TCER Working Paper Series

Who changed food consumption behavior after the COVID-19 pandemic? Empirical analysis of Japanese household spending panel data

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September 2022

Working Paper E-173
https://www.tcer.or.jp/wp/pdf/e173.pdf

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Abstract

The COVID-19 pandemic has had far-reaching consequences in our daily lives. After the pandemic, we were forced to stay at home, which significantly impacted food consumption behavior. People reduced their consumption of food-away-from-home (FAFH) but increased their consumption of food-at-home (FAH) and food delivery services (FDS). This study aims to demonstrate how food consumption behavior has changed after the COVID-19 outbreak. For this purpose, we analyze the household spending panel data obtained from Macromill, Inc. The data set includes biweekly food spending data from 1,448 households living in Tokyo, Tokai, and Kinki areas. Using the data, we compare household food spending for FAFH, FAH, and FDS before and after the COVID-19 outbreak. Although people shifted from FAFH to FAH and FDS on average following the COVID-19 outbreak, the intensity of the shift varies between sampling periods. Empirical results show that during the state of emergency (the first wave), the average household decreased FAFH expenditure by about 2% year-on-year but increased FDS expenditure by about 1.3%. We further investigate how the intensity of the transition from FAFH to FAH varies across households. Both single-person and single-parent households continued to rely on FAFH after the pandemic, whereas households with parents and children shifted more aggressively from FAFH to FAH than remaining households. These findings suggest that even during the COVID-19 pandemic, households with severe time constraints (single-person households and single-parent households) could not allocate time for meal preparation.

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Who changed food consumption behavior after the COVID-19 pandemic? Empirical analysis of Japanese household spending panel data after COVID-10 outbreak

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Abstract

The COVID-19 pandemic has had far-reaching consequences in our daily lives. After the pandemic, we were forced to stay at home, which significantly impacted food consumption behavior. People reduced their consumption of food-away-from-home (FAFH) but increased their consumption of food-at-home (FAH) and food delivery services (FDS). This study aims to demonstrate how food consumption behavior has changed after the COVID-19 outbreak. For this purpose, we analyze the household spending panel data obtained from Macromill, Inc. The data set includes biweekly food spending data from 1,448 households living in Tokyo, Tokai, and Kinki areas. Using the data, we compare household food spending for FAFH, FAH, and FDS before and after the COVID-19 outbreak. Although people shifted from FAFH to FAH and FDS on average following the COVID-19 outbreak, the intensity of the shift varies between sampling periods. Empirical results show that during the state of emergency (the first wave), the average household decreased FAFH expenditure by about 2% year-on-year but increased FDS expenditure by about 1.3%. We further investigate how the intensity of the transition from FAFH to FAH varies across households. Both single-person and single-parent households continued to rely on FAFH after the pandemic, whereas households with parents and children shifted more aggressively from FAFH to FAH than remaining households. These findings suggest that even during the COVID-19 pandemic, households with severe time constraints (single-person households and single-parent households) could not allocate time for meal preparation.

Key words: COVID-19, Dietary behavior, Food-at-home, Food-away-from-home
Category Number: 10, 14
JEL Classification: Q13, I14, D12

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Who changed food consumption behavior after the COVID-19 pandemic?

Empirical analysis of Japanese household spending panel data

1. Introduction

Coronavirus infection (COVID-19) quickly spread throughout the world after the first infection case was reported in Wuhan, China, in December 2019, and unprecedentedly impacted our social and economic life. More than 500 million people were infected as of July 1, 2022, and more than 6 million people had died (World Health Organization 2022). To curb the spread of the infectious diseases, governments have urged the public to refrain from going out. They even issued stay-at-home orders during a period of a serious infection, prohibiting leaving the house for anything other than essential daily purchases and medical care. Such COVID-19 countermeasures caused significant economic harm to the nation. In fact, several international organizations predicted that the COVID-19 could cause the greatest economic harm to the world since the Great Depression.[1]

The COVID-19 measures have had a significant impact on the country's economy and our daily lives. Older people started to take isolation measures on their own as medical facilities became overburdened with COVID-19 patients and less accessible. They stayed at home much longer than they had previously, and they started to avoid even seeing their children and grandchildren. Meanwhile, companies encouraged employees to work

[1] International Monetary Fund (2020) projected that the global growth would be – 4.9% in 2020.

from home, and a far larger number of people began working at home.[2] When schools were closed, parents needed to stay at home to take care of their children. These changes in daily activities have significantly impacted the way people consume food.

People were concerned about the risk of infection and avoided eating out voluntarily. Later, governments stated that restaurants should shorten their business hours. Because they had more time at home, some families increased their home cooking. As the cost of eating out rose and more home time became available due to the COVID-19 pandemic, households reduced food-away-from-home (FAFH) and increased food-at-home (FAH).

Several studies have already been conducted to investigate the effects of COVID-19 on household food consumption behavior. In the early stages of the COVID-19 pandemic, Godard (2021) assessed the impact of COVID-19 on food retail and food services in Canada, speculating that the roughly 30% of food dollars spent on FAFH would shift to FAH. Chenarides et al. (2021) conducted an online consumer survey in the United States in May 2020 to investigate food shopping behaviors and consumption during the lockdown. They confirmed that people bought more groceries than usual due to food-service closures. They also discovered that people increased their use of grocery delivery and pickup services. From mid-March to late April 2020, Ellison et al. (2021) conducted a household survey in the United States to learn how the COVID-19 pandemic altered food purchasing decisions. They noticed a decrease in FAFH expenditures and an increase in online grocery shopping.

[2] According to some surveys, the residential energy consumption increased after the COVID-19 pandemic period. Sabau (2020) analyzed US energy consumption in the first three months following a lockdown and reported that energy consumption in the residential sector increased by 8%. The Jyukankyo Research Institute, Inc. (2020) confirmed that energy consumption in Japan between April and June 2020 increased by 3.2% per household from the same period of the previous year.

These aforementioned studies were carried out to better understand the changes in household food consumption behavior during the initial period of COVID-19 outbreak. However, they assessed the impact of COVID-19 based on a survey conducted in the outbreak year. Given the seasonality of eating habits, we believe it would be difficult to accurately assess the impact of the COVID-19 pandemic based on a survey conducted in a relatively short period. A more accurate assessment of the impacts of COVID-19 necessitates a comparison of pre- and post-occurrence household food consumption behavior.

This study aims to demonstrate how the COVID-19 outbreak has affected household food consumption behavior. For this purpose, we analyze household spending panel data from 1,448 households in Japan's most densely populated area. We divided food spending into three categories: (1) FAH spending, (2) FAFH spending, and (3) food delivery service (FDS) spending. We then examine how households' spending changed before and after COVID-19. We believe that our data analysis has two advantages. First, using household-level spending data every two weeks enables us to assess the impact of the government's COVID-19 countermeasures more accurately. Second, combining household characteristics and food spending data allows us to determine who changed their food consumption behavior after the COVID-19 pandemic.

The results show that the shift from FAFH to FAH and FDS was maximized when the first state of emergency was declared; the average household decreased FAFH expenditure by about 2% year-on-year but increased FDS expenditure by about 1.3%. The results also shows that the intensity of the transition from FAFH to FAH varies across households; both single-person and single-parent households exhibit a small shift, whereas households with parent and children exhibit a large shift.

The remainder of the paper is structured as follows. Section 2 discusses previous research on FAFH and FAH and the new findings that the present study provides for future research in related fields. Section 3 provides context for the COVID-19 pandemic in Japan and explains the data used in the subsequent empirical analyses. Section 4 specifies the empirical model and reports on the empirical results. Finally, Section 5 concludes the paper by summarizing the empirical findings and discussing the implications for the FAFH and FAH discussions.

2. Food-at -home and food-away-from-home

The transition from FAH to FAFH is a phenomenon commonly observed in developed countries, and numerous researchers have studied the factors that influence it. FAH requires more time for food preparation than FAFH, even though FAFH costs more money. Previous research has demonstrated that the likelihood of and expenditures for FAFH tend to increase as the value of home time increases, particularly as induced by greater female labor force participation (Prochaskea and Schrimper 1973; Redman 1980; Kinsey 1983; McCracken and Brandt 1987; Yen 1993; Jensen and Yen 1996; Nayga 1996; Lo and Tashiro 2011). Meanwhile, several authors confirmed that the probability and amount of production time for FAH tend to decrease as the value of home time increases (Mancino and Newman 2007; Möser 2010).

Additionally, research has been conducted on the interchangeability of time and money in FAH. For instance, Hamermesh (2007) analyzed time diaries and expenditure data for the United States between 1985 and 2003 to determine how households combine time and goods inputs into FAH. The results indicate that the substitution of goods for time becomes difficult as the price of time increases. Hamermesh (2008) analyzed the

relative difficulty of goods–time substitution in home food production using time-diary and expenditure data for a sample of American households in 2003 and 2004. Results indicate that goods–time substitution in food production is quite challenging. Meanwhile, Huffman (2011) developed a household production model to estimate the demand for FAH and FAFH, and applied it to the analysis of the U.S. household sector during the second half of the twentieth century. The results show that FAH and FAFH are substitutes, whereas the price and income elasticities of demand for FAH are roughly twice as large as those for FAFH.

The illnesses caused by unhealthy habits impose monetary costs on society. In recent years, much attention has been paid to policies designed to improve eating and exercise habits. Countries have implemented various programs to assist people in maintaining a healthy diet and programs to return from FAFH to FAH. For example, the Supplemental Nutrition Assistance Program in the U.S. was introduced to improve the health of low-income individuals by assisting with food purchases. Davis and You (2011) argued that the time cost of food preparation at home is overlooked and posed a question on the program's effectiveness. An individual's ability to allocate time among various activities is limited. It is essential to identify the activities that are interchangeable with meal preparation. Furthermore, Scharadin and Jeanicke (2020) reported that time spent on secondary childcare is negatively correlated with the Healthy Eating Index of the household, whereas time spent on primary childcare is positively correlated.

All of the aforementioned studies confirmed a degree of time substitution between activities. However, they also confirmed that the degree varies among households based on income, time cost, occupation, and the presence of children.

We do not encounter a circumstance in which an exogenous shock uniformly alters time allocation because time allocation is the ultimate choice for an individual. In addition, we do not encounter a situation in which the value of time decreases, as economic development tends to increase its value. Given these facts, we believe that the COVID-19 pandemic presents a unique opportunity to examine how the relaxation of time constraints influences household food consumption behavior. Did people return from FAFH to FAH when the COVID-19 outbreak eased time restrictions? If so, what type of person has returned? The following empirical analysis aims to provide answers to these questions.

3. Background information and Data

3.1. Countermeasures for the COVID-19 outbreak

The time series changes in the number of newly infected individuals in Japan are depicted in Figure 1. The first infected person was confirmed on January 15, 2020. Since the number of infected people began increasing rapidly by the end of March 2020, the government proclaimed the first state of emergency for the Kinki and Tokyo metropolitan areas. On April 16, the government subsequently expanded its coverage nationwide. Although strict prevention measures, including the closure of elementary and junior high schools, were introduced under this first state of emergency, they were completely lifted on May 25. The government continued to urge the public to refrain from moving between prefectures but eased such self-restraint of movement on June 19. Although the number of infected people started to increase again soon after the movement restriction is relaxed, the government

started the "Go-to-travel campaign," a subsidized travel promotion program, on July 22 in the regions outside of Tokyo. This was done to help the damaged tourism industry. Tokyo residents were allowed to use this travel campaign program beginning on October 1 and running through December 14. Meanwhile, since the second infection outbreak in the summer, the government has urged restaurants to implement voluntary infection control measures. For instance, restaurants were asked to shorten their service hours from August 3 to 31. Despite beginning late September, the "Go to eat campaign," which distributed coupons redeemable at restaurants, ended on November 24.

[Figure 1 near here]

Although there was a temporary increase in eating out as the COVID-19 subsided, the food service industry remained depressed throughout 2020. The Japanese government, like other countries, provided a support fund for the food service industry. However, because the support fund was provided in a form that did not accurately reflect the business scales, large-scale firms received less support than small firms. For instance, there was little difference in funding between small and large restaurants.

3.2. Household spending panel data

We analyze the panel data on household spending obtained from Macromill, Inc.[3] Macromill Household Spending (MHS) data consists of spending information for survey monitors gathered via online surveys. Macromill requests that the survey monitors download a household account book application to scan the receipt data. The survey monitors must enter the pertinent information manually if the receipt information cannot be scanned with the application. Macromill compensates the panel survey monitors more than usual for online surveys to obtain reliable information. For the present study, we utilize the biweekly food expenditure data.

The study areas are Tokyo area (Saitama, Chiba, Tokyo, and Kanagawa), Tokai area (Gifu, Shizuoka, Aichi, and Mie), and Kinki area (Shiga, Kyoto, Osaka, Hyogo, Nara, and Wakayama). To focus on the households that accurately report spending information with the application, we only include households that routinely spent 10,000 yen or more on food in the previous two weeks. The survey period is from January 1, 2019, to December 31, 2020, and the number of the households is 1,448.

The MSH database contains information on socioeconomic characteristics. Table 1 summarizes the information regarding the survey monitors and their households for this study. The average age of survey monitors is 49.3 years old, and their average family size is 2.9 members. The table reveals that 70% of monitors are female, 80% are married, and 80% have children younger than 19 years old. As the primary

[3] Macromill, Inc., is a Japan-based company engaged in the provision of marketing research and digital marketing solutions mainly online.

food shopper in many households, the proportion of women would naturally increase relative to that of men. There are differences in the food consumption behavior between men and women, with men being more likely to dine out.

[Table 1 near here]

Table 2 shows the family and job types of the survey monitors. About half of the monitored households consist of couples and children. About 13.5% of households are single-person households, whereas about 22.3% of households are couple-only. Due to the urban setting of the survey area, the household size of the survey monitor is relatively small. In terms of occupation, 34.2% of the survey monitors are homemakers, and 25.4% hold part-time jobs. Meanwhile, about one-third of the survey monitors have full-time jobs.

[Table 2 near here]

This study aims to examine the aforementioned food spending panel data to determine whether dietary habits have changed due to COVID-19. Table 3 shows that the average household's annual total food spending was 747,825.4 and 772,267.6 JPY in 2019 and 2020, respectively. Therefore, the annual spending for all food increased by 3.2%.. In 2019 and 2020, the average household FAH spending was 637,382.0 and 686,684.6 JPY, respectively. Therefore, the annual spending for FAH increased by 7.5%. Meanwhile, from 2019 to 2020, FAFH spending fell dramatically. On average, it fell by 36.9%. Finally, there was a 29.3%

increase in FDS spending. The data clearly show that people stop eating at restaurants and began having food at home.[4]

[Table 3 near here]

4. Empirical model and results

4.1. Time series change in food spending expenditure

We compare FAH, FAFH, and FDS expenditure shares over two weeks between 2019 and 2020. During the two weeks of the survey, a household may not purchase storable foods such as seasonings and crop. Therefore, the analysis below is based on the four weeks' average spending.

Let $y_{h,p,k}^{19}$ and $y_{h,p,k}^{20}$ be household h's expenditures for the kth type of food consumption in period p in 2019 and 2020, respectively. We approximate the expenditure share of the kth type of food consumption in 2020 by the following logarithmic rate formula.

$$s_{h,p,k}^{20} = \ln\left(\frac{y_{h,p,k}^{20}+1}{\sum_k y_{h,p,k}^{20}+1}\right) \quad (1)$$

Because a household may not eat out or use delivery food services during the corresponding period, we add 1 to both the numerator and denominator.

To demonstrate how food consumption behavior changed following the COVID-19 outbreak, we first consider the following seemingly unrelated regression equations model.

[4] The rates of change in the consumer price index from 2019 to 2020 were 0% for all items, 1.3% for food, and 2.1% for eat out (Statistics Bureau of Japan, 2021).

$$\begin{aligned} s^{20}_{h,p,FAH} &= \alpha_{FAH} s^{19}_{h,p,FAH} + \beta_{FAH} r_{h,p,T} + \boldsymbol{\Gamma}_{p,FAH} \boldsymbol{D}_p + \boldsymbol{\Pi}_{FAH} \boldsymbol{R}_i + \varepsilon_{i,p,FAH} \\ s^{20}_{h,p,FAFH} &= \alpha_{FAFH} s^{19}_{h,p,FAH} + \beta_{FAFH} r_{h,p,T} + \boldsymbol{\Gamma}_{p,FAFH} \boldsymbol{D}_p + \boldsymbol{\Pi}_{FAFH} \boldsymbol{R}_i + \varepsilon_{i,p,FAFH} \\ s^{20}_{h,p,FDS} &= \alpha_{FDS} s^{19}_{h,p,FAH} + \beta_{FDS} r_{h,p,T} + \boldsymbol{\Gamma}_{p,FDS} \boldsymbol{D}_p + \boldsymbol{\Pi}_{FDS} \boldsymbol{R}_i + \varepsilon_{i,p,FDS} \end{aligned} \quad (2)$$

We included the expenditure share in 2019 $s^{19}_{h,p,\cdot}$ to take account of the difference in food consumption behavior among households before the COVID-19 outbreak. The variable $r_{i,p,T}$ is the logarithmic rate of change for total food spending. The associated parameter β quantifies the change in the expenditure share of the *k*th type of food consumption caused by an increase in total food spending. This variable is also included to account for the effect of price fluctuations and changes in household income over the study period.

We include period-specific dummies $\boldsymbol{D}_p$ to account for the difference between sampling periods in 2020. Parameter $\boldsymbol{\Gamma}$ quantifies the period-specific effects. We impose the following estimation constraints to accurately investigate how the choices among three meal types (FAH, FAFH, and FDS) were changed.

$$\gamma_{p,FAH} + \gamma_{p,FAFH} + \gamma_{p,FDS} = 0 \quad (3)$$

This constraint necessitates the reallocation of funds intended to purchase a particular type of meal during each period to purchase a different type of meal. For example, if households reduced their FAFH expenditures, they would increase their FAH or FDS expenditures.

The infection status and regulatory situation differ by region; hence, we decided to include prefecture dummies $\boldsymbol{R}_i$ in the estimation model. Finally, the error terms of $\varepsilon_{i,p,FAFH}$, $\varepsilon_{i,p,FAH}$, and $\varepsilon_{i,p,Deli}$ are allowed to be corrected.

[Figure 2 near here]

Unsurprisingly, all three expenditures variables in Equation 3 reached statistical significance at the 1% level; therefore, the expenditure share in the previous year has explanatory power in the present year. Although the logarithmic rates of change for total food expenditures reached statistical significance in the FAH and FAFH models at the 1% level, they reached significance in the FDS model at the 5% level. The estimated parameters are $\hat{\beta}_{FAH} = -0.048$, $\hat{\beta}_{FAFH} = 0.209$, and $\hat{\beta}_{FDS} = -0.087$. The results suggest that FAFH is a luxury good, whereas FAH and FDS are not.

The variation in the expenditure shares of FAH, FAFH, and FDS over the sampling periods is shown in Figure 1. Each period's vertical height of the curve is related to the value of the parameter γ_p. The figure shows that the share of FAFH was high at the beginning of the year, compared to the previous year, but began declining as the infection spread. With a decrease of about 1.8% from the prior year, FAFH's share experienced the greatest decline during the time of the state of emergency declaration. Although a portion of the decline increased FAH's share, the majority increased FDS's share because a large portion of the money spent on eating out went to FDS.

However, such an increase in FDS was only temporary. People stopped using FDS after the state of emergency was lifted. Figure 2 shows that households reduced their use of FAFH and FDS while increasing their use of FAH only. Because FDS includes restaurant take-out meals, restaurants will likely be unable to compensate for the decline in in-store sales by increasing take-out meal sales.

Figure 2 also shows that FAH's share remained consistently high throughout the year. However, during the "Go to Eat Campaign," FAH's share decreased. In fact, at the beginning of October, the proportions of expenditures for three meal types were roughly the same as the previous year.

These findings show that while the state of emergency reduced FAFH, the "Go to Eat Campaign" increased it. Therefore, the policies were effective at persuading people to change their food consumption habits, although it is less clear whether they were effective at infection control.

4.2. Who changed food consumption behavior?

In the previous section, we confirmed that, during the state of emergency, the average household reduced FAFH spending and increased FAH and FDS spending. After the lift of the state of emergency, households ceased using FDS and compensated for a significant portion of the FAFH reduction with the FAH increase. We expect that the pattern and intensity of such a shift in food consumption can vary by household. This section classifies households into various groups and compare the pattern and magnitude of food consumption shifts across these groups. Using a subsample of each group, we estimate the empirical model specified in Equation 3.

[Table 4 near here]

We initially compare the differences in food consumption patterns between married and unmarried households. Table 4 shows the change in the expenditure share brought on by the rise in overall food spending. The table demonstrates that as total food expenditure rises, married and unmarried households decrease FAH share but increase FAFH's and FDS's shares. the able also shows that the share of FAFH increases much faster in unmarried households than in married ones.

[Figure 3 near here]

Figure 3 compares the changes in FAH, FAFH, and FDS spending shares over time. During the state of emergency, both married and unmarried households reduced FAFH spending while increasing FDS spending. After the state of emergency was lifted, married households began spending less on FDS than the previous year, whereas unmarried households continued to spend the same amount. It has been confirmed that married households adjusted their food consumption behavior more smoothly than unmarried households throughout the year in response to the COVID-19 pandemic.

We next examine how changes in food consumption behavior differed by family type. We specifically compared the change in expenditure shares among single-person, couple-only, parent–child, senior, and single-parent households.

Table 4 compares the changes in expenditure share caused by the increase in total food spending. All three expenditure share variables became statistically significant in households with a parent and children, but not all of them did in the remaining households. According to the estimated parameters shown in the table, as total food expenditure increases, single-person households increase FAFH the fastest, followed by couple-only households. Meanwhile, households with seniors tend to increase FDS faster than other households as total food expenditure rises.

Subsequently, we look at how food consumption habits changed by household type during the survey period. Figure 4 only shows changes in FAH spending for the sake of brevity. It shows that although all

households increased or decreased their FAH share in a similar pattern, the magnitudes of the changes varied by household type. The figure specifically shows that households with couples and children adjusted their food consumption behavior most smoothly in response to the COVID-19 infection and its countermeasures. This is because the size of the household comprised of couples and children is often larger than the size of the remaining households, and children who usually ate outside the home began eating at home after COVID-19. Figure 4 shows that single-person and single-parent households did not significantly increase FAH. This finding suggests that those households struggle to find more time for meal preparation at home.

[Figure 4 near here]

Finally, we examine whether employment status influences food consumption behavior. Respondents' occupations are recorded in the Macromill survey, but their spouses' occupations are not. Given that most male respondents work full-time (Table 2) and that women prepare meals more frequently than men in Japanese households, we focus on the records of female respondents. The types of employment status are further divided into three categories: homemaker (no job and homemaker), part-time job, and full-time job (all remaining). Then, we investigate whether differences in employment status have contributed to the shift in food consumption behavior.

[Figure 5 near here]

Table 4 compares the shift in the expenditure share caused by the rise in total food spending by employment status. Regardless of employment status, we obtained the same sign for all three meal types; the signs of FAH, FAFH, and FDS are negative, positive, and negative, respectively. The findings imply that as the household's total food expenditure increases, they increase FAFH share but decrease FAH and FDS shares. The obtained parameters show that households with a wife who works part-time experience the greatest changes in their food consumption patterns in response to an increase in overall food expenditures; they experience the greatest transition from FAH to FAFH with an increase in income.

We examine how changes in food consumption behavior by employment status occurred during the survey period. Again, for brevity, Figure 5 only shows changes in FAH spending. It demonstrates that while all households experienced an upward or downward trend in their FAH share, the magnitudes of the changes varied depending on employment status. The figure shows that FAH spending increased significantly in households where women were homemakers but only slightly in those where women worked full-time.

5. Conclusion

We began spending more time at home during and even after the COVID-19 pandemic, which significantly impacted food consumption behavior. Using household spending panel data, this study examined how households changed their food consumption behavior after the COVID-19 outbreak. We observed the shifts from FAFH to FDS at the start of the COVID-19 outbreak, but such a shift stopped after the state of emergency was declared. As households became accustomed to the COVID-19 lifestyle, they began compensating for the decrease in FAFH spending by increasing FAH spending.

The results show that the degree of the shift from FAFH to FAH or FDS varied over the sampling period. Specifically, the shift was maximized when the first state of emergency was declared. According to the estimation results, although FAFH expenditure decreased by approximately 2%, FAH and FDS expenditure increased by approximately 0.7% and 1.3%, respectively. The magnitude of the shifts among FAH, FAFH, and FDS was greatly reduced after the state of emergency was lifted.

We also found that the degree of the shift from FAFH to FAH or FDS varies by household; both single-person and single-parent households exhibit a small shift, whereas households with parent and children exhibit a large shift.

People must devote time to food shopping and cooking to prepare home meals. Previous studies have reported that households engaged in activities other than food preparation were less likely to increase FAH, even when policies were implemented to make healthy foods more affordable. Although people spent more time at home following the COVID-19 pandemic, single and single-parent households still struggle to find time for meal preparation. Policies that target households with limited time and unable to share household chores with other family members are required to promote healthy eating habits. Unless such support is available, single person and single-parent households are unlikely to eat healthily.

This research can be extended in several directions. Although this study compares food consumption behavior between sampling periods, changes in time allocation for each household were not considered in detail. The analysis using more detailed data on household time allocation is necessary for more accurate empirical analysis. This study did not consider the accessibility to FAFH and FDS. Persons who use FAFH or FDS more

intensively are more likely to live in the areas where such services are readily available. It is necessary to conduct a study how the accessibility to FAFH and FDS affects food consumption behavior.

Acknowledgments:

This work was supported by JSPS KAKENHI Grant Numbers 20H01496 and Institute of Economic Research at Aoyama Gakuin.

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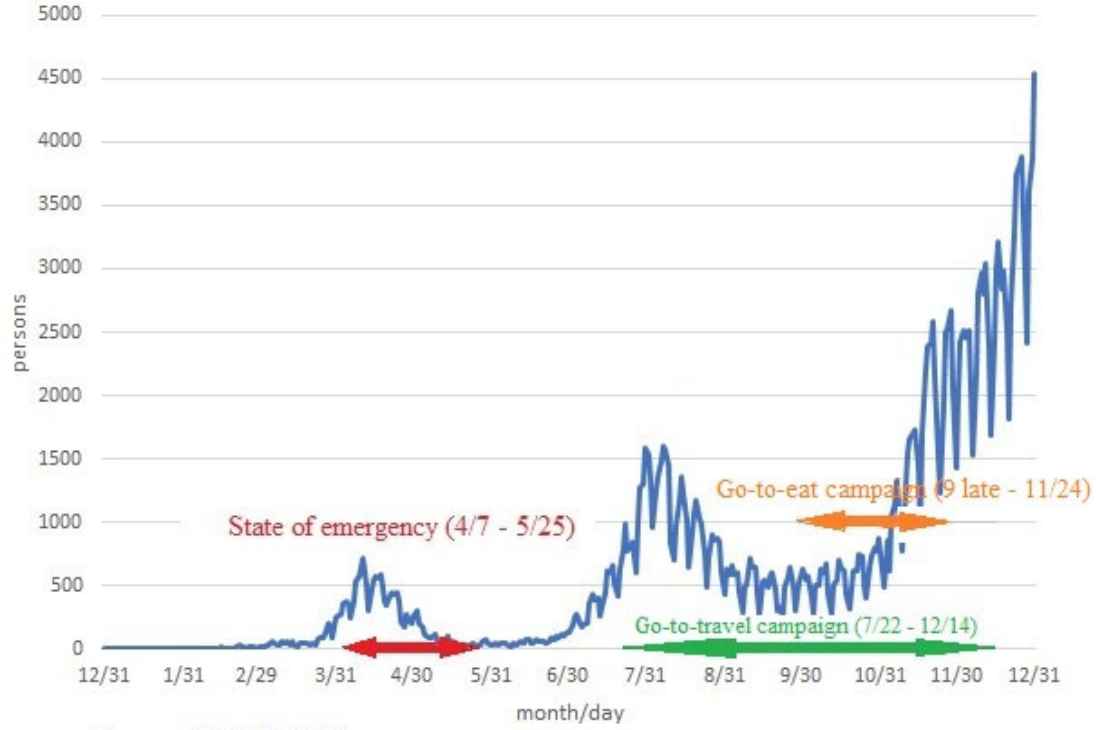
Figure 1. The number of infected persons in 2020



Source:NHK (2022)

Figure 2. Change in expenditure share

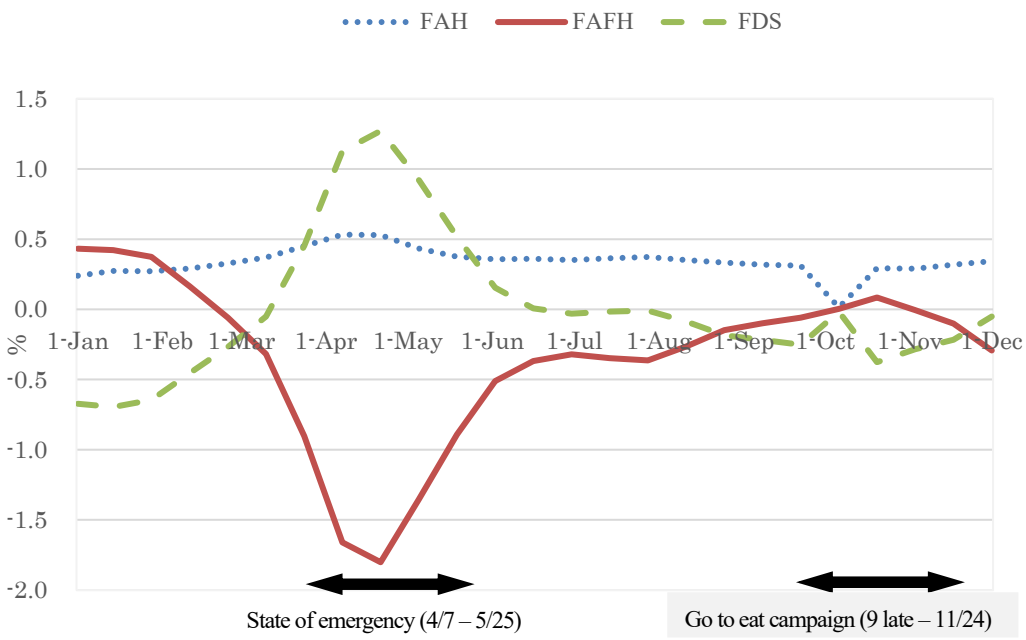


Figure 3. Married vs. unmarried households

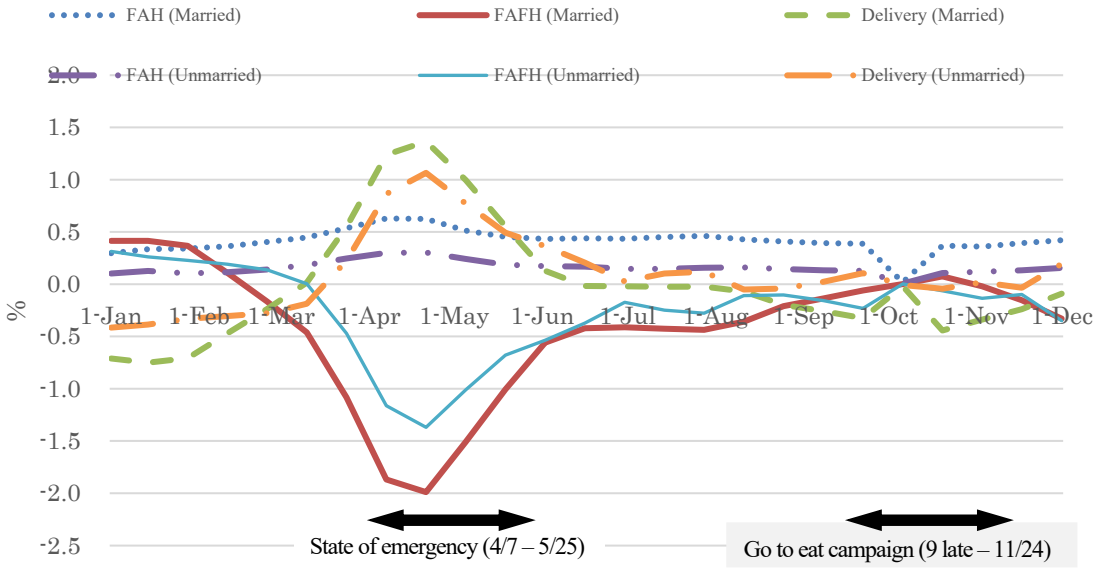


Figure 4. Change in FAH expenditure by household types

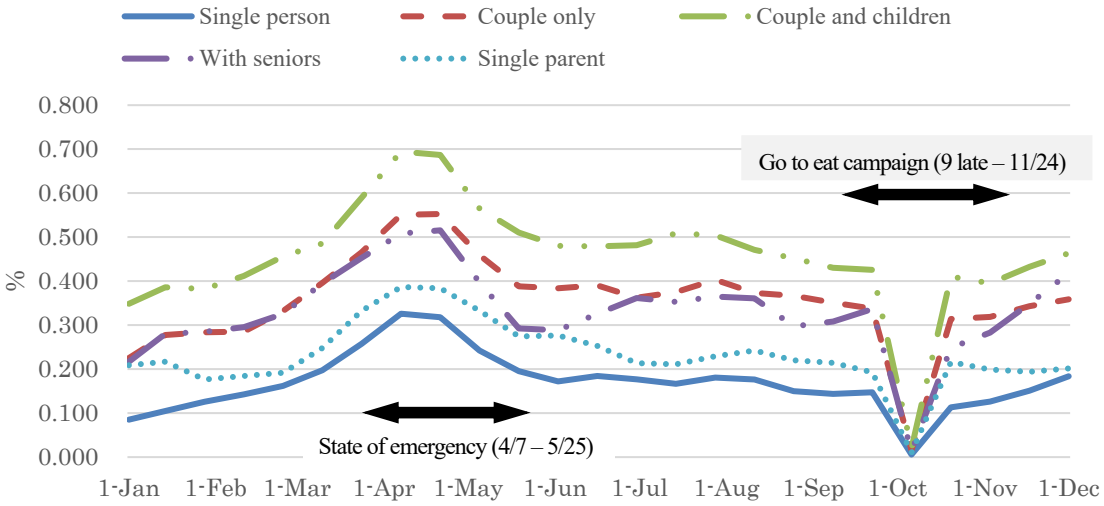


Figure 5. Change in FAH expenditure by job type (Female respondents only)

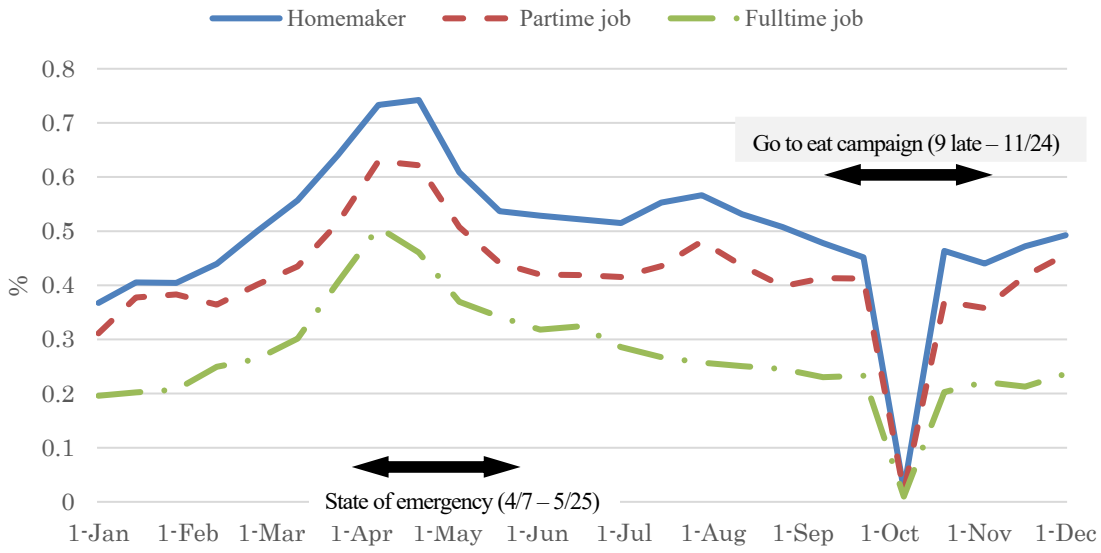


Table 1. Descriptive statistics of the survey monitors

	Average or share	Standard error	Minimum	Maximum
Age	49.3	9.7	27	65
Number of persons in a family	2.9	1.2	1	5
Female dummy	0.7		0	1
Marriage dummy	0.8		0	1
Children under 18 dummy	0.7		0	1

Table 2. Family type, job type, and prefecture (%)

family type		Job type			Prefecture	
			male	female		
Single-person	13.5	No job	0.4	46.2	Saitama	10.6
Couple-only	22.3	Homemaker	12.7	1.7	Chiba	6.5
Parents-and-children	49.3	Student	0.2	0.0	Tokyo	20.0
With seniors	4.6	Part-time job	7.7	31.7	Kanagawa	14.2
Single-parent	6.7	Freelance	2.7	1.1	Gifu	2.0
With non-relatives	1.2	Self-employed	6.7	1.7	Shizuoka	3.3
Others	2.6	President or executive	3.9	0.2	Aichi	11.0
		Office worker (clerk)	15.2	9.9	Mie	2.0
		Office worker (technical)	25.8	2.0	Shiga	1.7
		Office worker (other)	19.6	3.7	Kyoto	3.7
		Public servant	3.4	0.4	Osaka	14.6
		Other	1.8	1.5	Hyogo	7.8
					Nara	1.3
					Wakayama	1.2
Total	100.0	Total	100.0	100	Total	100.0

Table 3. Annual food spending before and after COVID-19

	Before (2019)	After (2020)	Change
	JPY	JPY	%
Total	747,825.4	772,267.6	3.2%
Food-at-home (FAH)	637,382.0	686,684.6	7.5%
Food-away-from-home (FAFH)	95,150.3	65,804.2	-36.9%
Take-out and delivery (FDS)	15,293.1	19,778.8	29.3%

Table 4. Change in the expenditure share caused by the total food spending increase (β)

Comparison	Groups	FAH	FAFH	FDS
Marital status	Married	-0.048***	0.135***	-0.106 ***
	Unmarried	-0.063***	0.636***	*-0.026*
Family type	Single-person	-0.096***	0.644***	*-0.083*
	Couple-only	-0.054***	0.349***	*0.029*
	Parents-and-children	-0.046***	0.097**	-0.151***
	With senior	*-0.052*	*-0.058*	0.521***
	Single-parent	*-0.005*	*-0.068*	-0.304**
job type	Homemaker	-0.038**	*0.065*	-0.132**
	Part-time job	-0.061***	0.273***	*-0.087*
	Full-time job	-0.032*	*0.082*	-0.272***

Note. ***, **, and * indicate statistically significant at the 1%, 5%, and 10%, respectively.