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"True Impact of Japan's Covid State of Emergency on Consumption"

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True Impact of Japan's Covid State of Emergency on Consumption[†]

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Abstract

This study examines the effect of the Covid pandemic containment measures on Japan's consumption, using high-frequency credit card data. Based on the assumption that neighboring municipalities on prefectural borders with different containment policies have an equivalent fear of contagion, this study distinguishes the negative effect of containment measures on consumption from the effect of fear, by employing a synthetic control method. Specifically, it constructs a synthetic control municipality that faces fear equal to that faced by untreated municipalities in the donor pool, and whose post-treatment consumption corresponds to the counterfactual consumption of the treated municipality without containment intervention. Comparing the synthetic control and treated municipalities' consumption with prefectural borders, allows the identification of the true impact of the containment policies on consumption. These results indicate that, the negative effects of the state of emergency on consumption is much lower than the extreme decline in consumers' spending.

Keywords: Covid; Pandemic; Stay-at-home order; State of emergency; Consumer activity; Fear of infection; Credit card data

JEL codes: D12, H12, I12, I18

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1 Introduction

The Covid-19 pandemic has caused severe economic disruptions. Many governments have adopted a series of measures (e.g., stay-at-home orders) to halt the spread of infection. Various researchers have examined how government orders affect consumer behavior during the pandemic and discussed how to balance the containment of Covid spread and minimization of the economic impact. However, less is known about the causal effect of movement restriction on consumption after controlling for fear of infection. Identifying the true effect of government measures on consumption and the effect of fear is informative for policymakers because they need to minimize the cost of restriction.

In this study, I estimate the causal effects of Japan's state of emergency on consumption, controlling for fear and anxiety about infection. Specifically, I employ the synthetic control method developed by Abadie and Gardeazabal (2003) and Abadie, Diamond, and Hainmueller (2010), which can provide reliable estimators even when researchers cannot find appropriate control units that can satisfy the parallel trend assumption of difference-in-differences method. In particular, I assume that neighboring municipalities on prefectural borders have an equivalent level of fear of contagion even when the prefectures of those municipalities have different containment policies. Based on this assumption, I construct a synthetic control municipality, which is a weighted average of untreated municipalities near the borders of treated municipalities. Because of the assumption, the synthetic control municipality has an equal level of fear as untreated municipalities. Because the outcome of the synthetic control unit mimics that of the treated unit in the absence of intervention, its post-treatment daily consumption corresponds to counterfactual consumption in the absence of policy intervention in the treated municipalities. Comparing the consumption of the synthetic control and the treated municipalities within the containment period, allows the identification of the true impact of containment policies on consumption, controlling for the fear of infection.

The results show that, the Japanese state of emergency reduces consumption even when controlled for the effect of fear of infection, but the impact is much lower than the observed extreme decline in consumers' spending. Furthermore, online shops and sectors that operate through small retail stores increase sales during a state of emergency, while sectors operating through large-scale retail stores (e.g., departmental stores and shopping centers), face a larger decline in sales. These changes in consumer behavior indicate the large impact of fear of infection on consumption.

When policymakers state an emergency, they need to consider how the state of emergency affects consumption and how to suppress its negative effects as small as possible while controlling the infection. This study indicates that it is more important to prevent the expansion of fear of infection than to hesitate to declare a state of emergency for afraid of its negative impact on consumption.

The remainder of this paper is organized as follows. Section 2 reviews the relevant studies. Section 3 describes the credit card data used in the study and their features. In Section 4, I present an estimation strategy that uses a synthetic control method. Section 5 discusses the results. In Section 6. Finally, Section 7 concludes the paper.

2 Literature review

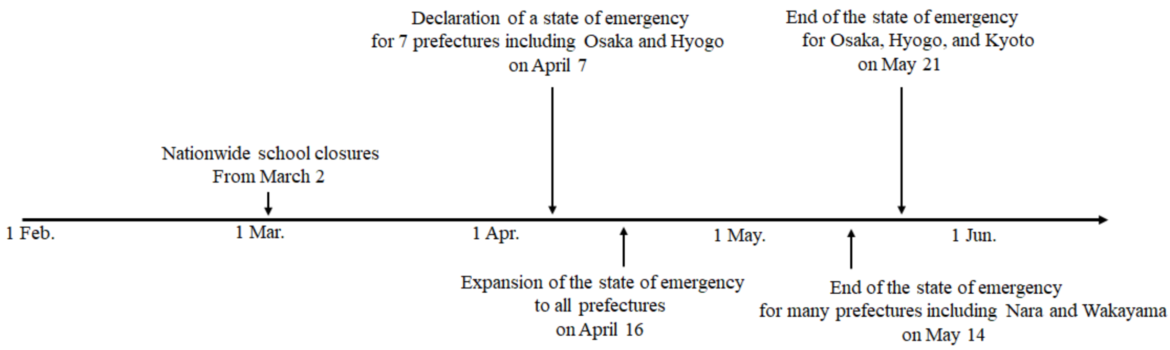
Several studies have examined the economic impact of Covid-19 and its related measures on consumer behavior. This study contributes to two recent strands of literature: (i) literature that measures the impact of Covid-19 pandemic and its related policies by using high-frequency alternative data, and (ii) literature that analyzes the effect of fear of the virus on consumers' behavior.

The growing literature uses high-frequency alternative data from credit card companies or banks to analyze consumers' behavior during the Covid-19 pandemic, and examines the impact of governments' measure on consumption (e.g., Chen, Qian, and Wen (2021) for China, Baker, Farrokhnia, Meyer, Pagel, and Yannelis (2020) and Chetty, Friedman, Hendren, Stepner, and Team (2020) for U.S., Bounie, Camara, and Galbraith (2023) for France, Carvalho et al. (2021) for Spain, Andersen, Hansen, Johannesen, and Sheridan (2022) for Denmark, and Watanabe (2020) for Japan). Most of these studies use the difference-in-differences method, which uses consumption within the same period of 2019 (a year before the pandemic) as the control group, to estimate the impact of government intervention on consumption. Specifically, Bounie et al. (2023) report that, the French containment policy reduced the value and volume of consumption by 41% and 50% respectively. Andersen et al. (2022) also find that, aggregate card spending declined approximately 29% during the government's shutdown. This study differs from the existing literature in that, it distinguishes the effect of government intervention on consumption from the fear of the virus. Comparing this study's results with those following the difference-in-differences method in the literature indicates that, the negative impact of stay-at-home orders on consumption is much smaller than those reported in the literature.

Some studies have examined the effects of the fear of infection on economic activity. Immordino, Jappelli, Oliviero, and Zazzaro (2022) study the effect of fear on consumption. Using a survey of Italian households, they report that the probability of consumption decreasing with an increase in savings after the pandemic is positively associated with the fear of contagion. Goolsbee and Syverson (2021) separate the negative effect of voluntary distancing due to fear of contagion and that of the government's containment measures. Their identification strategy is to compare differences in consumer behavior within commuting zones but across counties with different containment measures. Their estimated negative impact of shutdown policies on consumers' visits to stores is about 7 percentage points, while overall consumer traffic declines by 60 percentage points. Watanabe and Yabu (2021a) define the effects of stay-at-home measure as the intervention effect and the information effect. The former corresponds to the reduction in outings directly caused by the government's request, and the latter is the result of people's voluntary behavioral changes. Subsequently, Watanabe and Yabu (2021a) report that only one-quarter of the decline in outings could be explained by the government's intervention. Watanabe and Yabu (2021b) extend Watanabe and Yabu (2021a) and show that the information effect depends on peoples' own risk of serious illness and death while the intervention effect does not.

This study is closely related to Goolsbee and Syverson (2021), Watanabe and Yabu (2021a), and Watanabe and Yabu (2021b). However, they differ in certain respects. Primarily, the current study uses direct spending data, whereas the aforementioned studies use smartphone location data. These location data can be a good proxy for consumer behavior, but do not contain the value of spending.

Figure 1: The pandemic's timeline and the Japanese government's containment in 2020



I contribute to this study by estimating the impact of policy interventions using direct information on consumption. Second, although Watanabe and Yabu (2021a) and Watanabe and Yabu (2021b) use prefectural level data, this study uses municipality-level data. The fear of contagion that spreads horizontally to neighboring regions can be better controlled through municipality-level data. Based on the assumption that neighboring municipalities on prefectural borders fear contagion equivalently, despite the prefectures of these municipalities practicing different containment policies, the true impact of containment policies on consumption can be identified, by controlling for the effect of fear.

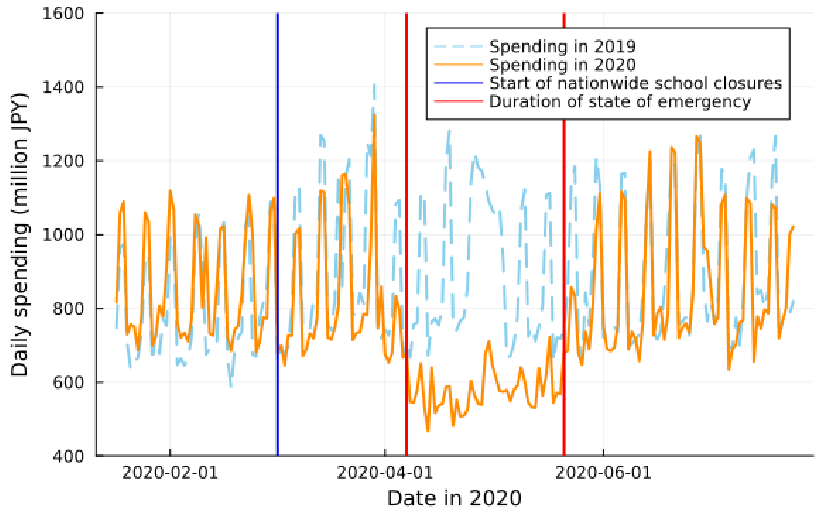
3 High-frequency credit card data

One of the richest datasets available at a daily frequency, credit card data, has been used here, which has been collected from Sumitomo Mitsui Card Company, Limited, one of the leading companies in Japan's payment card industry. The data covers transactions by Visa, Mastercard, iD. The dataset is a daily municipality-level spending dataset containing information on the date of transactions, gender, age group of card users, residential city of users, city of payment, and industry category of the shops where each transaction takes place. The data used in this study were recorded in 2019 and 2020, which includes the pre-pandemic periods and payments of users living in the Kansai region. The specific municipalities recorded in the data are presented in Table A.

3.1 Daily spending

Figure 1 presents the timeline for the early days of the 2020 pandemic. In Japan, the first case of Covid was confirmed on January 16, and in February, the number of new infections increased. The government requested nationwide school closures on March 2, calling for elementary schools, junior high schools, senior high schools, and schools for special needs education to close temporarily. The government declared a state of emergency on April 7 in seven prefectures, including Osaka and Hyogo. On April 16, the government extended the declaration to all the prefectures, including Kyoto, Nara, and Wakayama. The state of emergency was one of the most efficient measures taken by the Japanese government to prevent the spread of Covid, but it was different from other countries' lockdown. Governments in China,

Figure 2: Daily spending



the United States, and Europe had imposed nationwide lockdowns, forcing people to stay at home. In contrast, the Japanese government did not enforce similar measures, but requested people to refrain from stepping out except when necessary, for maintaining regularity in life without legal punishment. Despite this unique measure, the Japanese government succeeded in reducing the number of new infections and lifted the state of emergency in many prefectures, including Nara and Wakayama. The state of emergency ended on May 21 in Osaka, Hyogo, and Kyoto.

Figure 2 shows the aggregate spending values for 2019 and 2020. Although the spendings in 2020 and 2019 are similar before the start of the nationwide school closures, this level for 2020 fell below that of 2019, after the school closures. In particular, during the state of emergency, spending in 2020 was much lower than in 2019.

However, dividing the aggregate spending into spending within municipalities of residence, online-spending, and spending outside municipalities of residence, showcases the significant differences amongst the changes in the three types of spending during the pandemic. Figure 3 shows that, the reduction in spending within municipalities of residence during the state of emergency is more moderate than aggregate spending, as shown in Figure 2. Furthermore, Figure 4 shows an increase in online-spending during emergencies. By contrast, as shown in Figure 5, spending outside the municipalities of residence decreases more significantly than aggregate spending.

These spending trends indicate that, consumers refrained from visiting location distant from home during the state of emergency, and their consumption switched from offline to online-spending.

Figure 3: Daily spending within municipalities of residence

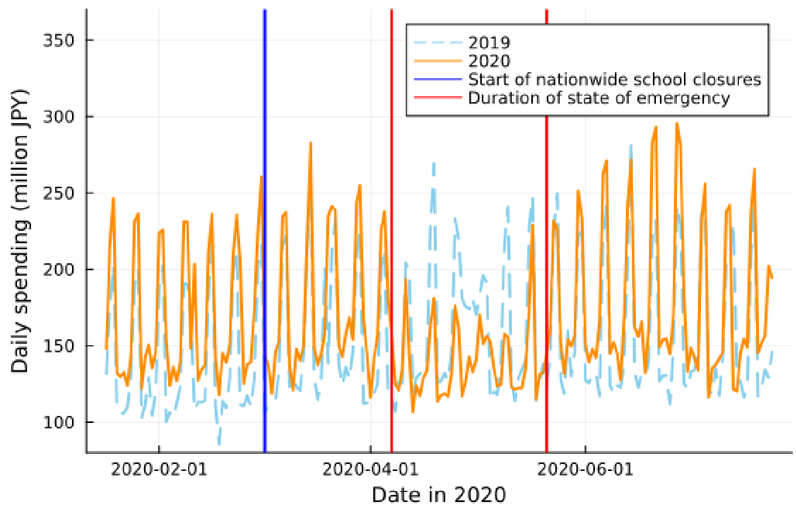


Figure 4: Daily online-spending

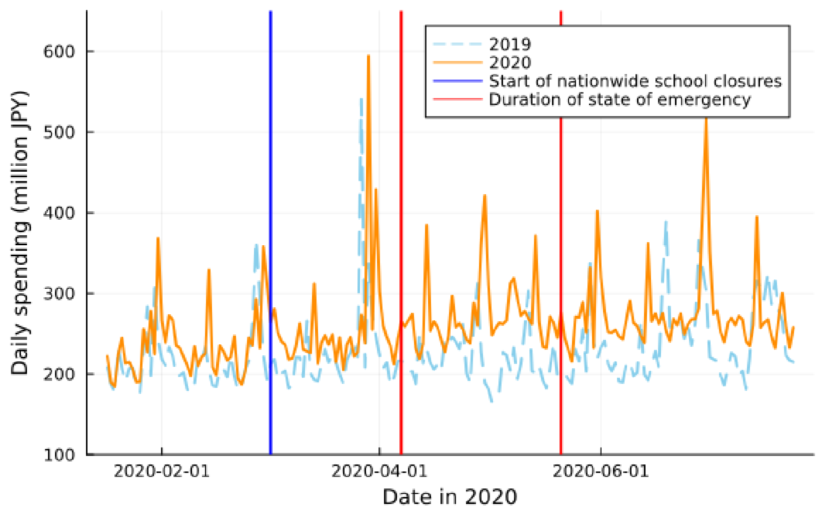


Figure 5: Daily spending outside municipalities of residence

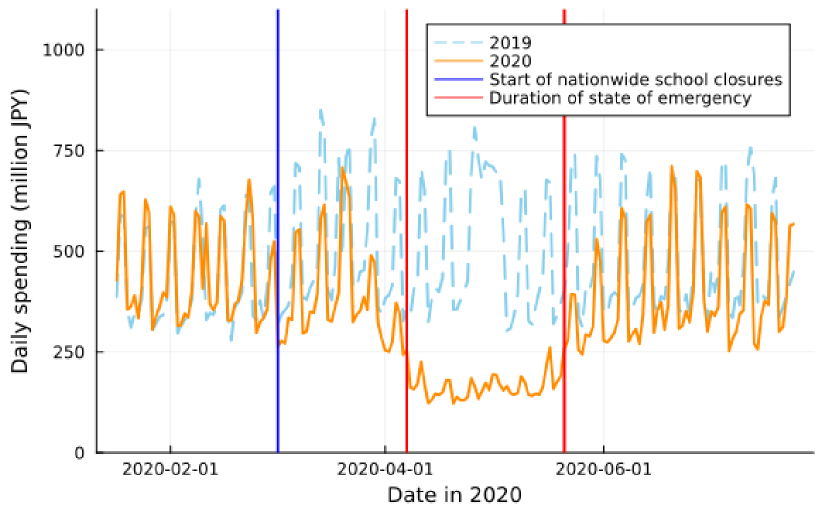
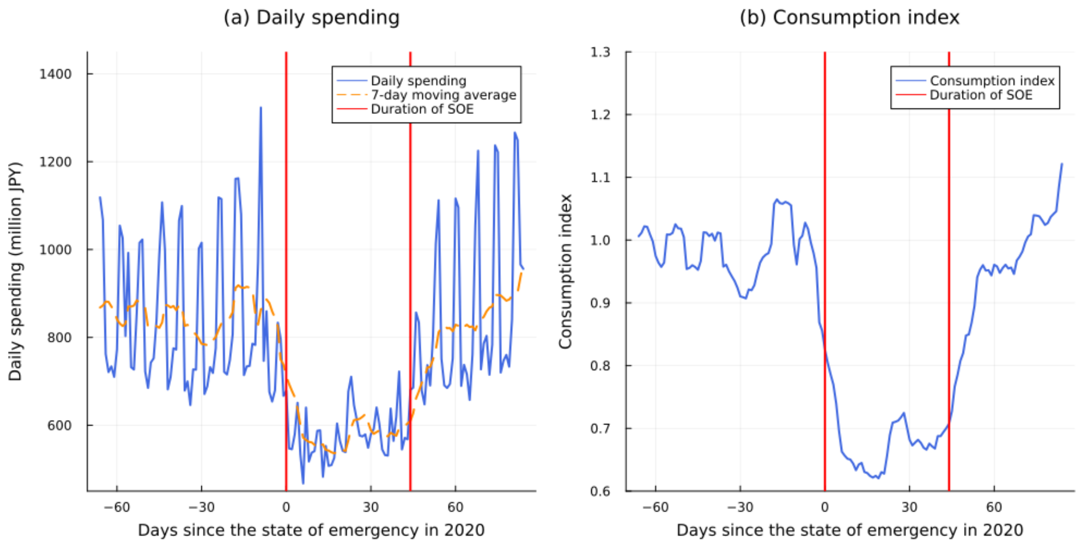


Figure 6: Daily spending and consumption index



3.2 Fear and consumption

This subsection demonstrates the negative effect of the fear of infection on consumption.

First, I construct a consumption index, which is the 7-days backward moving average of the value of spending divided by the average value of spending in the first half of February 2020. I use a backward moving average because the value of daily spending fluctuates greatly and is not suitable to analyze the trends. As Figure 6 shows, the consumption index captures the transition in daily spending.

Subsequently, Figure 7 shows the transition of consumption in the stores of different retail businesses. Online retail and sectors that operate through small retail stores, such as grocery stores and drugstores, increase sales during a state of emergency, while sectors operating through large-scale retail stores, such as departmental stores and shopping centers, face a larger decline in sales. Since crowded places created higher risk towards contracting the Covid-19 infection, this fear caused people to spontaneously refrain from visiting large stores. This trend began before the declaration of the state of emergency, as shown in Figure 7. Hence, it is confirmed that the anxiety of infection changes consumer behavior regardless of the state of emergency.

Figure 8 also illustrates the negative effects of the fear by comparing the transition of consumption by age group. Those aged 60 years and older reduces their consumption more significantly than other age-groups. This significant decline of the elderly consumption was observed even before the declaration of the state of emergency. Since the mortality risk of Covid is much higher for older people, the higher mortality risk induces higher fears of infection and causes a larger reduction in consumption among the elderly. Thus, it is again confirmed that the fear of contagion affects consumer behavior regardless of the state of emergency.

In summary, the negative effect of the fear of infection on consumption was confirmed even before the state of emergency. It is possible that the main cause of the extreme decline in consumers' spending during the state of emergency is not the stay-at-home request of the state of emergency itself, but the fear of infection. This indicates that controlling for the effect of the fear is important to estimate the causal impact of government measures on consumption.

Figure 7: Spending at retail stores

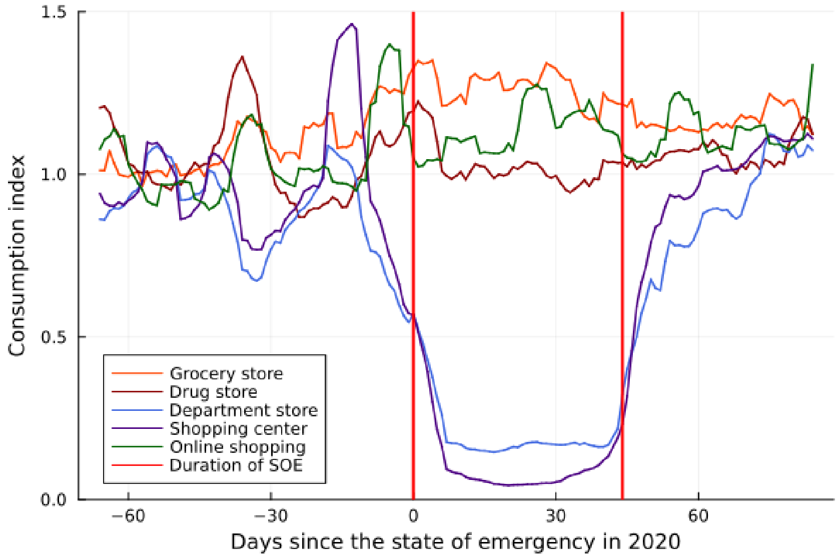


Figure 8: Spending by age group

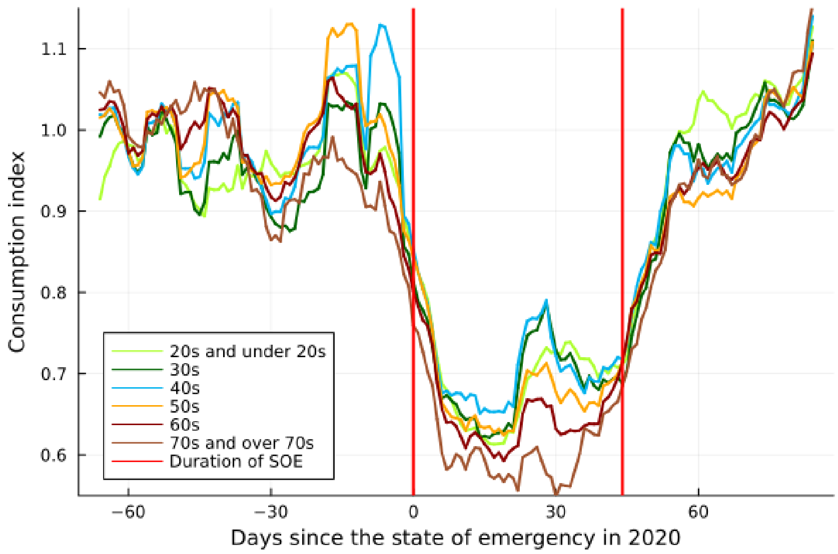
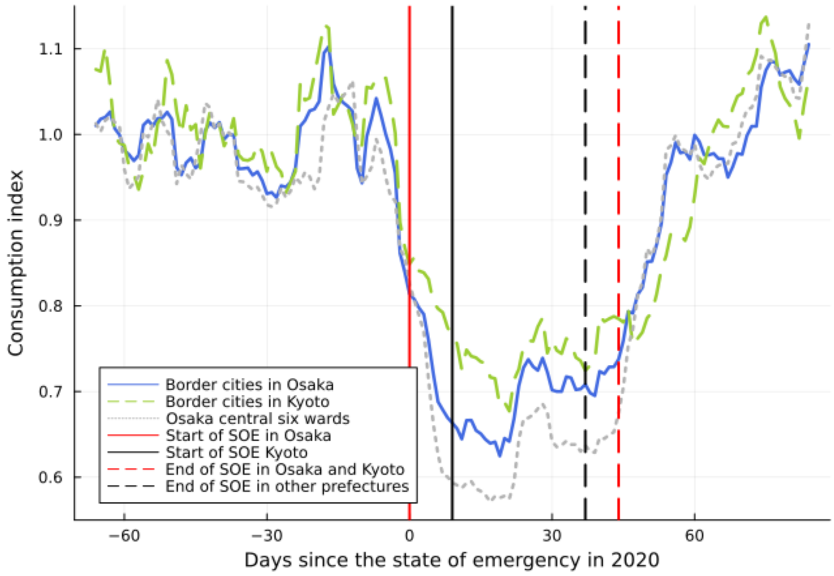


Figure 9: Consumption in border cities of Osaka and Kyoto



4 Estimation strategy

My econometric specification relies on the assumption that, neighboring municipalities on prefectural borders have an equivalent level of fear of contagion, despite those municipalities' prefectures practicing different containment policies. This assumption is justified by the infection's tendency to spread to neighboring areas. This study specifically focuses on the border between Osaka and Kyoto. Osaka's border municipalities were distant from the central area, which experienced a mass infection before the state of emergency's initiation. Thus, the risk of infection in these municipalities is assumed to be equal to that of Kyoto's border municipalities.

Figure 9 displays consumption in Osaka and Kyoto's border cities and consumption in six central Osaka wards. The decline in consumption in these wards was much larger than that in the border cities, since people in the former faced a much higher risk of infection than those in the latter. The transitions of consumption in Osaka and Kyoto's border cities were similar, especially for 30 days before Osaka's state of emergency began, indicating an equal level of fear of infection among these regions. After the state of emergency initiated in Osaka, the consumption decline in Osaka's border cities exceeded that of Kyoto, reflecting the negative effects of the state of emergency. The difference in consumption levels between these two regions converged after the beginning of the state of emergency. This further supports the finding that, the difference in the declining consumption during the nine days after the start of the state of emergency in Osaka, corresponds to the negative effect of the state of emergency.

To estimate the causal effect of the state of emergency on consumption, I employ a synthetic control method developed by Abadie and Gardeazabal (2003) and Abadie et al. (2010). This method is useful, when researchers cannot find appropriate control units that satisfy the parallel trend assumption of difference-in-differences method. The method is briefly illustrated below.

Suppose, there are $J+1$ units, where it can be assumed that $j = 1$ is the treatment unit affected by the government's state of emergency, and $j = 2, ..., J + 1$ denotes the control units unaffected by the state of emergency. The sample spans T periods, with the first T_0 periods occurring before the state of emergency. For each unit of j and time t, the outcome variable Y_{jt} is the unit's consumption index. I also observe k predictors of the outcome, denoted by $X_{1j}, ..., X_{kj}$, for each unit j, which included the pre-intervention outcomes and characteristics (daily new cases and income per capita of each municipality). Let X_j, $j = 1, ..., J + 1$ denote the $k \times 1$ vector of the predictors for units j, and X_0 denote the matrix collection of the predictors for the J untreated units, that is, $X_0 = [X_2, ..., X_{J+1}]$. The treatment effect for the treated unit $j = 1$ at time t for $t > T_0$ is defined as:

$$\tau_{1t} = Y_{1t} - Y_{1t}^N, \tag{1}$$

where Y_{1t} is the treatment unit's observed outcome and Y_{1t}^N is the counterfactual outcome, in the absence of treatment.

To estimate Y_{1t}^N, the synthetic control method approximates the characteristics of the treatment unit using the weighted average of the control units. If the weights $W = (w_2, ..., w_{J+1})$, the synthetic control unit $\hat{Y}_{1t}^N$ is,

$$\hat{Y}_{1t}^N = \sum_{j=2}^{J+1} w_j Y_{jt}. \tag{2}$$

The following two conditions are imposed on the weights W,

$$w_i \geq 0, \forall i, \tag{3}$$

$$\sum w_i = 1, \tag{4}$$

to constrain the synthetic control to interpolation only. That is, the counterfactual unit cannot take a value larger than the maximum value or smaller than the minimum value of the control units.

The weights W are selected such that, the resulting synthetic control best reproduces the predictor values of the treated unit. Specifically, W minimizes the loss function

$$||X_1 - X_0 W|| = \left(\sum_{h=1}^{k} v_h \left(X_{h1} - \sum_{j=2}^{J+1} w_j X_{hj} \right)^2 \right)^{\frac{1}{2}} \tag{5}$$

where the positive constants $v_1, ...v_k$ reflect the relative importance of each of the k predictors, and are chosen to minimize the mean squared prediction error of the synthetic control with respect to Y_{1t}^N for the pre-intervention periods.

In this study, the outcome of the treatment unit Y_{1t} is calculated as the weighted average of consumption by Osaka's border municipalities with Kyoto, including Osaka's Takatsuki, Ibaraki, and Hirakata. The control units are Kyoto's 16 municipalities and Nara's two municipalities (Ikoma and Nara). The pre-treatment period ranged from February 2 to April 6, 2020, and the post-treatment period ranged from April 7 to April 15, 2020, which is the duration of Osaka's state of emergency, but not Kyoto's.

As the outcome of the synthetic control unit mimics that of the treated unit in the absence of intervention, its post-treatment daily consumption corresponds to counterfactual consumption when there is no policy intervention in the treated municipalities. Comparing the consumption of the synthetic control municipality and the treated municipality in the post-treatment period allowed me to identify the true impact of containment policies on consumption, controlling for the fear of infection.

5 Results

Using the method described in Section 4, I construct a synthetic border cities in Osaka with weights chosen so that the pre-treatment consumption and covariates of the synthetic border cities in Osaka best match those of observed border cities in Osaka in the pre-treatment period. Table 1 reports the weights of untreated municipalities in the synthetic border cities in Osaka. All municipalities in the donor pool obtain positive weights. This is because they have borders with Osaka or they are geographically close to Osaka, if not share a common border with Osaka. Table 2 compares the pre-treatment characteristics of border cities in Osaka to those of the synthetic border cities in Osaka. The result indicate that the synthetic border cities is very similar to the actual border cities in Osaka in terms of consumption index and income per capita. The reason that difference between the actual new case of Covid infection and the predicted one is larger than other two variables is attributed to small sample size. Since the new case of Covid infection is reported in prefecture-level, each municipality in the same prefecture has same number of new case, which reduces the efficiency of prediction. Nonetheless, the predicted consumption index provide good comparison for actual consumption index of border cities in Osaka.

Figure 10 depicts the counterfactual consumption index, represented by the red dashed line for the synthetic border cities, and the blue solid line for the observed Osaka's border cities. The vertical dotted line indicates the declaration of the state of emergency in Osaka. Before this intervention, both consumption indices are similar. The observed consumption after the declaration declines by approximately 30%, compared to the average consumption in the first half of February. At first glance, it might seem like large decline of consumption due to the state of emergency. However, a concurrent significant decrease in consumption in synthetic border cities indicates that, significant reduction of spending would have occurred regardless of the government intervention. Thus, massively reduced spending should be attributed to the fear of infection, instead of the state of emergency.

The gap between the consumption indexes of two units is reported in Figure 11. This result indicates that the causal effect of the state of emergency is approximately −8%, which is significantly smaller than the observed decline in aggregate spending.

Table 1: Synthetic control weights for border cities in Osaka

Municipality	Prefecture	Weight
Kita-ku, Kyoto City	Kyoto	0.053
Kamigyo-ku, Kyoto City	Kyoto	0.059
Sakyo-ku, Kyoto City	Kyoto	0.058
Nakagyo-ku, Kyoto City	Kyoto	0.056
Higashiyama-ku, Kyoto City	Kyoto	0.059
Shimogyo-ku, Kyoto City	Kyoto	0.058
Minami-ku, Kyoto City	Kyoto	0.057
Ukyo-ku, Kyoto City	Kyoto	0.060
Fushimi-ku, Kyoto City	Kyoto	0.056
Yamashina-ku, Kyoto City	Kyoto	0.061
Nishikyo-ku, Kyoto City	Kyoto	0.060
Uji	Kyoto	0.045
Kameoka	Kyoto	0.033
Yawata	Kyoto	0.052
Kyotanabe	Kyoto	0.056
Kizugawa	Kyoto	0.053
Nara	Nara	0.058
Ikoma	Nara	0.065

Table 2: Predictor means before the treatment period

Variables	Border cities in Osaka	Synthetic border cities in Osaka
Consumption index	0.99	0.99
New case of Covid infection	2.01	0.70
Income per capita	1592.37	1614.28

Figure 10: Synthetic control city vs. border city in Osaka

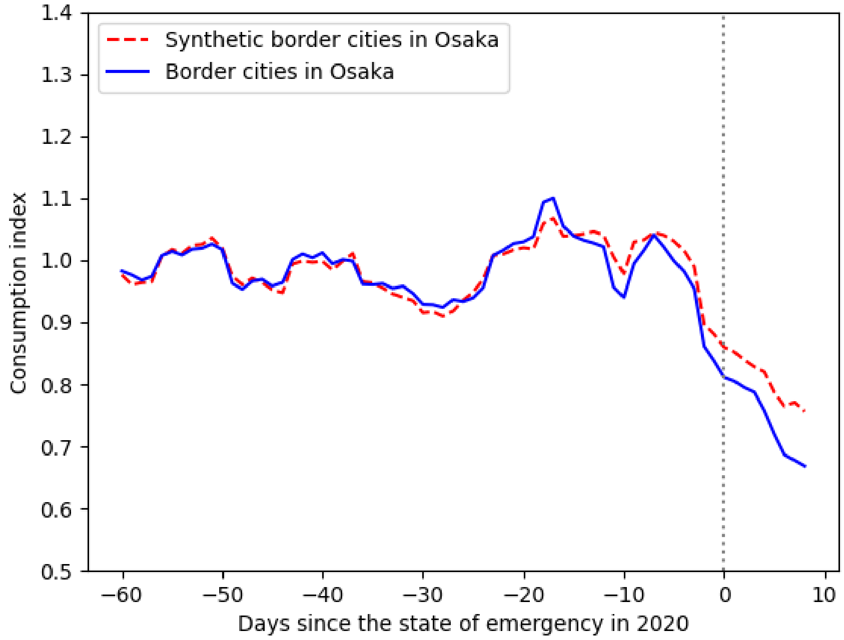


Figure 11: Treatment estimate for border city in Osaka

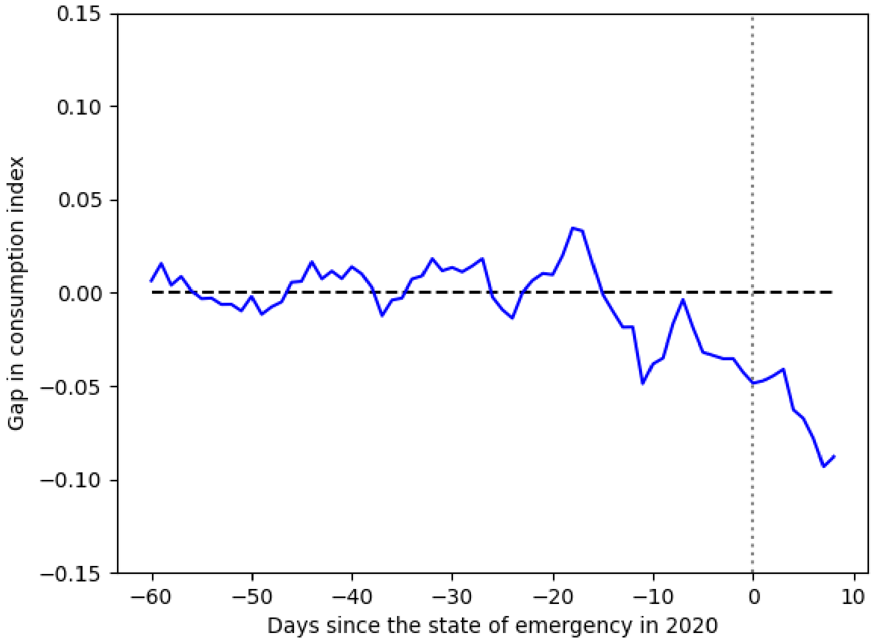
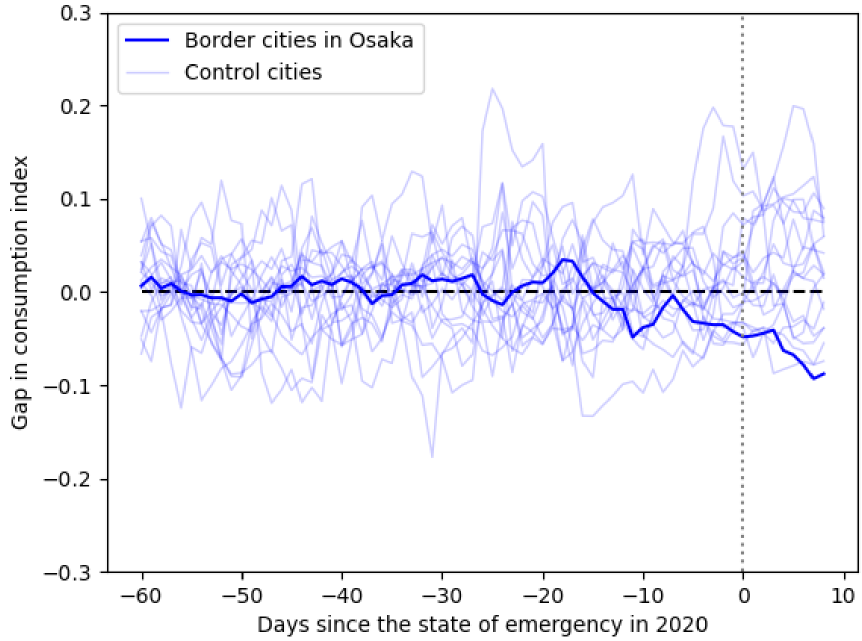


Figure 12: Treatment estimate for border city in Osaka and other untreated cities



6 Robustness test

I conduct a placebo study where I reassign the treatment to untreated units to evaluate the credibility of the result in Section 5. This robustness test enables me to confirm if the result obtained in Section 5 is statistically significant and not just caused by random luck. To conduct this placebo study, I permute the treated and untreated units exhaustively and obtain synthetic control estimates for municipalities that did not experience the government intervention. Subsequently, I get the placebo effects by comparing the synthetic control estimates and observed outcomes of each untreated municipality.

Figure 12 shows the results for the placebo test. The blue line represents the treatment effect in consumption index for the treatment unit, that is, border cities in Osaka. The light blue lines are the placebo effects for the untreated units. As the figure makes apparent, the estimated effect on the treatment unit is larger than the distribution of the effects for the untreated units. Table 3 reports the ratio of the post-treatment root mean squared prediction error (RMSPE) to the pre-treatment RMSPE. It is also confirmed that the ratio of post-treatment RMSPE to the pre-treatment RMSPE for Osaka's border cities is larger than other municipalities.

Thus, the result of the placebo test confirms the credibility of the result in Section 5.

7 Conclusion

This study focuses on estimating the causal effect of movement restriction on consumption, when controlling for fear of Covid infection. The results of the synthetic control method indicate that, the stay-at-home request for Japan's state of emergency reduces consumption despite controlling for the effect of fear of infection, but the impact is much lower than the observed significant decline in consumers' spending. Specifically, online shops and sectors that operate through small retail stores increase sales during a state of emergency, while sectors operating through large-scale retail stores (e.g., departmental stores and shopping centers) face a larger decline in sales. These changes in consumer behavior indicate the large impact of fear of infection on consumption.

The study has several important policy implications. Rapidly declining consumption during the pandemic was caused by fear of infection, rather than the government's stay-at-home request. Although many attributed the decrease in consumption to the state of emergency and resistance towards this declared state, hesitating to declare it may cause much larger decline in consumption through expanding fear of infection. This study indicates that, it is more important to prevent the expanding fear of infection than to hesitate to declare a state of emergency for fear of its negative impact on consumption.

Table 3: Ratio of post-treatment RMSPE to pre-treatment RMSPE

Municipality	Prefecture	Ratio of RMSPE (post/pre)
Border cities in Osaka	Osaka	3.65
Kita-ku, Kyoto City	Kyoto	1.02
Kamigyo-ku, Kyoto City	Kyoto	0.34
Sakyo-ku, Kyoto City	Kyoto	3.32
Nakagyo-ku, Kyoto City	Kyoto	0.51
Higashiyama-ku, Kyoto City	Kyoto	1.11
Shimogyo-ku, Kyoto City	Kyoto	2.17
Minami-ku, Kyoto City	Kyoto	1.08
Ukyo-ku, Kyoto City	Kyoto	1.83
Fushimi-ku, Kyoto City	Kyoto	0.94
Yamashina-ku, Kyoto City	Kyoto	0.67
Nishikyo-ku, Kyoto City	Kyoto	0.72
Uji	Kyoto	3.02
Kameoka	Kyoto	1.03
Yawata	Kyoto	2.95
Kyotanabe	Kyoto	0.99
Kizugawa	Kyoto	0.82
Nara	Nara	2.47
Ikoma	Nara	1.96

A Appendix: Supplementary table

Table A1: List of municipalities

Municipality	Prefecture	Duration of SOE in 2020
Kita-ku, Kyoto City	Kyoto	April 16 – May 21
Kamigyo-ku, Kyoto City	Kyoto	—”—
Sakyo-ku, Kyoto City	Kyoto	—”—
Nakagyo-ku, Kyoto City	Kyoto	—”—
Higashiyama-ku, Kyoto City	Kyoto	—”—
Shimogyo-ku, Kyoto City	Kyoto	—”—
Minami-ku, Kyoto City	Kyoto	—”—
Ukyo-ku, Kyoto City	Kyoto	—”—
Fushimi-ku, Kyoto City	Kyoto	—”—
Yamashina-ku, Kyoto City	Kyoto	—”—
Nishikyo-ku, Kyoto City	Kyoto	—”—
Uji	Kyoto	—”—
Kameoka	Kyoto	—”—
Yawata	Kyoto	—”—
Kyotanabe	Kyoto	—”—
Kizugawa	Kyoto	—”—
Miyakojima-ku, Osaka City	Osaka	April 7 – May 21
Fukushima-ku, Osaka City	Osaka	—”—
Konohana-ku, Osaka City	Osaka	—”—
Nishi-ku, Osaka City	Osaka	—”—
Minato-ku, Osaka City	Osaka	—”—
Taisho-ku, Osaka City	Osaka	—”—
Tennoji-ku, Osaka City	Osaka	—”—
Naniwa-ku, Osaka City	Osaka	—”—
Nishiyodogawa-ku, Osaka City	Osaka	—”—
Higashiyodogawa-ku, Osaka City	Osaka	—”—
Higashinari-ku, Osaka City	Osaka	—”—

Continued on next page

Table A1: List of municipalities (Continued)

Municipality	Prefecture	Duration of SOE in 2020
Ikuno-ku, Osaka City	Osaka	—”—
Asahi-ku, Osaka City	Osaka	—”—
Joto-ku, Osaka City	Osaka	—”—
Abeno-ku, Osaka City	Osaka	—”—
Sumiyoshi-ku, Osaka City	Osaka	—”—
Higashisumiyoshi-ku, Osaka City	Osaka	—”—
Nishinari-ku, Osaka City	Osaka	—”—
Yodogawa-ku, Osaka City	Osaka	—”—
Tsurumi-ku, Osaka City	Osaka	—”—
Suminoe-ku, Osaka City	Osaka	—”—
Hirano-ku, Osaka City	Osaka	—”—
Kita-ku, Osaka City	Osaka	—”—
Chuo-ku, Osaka City	Osaka	—”—
Sakai	Osaka	—”—
Kishiwada	Osaka	—”—
Toyonaka	Osaka	—”—
Suita	Osaka	—”—
Takatsuki	Osaka	—”—
Kaizuka	Osaka	—”—
Hirakata	Osaka	—”—
Ibaraki	Osaka	—”—
Yao	Osaka	—”—
Izumisano	Osaka	—”—
Neyagawa	Osaka	—”—
Kawachinagano	Osaka	—”—
Izumi	Osaka	—”—
Higashiosaka	Osaka	—”—
Higashinada-ku, Kobe City	Hyogo	April 7 – May 21
Nada-ku, Kobe City	Hyogo	—”—

Continued on next page

Table A1: List of municipalities (Continued)

Municipality	Prefecture	Duration of SOE in 2020
Hyogo-ku, Kobe City	Hyogo	—”—
Nagata-ku, Kobe City	Hyogo	—”—
Suma-ku, Kobe City	Hyogo	—”—
Tarumi-ku, Kobe City	Hyogo	—”—
Kita-ku, Kobe City	Hyogo	—”—
Chuo-ku, Kobe City	Hyogo	—”—
Nishi-ku, Kobe City	Hyogo	—”—
Himeji	Hyogo	—”—
Amagasaki	Hyogo	—”—
Akashi	Hyogo	—”—
Nishinomiya	Hyogo	—”—
Ashiya	Hyogo	—”—
Kakogawa	Hyogo	—”—
Takarazuka	Hyogo	—”—
Kawanishi	Hyogo	—”—
Nara	Nara	April 16 – May 14
Yamatotakada	Nara	—”—
Yamatokoriyama	Nara	—”—
Kashihara	Nara	—”—
Ikoma	Nara	—”—
Kashiba	Nara	—”—
Wakayama	Wakayama	April 16 – May 14
Hashimoto	Wakayama	—”—
Kinokawa	Wakayama	—”—

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