Supplementary Information

In this online appendix, we summarize the sub-evidence for the main article. First, we present the data. Second, we describe the derivation of the estimating equation. Third, we cover basic statistics for each variable. Fourth, we cover regression tables for statistical testing. Finally, we provide supplementary information about the treatment effects.

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A. Data

Our data used for control variables come from multiple sources. We will list them one by one.

A.1 COVID-19 policy dummies

The emergency declaration dummy was created based on the progress of the government's response as summarized by Tottori Prefecture on its website for new coronavirus infections. The site lists the prefectures that are subject to the issuance, change, and cancellation of emergency declarations in chronological order. Based on this information, we determined whether each prefecture was under a state of emergency declaration at a certain time.

School closure dummies were created based on information of school closures for the national government and each prefecture in the time-series news archives on NHK's special website for new coronaviruses. The variable was set to 1 only when schools were closed in the entire prefecture. For municipality or school-level closure, the variable is set to be 0.

Large-scale assembly dummies were created based on the governor's press conferences and updates on coronavirus in each prefecture. The criterion for variable 1 was defined as an event capacity of 5,000 people or less and a capacity ratio of 50% or less in each prefecture, and was set to 0 if either of these criteria was not met. In cases where the prefectural criteria were based on the guidelines of the respective industry, dummies were created based on the common guidelines of event-related industries. For the references, see excel file in the github repository [PERSISTENT WEB LINK TO DATASETS].

A.2 COVID-19 test cases

In the analysis of the infection prevention effect, the number of COVID-19 test cases in each prefecture was added as a control variable. As of 2020, the number of tests in each prefecture varies in Japan, especially because of the capacity of each municipality to test. If the number of tests itself is small, the number of new infection cases may be underestimated. We referred to the data on the number of tests published on the website of each prefecture.

A.3 Restaurant website views

The rate of increase in the number of restaurant website views per week was also used as another indicator to capture the business conditions of restaurants. This data is available on V-RESAS, published by the Cabinet Office. In this data, the rate of increase or decrease in the restaurant website views compared to the same week in 2019 is disclosed for each prefecture. The original data is held by Retty, Japan's largest word-of-mouth gourmet service operated by Retty, Inc..

A.4 Mobility by residential type

In addition to the number of visitors to restaurants, we also used the human flow data published by V-RESAS to examine the impact on human flow in and across the prefectures. The weekly data shows the rate of increase or decrease in the mobility by residential type (within the municipality, within the prefecture, or from outside the prefecture) compared to the same week in 2019 for each prefecture.

A.5 Mobility inflow and outflow by prefecture

We used Agoop's paid data for the human flow within each prefecture and the human flow from outside the prefecture into each prefecture. Agoop's human flow data is the aggregate data of users' GPS information held by Agoop. Agoop's human flow data is the aggregate data of GPS information of users held by Agoop, and it is the data that estimates the population of the entire human flow from a sample of the number of people who existed at a certain coordinate at a certain time. Therefore, it is possible to grasp not only the total number of people in a prefecture, but also the movement of people from a specific prefecture to a specific prefecture/municipality. This data was used to estimate the number of potentially infected people coming from other prefectures as shown in the SIR model above, rather than as an objective variable.

A.6 Mobility by facility type

For the mobility data, we also deployed the "COVID-19: Community Mobility Report" published by Google. The data reveals the rate of increase or decrease in human flow in six types of locations ("retail and entertainment," "grocery stores and pharmacies," "parks," "transfer stations," "workplaces," and "residences") by country and region/prefecture. The median value for each day of the week for the five-week period from January 3 to February 6, 2020 is used as the baseline for the rate of change. Thus, the daily data is the rate of change from the base values for each day of the week.

A.7 Weather data

For the weather data of temperature and precipitation, we used the daily weather observation data of observatories in each prefecture using the "Past Weather Data Search" of the Japan Meteorological Agency. When extracting the data from the database, several municipalities with observatories were chosen from several municipalities with the top population. In detail, Yamanashi Prefecture is represented by Kofu and Kawaguchiko; Nagano Prefecture by Nagano, Matsumoto, Ueda, and Iida; Shizuoka Prefecture by Hamamatsu, Shizuoka, and Fuji; Gunma Prefecture by Maebashi and Isesaki; Ibaraki Prefecture by Tsukuba, Mito, and Hitachi; and Tochigi Prefecture by Utsunomiya and Oyama. The average values of these municipalities was set as the representative location for each prefecture. For the values, the weekly precipitation total and the weekly average temperature was used as the representative respectively.

A.8 Stay-home rate

We used the data on stay-home rate as a robustness check in the economic impact analysis. The Mizuno Laboratory of the National Institute of Informatics and the Graduate University for Advanced Studies publishes the data on stay-home. The data is collected by age group and time, based on the population data estimated in real-time from the information of about 78 million base stations of DOCOMO, a major Japanese telecommunication company. They defined the number of people going out from residential areas as

$$The\ number\ of\ people\ going\ out = daytime\ population - nighttime\ population$$

and

$$The\ Stay-home\ rate$$
$$= 1 - \frac{Number\ of\ people\ who\ go\ out\ from\ 9:00\ to\ 18:00\ on\ a\ given\ day * average\ time\ spent\ out}{Number\ of\ people\ who\ go\ out\ from\ 9:00\ to\ 18:00\ on\ a\ normal\ day * average\ time\ spent\ out}$$

B Estimation equation

The epidemiological analysis is based on the SIR-applied fixed effect model. This section shows the process of how the equation is derived from the SIR model.

The SIR model is the most basic mathematical model that captures the epidemic dynamics of infectious diseases that spread directly from person to person. The model estimates the infection status in three stages: Susceptible, Infectious, and Removed.

$$\frac{dI(t)}{dt} = \beta S(t)I(t) - \gamma I(t)$$

β denotes infectivity, and γ denotes recovery rate. The above ordinary differential equation is a model that represents the number of population increases in the stage of infection, and can be rewritten as follows when estimating the number of newly infected people.

$$COVID = \beta SI$$

This multiplication can be converted into addition in logarithmic form.

$$ln(COVID) = ln\beta + lnS + lnI$$

Previous studies have shown that the coefficients of the variables on the right-hand side of the equation tend not to be equal to one when the two sides are logarithmic. In addition, it has been shown that it is appropriate to add the infectivity common to all regions and time points as the intercept. Therefore, we transform the model by adding coefficients to the variables and the intercept as follows

$$ln(COVID) = \delta_0 + \delta_1 ln\beta + \delta_2 lnS + \delta_3 lnI$$

In order to adapt this basic estimation equation to changes in external circumstances that affect the infection cases, we add control variables such as economic activity variables and weather conditions. In addition, the purpose of the GZ certification policy that we want to estimate is to reduce the infectivity (β) that can be transferred from one infected person to another. Therefore, we redefine the infectivity (β) as follows to derive the main estimation model.

$$ln\beta = \alpha_1 lnGZ + u$$

$$ln(COVID) = \delta_0 + \alpha_1 lnGZ + \delta_2 lnS + \delta_3 lnI + \delta_4 lnControl + u$$

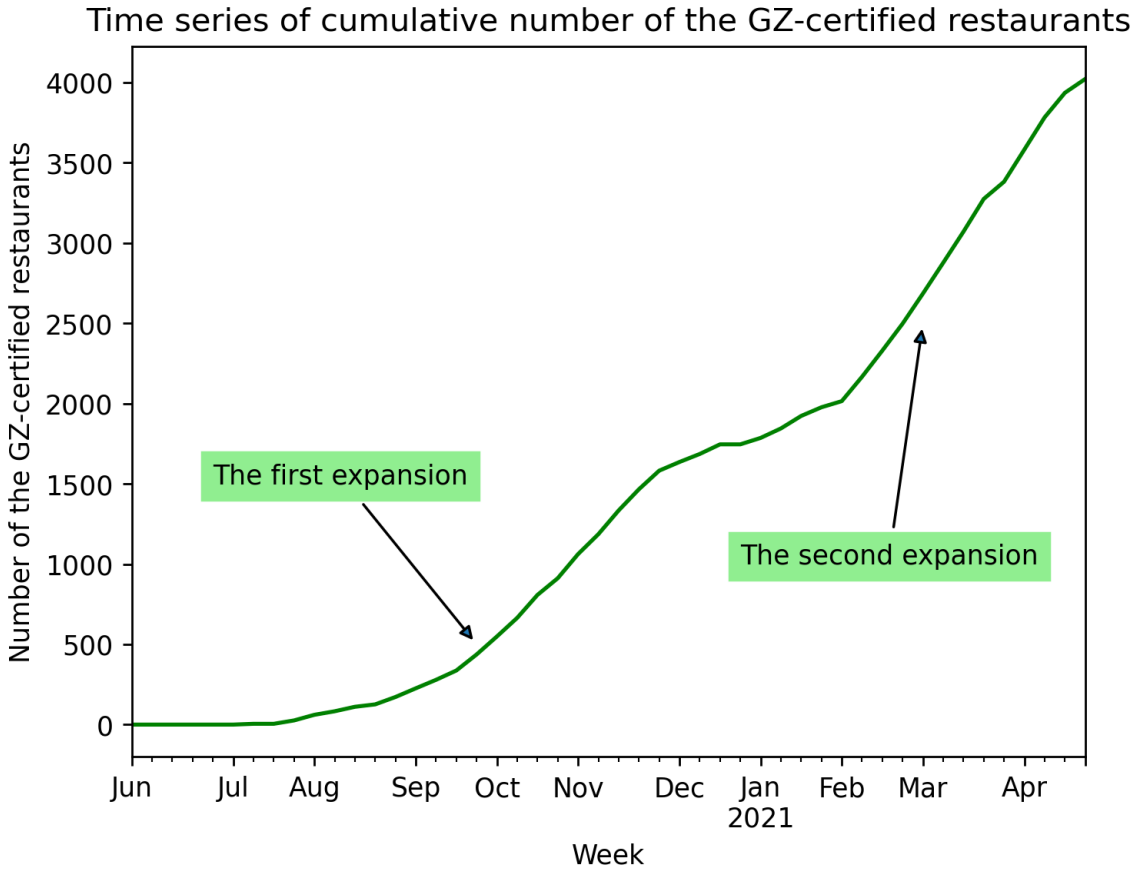
C Basic Statistics

C.1 Summary statistics of analysis

Table 1: Summary Statistics

Statistic	N	Mean	St. Dev.
New cases per day	408	76.061	122.493
Number of customers per restaurant	408	254.371	86.767
Sales per restaurant	408	585,798.500	174,182.800
Average temperature	408	56.563	14.107
Average rainfall	408	3.926	5.531
Infectious	408	172.859	260.401
Susceptible	408	2,205,422.000	877,185.900
Number of COVID-19 tests	408	1,711.466	2,655.616

C.2 Cumulative number of the GZ-certified restaurants



D Statistical Testing

D.1 Infection Prevention Effects

Table 2: The COVID-19 new infection cases (2 week lag) and the Green Zone certification

	Dependent variable:				
	New infection cases (2 week lag), log				
	(1)	(2)	(3)	(4)	(5)
Cumulative GZ-certified restaurants, log	−0.088***	−0.105***	−0.107***		−0.126***
	(0.015)	(0.024)	(0.025)		(0.028)
Cumulative GZ-certified restaurants and hotels, log				−0.104***	
				(0.024)	
Infectious, log	0.558***	0.569***	0.566***	0.565***	0.544***
	(0.048)	(0.045)	(0.040)	(0.040)	(0.042)
Susceptible, log	−45.353	−45.843	−44.997	−61.487	32.518
	(69.254)	(92.506)	(89.342)	(82.870)	(121.902)
State of Emergency	0.030	0.141	0.085	0.096	−0.183
	(0.223)	(0.198)	(0.180)	(0.180)	(0.200)
Tests (2 week lag), log	0.047*	0.051*	0.049**	0.050**	0.052**
	(0.021)	(0.021)	(0.019)	(0.019)	(0.018)
Customers per restaurant, log		0.550	0.548	0.612	0.540
		(0.419)	(0.449)	(0.446)	(0.480)
Average temperature, log			−0.342	−0.344	−0.317
			(0.470)	(0.466)	(0.501)
Average rainfall, log			−0.107	−0.104	−0.115
			(0.058)	(0.058)	(0.061)
School closure					−0.252
					(0.275)
Gathering restriction					0.336**
					(0.083)
Prefecture FE	X	X	X	X	X
Week FE	X	X	X	X	X
Observations	396	396	396	396	396
R^2	0.929	0.930	0.930	0.930	0.931
Adjusted R^2	0.913	0.913	0.913	0.913	0.914

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the log-transformed value of the number of new infection cases (2 week lag) plus one. The unit of analysis is prefecture and week, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 66 weeks from the third week of January, 2020 to the third week of April, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. Cumulative GZ-certified restaurants and hotels, log is the log-transformed value of the number of cumulative certified-GZ restaurants and hotels plus one. Infectious, log is the log-transformed value of the number of potentially infected people plus one. Susceptible, log is the log-transformed value of the total number of susceptible population. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. Tests (2 week lag), log is the log-transformed value of the number of COVID-19 tests plus one. Customers per restaurant, log is the log-transformed value of the number of customers per restaurant. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.2 Infection Prevention Effects(1 week lag analysis)

Table 3: COVID-19 new cases (1 week lag) and the Green Zone certification

	Dependent variable:				
	New infection cases (1 week lag), log				
	(1)	(2)	(3)	(4)	(5)
Cumulative GZ-certified restaurants, log	−0.083***	−0.094***	−0.093***		−0.108***
	(0.015)	(0.020)	(0.019)		(0.022)
Cumulative GZ-certified restaurants and hotels, log				−0.090***	
				(0.018)	
Infectious, log	0.562***	0.575***	0.574***	0.573***	0.560***
	(0.048)	(0.043)	(0.041)	(0.041)	(0.041)
Susceptible, log	−107.523	−102.924	−99.505	−113.259	−29.163
	(75.138)	(90.837)	(86.466)	(80.316)	(132.249)
State of Emergency	0.009	0.089	0.090	0.100	−0.123
	(0.185)	(0.194)	(0.213)	(0.215)	(0.191)
Tests (1 week lag), log	0.049*	0.053**	0.053*	0.054*	0.052*
	(0.021)	(0.020)	(0.022)	(0.021)	(0.022)
Customers per restaurant, log		0.395	0.365	0.422	0.333
		(0.412)	(0.412)	(0.417)	(0.413)
Average temperature, log			0.355	0.352	0.397
			(0.433)	(0.445)	(0.413)
Average rainfall, log			−0.008	−0.005	−0.014
			(0.117)	(0.116)	(0.115)
School closure					−0.285
					(0.189)
Gathering restriction					0.263*
					(0.111)
Prefecture FE	X	X	X	X	X
Week FE	X	X	X	X	X
Observations	402	402	402	402	402
R^2	0.932	0.932	0.932	0.932	0.933
Adjusted R^2	0.916	0.916	0.916	0.916	0.916

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the log-transformed value of the number of new infection cases (1 week lag) plus one. The unit of analysis is prefecture and week, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 67 weeks from the third week of January, 2020 to the fourth week of April, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. Cumulative GZ-certified restaurants and hotels, log is the log-transformed value of the number of cumulative certified-GZ restaurants and hotels plus one. Infectious, log is the log-transformed value of the number of potentially infected people plus one. Susceptible, log is the log-transformed value of the total number of susceptible population. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. Tests (1 week lag), log is the log-transformed value of the number of COVID-19 tests plus one. Customers per restaurant, log is the log-transformed value of the number of customers per restaurant. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.3 Economic Effects

Table 4: Restaurants' sales and customers (POS) and the Green Zone certification

	Dependent variable:							
	Sales per restaurant, log				Customers per restaurant, log			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cumulative GZ-certified restaurants, log	0.018***	0.016***	0.016***	0.016***	0.040***	0.037***	0.037***	0.037***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
State of Emergency	−0.267***	−0.264***	−0.257***	−0.261***	−0.223***	−0.219***	−0.217***	−0.219***
	(0.018)	(0.017)	(0.014)	(0.037)	(0.032)	(0.030)	(0.030)	(0.040)
The number of new COVID-19 cases, log		−0.013	−0.015	−0.015		−0.017	−0.018	−0.018
		(0.010)	(0.011)	(0.011)		(0.012)	(0.013)	(0.012)
Average temperature, log			0.296*	0.298*			0.188*	0.187*
			(0.129)	(0.128)			(0.089)	(0.091)
Average rainfall, log			−0.007	−0.007			−0.012**	−0.012**
			(0.005)	(0.005)			(0.004)	(0.004)
School closure				0.085				−0.062
				(0.108)				(0.072)
Gathering restriction				0.004				0.002
				(0.041)				(0.035)
Prefecture FE	X	X	X	X	X	X	X	X
Day FE	X	X	X	X	X	X	X	X
Observations	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106
R^2	0.935	0.935	0.935	0.935	0.947	0.947	0.947	0.947
Adjusted R^2	0.921	0.922	0.922	0.922	0.936	0.936	0.937	0.937

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the log-transformed value of POS sales per restaurant and the number of customers per restaurant. The unit of analysis is prefecture and day, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 912 days from January 1st, 2019 to April 30th, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.4 Restaurants' view

Table 5: Restaurants' View (percentage change) and the Green Zone certification

	Dependent variable:		
	Restaurants' View (percentage change)		
	(1)	(2)	(3)
Cumulative GZ-certified restaurants, log	1.900***	1.497***	1.297***
	(0.252)	(0.253)	(0.308)
State of Emergency	−3.842**	−4.281**	−8.499**
	(1.164)	(1.390)	(2.792)
The number of new COVID-19 cases, log		−1.709**	−1.984***
		(0.449)	(0.466)
Average temperature, log		−25.388	−24.386
		(17.074)	(17.322)
Average rainfall, log		−0.372	−0.517
		(0.480)	(0.512)
School closure			6.563**
			(2.242)
Gathering restriction			4.808
			(4.042)
Restraurants' View Yamanashi mean		-21.052	
Restraurants' View Control mean		-22.641	
Prefecture FE	X	X	X
Week FE	X	X	X
Observations	408	408	408
R^2	0.947	0.950	0.953
Adjusted R^2	0.935	0.939	0.941

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the percent change of the number of restaurant-website views compared to the 2019 baseline (V-RESAS). The unit of analysis is prefecture and week, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 68 weeks from the third week of January, 2020 to the fifth week of April, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.5 Google Mobility data

Table 6: Mobility type (Google Mobility) the Green Zone certification

	Dependent variable:											
	retail and recreation		grocery and pharmacy		parks		transit stations		workplaces		residential	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Cumulative GZ-certified restaurants, log	0.372***	0.366***	0.051	0.099	2.804***	3.138***	0.448***	0.548**	−0.029	−0.003	−0.061***	−0.060***
	(0.042)	(0.045)	(0.038)	(0.062)	(0.101)	(0.346)	(0.051)	(0.180)	(0.051)	(0.048)	(0.013)	(0.006)
State of Emergency	−3.992***	−3.890***	−0.245	−0.393	4.231	5.191	−2.007	−1.387	−1.410***	−1.282***	1.006***	0.964***
	(0.583)	(0.421)	(0.468)	(0.357)	(4.044)	(3.188)	(2.514)	(2.132)	(0.343)	(0.258)	(0.234)	(0.171)
The number of new COVID-19 cases, log		−0.180		0.121		0.538		0.127		0.031		0.060*
		(0.107)		(0.129)		(0.972)		(0.527)		(0.070)		(0.029)
Average temperature, log		8.489**		5.912**		74.310***		27.060**		6.769**		−3.482**
		(2.193)		(1.679)		(7.775)		(7.974)		(1.881)		(0.989)
Average rainfall, log		−0.769***		−1.084***		−4.338***		−0.653		−0.261***		0.298***
		(0.101)		(0.088)		(0.520)		(0.329)		(0.061)		(0.031)
Prefecture FE	X	X	X	X	X	X	X	X	X	X	X	X
Date FE	X	X	X	X	X	X	X	X	X	X	X	X
Observations	2,646	2,646	2,646	2,646	2,627	2,627	2,646	2,646	2,646	2,646	2,646	2,646
R^2	0.965	0.967	0.897	0.910	0.837	0.860	0.899	0.905	0.991	0.991	0.984	0.987
Adjusted R^2	0.958	0.961	0.876	0.891	0.803	0.830	0.879	0.885	0.989	0.989	0.981	0.984

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the percent change in human flow for a given facility type compared to the January 2020 baseline (Google Mobility). The unit of analysis is prefecture and day, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 441 days from February 15th, 2020 to April 30, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.6 V-RESAS

Table 7: Inter-regional Mobility and the Green Zone certification

	Dependent variable:								
	incity			inpref			outpref		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cumulative GZ-certified restaurants, log	−0.115***	−0.106***	−0.109***	0.224**	0.177*	0.204*	1.055***	1.132***	0.788***
	(0.022)	(0.026)	(0.024)	(0.060)	(0.081)	(0.083)	(0.163)	(0.148)	(0.148)
State of Emergency	0.630**	0.589**	0.533**	−5.249***	−5.128***	−4.586***	−0.125	−0.212	−7.466*
	(0.240)	(0.166)	(0.190)	(0.585)	(0.459)	(0.589)	(2.457)	(2.680)	(2.932)
The number of new COVID-19 cases, log		0.050	0.046		−0.254	−0.220		0.424	−0.050
		(0.050)	(0.047)		(0.177)	(0.178)		(0.466)	(0.371)
Average temperature, log		−1.461	−1.465		6.131	6.090		−10.450	−8.691
		(1.701)	(1.705)		(3.778)	(3.707)		(16.018)	(16.521)
Average rainfall, log		0.007	0.005		−0.167	−0.149		0.552	0.303
		(0.107)	(0.108)		(0.317)	(0.319)		(0.735)	(0.743)
School closure			−0.124			0.231			11.736***
			(0.184)			(0.850)			(1.441)
Gathering restriction			0.062			−0.611			8.271**
			(0.145)			(0.354)			(3.190)
Mean of Mobility in Yamanashi		5.49			-7.079			-27.778	
Mean of Mobility in Control		5.165			-7.584			-27.881	
Prefecture FE	X	X	X	X	X	X	X	X	X
Week FE	X	X	X	X	X	X	X	X	X
Observations	408	408	408	408	408	408	408	408	408
R^2	0.980	0.980	0.980	0.963	0.963	0.963	0.942	0.943	0.949
Adjusted R^2	0.975	0.975	0.975	0.954	0.955	0.955	0.929	0.929	0.936

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the percent change in inter-regional human flow (within a city, within a prefecture, and across prefectures) compared to the 2019 baseline (V-RESAS). The unit of analysis is prefecture and week, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 68 weeks from the third week of January, 2020 to the fifth week of April, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

D.7 Stay-home rate

Table 8: The stay-home rate by male age group and the Green Zone certification

	Dependent variable:						
	M15	M20	M30	M40	M50	M60	M70
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cumulative GZ-certified restaurants, log	0.003**	−0.002**	−0.003***	−0.002***	−0.002***	−0.003*	−0.003**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
State of Emergency	0.003	0.011**	0.020***	0.013***	0.011***	0.028***	−0.018*
	(0.016)	(0.003)	(0.003)	(0.003)	(0.002)	(0.006)	(0.008)
The number of new COVID-19 cases, log	0.001	0.004**	0.003*	0.002*	0.002*	0.000	0.005**
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Average temperature, log	0.027	−0.039	−0.027	−0.013	−0.015	−0.084	−0.128*
	(0.050)	(0.024)	(0.039)	(0.039)	(0.027)	(0.048)	(0.062)
Average rainfall, log	0.009*	0.002*	0.004***	0.006***	0.006***	0.008***	0.015***
	(0.004)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
School closure	0.007	0.019*	0.017**	0.007	0.012**	0.024	0.024
	(0.050)	(0.008)	(0.005)	(0.005)	(0.004)	(0.015)	(0.013)
Gathering restriction	0.040**	0.005	0.014***	0.011***	0.011***	0.012**	0.021***
	(0.013)	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)
Prefecture FE	X	X	X	X	X	X	X
Day FE	X	X	X	X	X	X	X
Observations	2,694	2,694	2,694	2,694	2,694	2,694	2,694
R^2	0.925	0.931	0.950	0.964	0.964	0.959	0.947
Adjusted R^2	0.910	0.917	0.940	0.956	0.957	0.951	0.936

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the day-time (from 9 am to 6 pm) stay-home rate for males, which indicates the percentage of people who refrain from going out compared to the baseline value; the closer to 1, the more people refrain from going out, and the closer to 0, the more people go out. The unit of analysis is prefecture and day, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 449 days from January 1st, 2020 to March 24th, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

Table 9: The stay-home rate by female age group and the Green Zone certification

	Dependent variable:						
	F15	F20	F30	F40	F50	F60	F70
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cumulative GZ-certified restaurants, log	−0.002	−0.002	−0.003**	−0.002***	−0.001*	−0.002***	−0.003**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
State of Emergency	−0.009	0.009	0.011	0.012**	0.020***	0.019***	0.023**
	(0.015)	(0.006)	(0.006)	(0.004)	(0.005)	(0.003)	(0.007)
The number of new COVID-19 cases, log	0.002	0.002	0.003	0.002	0.002	0.003**	0.004*
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Average temperature, log	0.006	−0.063	−0.024	0.006	−0.022	−0.032	−0.136*
	(0.062)	(0.038)	(0.051)	(0.029)	(0.028)	(0.043)	(0.057)
Average rainfall, log	0.006*	0.004***	0.006***	0.006***	0.006***	0.007***	0.012***
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
School closure	0.007	0.025	0.016	0.006	0.015**	0.009	0.012
	(0.052)	(0.016)	(0.010)	(0.014)	(0.005)	(0.016)	(0.012)
Gathering restriction	0.048***	0.005	0.014***	0.014***	0.009***	0.009***	0.019***
	(0.011)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)
Prefecture FE	X	X	X	X	X	X	X
Day FE	X	X	X	X	X	X	X
Observations	2,694	2,694	2,694	2,694	2,694	2,694	2,694
R^2	0.936	0.943	0.960	0.966	0.966	0.961	0.948
Adjusted R^2	0.922	0.931	0.951	0.959	0.959	0.953	0.938

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the day-time (from 9 am to 6 pm) stay-home rate for females, which indicates the percentage of people who refrain from going out compared to the baseline value; the closer to 1, the more people refrain from going out, and the closer to 0, the more people go out. The unit of analysis is prefecture and day, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 449 days from January 1st, 2020 to March 24th, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

Table 10: The night-time stay-home rate and the Green Zone certification

	Dependent variable:		
	NSHR		
	(1)	(2)	(3)
Cumulative GZ-certified restaurants, log	-0.004^{***}	-0.003^{**}	-0.004^{***}
	(0.001)	(0.001)	(0.001)
State of Emergency	0.086^{***}	0.088^{***}	0.070^{***}
	(0.014)	(0.015)	(0.017)
The number of new COVID-19 cases, log		0.005	0.004
		(0.003)	(0.003)
Average temperature, log		0.023	0.024
		(0.031)	(0.032)
Average rainfall, log		0.009^{***}	0.009^{***}
		(0.002)	(0.002)
School closure			−0.001
			(0.004)
Gathering restriction			0.021^{*}
			(0.010)
Prefecture FE	X	X	X
Day FE	X	X	X
Observations	2,724	2,724	2,724
R^2	0.947	0.948	0.948
Adjusted R^2	0.937	0.937	0.938

Notes: *p<0.1; **p<0.05; ***p<0.01 The dependent variable is the night-time (from 8pm to 0am) stay-home rate, which indicates the percentage of people who refrain from going out compared to the baseline value; the closer to 1, the more people refrain from going out, and the closer to 0, the more people go out. The unit of analysis is prefecture and day, and the fixed effects are introduced in all models. For the observations, six prefectures are targeted, and the period of analysis is for 454 days from January 1st, 2020 to March 29th, 2021. The values in parentheses are cluster-robust standard errors. Clustering is at the prefecture level. Cumulative GZ-certified restaurants, log is the log-transformed value of the number of cumulative certified-GZ restaurants plus one. State of Emergency is the dummy variable that takes the value 1 if the state of emergency is declared. The number of new COVID-19 cases, log is the log-transformed value of the daily number of infection cases plus one. Average temperature, log is the log-transformed value of the mean temperature (Fahrenheit degrees). Average rainfall, log is the log-transformed value of the aggregated rainfall (in millimeters). School closure is the dummy variable that takes the value 1 if the school closure is declared. Gathering restriction is the dummy variable that takes the value 1 if the large-scale gathering restriction is declared.

E Treatment Effect

E.1 Comparison of Treatment and Control prefecture

	Yamanashi	Shizuoka	Tochigi	Nagano	Gunma	Ibaraki
Population (in thousands)	811	3,644	2,049	1,942	1,934	2,860
Population density ($/km^2$) *	4,668	5,267	4,244	3,997	4,691	4,570
Distance to Tokyo (km)	101.7	142.8	172.8	96.4	98.8	99.3

Notes: Population and population density are from the 2019 and 2014 National Census, respectively. For distance to Tokyo, see "Distance between Prefectural Offices" by the Geospatial Information Authority of Japan. *In prefectures in the Tokyo metropolitan area that were excluded from the control group, population density is about two to three times that of Yamanashi. In particular, the population densities of Tokyo, Kanagawa, Saitama, and Chiba prefectures are 12,022, 8,979, 8,340, and 7,145 persons/km^2, respectively.

E.2 Comparison of policies in Treatment and Control prefecture

	Yamanashi	Shizuoka	Tochigi	Nagano	Gunma	Ibaraki
Title of the certification policy	Yamanashi Green Zone Certification	Fujinokuni Safety and Security Certification	Tochimaru Reliable Certification	Shinshu Safe Store Certification System	Stop Covid-19! Countermeasure Certification System	Ibaraki's Amabie-chan
Introduction date	May 2020	May 2021	May 2021	April 2021	July 2020	June 2020
Third-party onsite inspection requirements	Yes	Yes	Yes	Yes	Yes	Yes (from April 14, 2021)
Subsidies on indoor infection control measures	From July 10, 2020	Only in Hamamatsu City	From January 22, 2021	From September 15, 2020 - December 28, 2020	Only in Maebashi City	From October 2, 2020 to December 31, 2020
Prefectural/municipal support on the introduction of delivery services	In certain cities	From April 17, 2020	From January 22, 2021	From September 15, 2020 - December 28, 2020	Only in Maebashi City	In certain cities

Notes: Prepared by the authors with reference to prefectures' press releases and newspaper articles. Gunma Prefecture introduced a certification system around the same time as Yamanashi, but the penetration rate remains 21.6% as of October 2020 (see Reference List 17-35).

E.3 List of Business suspension request

	First Emergency Declaration (April 2020 - May 2020)	Second Emergency Declaration (January 2021 - March 2021)	Third Emergency Declaration (April 2021 - June 2021)
Yamanashi	April 20 - May 14 (business closure on bars and nightclubs) May 15 - February 12 (qualified facilities were individually exempted)	January 25 - February 7	No
Shizuoka	April 25 - May 17 (bars and nightclubs only)	December 23 - January 5 (only in Fuji City)	May 19 - June 1 (only in Kosai City)
Tochigi	April 18 - May 15 (restriction on alcohol service hours only)	January 8 - February 21 (in specified cities until January 12)	No
Nagano	April 23 - May 15	January 18 - February 4 (in specified cities)	April 2 - 9 (Nagano City) April 21 - 29 (in specified cities)
Gunma	April 18 - May 15	December 15 - March 1 (in specified cities)	May 8 - June 20
Ibaraki	April 18 - May 17 (bars and nightclubs only)	November 30 - December 20, January 6 - 17 (in specified cities) January 18 - February 22 (entire Prefecture)	April 22 - June 16 (in specified cities)

Notes: Prepared by the authors with reference to each prefecture's official website and newspapers (see Reference List 36-64).

E.4 GZ Certification criteria

Standards pertaining to measures for prevention of infectious diseases (Restaurant industry)

E.4.1. Prevention of infectious diseases among visitors

(1) Store entry, order, and payment

- Disinfection equipment shall be installed at the entrance of the store, and hand sanitization shall be indicated at the entrance.
- When there is a queue due to waiting for a turn, etc., a minimum distance of 1 meter (2 meters if no mask is worn) shall be maintained between visitors.
- When serving customers face-to-face at the cash register, etc., use acrylic panels, transparent vinyl curtains, partitions, etc. to shield the customers. In addition, use coin trays or introduce cashless payment.
- Those with fever (e.g., 1 degree above normal), cold symptoms (e.g., cough, sore throat), vomiting, diarrhea, etc., even if they have mild symptoms, should not be admitted.
- Make it known that people should wear masks except when eating or drinking, and request that people wash their hands and disinfect their hands regularly.
- Remind people to practice good cough etiquette.
- If there is an elevator, limit the number of passengers by adjusting the weight sensor of the elevator. Capacity:_____, Passenger limit:____
- If there is a pick-up truck, shield the driver's seat and rear seat of the pick-up truck with an acrylic plate or transparent vinyl curtain.

(2) Meals and in-store use

[One of these must be met for placement between tables]

- Tables used by the same group and tables used by other groups should be placed so that there is at least 1 meter of interpersonal distance between them.
  - Table-to-table distance: ____ m
- Use acrylic panels, transparent plastic curtains, partitions, etc. to shield the space between tables used by the same group and tables used by other groups.

[One of the following conditions must be met for placement on the same table]

Exclude cases where a small number of family members, elderly people with caregivers, infants, disabled people, etc. wish to sit face-to-face.

- Do not place seating directly in front of each other. Seating should be arranged so that the distance between seats is at least 1 meter. Seat-to-seat distance: ____m.
- Install partitions on tables to shield them.

- Avoid having too many people at the same time by limiting the length of stay* and using a reservation system. (*Approximately 2 hours).

- Avoid large plates and serve food individually, or have employees serve the food.

[In buffet style, one of the following must be met]

- A new small plate should be used by each user for each serving, and food and drinks should be protected by covers to prevent splashing, and masks, disposable gloves, etc. should be worn when serving. When serving, make sure to wear masks, disposable gloves, etc., and do not share tongs or chopsticks for serving.
- Serve food on small plates or have staff serve food.

- Avoid setting up common tabletop condiments, pots, etc., or disinfect them when changing customers.
- Remind customers not to share or use spoons, chopsticks, or other utensils.
- Reduce the volume of background music in the store and remind customers to avoid loud conversations.
- Coughing etiquette should be strictly observed. (For ventilation standards, see "3. Hygiene Management of Facilities and Equipment" for ventilation standards).
- If the toilet has a lid, indicate that waste should be flushed after the lid is closed.
- Indicate that people should wash their hands and disinfect their hands after using the restroom.
- If there is a smoking area, reduce the number of people using it at one time, and keep a distance between people. If there is a smoking area, request that the three densities be avoided by reducing the number of people using the area at once, keeping a good distance between people, etc.
  - Size of the smoking space: _____ m^2 Maximum capacity: _____

E.4.2. Prevention of infectious diseases among employees

- Make sure to wear masks.
- Take your temperature and check your physical condition before starting work.
- If there are multiple rooms, limit per smoking space. If you have a fever (e.g., more than 1 degree above normal), a cold (cough, sore throat, etc.), vomiting, diarrhea, or other symptoms, even if they are mild. symptoms such as vomiting or diarrhea.
- Employees who are infected or suspected to be infected, or who are judged to be in close contact with infected employees, are prohibited from working. Employees who are infected, suspected to be infected, or determined to be a close contact shall not be allowed to work.
- Hand disinfection and hand washing are to be performed regularly at the beginning of work, after touching areas or items that come into contact with others, after cleaning, and after using the toilet.
- When accepting orders from users or serving food, be careful not to stand in front of users and maintain a safe distance from them.
- In the break area, reduce the number of people taking a break at one time, and avoid eating and talking face-to-face.
- Ventilate the break area at all times (for ventilation standards, refer to "3. Thorough hygiene management of facilities and equipment") and disinfect shared items on a regular basis.
- Employees' uniforms should be laundered regularly after work on the day in question.
  - Frequency of uniform washing: _____

E.4.3. Thorough hygiene management of facilities and equipment

- For facilities subject to the Building Management Law*, check whether they meet the standards for air quality control based on the law, and if not, maintain and manage the ventilation equipment appropriately, including cleaning and maintenance.
  - * Law Concerning the Protection of Sanitary Environments in Buildings

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[For facilities not covered by the Building Management Law, one of the following must be met]

- The required ventilation volume (30 m^3 per hour per person) shall be secured by ventilation equipment. If the required ventilation volume is not enough, the ventilation system shall be installed.
- If the required ventilation volume is not sufficient, adjust the number of people entering the store to secure the required ventilation volume per person, and properly maintain the ventilation equipment, including cleaning and maintenance.
- For ventilation by opening windows, open all windows in two directions (or open the door if there is only one window) once every 30 minutes for about 5 minutes to ensure sufficient ventilation.

[Appeal items] This is not a mandatory requirement for certification, but it is an item that can be appealed as a voluntary effort by the business.

- The details of ventilation (air flow) in common areas where people are crowded in the facility are clearly shown.
- In order to secure the required amount of ventilation per person in a densely populated common area in the facility, the ventilation system should be designed for each area.
  - (In the case of limiting the number of persons to ensure the required ventilation volume) Ventilation volume: m^3/hour ÷ 30 m^3/person/hour = ____person

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- Prohibit the use of hand dryers and common towels, and provide paper towels or encourage the use of personal towels.
- Wipe down and disinfect items shared with others and areas that are touched by multiple people regularly, such as when changing users, using disinfecting ethanol, sodium hypochlorite, or commercially available detergents containing surfactants.
  - [areas shared with others in the restaurant industry and frequently touched]
    - * Tables, chairs, menu books, condiments, drink bars, doorknobs, light switches, touch panels, tabletop bells, cash registers, faucets, handrails, toilet seats, washing levers, coin trays, ticket vending machines, elevator buttons, etc.

[Appeal items]

- In order to reduce the risk of contact and droplet infections, the following measures should be taken to avoid overlapping lines of flow for users. Describe in detail: _____

- Those who collect garbage should wear masks and gloves, and always wash their hands after work.
- Garbage, hand towels, etc. that may have food residue, snot, saliva, etc. on them should be sealed in plastic bags. sealed in a plastic bag for disposal.

E.4.4. Preparation and publication of checklists

- Each facility or business operator shall prepare a checklist that specifies specific methods and procedures, frequency of cleaning and disinfection, spacing between people, etc., after assessing the risks in the facility, and disclose the daily checks using the checklist.

E.4.5. Policy for dealing with an outbreak of infection

- In the event that an employee of the facility is found to be infected, the facility will respond and cooperate with the public health center's instructions and investigations in a sincere and proactive manner, take measures to prevent the spread of infection from the facility, and if necessary, publicize information to prevent the spread of infection, such as business days when there is a possibility of infection.
- Provide employees with training opportunities to ensure that they are taking appropriate actions to prevent the spread of infection, such as refraining from going to work if they are suspected of being infected until the test results are known.
- If the results of a proactive epidemiological survey conducted by the public health center reveal that an infected person has been using the facility in question, take measures to prevent the spread of infection through the facility in question by responding and cooperating with the public health center's advice and instructions in good faith and proactively.

[Appeal Items]

- In order to identify the risk of infection at an early stage, employees should be encouraged or required to use an application for notification of close contact provided by the government.
- In addition to the above, introduce a system for early identification of infection risk.

Describe in detail: _____

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