RIETI Discussion Paper Series 21-E-012

Designing a Tourism Stimulus During the COVID-19 Pandemic in Japan

MATSUURA, Toshiyuki
Keio University

SAITO, Hisamitsu
Hokkaido University

RIETI
Research Institute of Economy, Trade & Industry, IAA
The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 21-E-012

Feburary 2021

Designing a tourism stimulus during the COVID-19 pandemic in Japan[1†]

Toshiyuki Matsuura
Keio University

Hisamitsu Saito
Hokkaido University

Abstract: The spread of coronavirus disease 2019 (COVID-19) has significantly reduced tourism demand worldwide. Travel subsidies have been implemented to stimulate demand, but their effectiveness is yet to be evaluated rigorously. This study examines the determinants of the weekly tourist flow between Japanese regions during the COVID-19 pandemic and evaluates the effectiveness of different types of travel subsidies in mitigating economic damage to the accommodation sector. The results show that the pandemic decreases both outbound and inbound tourism demand, deteriorating tourism businesses even in areas not severely affected by the disease. We also find that tourists shift their destination from distant to neighboring regions, but a travel subsidy by the Japanese government effectively creates tourism demand for distant regions. Moreover, it induces tourists to stay in luxury accommodation, further augmenting hotel sales.

Keyword: COVID-19, DID analysis, gravity model, tourism demand, travel subsidy
JEL classification code: Z38, I12, D04

[1†] We thank Masayuki Morikawa, Nobuaki Yamashita, and other seminar participants at Applied Regional Science Conference and Keio University. This study is supported by JSPS KAKENHI Grant 18H03637. This study is conducted as a part of the research at the Research Institute of Economy, Trade and Industry (RIETI).

1. Introduction

Tourism demand disappeared significantly after the worldwide spread of the coronavirus disease 2019 (COVID-19). 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 and tourism businesses are abundant (e.g., Kuo et al. 2008, Karabulut et al. 2020, Zeng et al. 2005). 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[1]. These studies have greatly improved our understanding of the potential economic impact of the COVID-19 pandemic on the tourism industry (Zenker and Kock 2020).

Furthermore, some studies discuss the effectiveness of policies to mitigate economic damage to the tourism industry caused by natural or man-made disasters. For instance, Blake and Sinclair (2003) consider the cost-effectiveness of policy measures to mitigate the negative shocks of the September 11 terrorist incident. Matsushita (2019) examines the impact of a temporal travel subsidy on tourist inflow after a huge earthquake in Japanese prefectures. To alleviate the economic shocks of COVID-19, several countries have already implemented or planned to launch a variety of travel subsidies (OECD 2020). Nevertheless, empirical studies have not yet accumulated sufficient evidence to evaluate their effectiveness during the spread of an infectious disease. Travel subsidies are effective to support tourism and related businesses if they can create sufficient tourism demand. However, travel subsidies

[1] The gravity model is an empirical methodology that has been widely used in tourism literature to identify the determinants of tourist flow between countries/regions (Morley et al. 2014).

may not yield adequate income for tourism businesses if the concern about the infectious disease reduces consumers' willingness to travel (Rittichainuwat and Chakraborty, 2009). This study contributes to the debate by identifying whether and to what extent travel subsidies can recover tourism demand during the spread of the COVID-19 pandemic.

To design an effective policy instrument, we need to develop an economic model that explains tourist flows during the COVID-19 pandemic. In this study, we apply a gravity equation to the weekly tourist flow between Japanese prefectures. Its application to Japanese data is of interest to both a policy and academic audience. Due to the stagnation in manufacturing production and the relocation of plants to Asian countries, the tourism industry serves as the economic backbone in many Japanese regions, especially in remote areas. However, because strict restrictions are currently imposed on inbound travel by foreigners, attracting domestic travelers is a key issue for the Japanese accommodation sector. To stimulate domestic travel, the Japanese government implemented a nationwide travel subsidy named the "Go to Travel Campaign" (GTC) from July 22, 2020. The GTC was initially designed as an ad valorem type of subsidy, offering a 35% discount on travel expenses for any domestic travel. However, travel from/to 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 from/to Tokyo were observed after the announcement of the exclusion, suggesting that it was unexpected to consumers. Later, the government expanded its coverage to include travel from/to Tokyo from October 1.

Drawing on this case as a natural experiment, this study applies difference-in-difference (DID) analysis to the gravity model. According to the Japan Tourism Agency, the Ministry of Land, Infrastructure, Transport and Tourism (JTA-MLIT), the Japanese government spent JPY 110 billion by September 30, 2020 toward a discount of 25 million overnight stays, implying that the GTC created a maximum tourism demand of JPY 314 billion (110 billion/0.35)[2]. However, this figure includes the number of tourists who would travel even without the GTC. By evaluating the extent to which tourist flow between prefectures other than Tokyo increases compared with tourist flow from/to Tokyo after the implementation of the GTC, we can predict the number of tourists who would travel even without the GTC and exclude it from the tourism demand created by the GTC. Surprisingly, even after controlling for such tourists, the GTC still increases tourist flow by nearly 55%, which is much larger than the price elasticity implies.

Moreover, because the GTC takes an ad valorem form, its income effect likely provides tourists with an incentive to occupy more luxury rooms than they usually do, further augmenting the sales of hotels. Although local governments additionally provided subsidies to stimulate domestic travel in the same period, they take a specific form, which has a weaker income effect and, hence, should provide tourists with a weaker incentive to upgrade their hotel rooms versus the GTC. By comparing the impact of GTC and travel subsidies by local governments on consumers' hotel choice, we demonstrate that the GTC is more likely to induce travelers to upgrade their accommodation to the luxury type. Quantitatively, an average tourist using the GTC subsidy pays a 13% higher price for a hotel room. Combined

[2] JPY 100 is approximately equivalent to USD 1.

with the estimated impact on tourist flow, we conclude that the GTC creates a tourism demand of JPY 258 billion. These findings demonstrate the effectiveness of travel subsidies in alleviating the economic damage of the COVID-19 pandemic to the accommodation sector.

The remainder of this paper is organized as follows. Section 2 describes the study's data. Section 3 explains the spread of COVID-19 in Japan, its impact on tourist flow, and its policy responses. Section 4 develops the estimation models, and Section 5 presents the estimation results. Section 6 concludes the paper with a summary of the results and policy implications.

2. Data

The primary data source is the *Tourism Forecast Platform* published by the Japan Travel and Tourism Association (JTTA). It is a public interest incorporated association for the promotion of tourism and the tourism industry. The JTTA collects accommodation records and reservation data from over-the-counter sales of travel agencies and domestic and overseas online sales[3]. The JTTA combines these data with the figures in the *Overnight Travel Statistics Survey* published by JTA-MLIT, 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[4]. The period January 1,

[3] Data of 1 to 3 million overnight stays are added to the accommodation records once every 2 weeks.

[4] This type of data, created by private business establishments or associations, is called alternative data, and is now frequently used by academics to supplement official statistics. For example, Kikuchi et al. (2020) employ credit card transaction data to evaluate the impact of the COVID-19 crisis on earnings inequality among Japanese consumers.

2017 to September 30, 2020 is utilized for analysis[5]. 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. For instance, the Japanese government declared a state of emergency for Tokyo and the six other prefectures on April 7, 2020 and expanded its coverage to all other prefectures on April 16. The state of emergency was gradually lifted at the end of May 2020, in accordance with the regional COVID-19 situation. To promote domestic travel, national and local governments implemented travel subsidies, but at different periods. Our data allow us to precisely control for such frequent changes in the COVID_19 situation and travel-related policies.

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 as a solo traveler) and the price ranges of hotel rooms per person per night (pp/pn) (below JPY 10,000; JPY 10,000–30,000; or above JPY 30,000). Using the latter information, we can estimate the average price of hotel rooms pp/pn for each origin–destination prefecture pair. In sum, the data allow us to evaluate the impact of the COVID-19 pandemic on the sales of hotels and on tourist flow in greater detail. For example, we can examine whether the impact differs between weekdays and weekends[6] or between solo and family travelers[7].

---

[5] Because any domestic travel, including that from/to Tokyo, is the subject of the GTC after October 1, its impact is captured by time-fixed effects (see Section 4). Therefore, extending the estimation period does not necessarily improve the evaluation of the effectiveness of travel subsidies.

[6] In this study, a week refers to a consecutive period starting from Monday to Sunday. For example, the first week of 2020 starts from January 6. 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.

[7] We also examined if the impact differs between age groups but did not find any significant difference

The number of confirmed cases of COVID-19 was obtained from the webpage *Dashboard & Map of COVID-19 Japan Case* constructed by J.A.G Japan[8]. The webpage compiles a list of individual patients from press releases by the Ministry of Health, Labour and Welfare, and local governments. We counted the number of confirmed COVID-19 cases in the list by date of confirmed infection and the prefecture where the patient was examined. Because mass media reports this number on television, newspapers, and via the Internet, we believe that consumers rely on this information when they plan their travel. Below, we aggregate both the daily data on tourist flow and the number of infected cases to the weekly level to smooth out daily fluctuations. Finally, as for the national and local policies related to COVID-19, we refer to the webpages of the Cabinet Secretariat and local governments.

3. Spread of COVID-19, tourist flow, and policy responses in Japan

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.

Figure 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 in the figure show the quartiles of confirmed cases in the prefectures. For readability, we excluded prefectures

between them.

[8] https://gis.jag-japan.com/covid19jp/.

with outside values in the plots (Tukey, 1977). However, even without outliers, a large variation is observed in the number of confirmed cases across prefectures. Therefore, we classify prefectures into two groups according to the median cumulative number of confirmed cases at the end of September. To focus on the effect of the COVID-19 pandemic on tourism demand, we consider 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 and obtain the average for each group. The dashed (solid) line in Figure 1 indicates the average across prefectures with a large (small) number of confirmed cases.

Overall, Figure 1 indicates that the changes in the number of overnight stays and infected cases are closely related to each other. The number of overnight stays mostly remained at the same level as in the same week of the previous year until early March, when the spread of COVID-19 was still low in Japan. However, the first wave of COVID-19 occurred after that, halving the number of overnight stays compared to the same time in the previous year. The drop troughed during the state of emergency, in which the government requested to avoid unnecessary outings and voluntarily close businesses, including tourist attractions, hotels, and restaurants. After the state of emergency was lifted on May 25, we observed a quick recovery in the number of overnight stays corresponding to the 50 to 75% levels of the same week in 2019. However, with the second wave of infection, starting at the beginning of July, the number of overnight stays again plummeted. As the second wave showed a decreasing trend toward the end of September, tourist inflow gradually recovered and finally exceeded the pre-pandemic levels in prefectures with a small number of confirmed cases.

Notably, the solid and dashed lines are located close to and move parallel to each other throughout the period, indicating that the spread of the coronavirus disease has a similar impact on tourism demand regardless of the number of confirmed cases in the destination. This finding contrasts with the cases of locally spread infectious diseases examined in previous studies (Cooper, 2005). If an infectious disease spreads locally, the affected region and its neighborhood can recover the inbound tourism demand by controlling its spread. However, regarding the COVID-19 pandemic, a social concern that travelers may spread the virus at the destination likely reduces the willingness to travel, particularly among consumers in severely affected regions[9]. Consequently, as Figure 1 suggests, keeping the number of infected people under control in the destination alone will be insufficient to boost tourism demand. Hence, without controlling the spread of the disease within a nation, the declining outbound tourism demand may negatively affect tourism businesses, even in areas not severely affected by COVID-19. The discussion thus far yields the following hypothesis:

Hypothesis 1: *The COVID-19 pandemic decreases tourist flow. The number of confirmed cases in the origin (destination) reduces outbound (inbound) tourism demand.*

To stimulate domestic travel after lifting the state of emergency, the national and local governments implemented several travel subsidies. Table 2 summarizes the representative travel policies related to the COVID-19 pandemic in Japan. The prefecture of

[9] For example, Farzanegan et al. (2020) conclude that the number of confirmed COVID-19 cases in the destination increases with the number of inbound tourists.

Nagano implemented the first travel subsidy in Japan at the end of May 2020, followed by other prefectures in June or July, but with different coverages and rates. A typical subsidy was equivalent to JPY 5,000 for every resident traveling within the prefecture. On July 22, the Japanese government announced the introduction of a nationwide travel subsidy, the GTC[10]. The campaign offered a 35% discount on accommodation and other travel expenses for any domestic travel, except for those from/to Tokyo[11]. Furthermore, consumers could use the discount repeatedly during the campaign period. Figure 1 suggests that both the travel subsidies from the local government and the GTC were effective in 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 GTC, respectively.

Both the GTC and travel subsidies by local governments increased the number of overnight stays, but in different ways. The GTC is an ad valorem type of subsidy, while the local travel subsidies are specific. Hence, the GTC likely encourages tourists to stay in luxury accommodation than they usually do, but local travel subsidies are less likely to do so. For example, let us assume that there are two hotels: luxury hotel A and economy hotel B, the former having more expensive rooms. Since the GTC 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 hotels A and B. Contrastingly, because local travel subsidies provide a specific amount of money to travelers, hotel B becomes relatively cheaper than hotel A. Therefore, the

[10] The GTC was originally scheduled from July 22, 2020 to February 1, 2021. However, due to increasing COVID-19 cases nationwide, it was temporarily suspended on December 28, 2020.

[11] The maximum subsidy that can be received is JPY 14,000 pp/pn. In other words, the part of travel expenses that exceed JPY 40,000 pp/pn is not discounted.

substitution effect implies that the GTC does not affect the relative demand between hotels A and B, but local travel subsidies do by increasing the relative demand for hotel B. A reduction in room prices due to subsidies also causes an income effect. Generally, luxury hotels have a higher income elasticity of demand than economy hotels (Canina and Carvell, 2005). Therefore, the income effect suggests that both the GTC 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 GTC but ambiguous for local travel subsidies. Consequently, we can derive the following hypothesis regarding the impact of travel subsidies.

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

In the following sections, we explain our empirical framework to test these hypotheses and provide the estimation results.

4. Empirical methodology

In this study, we apply the following gravity model to weekly tourist flows between Japanese prefectures (Morley et al., 2014):

(1) $$F_{odwy} = \exp\{\beta_0 + \beta_1 \ln(1 + CVD_{ow-1y}) + \beta_2 \ln(1 + CVD_{dw-1y}) + \beta_3 GTC_{odwy} + \beta_4 SUB_{odwy} + \beta_5 EMG_{owy} + \beta_6 EMG_{dwy} + \delta_{od} + \delta_{wy} + \delta_{dw}\} \varepsilon_{odwy},$$

where, F_{odwy} represents the number of overnight stays of tourists from the origin prefecture o to the destination prefecture d in week w of year y. CVD_{rw-1y} denotes the average number of confirmed cases per day over the past week $w-1$ of year y in prefecture $r, r = o, d$, constituting time-variant travel obstacles. We explicitly consider the number of infected cases in both the origin and the destination. We assume that consumers assess the COVID-19 situation approximately a week before they decide to travel. We expect that an increase in the number of confirmed cases in the origin (destination) will reduce the number of outbound (inbound) tourists.

GTC_{odwy} and SUB_{odwy} denote the GTC and travel subsidies by local governments, respectively. Note that SUB_{odwy} measures the amount of subsidies paid to each eligible traveler. Contrastingly, the discount rate does not vary across the origin–destination pairs in the GTC. Therefore, to examine its impact rigorously, we employ the DID approach, where travel between prefectures other than Tokyo belongs to a treatment group while travel from/to Tokyo belongs to a control group. Any travel in a treatment group is the subject of the GTC during the post-treatment period beginning from the week of July 20, 2020. Econometrically, GTC_{odwy} is defined as a dummy variable valued at one for any travel except for those from/to Tokyo after the implementation of the GTC. To further control for the impact of COVID-19 related policies, we introduce EMG_{owy} (EMG_{dwy}), valued at one for any outbound (inbound) travel during the state of emergency period in the origin (destination). Note that all independent variables discussed thus far are zero-valued from 2017 to 2019 because the first coronavirus patient in Japan was diagnosed in January 2020.

Table 3 presents the summary statistics of the variables.

Lastly, δ_{od} are origin–destination fixed effects, capturing the push force for outbound tourists from the origin, the pull force for inbound tourists to the destination, and time-invariant travel obstacles, such as distance and travel time between the origin and the destination. δ_{wy} are time (i.e., week–year) fixed effects that consider factors that are specific to week w of year y but are common across prefectures, such as the number of confirmed cases at the national level. δ_{dw} are week–destination fixed effects that control for seasonal fluctuations in tourism demand. They are specific to each week and destination pair because the degree of seasonality shows a significant regional variation, according to climate and locally available activities at the destination (Saito and Romão, 2018). Finally, ε_{odwy} represents disturbances.

The log of Equation (1) is generally estimated using ordinary least squares (OLS). However, F_{odwy} frequently takes zero value, especially between economically small prefectures during the state of emergency. Omitting observations with a zero-valued dependent variable can seriously bias the estimates. Thus, we follow Santos Silva and Tenreyro (2006) and estimate Equation (1) utilizing the Poisson pseudo-maximum-likelihood (PPML) estimator. However, 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 Equation (1).

Next, to test the second part of hypothesis 2 that the GTC induces tourists to upgrade their hotel rooms, we examine whether the GTC increases the average price of hotel rooms. However, 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 GTC shifts the demand of hotels from economy to luxury ones. Thus, we suppose that the same specification as Equation (1) holds for the determinants of (i) the average room price and (ii) the share of overnight stays of tourists from prefecture o to d by hotel category (economy, middle class, and luxury)[12].

(2) $\ln P_{odwy} = \alpha_0 + \alpha_1 \ln\left(1 + CVD_{ow-1y}\right) + \alpha_2 \ln\left(1 + CVD_{dw-1y}\right) + \alpha_3 GTC_{odwy} + \alpha_4 SUB_{odwy} + \alpha_5 EMG_{owy} + \alpha_6 EMG_{dwy} + \delta_{od} + \delta_{wy} + \delta_{dw} + \xi_{odwy}$, and

(3) $S^i_{odwy} = \gamma^i_0 + \gamma^i_1 \ln\left(1 + CVD_{ow-1y}\right) + \gamma^i_2 \ln\left(1 + CVD_{dw-1y}\right) + \gamma^i_3 GTC_{odwy} + \gamma^i_4 SUB_{odwy} + \gamma^i_5 EMG_{owy} + \gamma^i_6 EMG_{dwy} + \delta^i_{od} + \delta^i_{wy} + \delta^i_{dw} + \nu^i_{odwy}$,

where, P_{odwy} denotes the average price of hotel rooms pp/pn in prefecture d paid by tourists from prefecture o; S^i_{odwy} is the share of overnight stays of tourists from prefecture o in category i hotels in prefecture d; $i = 1, 2, 3$ for the economy, middle class, and luxury hotels, respectively; and ξ_{odwy} and ν^i_{odwy} are disturbances. We employ OLS to estimate Equations (2) and (3). The presence of zero-valued dependent variables does not matter here because room prices cannot be defined without tourist flow.

Finally, we evaluate the extent to which the GTC contributes to the recovery of hotel sales compared to the level during the pre-corona period. Let W denote the weeks during

[12] Economy, middle class, and luxury hotels are hotels whose room price pp/pn is below JPY 10,000, JPY 10,000–30,000, and above JPY 30,000, respectively.

which the GTC was implemented (i.e., the weeks between July 20 to September 27). Then, the total sales of hotels in Japan for $w \in W$ of year y (V_y) is obtained by aggregating the revenue from tourists originating from prefecture o to d (V_{odwy}).

(4) $$V_y \equiv \sum_{w \in W} \sum_d \sum_o V_{odwy} = \sum_{w \in W} \sum_d \sum_o P_{odwy} F_{odwy}.$$

We obtain the total sales of hotels in the corresponding weeks in 2019 (V_{y-1}) as a reference value in a pre-corona period. By totally differentiating Equation (4) divided by V_{y-1} with respect to GTC_{odwy}, we obtain:

(5) $$\frac{dV_y}{V_{y-1}} = \frac{(\beta_3+\alpha_3) \sum_{w \in W} \sum_d \sum_o V_{odwy}\big|_{GTC=0} dGTC_{odwy}}{V_{y-1}},$$

where, $V_{odwy}\big|_{GTC=0}$ is the predicted sales of hotels if travel from o to d is not the subject of the GTC, which is obtained as the product of the predicted values of Equations (1) and (2) while setting $GTC_{odwy} = 0$. Because $dGTC_{od}$ is valued at one for any travel except for those from/to Tokyo (TYO) for $w \in W$, we can rewrite Equation (5) as:

(6) $$\frac{dV_y}{V_{y-1}} = \frac{(\beta_3+\alpha_3) \sum_{w \in W} \sum_{d \neq TYO} \sum_{o \neq TYO} V_{odwy}\big|_{GTC=0}}{V_{y-1}}.$$

Equation (6) measures the total tourism demand in Japan created by the GTC relative to the total tourism demand during the corresponding weeks in a pre-corona period. We can rearrange Equation (5) to consider the counterfactual case in which travel from/to Tokyo was the subject of the GTC as follows:

(7) $$\frac{dV_y}{V_{y-1}} = \frac{(\beta_3+\alpha_3) \sum_{w \in W} \left(\sum_{d \neq TYO} \sum_{o \neq TYO} V_{odwy}\big|_{GTC=0} + \sum_{d \neq TYO} V_{TYOdwy}\big|_{GTC=0} + \sum_o V_{oTYOwy}\big|_{GTC=0} \right)}{V_{y-1}}.$$

The first term in the second parenthesis is equivalent to Equation (6), while the second and third terms measure the counterfactual impact in the case where travel from/to Tokyo was the subject of the GTC. The last two terms demonstrate the extent to which travelers from/to

Tokyo contribute to the overall tourism demand in Japanese prefectures.

5. Estimation results

Below, we first examine the determinants of tourist flow, focusing on the impact of travel obstacles, such as the number of infected cases and distance. Then, we discuss the effectiveness of the GTC in mitigating the negative impact of the COVID-19 pandemic on tourist flow and the GTC's impact on room prices. Finally, we quantify the GTC's impact on hotel sales.

5.1 The determinants of tourist flows

Table 4 presents our baseline results. Column (1) indicates that the number of confirmed cases in the destination significantly reduces inbound travelers. This finding is consistent with that of previous studies. Additionally, the number of confirmed cases in the origin discourages outbound travel. The risk that travelers may spread the disease in the destination decreases outbound tourism demand in the case COVID-19. Moreover, tourist flow is low during the state of emergency. Column (2) introduces time fixed effects, considering the number of confirmed cases in the nation. Surprisingly, after controlling for the number of confirmed cases in the nation, the number of infected cases in both the origin and destination is no longer significant. This finding suggests that consumers react more strongly to the spread of the virus nationwide than to the spread within their own prefecture or the destination when they make a travel plan. We return to this issue in Table 5. Dummy variables for the state of emergency also become insignificant because the periods of such overlap in most origin–destination pairs (see Table 2), and its impact is captured by time fixed effects. Consequently, we omitted dummy variables for the state of emergency from the estimation models henceforth. Finally, our results are robust to the distinction between weekdays and weekends[13] (columns 3 and 4) and the replacement of the number of confirmed cases with the number of cases per thousand inhabitants (columns 5 to 7).

Table 5 considers the impact of distance on travel destination choices. The national and local governments requested self-restraint on inter-prefecture travel, particularly during and after the state of emergency, which likely affected consumers' decision regarding travel destination. Hence, columns (1), (3), and (5) include an interaction term between the number of cases in the origin and a dummy variable for travel within their own prefecture[14]. The results indicate that as the number of infected cases increases in a prefecture, residents in that region tend to travel more within their own prefecture, presumably to avoid inter-prefecture travel. To demonstrate this more clearly, in columns (2), (4), and (6), the number of infected cases, both in the origin and the destination, interact with categorical variables that measure the distance between them. Specifically, we construct three categorical variables that take the value one for travel between prefectures that are less than 250 km apart, 250–500 km apart, and over 500 km apart. Note that the first and last categories approximately correspond to the most frequent range of distance traveled by automobiles and high-speed rail or air,

[13] 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 weekend observations.

[14] An interaction term between the number of cases in the destination and a dummy variable for travel within their own prefecture is not included to avoid perfect multicollinearity.

respectively, according to the *Travel Mode Survey* by MLIT. We confirm that the spread of coronavirus disease in the origin raises the number of intra-prefecture tourists while reducing the number of outbound travelers to distant prefectures. The number of confirmed cases in the destination also decreases the number of inbound tourists for that region, especially in regions far from the origin. In conclusion, the spread of COVID-19 causes travelers to shift their destination from distant areas that can be reached by high-speed public transportation systems to neighboring regions within driving distance.

5.2 The effectiveness of travel subsidies

Table 6 examines the impact of the GTC and travel subsidies by local governments on the number of overnight stays and the average price of hotel rooms pp/pn for the whole week, weekdays, and weekends[15]. In the Appendix, we confirm that the parallel trend assumption is satisfied for tourist flows and the average price before the GTC implementation. Therefore, we can interpret the parameter on the GTC as its impact on tourist flows, excluding those who would travel even without the GTC subsidy. The results show that both the GTC and local travel subsidies significantly increased the number of overnight stays and the average price of hotel rooms. Quantitatively, the GTC increased the number of overnight stays by 55%. Vives et al. (2019) summarize the price elasticity estimates of hotel demand in previous studies and conclude that the demand is price inelastic. Because the GTC reduces the price of

---

[15] The price of hotel rooms is not reported if tourist flows between prefectures is zero. Because we cannot obtain the average price in such cases, the number of price observations is less than the number of tourist flow observations.

hotels maximum by 35%, the inelastic price elasticity indicates that an increase in hotel demand due to a reduction in room prices should be less than 35%. We do not have a specific reason to explain this gap, but we suppose that because of the government's requests to avoid unnecessary outings during the state of emergency, the marginal utility of travel is very high just before the implementation of the GTC. A very high marginal utility of travel may yield a higher price elasticity of hotel demand than the regular period[16]. Lastly, the coefficients for tourist flows are greater for weekends than for weekdays. Because leisure (business) travel tends to be concentrated on weekends (weekdays), this finding suggests that leisure travel is encouraged more by subsidies than is business travel.

To further focus on the difference between leisure and business travel, Table 7 examines whether the impact of subsidies differs between solo and family travelers[17]. Generally, family travelers are more likely to be leisure-oriented than are solo travelers. The results in Table 7 show that the GTC subsidy has a similar impact on both family and solo travelers, but local travel subsidies only encourage families to travel. Because local travel subsidies mostly aim to promote short local trips, solo travelers with business purposes may not react to such subsidies.

Table 8 considers the case where the impact of the GTC can vary depending on the distance between the origin and the destination. Because its discount additionally applies to transportation expenses, we expect that the GTC encourages long-distance travel. Although

---

[16] Consider a linear demand function. We can show that price elasticity increases as the quantity demanded declines.

[17] Family travelers include individuals traveling with family members or traveling as a couple.

the GTC enhances tourist flows for any range of travel, its impact monotonically decays with distance, except for weekends. The policy design of the GTC may explain this difference. Its discount applies to any overnight stays at registered hotels, and to transportation, dining, and shopping only if included in a travel package purchased through registered travel agents[18]. Since leisure travelers are the main customers of such travel packages, the GTC encourages long-distance leisure travel on weekends.

Finally, Table 9 demonstrates how the COVID-19 pandemic affects the distribution of hotel room prices. The table shows that both the GTC and local travel subsidies decrease (increase) the share of overnight stays in the economy (middle class) hotels, inducing travelers to upgrade their accommodation from economy to middle-class hotels. Contrastingly, only the GTC significantly raises the share of overnight stays in luxury hotels. The results are consistent with the argument that the GTC encourages tourists to stay in higher-class hotels than they usually do, but local travel subsidies are less likely to do so.

5.3 Impact of travel subsidies on hotel sales

Based on results (1) and (2) of Table 6, we evaluate the effectiveness of the GTC to remedy the economic damage to the accommodation sector caused by the COVID-19 pandemic. Our focus here is threefold. First, we examine the extent to which the GTC contributes to the recovery of hotel demand during the spread of COVID-19. Second, we argue how much the total sales of hotels would increase if travel from/to Tokyo was the subject of the GTC.

[18] The fraction of consumers traveling between July and September, 2020 using travel packages is 6%, according to *Travel and Tourism Consumption Trend Survey* by JTA-MLIT.

Finally, we assess the cost-effectiveness of the GTC.

Table 10 summarizes the results. The predicted total sales of hotels during the period of the GTC (i.e., the weeks of July 20 to September 27) relative to those in 2019 was 59.4%. By evaluating Equation (6), we find that the GTC raised tourism demand by 17.3% of the total hotel sales in 2019, contributing to one-third (17.3/59.4) of the predicted total hotel sales in 2020. We obtain the impact of travel subsidies by local governments similarly. The impact presented in Table 10 shows that during the period of the GTC, local travel subsidies create 5.4% of the tourism demand in a pre-corona period, which is much smaller than the tourism demand created by the GTC. Decomposing the tourism demand by origin of tourists demonstrates that tourists from other prefectures account for 76.9% (13.3/17.3) and 44.4% (2.4/5.4) of the total demand created by the GTC 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 Equation (7) illustrates that hotels in Tokyo and prefectures other than Tokyo would increase their sales by 1.8% and 4.4% of the total sales earned in the pre-corona period, respectively, if travel to/from Tokyo was the subject to the GTC. Aggregating these two amounts to 6.2% of the total hotel sales for the pre-corona period.

Finally, according to the JTA-MLIT, the Japanese government spent JPY 110 billion on the GTC to subsidize 25 million overnight stays from July 22 to September 30, 2020. Note that this figure includes the number of tourists who would travel even without the GTC. To examine the cost-effectiveness of travel subsidies rigorously, we need to exclude those tourists from the impact evaluation. The prediction based on Equation (1) indicates that the GTC yields 17 million overnight stays for July 20, 2020, and September 27. By using the total expenditure of JPY 1,488 billion on accommodation during the corresponding weeks in 2019[19], the tourism demand created by the GTC is estimated at JPY 258 billion. A comparison between government spending on the GTC of JPY 110 billion and tourism demand created by it shows that the GTC has more than doubled the revenue received by the accommodation sector.

6. Summary and discussion

Globally, we are experiencing major and rapid escalation of COVID-19 cases. The pandemic affects almost all sectors of the economy, including the tourism industry. Many tourism-related businesses have closed, such as hotels, restaurants, tourist attractions, and tour operations. National and local governments are asked to enhance tourist flow while controlling the spread of the pandemic. This study aims to provide policy implications for this issue. For this purpose, employing weekly data on tourist flow between Japanese prefectures, we examine the determinants of tourist flow during the COVID-19 pandemic and evaluate the effectiveness of different types of travel subsidies in mitigating its negative shocks.

The spread of COVID-19 significantly reduced tourism demand in Japan. However,

[19] The average price is estimated based on the number of overnight stays in each of the three price ranges of hotel rooms and may not be precise. Thus, the total expenditure on accommodation in 2019 is obtained by multiplying the number of tourists from the *Overnight Travel Statistics Survey* with the average unit value of accommodation from the *Travel and Tourism Consumption Trend Survey*.

in contrast to infectious diseases that spread locally, the COVID-19 pandemic decreased both outbound and inbound tourists. Furthermore, consumers who decided to travel tended to avoid long-distance travel by shifting from inter- to intra-prefecture travel. Our results indicate that travel subsidies are effective in boosting tourism demand. However, most of the travel subsidies by local governments are for residents traveling within their own prefectures. Because this type of travel accounts for a small fraction of tourism demand during the regular period, we cannot expect a significant contribution from local travel subsidies for the recovery of poor tourism demand. The GTC, a nationwide travel subsidy by the Japanese government, will complement them by increasing tourism demand to distant regions, particularly for leisure purposes. However, the ad valorem type of the campaign is more likely to shift demand from economy to middle or luxury hotels than the specific type of local travel subsidies. Therefore, policymakers are advised to pay more attention to the management of cheaper hotels.

In conclusion, controlling the spread of coronavirus disease nationwide is of utmost priority for national and local governments to recover tourism demand. Providing travel subsidies is an effective tool for sustaining tourism businesses. However, the GTC was temporarily suspended on December 28, 2020, because COVID-19 is yet to show any sign of convergence in Japan. It is also argued that the increased number of leisure tourists during the summer vacation period might be a factor causing the second wave of COVID-19 in Europe. To seek a proper balance between tourism and public health, whether and to what extent the implementation of the GTC has accelerated the spread of the COVID-19 pandemic in Japan remains an important topic for further investigation.

References

Blake, A. and M. Sinclair (2003), 'Tourism crisis management: US response to September 11', *Annals of Tourism Research*, 30: 813–832.

Canina, L. and S. Carvell (2005), 'Lodging demand for urban hotels in major metropolitan markets', *Journal of Hospitality and Tourism Research*, 29: 291–311.

Cooper, M. (2006), 'Japanese tourism and the SARS epidemic of 2003', *Journal of Travel and Tourism Marketing*, 19: 117–131.

Farzanegan M., Gholipour, H., Feizi, M, Nunkoo, R., and A. Andargoli (2020), 'International tourism and outbreak of Coronavirus (COVID-19): A cross-country analysis', *Journal of Travel Research*.

Karabulut, G., Bilgin, M., Demir, E., and A. Doker (2020), 'How pandemics affect tourism: International evidence', *Annals of Tourism Research*, 84: 102991.

Kikuchi, S., Kitao, S., and M. Mikoshiba (2020), 'Heterogeneous vulnerability to the COVID-19 crisis and implications for inequality in Japan', *Crepe Discussion Paper* no. 71.

Kuo, H.I., Chen, C.C., Tseng, W.C., Ju, L.F., and B.W. Huang (2008), 'Assessing impacts of SARS and Avian Flu on international tourism demand to Asia', *Tourism Management*, 29: 917–928.

Matsushita, N. (2019), 'Analysis on the impact of restoration measures "Fukkouwari" to recovery process of tourism industry in the Kumamoto earthquake', *Journal of Japan*

Society of Civil Engineers, Ser. D3, 75: 1–10.

Morley, C., Rosselló, J., and M. Santana-Gallego (2014), 'Gravity models for tourism demand: theory and use', *Annals of Tourism Research*, 48: 1–10.

Organisation for Economic Co-operation and Development (2020), 'Mitigating the impact of COVID-19 on tourism and supporting recovery', *OECD Tourism Papers*, 2020/03, OECD Publishing, Paris.

Rittichainuwat, B.N., and G. Chakraborty (2009), 'Perceived travel risks regarding terrorism and disease: The case of Thailand', *Tourism Management*, 30: 410–418.

Rosselló, J., Santana-Gallego, M., and W. Awan (2017), 'Infectious disease risk and international tourism demand', *Health Policy and Planning*, 32: 538–548.

Saito, H. and J. Romão (2018), 'Seasonality and regional productivity in the Spanish accommodation sector', *Tourism Management*, 69: 180–188.

Santos Silva, J.M.C. and S. Tenreyro (2006), 'The log of gravity', *Review of Economics and Statistics*, 88: 641–658.

Tukey, J.W. (1977), *Exploratory Data Analysis*. MA: Addison-Wesley.

Vives, A., Jacob, M., and E. Aguiló (2019), 'Online hotel demand model and own-price elasticities: An empirical application in a mature resort destination', *Tourism Economics*, 25: 670–694.

Zeng, B., Carter, R., and T. De Lacy (2005), 'Short-term perturbations and tourism effects: The case of SARS in China', *Current Issues in Tourism*, 8: 306–322.

Zenker, S. and F. Kock (2020), 'The coronavirus pandemic: A critical discussion of a tourism research agenda', *Tourism Management*, 81: 104164.

Table 1. Tourism Demand in Japanese Prefectures in a Pre-Corona Period

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 %.
Source: JTTA, Tourism Forecast Platform.

Table 2. Travel Policies Related to the COVID-19 Pandemic

Date	Content	
State of emergency		
April 7	Declared in 7 prefectures	
April 16	Declared in all prefectures	
May 14	Lifted in all prefectures, except for 8	
May 21	Lifted in all prefectures, except for 3	
May 25	Lifted in all prefectures	
Go to Travel Campaign		
July 22–September 30, 2020	A 35% discount on travel expenses except for travel from/to Tokyo	
Travel subsidies by local governments		
Implemented in	Implemented by	Content
May	1 prefecture	Subsidy of JPY 2,000–15,000 (mode: 5,000) per person for residents traveling within the own prefecture (23 prefectures), for residents traveling within the 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: Webpages of the Cabinet Secretariat and local governments.

Table 3. Variable Definitions and Summary Statistics

Variable	Mean	Std. dev.
Continuous variable		
Number of overnight stays	489.671	1333.994
Number of overnight stays by family travelers	326.636	997.384
Number of overnight stays by solo travelers	60.427	192.469
The average price of hotel rooms per person per night, in JPY 10,000	1.351	0.781
Share of overnight stays in economy hotels	0.468	0.326
Share of overnight stays in middle-class hotels	0.440	0.315
Share of overnight stays in luxury hotels	0.092	0.188
Number of confirmed COVID-19 cases in the origin	0.151	0.597
Number of confirmed COVID-19 cases in the destination	0.151	0.597
Amount of travel subsidy by local governments in JPY 10,000	0.003	0.045
Dummy variable		
Travel within the own prefecture	0.021	0.144
Travel between prefectures that are <250 km apart	0.254	0.435
Travel between prefectures that are 250–500 km apart	0.291	0.454
Travel between prefectures that are >500 km apart	0.435	0.496
State of emergency in the origin	0.022	0.148
State of emergency in the destination	0.022	0.148
Go to Travel Campaign	0.049	0.216

Note: Family travelers include individuals traveling with family members or traveling as 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.
Source: J.A.G Japan, Dashboard & Map of COVID-19 Japan Case.
JTTA, Tourism Forecast Platform.
Webpages of the Cabinet Secretariat and local governments.

Table 4. Gravity Model of Tourist Flow: Base Model

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Weekly		Weekday	Weekend	Weekly	Weekday	Weekend
$\ln(1 + CVD_{ow-1y})$	-0.0697***	0.000195	0.00411	-0.00258			
	(0.0121)	(0.0258)	(0.0258)	(0.0263)			
$\ln(1 + CVD_{dw-1y})$	-0.103***	-0.0342	-0.0111	-0.0545			
	(0.0219)	(0.0337)	(0.0324)	(0.0351)			
$\ln(1 + CVD_{ow-1y}/\text{population}_{oy})$					-8.838	-6.155	-10.66
					(8.386)	(8.103)	(8.725)
$\ln(1 + CVD_{dw-1y}/\text{population}_{dy})$					-11.95	-7.427	-16.34*
					(7.886)	(6.582)	(9.075)
State of emergency in origin	-0.953***	-1.56e-05	-0.0831	0.0579	0.0180	-0.0640	0.0746
	(0.0479)	(0.0940)	(0.105)	(0.124)	(0.102)	(0.113)	(0.129)
State of emergency in destination	-0.508***	-0.0467	-0.156	0.0398	-0.0919	-0.164	-0.0382
	(0.0550)	(0.101)	(0.110)	(0.137)	(0.122)	(0.132)	(0.153)
Origin–destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Destination–week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	432,964	432,964	428,546	432,964	432,964	428,546	432,964
Log likelihood	-3.4e+07	-1.9e+07	-2.1e+07	-2.8e+07	-1.9e+07	-2.1e+07	-2.8e+07

Note: The dependent variable is the number of overnight stays. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5. The Impact of Distance on Tourist Flow

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Weekly		Weekday		Weekend	
$\ln(1+CVD_{ow-1y})$	-0.0244		-0.0222		-0.0265	
	(0.0159)		(0.0151)		(0.0168)	
$\ln(1+CVD_{ow-1y})$						
$\times$ Own prefecture	0.370***	0.247***	0.354***	0.261***	0.384***	0.234***
	(0.0196)	(0.0213)	(0.0196)	(0.0209)	(0.0194)	(0.0224)
$\times < 250$ km apart		-0.0141		-0.0101		-0.0156
		(0.0240)		(0.0240)		(0.0241)
$\times$ 250 – 500 km apart		-0.0411**		-0.0404**		-0.0431**
		(0.0191)		(0.0176)		(0.0206)
$\times > 500$ km apart		-0.0446***		-0.0445***		-0.0462***
		(0.0155)		(0.0152)		(0.0163)
$\ln(1+CVD_{dw-1y})$	-0.103***		-0.0748***		-0.128***	
	(0.0179)		(0.0182)		(0.0185)	
$\ln(1+CVD_{dw-1y})$						
$\times < 250$ km apart		-0.00718		0.0298		-0.0369
		(0.0281)		(0.0287)		(0.0280)
$\times$ 250 – 500 km apart		-0.112***		-0.0818***		-0.137***
		(0.0190)		(0.0189)		(0.0204)
$\times > 500$ km apart		-0.171***		-0.144***		-0.196***
		(0.0203)		(0.0217)		(0.0200)
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	432,964	432,964	428,546	428,546	432,964	432,964
Log likelihood	-1.8e+07	-1.8e+07	-2.0e+07	-2.0e+07	-2.7e+07	-2.7e+07

Note: The dependent variable is the number of overnight stays. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6. The Impact of Travel Subsidy on Tourist Flow and Room Price

	(1)	(2)	(3)	(4)	(5)	(6)
	Weekly		Weekday		Weekend	
	# of stays	Price	# of stays	Price	# of stays	Price
Variable	PPML	OLS	PPML	OLS	PPML	OLS
Go to Travel Campaign	0.547***	0.134***	0.476***	0.109***	0.594***	0.146***
	(0.0837)	(0.0204)	(0.0767)	(0.0229)	(0.0918)	(0.0217)
Local travel subsidies	0.498**	0.0534**	0.396**	0.0674**	0.595***	0.0342
	(0.197)	(0.0212)	(0.193)	(0.0261)	(0.203)	(0.0217)
$\ln(1 + CVD_{ow-1y})$						
$\times$ Own prefecture	0.274***	-0.0204	0.287***	-0.0312*	0.259***	-0.0205
	(0.0389)	(0.0156)	(0.0312)	(0.0165)	(0.0451)	(0.0146)
$\times < 250$ km apart	0.0424**	0.0129***	0.0364*	0.0126***	0.0476**	0.0116***
	(0.0187)	(0.00403)	(0.0192)	(0.00456)	(0.0188)	(0.00405)
$\times$ 250 − 500 km apart	0.0154	0.00443	0.00502	0.00162	0.0218	0.00254
	(0.0168)	(0.00357)	(0.0166)	(0.00437)	(0.0176)	(0.00390)
$\times > 500$ km apart	0.0117	0.000359	0.000805	-0.00726	0.0191	0.00620
	(0.0147)	(0.00441)	(0.0150)	(0.00533)	(0.0150)	(0.00484)
$\ln(1 + CVD_{dw-1y})$						
$\times < 250$ km apart	0.0302	-0.0273***	0.0598**	-0.0317***	0.00584	-0.0303***
	(0.0272)	(0.00493)	(0.0284)	(0.00535)	(0.0267)	(0.00535)
$\times$ 250 − 500 km apart	-0.0722***	-0.0416***	-0.0502***	-0.0400***	-0.0918***	-0.0417***
	(0.0171)	(0.00507)	(0.0182)	(0.00602)	(0.0175)	(0.00556)
$\times > 500$ km apart	-0.122***	-0.0478***	-0.106***	-0.0420***	-0.140***	-0.0498***
	(0.0198)	(0.00512)	(0.0216)	(0.00644)	(0.0190)	(0.00545)
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	432,964	311,014	428,546	251,111	432,964	274,594
Log likelihood	-1.8e+07		-2.0e+07		-2.6e+07	
R-squared		0.230		0.210		0.216

Note: The dependent variable and estimator used are indicated in the table header. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Gravity Model of Tourist Flow: Family vs. Solo Travelers

	(1)	(2)	(3)	(4)	(5)	(6)
	Weekly		Weekday		Weekend	
Variable	Family	Solo	Family	Solo	Family	Solo
Go to Travel Campaign	0.570***	0.482***	0.525***	0.395***	0.595***	0.591***
	(0.103)	(0.0531)	(0.0995)	(0.0533)	(0.109)	(0.0551)
Local travel subsidies	0.527**	-0.0463	0.432**	-0.0764	0.625***	-0.0132
	(0.217)	(0.0726)	(0.219)	(0.0783)	(0.218)	(0.0747)
$\ln(1 + CVD_{ow-1y})$						
$\times$ Own prefecture	0.249***	0.301***	0.267***	0.279***	0.231***	0.328***
	(0.0445)	(0.0203)	(0.0362)	(0.0210)	(0.0513)	(0.0214)
$\times < 250$ km apart	0.0427**	0.0589***	0.0422**	0.0411**	0.0435**	0.0729***
	(0.0198)	(0.0184)	(0.0210)	(0.0189)	(0.0197)	(0.0186)
$\times$ 250 – 500 km apart	0.00921	0.00480	-0.00337	-0.00844	0.0174	0.0192
	(0.0194)	(0.0152)	(0.0201)	(0.0154)	(0.0197)	(0.0161)
$\times > 500$ km apart	0.00285	0.0180	-0.00483	0.00130	0.00870	0.0400**
	(0.0174)	(0.0157)	(0.0186)	(0.0166)	(0.0174)	(0.0157)
$\ln(1 + CVD_{dw-1y})$						
$\times < 250$ km apart	0.000663	0.0555	0.0200	0.0760**	-0.0142	0.0382
	(0.0270)	(0.0339)	(0.0288)	(0.0347)	(0.0270)	(0.0328)
$\times$ 250 – 500 km apart	-0.107***	-0.00262	-0.0924***	0.00139	-0.120***	-0.00489
	(0.0217)	(0.0148)	(0.0241)	(0.0154)	(0.0216)	(0.0157)
$\times > 500$ km apart	-0.172***	-0.0674***	-0.160***	-0.0635***	-0.186***	-0.0690***
	(0.0200)	(0.0208)	(0.0216)	(0.0226)	(0.0195)	(0.0194)
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	432,964	432,964	428,546	428,546	432,964	432,964
Log likelihood	-1.6e+07	-4.2e+06	-1.8e+07	-5.4e+06	-2.5e+07	-5.8e+06

Note: The dependent variable is the number of overnight stays. "Family" includes travel by family members and couples. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8. The Impact of Travel Subsidy and Distance on Tourist Flow

Variable	(1) Weekly	(2) Weekday	(3) Weekend
Go to Travel Campaign			
$\times$ Own prefecture	0.633***	0.734***	0.536***
	(0.182)	(0.188)	(0.181)
$\times < 250$ km apart	0.575***	0.499***	0.603***
	(0.0970)	(0.0950)	(0.0994)
$\times\ 250-500$ km apart	0.569***	0.455***	0.660***
	(0.0824)	(0.0796)	(0.0870)
$\times > 500$ km apart	0.431***	0.366***	0.514***
	(0.0874)	(0.0905)	(0.0898)
Local travel subsidies	0.451**	0.260	0.620***
	(0.203)	(0.197)	(0.209)
$\ln(1+CVD_{ow-1y})$			
$\times$ Own prefecture	0.265***	0.261***	0.265***
	(0.0505)	(0.0495)	(0.0506)
$\times < 250$ km apart	0.0418**	0.0393**	0.0455**
	(0.0197)	(0.0200)	(0.0203)
$\times\ 250-500$ km apart	0.0152	0.0112	0.0145
	(0.0180)	(0.0173)	(0.0190)
$\times > 500$ km apart	0.0240	0.0144	0.0256
	(0.0151)	(0.0147)	(0.0163)
$\ln(1+CVD_{dw-1y})$			
$\times < 250$ km apart	0.0290	0.0620**	0.00343
	(0.0288)	(0.0297)	(0.0284)
$\times\ 250-500$ km apart	-0.0726***	-0.0458**	-0.0980***
	(0.0170)	(0.0183)	(0.0173)
$\times > 500$ km apart	-0.110***	-0.0918***	-0.134***
	(0.0203)	(0.0221)	(0.0200)
Origin–destination FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Destination–week FE	Yes	Yes	Yes
Observations	432,964	428,546	432,964
Log likelihood	-1.8e+07	-2.0e+07	-2.6e+07

Note: The dependent variable is the number of overnight stays. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9. Gravity Model of Tourist Flow: By Type of Hotels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Weekly			Weekday			Weekend		
Variable	Economy	Middle class	Luxury	Economy	Middle class	Luxury	Economy	Middle class	Luxury
Go to Travel Campaign	-0.0791***	0.0368***	0.0423***	-0.0621***	0.0297**	0.0324***	-0.0807***	0.0299***	0.0508***
	(0.0116)	(0.0105)	(0.00821)	(0.0137)	(0.0127)	(0.00943)	(0.0129)	(0.0116)	(0.00880)
Local travel subsidies	-0.0686***	0.0700***	-0.00145	-0.0797***	0.0739***	0.00581	-0.0579***	0.0717***	-0.0137
	(0.0157)	(0.0142)	(0.00895)	(0.0187)	(0.0164)	(0.0112)	(0.0167)	(0.0162)	(0.00907)
$\ln(1 + CVD_{ow-1y})$									
$\times$ Own prefecture	0.00647	-0.000132	-0.00634	0.0104	0.000734	-0.0111**	0.0133*	-0.00731	-0.00597
	(0.00806)	(0.00551)	(0.00512)	(0.00850)	(0.00607)	(0.00533)	(0.00788)	(0.00573)	(0.00492)
$\times < 250$ km apart	-0.00430*	-0.000895	0.00519***	-0.00626**	0.00225	0.00401**	-0.000824	-0.00376	0.00458**
	(0.00255)	(0.00221)	(0.00180)	(0.00304)	(0.00280)	(0.00204)	(0.00269)	(0.00248)	(0.00183)
$\times$ 250 – 500 km apart	-0.00473*	0.00222	0.00251	-0.000935	-0.00155	0.00248	-0.00240	0.000991	0.00141
	(0.00247)	(0.00247)	(0.00176)	(0.00303)	(0.00291)	(0.00209)	(0.00265)	(0.00263)	(0.00193)
$\times > 500$ km apart	0.00155	-0.00562**	0.00407*	0.00837**	-0.0111***	0.00272	-0.00112	-0.00456*	0.00569**
	(0.00280)	(0.00245)	(0.00230)	(0.00345)	(0.00298)	(0.00276)	(0.00296)	(0.00275)	(0.00260)
$\ln(1 + CVD_{dw-1y})$									
$\times < 250$ km apart	0.0141***	-0.0120***	-0.00213	0.0185***	-0.0155***	-0.00298	0.0171***	-0.0139***	-0.00326
	(0.00319)	(0.00276)	(0.00215)	(0.00360)	(0.00337)	(0.00237)	(0.00361)	(0.00319)	(0.00229)
$\times$ 250 – 500 km apart	0.0237***	-0.0166***	-0.00712***	0.0218***	-0.0145***	-0.00732***	0.0247***	-0.0182***	-0.00649**
	(0.00341)	(0.00316)	(0.00226)	(0.00387)	(0.00355)	(0.00265)	(0.00359)	(0.00358)	(0.00263)
$\times > 500$ km apart	0.0277***	-0.0188***	-0.00895***	0.0212***	-0.0129***	-0.00828***	0.0307***	-0.0218***	-0.00892***
	(0.00368)	(0.00328)	(0.00233)	(0.00466)	(0.00409)	(0.00288)	(0.00379)	(0.00349)	(0.00260)
Origin–destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination–week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	311,014	311,014	311,014	251,111	251,111	251,111	274,594	274,594	274,594
R-squared	0.148	0.089	0.138	0.140	0.083	0.125	0.140	0.089	0.134

Note: The dependent variable is the share of overnight stays in the type of hotel indicated in the table header. Standard errors clustered by origin–destination pairs are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10. The Impact of Travel Subsidy on Hotel Sales

	The predicted sales of hotels in 2020 relative to those in 2019	Tourists from		Counterfactual case	
		Their own prefecture	Other prefectures	From Tokyo	To Tokyo
Travel subsidy					
GTC	17.3%	4.0%	13.3%	4.4%	1.8%
Local travel subsidies	5.4%	3.1%	2.4%		
Base demand	36.6%				
Total	59.4%				

Note: Base demand refers to the predicted sales of hotels without travel subsidies. The GTC and local travel subsidies show the predicted sales of hotels attributed to their respective travel subsidies. All figures are of the relative sales from July 20 to September 27, 2020, per total predicted sales of hotels in the corresponding weeks in 2019. The figure in "To Tokyo" in the counterfactual case includes the predicted sales of hotels in Tokyo from tourists originating from there.

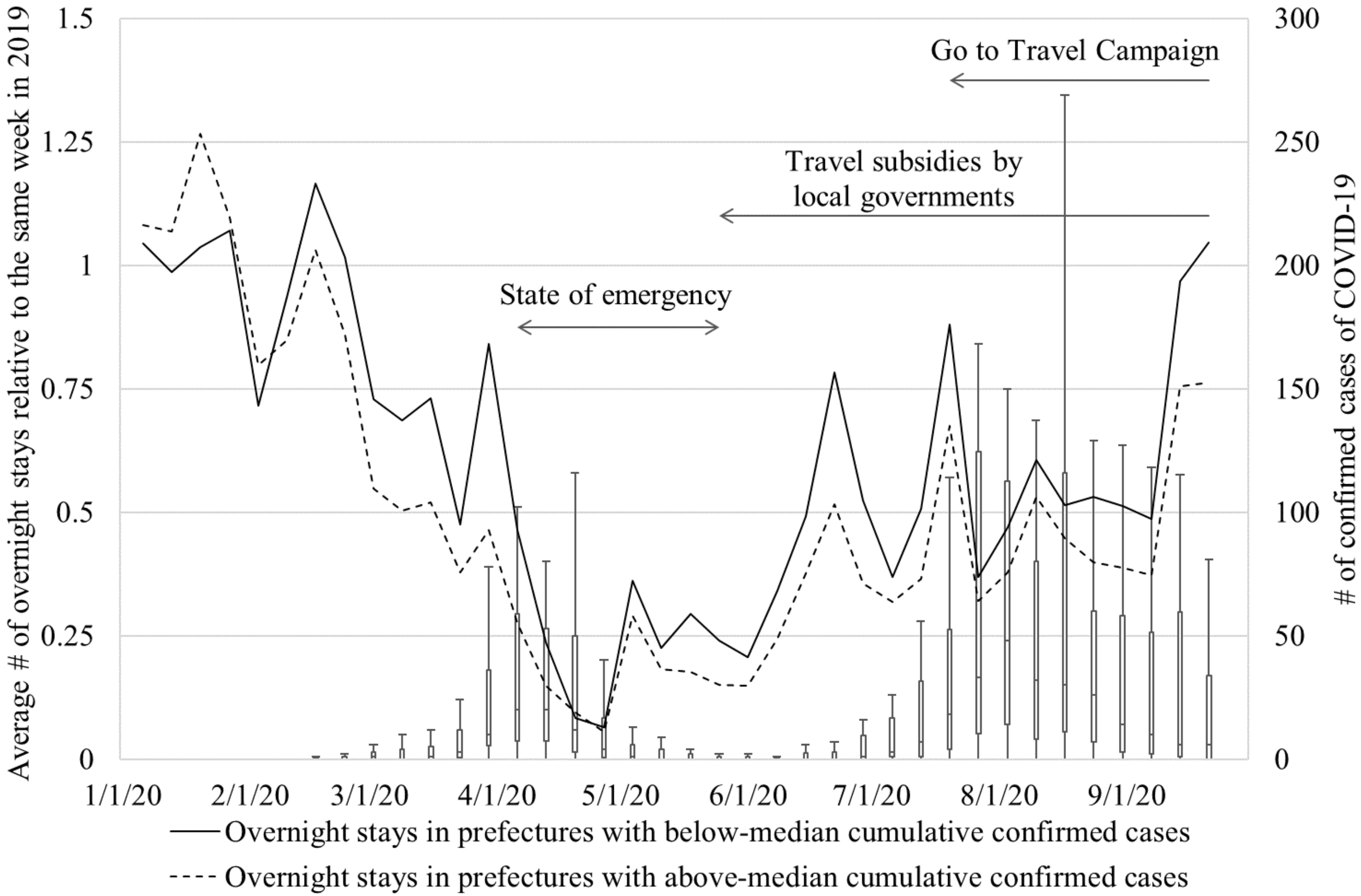

Figure 1. Overnight Stays and Confirmed Cases of COVID-19 in Japanese Prefectures in 2020

Note: Outside values are excluded in the box plots.

Source: JTTA, Tourism Forecast Platform.

Appendix: Test of Parallel Trend Assumption

To test the parallel trend assumption, we add Equations (1) and (2) 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. If the coefficients on interaction terms in Equation (1) are not significant from zero before the implementation of the GTC (i.e., July 22), tourist flows between prefectures in a treatment group follows the same time trend as tourist flows between prefectures in a control group. We can test the parallel trend assumption for the average room price by checking the coefficients of the interaction terms in Equation (2). Figures A1 and A2 show that almost all coefficients are not significantly different from zero before the week starting from July 20, but become significant after the implementation of the GTC.

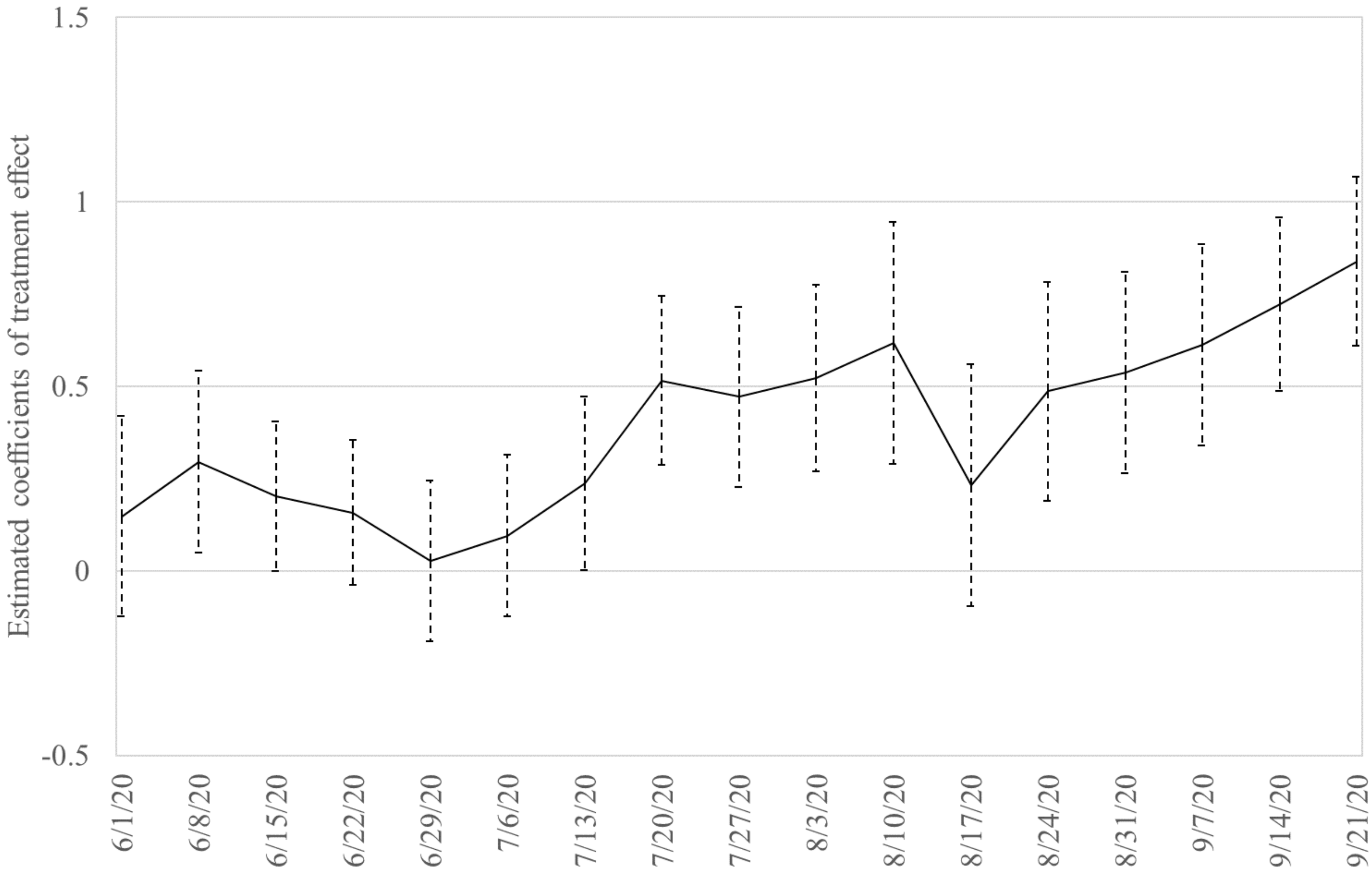

Figure A1. Estimated Coefficients of Treatment Effect on Tourist Flow

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 95% confidence interval.

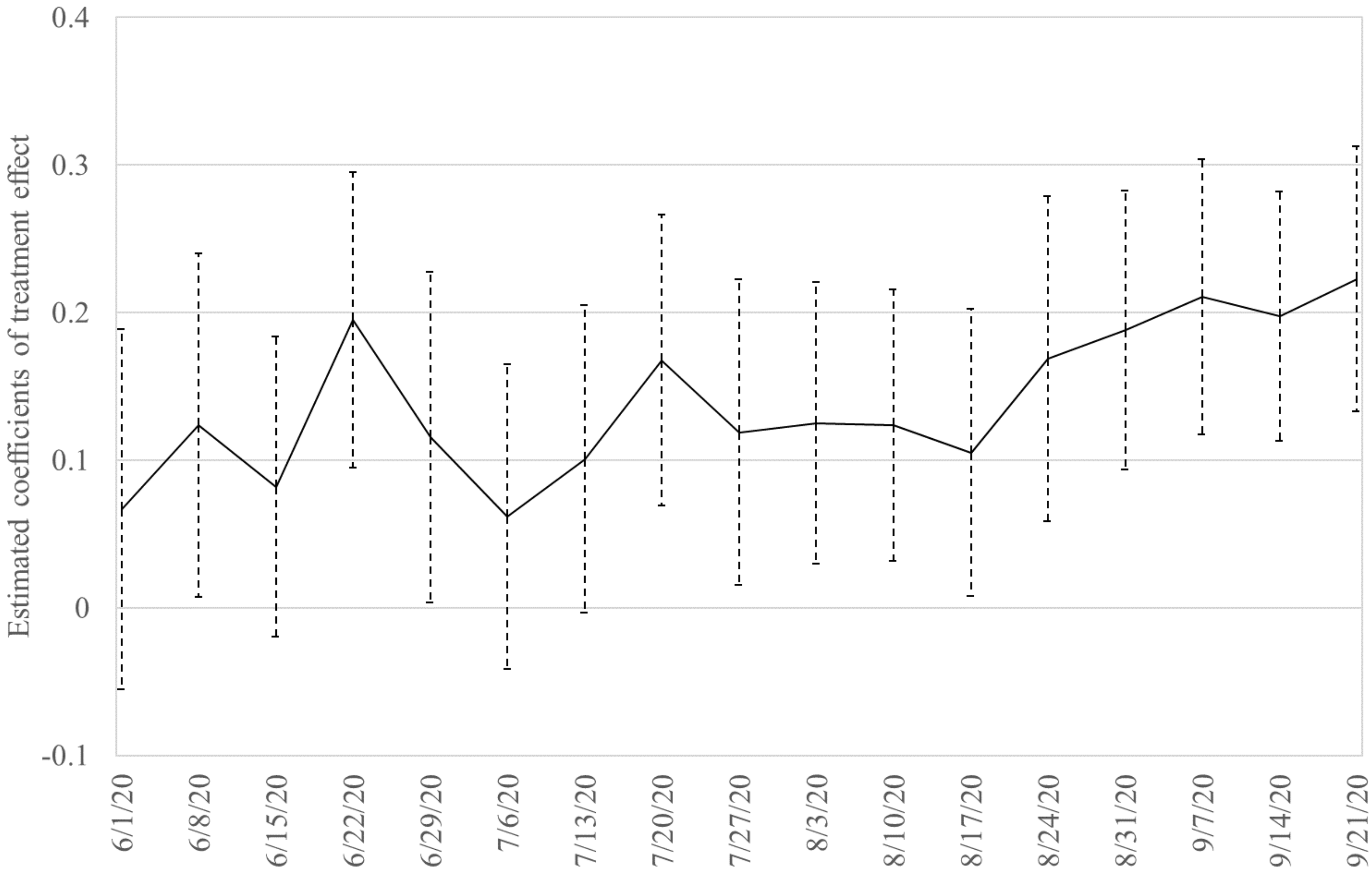

Figure A2. Estimated Coefficients of Treatment Effect on Room Price

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 95% confidence interval.