Changes in Eating Out Behavior During the COVID-19 Pandemic and Their Modeling

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Background & Purpose

- **Background**
  - Behavioral changes due to the COVID-19 pandemic vary depending on individual attributes and habits (based on basic statistics).
  - In particular, there are significant differences in individual attitudes when it comes to eating out.

- **Purpose**
  - Modeling eating-out behavior and gaining insights into policies that encourage changes in eating-out behavior.

Basic Analysis

- Average weekly trips remained unchanged during the declaration period, while Eat-out trips decreased compared to before and after the declaration period.

trips	n	mean_diff	sd_diff	t	p_approx
during - before	72	0.58	5.92	0.83	0.41
after - during	60	-0.08	5.29	-0.12	0.91
after - before	78	1.36	5.40	2.23	0.03

eat_out	n	mean_diff	sd_diff	t	p_approx
during - before	72	-0.35	1.06	-2.77	0.01
after - during	60	0.38	1.05	2.80	0.01
after - before	78	0.04	1.01	0.34	0.73

Model Overview and Structure

Model

- Binary Logit model
- Regression model
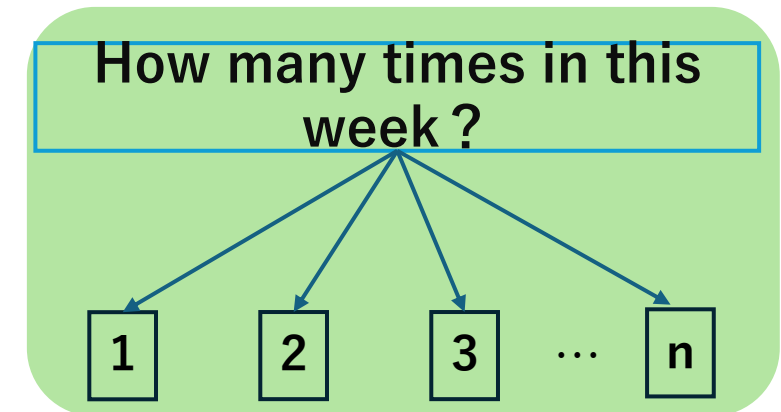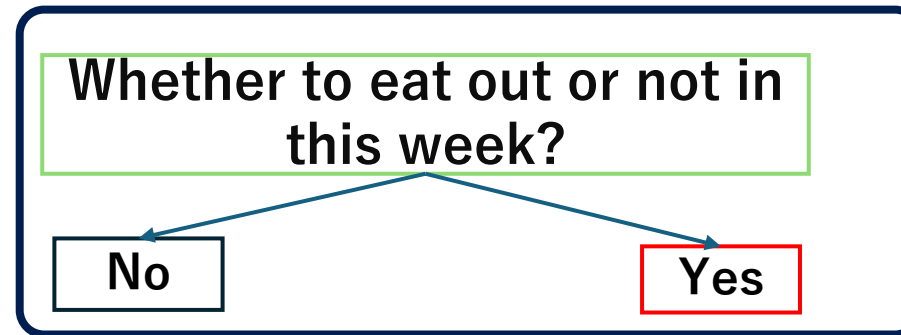
Model Overview and Structure

- **Binary Logit Model（Eating out or not?）**
  - **Utility:** $V = \beta_1 x_1 + \beta_2 x_2 + \cdots + \varepsilon$
- **Explanatory variables** (Constant, Female dummy, Vaccination, State of Emergency, Number of Commuting, Average number of trips, Average trip time, Age 50+)

- **Multiple Regression Model（How many times?）**
  - **Formula:** $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n$
- **Explanatory variables** (Constant, Vaccination, Family members living together, Car ownership, Motorcycle or bicycle ownership, State of Emergency)

Estimation Results — Binary Logit

	Estimate	t-value		Estimate	t-value
Constant	0.27	2.20**	Number of commuting	-0.12	-4.37***
Female dummy	0.32	2.30**	Average number of trips	0.29	6.51***
Vaccination dummy	-0.43	-3.17***	Average trip time	-0.0001	-4.30***
State of Emergency dummy	-0.38	-1.60	Age 50+ dummy	0.29	2.37**

Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Sample size : 1296
Initial log-likelihood   : -898.32
Final log-likelihood   : -800.91
Likelihood ratio index   : 0.11
Adjusted likelihood ratio index : 0.0995
McFadden's pseudo R^2 : 0.11
Hit rate   :64.89%

Consideration

・The female dummy, the average number of trips, and being age 50+ have positive coefficients, indicating these factors make dining-out behavior more likely.

・The negative coefficient on the vaccination dummy likely reflects that people with higher infection awareness were less inclined to dine out.

・The 4th State of Emergency shows no statistically significant effect on going out.

Estimation Result - OLS Regression

- Eat-out

	Estimate	t-value
Constant	0.71	4.41***
Vaccination	0.24	5.26***
Family members living together	-1.01	-8.13***
Car	-0.23	-2.30**
Do not own a car,motorcycle or bicycle	1.29	6.23***
Wave 4	-0.18	-1.02

Sample size	1037
Log-likelihood	-2037.2
AIC	4086
BIC	4116
Covariance type	HC1
F-static	18.41
Prob(F-static)	1.54e-17
R-squared	0.119
Adj. R-squared	0.115

Significance levels : *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Cosideration

- Declaining a state of emergency is not dominant
- Vaccine have become dominant
- Having a family gave an advantage

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Summary

- Behavioral changes due to COVID-19 are prominently reflected in dining-out behavior.

- By using a binary logit model and a regression model, dining-out behavior is modeled in terms of whether or not people dine out and how many times they dine out.

- The average number of trips and individual attributes fundamentally influence dining-out behavior.

People who received the vaccine are less likely to engage in dining-out behavior,
but when they do dine out, the number
of times tends to be higher.