subsidies is robust in the dynamic panel framework.

Column (4) introduces multilateral resistance terms. International trade literature argues that trade between two countries depends on trade costs between them relative to those with other countries (Feenstra, 2016). For example, a reduction in trade costs between country A and B may not considerably increase exports from country A to B if country B can import goods from...

Table 4
Gravity model of tourist flow: base model.

| Variable              | (1)            | (2)            | (3)            | (4)            | (5)            |
|-----------------------|----------------|----------------|----------------|----------------|----------------|
|                       | The number of confirmed cases (CVD/POP) in: | w=1 | w=1 | w=1 | Average of w=1 and w = 2 |
|                       | w−1       | w−1       | w−1       |                   |
| GTC                   | 0.496***    | 0.426***    | 0.335***    | 0.598***        | 0.539***       |
|                       | (0.136)    | (0.0796)    | (0.0799)    | (0.101)         | (0.133)        |
| SUB                   | 0.706***    | 1.961***    | 0.449***    | 1.317***        | 0.743***       |
|                       | (0.171)    | (0.207)     | (0.118)     | (0.131)         | (0.170)        |
| CVD/(POP x d)        | 55.72***    | 25.42*      | 35.22***    | 53.85***        | 62.49***       |
|                       | (21.43)    | (13.39)     | (13.31)     | (9.478)         | (23.74)        |
| CVD/(POP x d)        | 6.677       | 23.89*      | 4.736       | −10.39*         | 10.79          |
|                       | (7.724)    | (5.282)     | (4.635)     | (4.993)         | (7.630)        |
| CVD/(POP x d)        | −5.034      | −21.08***   | −5.089      | −30.82***       | −2.658         |
|                       | (7.354)    | (7.305)     | (4.371)     | (6.157)         | (7.293)        |
| CVD/(POP x d)        | −11.56      | −43.66***   | −10.89**    | −30.35***       | −5.053         |
|                       | (7.989)    | (10.91)    | (4.685)     | (7.221)         | (7.753)        |
| CVD/(POP x d)        | 6.380       | −33.61***   | −0.854      | 6.966           | 11.53          |
|                       | (10.13)    | (11.79)     | (6.268)     | (7.157)         | (10.60)        |
| CVD/(POP x d)        | −28.23***   | 7.130       | −22.95***   | −30.95***       | −24.51***      |
|                       | (7.759)    | (8.440)    | (4.302)     | (8.089)         | (7.554)        |
| CVD/(POP x d)        | −18.74***   | −7.521      | −12.97***   | −30.36***       | −20.24***      |
|                       | (6.737)    | (5.480)    | (4.185)     | (7.414)         | (6.319)        |
| EMGs                  | −0.143*     | (0.0789)    | −0.329***   | (0.0914)        |
| EMDs                  | −0.359***   | (0.0575)    | −0.354***   | (0.0575)        |
| ln(1 + F orig−1r)    | 0.365***    | (0.0117)    | 0.365***    | (0.0117)        |
| ln(1 + F dest−1r)    | 0.365***    | (0.0117)    | 0.365***    | (0.0117)        |

Note: Table shows the estimation results of Eq. (3). The dependent variable is the number of overnight stays. The constant is not reported. Column (3) is estimated by a dynamic Poisson estimator, which includes the initial value of tourist flow and the group means of the time-varying continuous exogenous variables. Standard errors clustered by origin–destination pairs are in parentheses.

* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.
*** Indicates statistical significance at the 1% level.

Thus far, we have examined the impact of domestic travel subsidies on tourist flow for the entire week. To focus on the difference between leisure and business travel, we estimate Eq. (3) separately for weekdays and weekends and for family and solo travel subsidies is still larger than the corresponding impact in (1). The underlying assumption in Eq. (3) is that consumers assess the COVID-19 situation approximately a week before they decide to travel. However, this assumption is not as strict as it seems because the variable also reflects the number of cases in the recent past. That is, the number of confirmed cases generally shows a high serial correlation within a region. Indeed, we find that the results in column (5) are very similar to those in column (1). We further confirmed the robustness of our result by replacing the variable with the average number of confirmed cases over the last 4 weeks (i.e., 1 month).

Finally, we replace the number of confirmed cases in week w=1 in Eq. (3) with the average number of cases over the last 2 weeks in column (5). The underlying assumption in Eq. (3) is that consumers assess the COVID-19 situation approximately a week before they decide to travel. However, this assumption is not as strict as it seems because the variable also reflects the number of cases in the recent past. That is, the number of confirmed cases generally shows a high serial correlation within a region. Indeed, we find that the results in column (5) are very similar to those in column (1). We further confirmed the robustness of our result by replacing the variable with the average number of confirmed cases over the last 4 weeks (i.e., 1 month).

Thus far, we have examined the impact of domestic travel subsidies on tourist flow for the entire week. To focus on the difference between leisure and business travel, we estimate Eq. (3) separately for weekdays and weekends and for family and solo travel subsidies are in parentheses.
travelers in Table 5. Generally, leisure (business) travel tends to be concentrated on weekends (weekdays) (Abrate et al., 2012; Schamel, 2012) and family travelers are more likely to be leisure-oriented than solo travelers. Columns (1) to (4) of Table 5 show that the coefficients on the campaign and local travel subsidies are greater for weekends than for weekdays for both family and solo travelers, suggesting that leisure travel was encouraged more by subsidies than was business travel. Moreover, the campaign had the smallest impact on solo travelers traveling on weekdays, consistent with the low sensitivity to room prices of business travelers. Lastly, local travel subsidies only encouraged families to travel, as they mostly aim to promote short local trips; solo travelers with business purposes did not react to them.

The discount by the campaign was applied to transportation expenses, too. Thus, we expect that the campaign encouraged long-distance travel. To investigate how the distance between the origin and the destination affects the impact of the campaign on tourist flow, we estimate Eq. (11):

$$F_{odwy} = \exp \left( \beta_0 + \sum_{i=0}^{3} \beta_i \text{GTC}_{odwy} \times d_i + \beta_2 \text{SUB}_{odwy} + \sum_{i=0}^{3} \beta_i \text{CVD}^{aw-1y} \times d_i + \sum_{i=1}^{3} \beta_i \text{CVD}^{dw-1y} \times d_i + \delta_0 + \delta_{od} + \delta_{wy} + \delta_{chw} \right) \epsilon_{odwy}$$

Equation (11)

Columns (5) and (6) of Table 5 present the estimation results. Although the campaign enhanced tourist flows for any range of travel, its impact monotonically decayed with distance, particularly for weekdays. The policy design of the campaign may explain this difference. Its discount applied to any overnight stays at registered hotels, but to transportation, dining, and shopping only if included in a travel package purchased through registered travel agents. Since leisure travelers are the main customers of such travel packages, the campaign encouraged long-distance leisure travel on weekends.

Table 5

Gravity model of tourist flow: family vs. solo travelers.

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|----------|-----|-----|-----|-----|-----|-----|
|          | Weekday | Solo | Family | Solo | Total | Total |
| GTC      | 0.519*** | 0.378*** | 0.568*** | 0.526*** |       |       |
|          | (0.138) | (0.0633) | (0.164) | (0.0721) |       |       |
| GTC × d0 | 1.105*** | 0.887*** |       |       |       |       |
|          | (0.232) | (0.278) |       |       |       |       |
| GTC × d1 | 0.562*** | 0.630*** |       |       |       |       |
|          | (0.144) | (0.171) |       |       |       |       |
| GTC × d2 | 0.450*** | 0.586*** |       |       |       |       |
|          | (0.128) | (0.155) |       |       |       |       |
| GTC × d3 | 0.230 | 0.364*** |       |       |       |       |
|          | (0.146) | (0.170) |       |       |       |       |
| SUB      | 0.706*** | 0.069 | 0.840*** | 0.129 |       |       |
|          | (0.186) | (0.0817) | (0.195) | (0.0962) |       |       |
| CVD<sub>d</sub>/POP<sub>y</sub> × d0 | 60.27*** | 72.92*** | 47.43*** | 76.28*** | 55.49*** | 48.45*** |
|          | (22.06) | (11.46) | (21.91) | (13.11) | (21.78) | (21.83) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d1 | 13.43* | −2.169 | 8.378 | 1.683 | 13.02* | 9.726 |
|          | (7.304) | (5.436) | (8.070) | (6.122) | (7.733) | (9.112) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d2 | −4.034 | −11.52** | −0.587 | −7.083 | 0.173 | 1.080 |
|          | (7.218) | (5.531) | (8.426) | (6.076) | (7.584) | (9.59) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d3 | −15.39* | −6.833 | −12.38 | −2.302 | 2.056 | 3.141 |
|          | (8.491) | (5.977) | (9.278) | (5.954) | (7.850) | (9.430) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d4 | 6.816 | 30.16*** | −3.632 | 13.45 | 19.15* | 2.041 |
|          | (9.836) | (10.79) | (9.863) | (11.16) | (10.61) | (11.37) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d5 | −31.42*** | 1.166 | −43.44*** | −4.621 | −13.94* | −30.84** |
|          | (8.297) | (5.398) | (9.686) | (5.994) | (7.133) | (9.028) |
| CVD<sub>d</sub>/POP<sub>y</sub> × d6 | −10.12* | −21.21** | −23.68*** | −28.57*** | −5.084 | −17.88*** |
|          | (5.212) | (8.065) | (8.360) | (7.699) | (4.371) | (7.488) |
| Origin–destination FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination–week FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 428,546 | 428,546 | 432,964 | 432,964 | 428,546 | 432,964 |
| Log likelihood | −1.8e+07 | −5.5e+06 | −2.5e+07 | −5.9e+06 | −2.0e+07 | −2.6e+07 |
| Pseudo R-squared | 0.884 | 0.867 | 0.907 | 0.869 | 0.912 | 0.926 |

Note: Columns (1) to (4) show the estimation results of Eq. (3) for the subgroup indicated in the table header. “Family” includes travel by family members and couples. Columns (5) and (6) show the estimation results of Eq. (3). The dependent variable is the number of overnight stays. The constant is not reported. Standard errors clustered by origin–destination pairs are in parentheses. There is a string of consecutive holidays from the end of April to the beginning of May in Japan. Consequently, the number of weekday observations is less than that of weekend observations.

* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.
*** Indicates statistical significance at the 1% level.
Cost-effectiveness of domestic travel subsidies

To quantify the impact of domestic travel subsidies on hotel sales, column (1) of Table 6 examines the impact of the campaign and travel subsidies by local governments on the average price of hotel rooms per person per night for the entire week. The results show that both the campaign and local travel subsidies significantly increased the average price of hotel rooms. Columns (2) to (4) of Table 6 demonstrate how the pandemic affected the distribution of hotel room prices. The table shows that both the campaign and local travel subsidies induced travelers to upgrade their accommodation from economy to middle-class hotels. In contrast, only the campaign significantly raised the share of overnight stays in luxury hotels. The results are consistent with the argument that the campaign encourages tourists to stay in higher-class hotels than they usually do, but local travel subsidies are less likely to do so.

Based on results (1) of Table 4 and (1) of Table 6, we evaluate the effectiveness of the campaign to remedy the economic damage to the accommodation sector caused by the pandemic. Our focus here is threefold. First, we examine the extent to which the campaign contributed to the recovery of hotel demand during the pandemic. Second, we argue how much the total sales of hotels would have increased if travel to/from Tokyo had been the subject of the campaign. Finally, we assess the cost-effectiveness of the campaign.

Table 7 summarizes the results. The predicted total sales of hotels during the period of the campaign relative to those in 2019 is 59.4%. By evaluating Eq. (10), we find that the campaign raised tourism demand by 17.1% of the total hotel sales in 2019. We can obtain the impact of travel subsidies by local governments similarly. The impact presented in Table 7 shows that during the campaign, local travel subsidies created 6.3% of the tourism demand in a pre-COVID-19 period, which is much smaller than the tourism demand created by the campaign. Decomposing the tourism demand by the origin of tourists demonstrates that inter-prefectural travel accounts for 75.4% (12.9/17.1) and 42.9% (2.7/6.3) of the total demand created by the campaign and local travel subsidies, respectively. Consequently, attracting tourists from various regions, including distant ones, is key to enhancing the effectiveness of travel subsidies.

Next, the evaluation of Eq. (10) illustrates that hotels in Tokyo and prefectures other than Tokyo would have increased their sales by 1.7% and 4.3% of the total sales earned in the pre-COVID-19 period, respectively, if travel to/from Tokyo had been the subject of the campaign. Finally, according to the Japan Tourism Agency, the Japanese government spent JPY 110 billion on the campaign to subsidize 25 million overnight stays from July 22 to September 30, 2020. Note that this figure includes the number of tourists who would have traveled even without the campaign. The prediction based on Eq. (3) indicates that the campaign yielded 16 million overnight stays for July 20 and September 27, 2020. The results are consistent with the argument that the campaign raised tourism demand by 17.1% of the total hotel sales in 2019. We can obtain the impact of travel subsidies by local governments similarly. The impact presented in Table 7 shows that during the campaign, local travel subsidies created 6.3% of the tourism demand in a pre-COVID-19 period, which is much smaller than the tourism demand created by the campaign. Decomposing the tourism demand by the origin of tourists demonstrates that inter-prefectural travel accounts for 75.4% (12.9/17.1) and 42.9% (2.7/6.3) of the total demand created by the campaign and local travel subsidies, respectively. Consequently, attracting tourists from various regions, including distant ones, is key to enhancing the effectiveness of travel subsidies.

Table 6
The impact of travel subsidy on room price and tourist flow by type of hotel.

| Variable                      | (1) Room price | (2) Economy | (3) Middle class | (4) Luxury |
|-------------------------------|----------------|-------------|-----------------|------------|
| GTC                           | 0.159***       | –0.0947***  | 0.0546***       | 0.0401***  |
| (0.0225)                      | (0.0137)       | (0.0118)    | (0.00877)       |            |
| SUB                           | 0.0797***      | –0.08319**  | 0.0808**        | 0.00219    |
| (0.0211)                      | (0.0156)       | (0.0141)    | (0.00887)       |            |
| CVD_{d}/POP_{d} \cdot d_{1}  | –2.620         | –1.328      | 3.911           | –2.583**   |
| (4.975)                       | (3.336)        | (2.583)     | (1.384)         |            |
| CVD_{d}/POP_{d} \cdot d_{2}  | 6.190***       | –2.169***   | 0.867           | 1.302**    |
| (1.333)                       | (0.835)        | (0.767)     | (0.590)         |            |
| CVD_{d}/POP_{d} \cdot d_{3}  | 3.356***       | –2.039**    | 1.735***        | 0.303      |
| (1.293)                       | (0.913)        | (0.882)     | (0.592)         |            |
| CVD_{d}/POP_{d} \cdot d_{4}  | –0.372         | 1.585*      | –2.197***       | 0.612      |
| (1.366)                       | (0.942)        | (0.730)     | (0.658)         |            |
| CVD_{d}/POP_{d} \cdot d_{5}  | –6.190***      | 2.033*      | –0.759          | –1.273*    |
| (1.670)                       | (1.112)        | (0.989)     | (0.707)         |            |
| CVD_{d}/POP_{d} \cdot d_{6}  | –10.71***      | 5.383***    | –3.357***       | –2.025***  |
| (1.466)                       | (1.095)        | (1.115)     | (0.711)         |            |
| CVD_{d}/POP_{d} \cdot d_{7}  | –7.173***      | 2.654**     | –0.553          | –2.101***  |
| (1.407)                       | (0.782)        | (0.772)     | (0.634)         |            |
| Origin–destination FE         | Yes            | Yes         | Yes             | Yes        |
| Time FE                       | Yes            | Yes         | Yes             | Yes        |
| Destination–week FE           | Yes            | Yes         | Yes             | Yes        |
| Observations                  | 311,014        | 311,014     | 311,014         | 311,014    |
| R-squared                     | 0.229          | 0.148       | 0.088           | 0.138      |

Note: Column (1) shows the estimation results of Eq. (5). The dependent variable is the average price of hotel rooms. Columns (2) to (4) show the estimation results of Eq. (6). The dependent variable is the share of overnight stays in the type of hotel indicated in the table header. The constant is not reported. Standard errors clustered by origin–destination pairs are in parentheses. The price of hotel rooms is not reported if tourist flows between prefectures are zero. Since we cannot obtain the average price in such cases, the number of price observations is lower than the number of tourist flow observations.

* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.
*** Indicates statistical significance at the 1% level.
billion (1.49 trillion × 0.171). A comparison between government spending on the campaign of JPY 110 billion and tourism de-
mand created by it shows that the campaign more than doubled the revenue received by the accommodation sector.

Kulendran and Dwyer (2009) examined the cost-effectiveness of the destination promotion programs in Australia and showed
that the return varies between 3 and 26, depending on the tourists’ country of origin. The return is of a similar magnitude in Hong
Kong too (Zhang et al., 2010). Note that these studies measure the impact of the promotion programs on total tourism-related
expenditures by international tourists while our study measures the impact on the expenditure on accommodation by domestic
tourists. Therefore, although we cannot directly compare the impacts, we find that the return obtained in this study is reasonable.

Conclusions

Globally, we are experiencing a major and rapid escalation of COVID-19 cases. Many tourism-related businesses such as hotels,
restaurants, tourist attractions, and tour operations have closed. National and local governments need to design a cost-effective
measure to support them. We employ weekly data on tourist flow between Japanese prefectures and examine the cost-effectiveness of domestic travel subsidies. The results provide two significant implications for the literature. First, we identify the underlying mechanism of tourist flow during the pandemic. Second, we discuss the effectiveness of a price-discount strategy in mitigating economic damage to the accommodation sector caused by the pandemic.

The results are summarized as follows. In contrast to infectious diseases that have only local effects, the COVID-19 pandemic decreased tourism demand not only to but also from severely affected regions. Tourists in those regions shifted from inter- to intra-prefectural travel within driving distance. However, domestic travel subsidies during the pandemic could cost-effectively mitigate its impact on the tourism industry. We find that room-price discounts by the campaign induced a more than proportional increase in tourism demand. Particularly, leisure travelers reacted more strongly to the discounts than business travelers, by increasing their tourism demand for distant regions. The type of subsidy also mattered. Ad valorem subsidies were more likely to shift demand from economy to middle class or luxury hotels than specific ones.

In conclusion, controlling the spread of COVID-19 nationwide is of utmost priority for national and local governments to re-
cover tourism demand. Providing domestic travel subsidies is a cost-effective tool for sustainable tourism businesses. However, the campaign was temporarily suspended on December 28, 2020, because COVID-19 was yet to show any sign of convergence in Japan. To seek a proper balance between tourism and public health, whether and to what extent the implementation of the campaign has accelerated the spread of the COVID-19 pandemic in Japan remains an important topic for further investigation.

CRediT authorship contribution statement

Toshiyuki Matsuura: Conceptualization, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – review & editing, Supervision, Project administration, Funding acquisition. Hisamitsu Saito: Methodology, Investigation, Writing – original draft, Writing – review & editing, Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Test of parallel trend assumption

To test the parallel trend assumption, we add Eqs. (3) and (5) interaction terms between time-fixed effects and a dummy variable valued at one, if travel from prefecture o to d belongs to a treatment group. The parallel trend assumption holds if the coefficients on interaction terms in Eqs. (3) and (5) are not significantly different from zero before the implementation of the campaign (i.e., July 22). Figs. A1 and A2 show that almost all coefficients are insignificant before the week starting July 20 but become significant after the implementation of the campaign.

![Fig. A1. Estimated coefficients of treatment effect on tourist flow note: The solid line shows the estimated coefficients of the interaction between the treatment effect dummy and time-fixed effects. The dashed line represents the 99% confidence interval.](image1)

![Fig. A2. Estimated coefficients of treatment effect on room price note: The solid line shows the estimated coefficients of the interaction between the treatment effect dummy and time-fixed effects. The dashed line represents the 99% confidence interval.](image2)

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