



# 新型コロナウイルスワクチン 接種が交通手段選択に及ぼす 影響

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# Background

新型コロナウイルスの流行により公共交通の利用者・売上は減少傾向にある  
Public transportation ridership and sales are declining due to the outbreak of the new coronavirus are on the decline

## ▶ 政府による政策 Government Policy

① ワクチン接種の促進 Promoting Vaccination

### ② 公共交通利用者の促進政策

Policies to promote public transportation users focusing on travel distance

(1) 長距離移動(飛行機や新幹線や高速バス)

⇒ Goto トラベルや全国支援旅行による利用料金の割引による利用者促進  
There are policies to promote transit users for long-distance travel.

(2) 短距離移動(鉄道や路線バス)

⇒ 財政的な支援のみ (利用者を促進させる取り組みは実現されていない)

Few policies to promote transit users for short trips

## 短距離移動(地域交通)の利用促進に注目した分析・政策が必要

Analysis and policies that focus on promoting the use of short-distance travel (regional transportation) are needed.

# Hypothesis & Objective

## ▶ Hypothesis

地域交通利用の促進については積極的な支援は見られないが...

**ワクチンの接種**によって人々は**地域の公共交通**の利用への抵抗は減少しているのではないだろうか

Although there has been no active support for the promotion of local transportation use, vaccination may have reduced resistance to the use of local public transportation.

## ▶ Objective

① **ワクチン接種が地域の公共交通の選択に与える影響を明らかにする**

The Impact of Vaccination on Local Public Transportation Choices Clarifying the impact of vaccination on local public transportation choices

② **地域の公共交通の利用を促す政策を提案する**

Propose policies to encourage the use of public transportation in the region

# Methodology ( Data )

## ▶ **使用データ** usage data 豊洲PPデータ(2018年及び2021年の9月～10月)

Toyosu PP Data(9~10 of 2018 and 2021 )

## ▶ **データクリーニング** data cleaning

- 性別,年齢が欠損値でない Gender and Age is not NA
- 徒歩の移動距離が 5 km以内 Walking distance of less than 5 km

## ▶ **サンプル数** Number of samples

- 2018 : 12,321
- 2021 : 19,357

※2021年データのうちワクチン接種者(1回以上)は77%  
77% of those vaccinated (at least once) in 2021 data

# Methodology ( Data )

## ▶ 交通手段の分類 Transportation Classification

鉄道，バス，自家用車，自転車，徒歩の5分類を行った。

Five categories were used: rail, bus, private car, bicycle and walking.

さらに移動する際他の利用者と乗り合わせる公共交通と  
自動車など一人で貸切ることのできるものを自主交通とする

Public Transportation is defined as a type of transport in which you share a vehicle with other users, and  
Private Transportation is defined as vehicles that can be hired by one person, such as cars/taxis.

## ▶ 移動目的の分類 Classification of travel purpose

出社や通学などのあらかじめ決められているトリップを **scheduled**  
娯楽や散策などのトリップを **leisure**  
ショッピングなどをその他トリップを **others** とする

Scheduled for predetermined trips, such as going to work or commuting

Leisure trips, such as recreation and walking

Other trips such as shopping, etc. as OTHERS

# Methodology ( Analysis Items )

## ① 2018,2021の交通分担率比較

Traffic sharing ratio comparison for 2018 and 2021

## ② 交通モード毎の利用目的の分担率の比較

Percentage share of intended use by transportation mode in 2021

## ③ ワクチン接種によるモード選択の比較

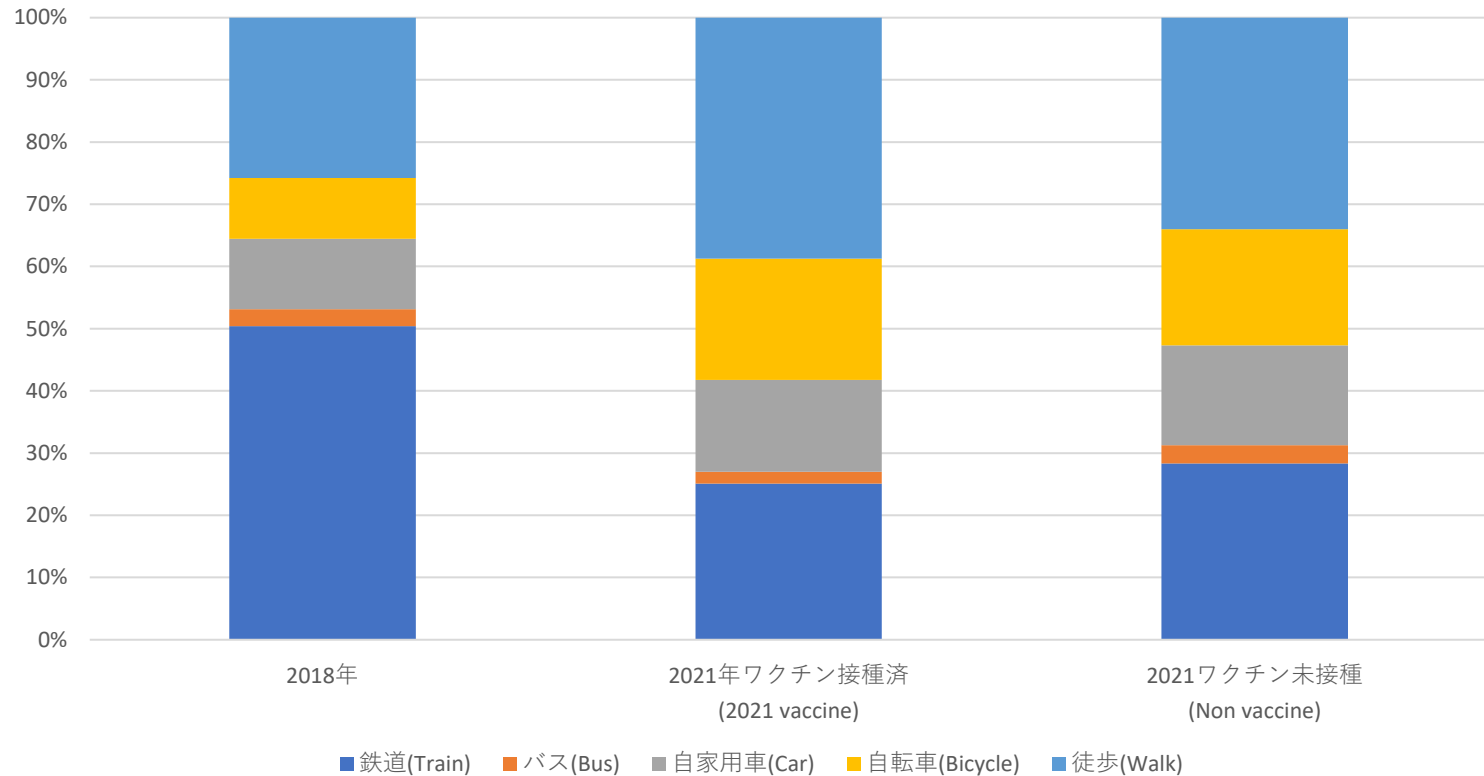
Comparison of mode selection by personal attributes

## ④ 多項ロジットモデル(MNL)による交通手段選択の推定

Multinomial logit model (MNL) estimation of transportation mode choice

# ① 2018年・2021年の交通分担率の比較

Comparison of traffic sharing rates for 2018 and 2021



- ・ 2018年と比べてコロナ禍の2021年では公共交通手段の選択割合が減少

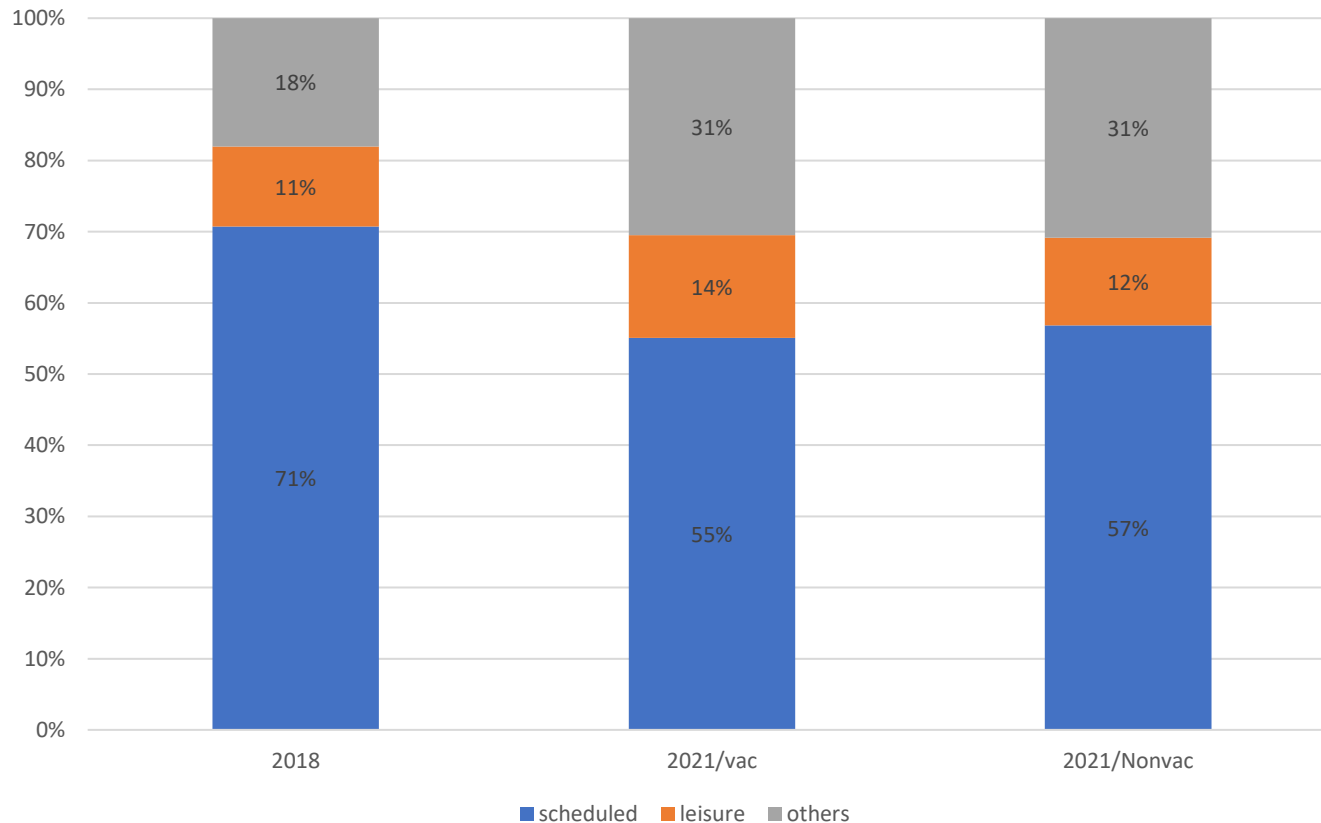
Decrease in the percentage of public transportation choices in 2021 for the Corona Disaster compared to 2018.

- ・ 特にワクチン接種済みの人は公共交通の利用が低い傾向にある

Vaccination rates tend to be low, especially among those who have been vaccinated

## ②交通モード毎の利用目的の分担率の比較

Comparison of purpose-of-use sharing by transportation mode



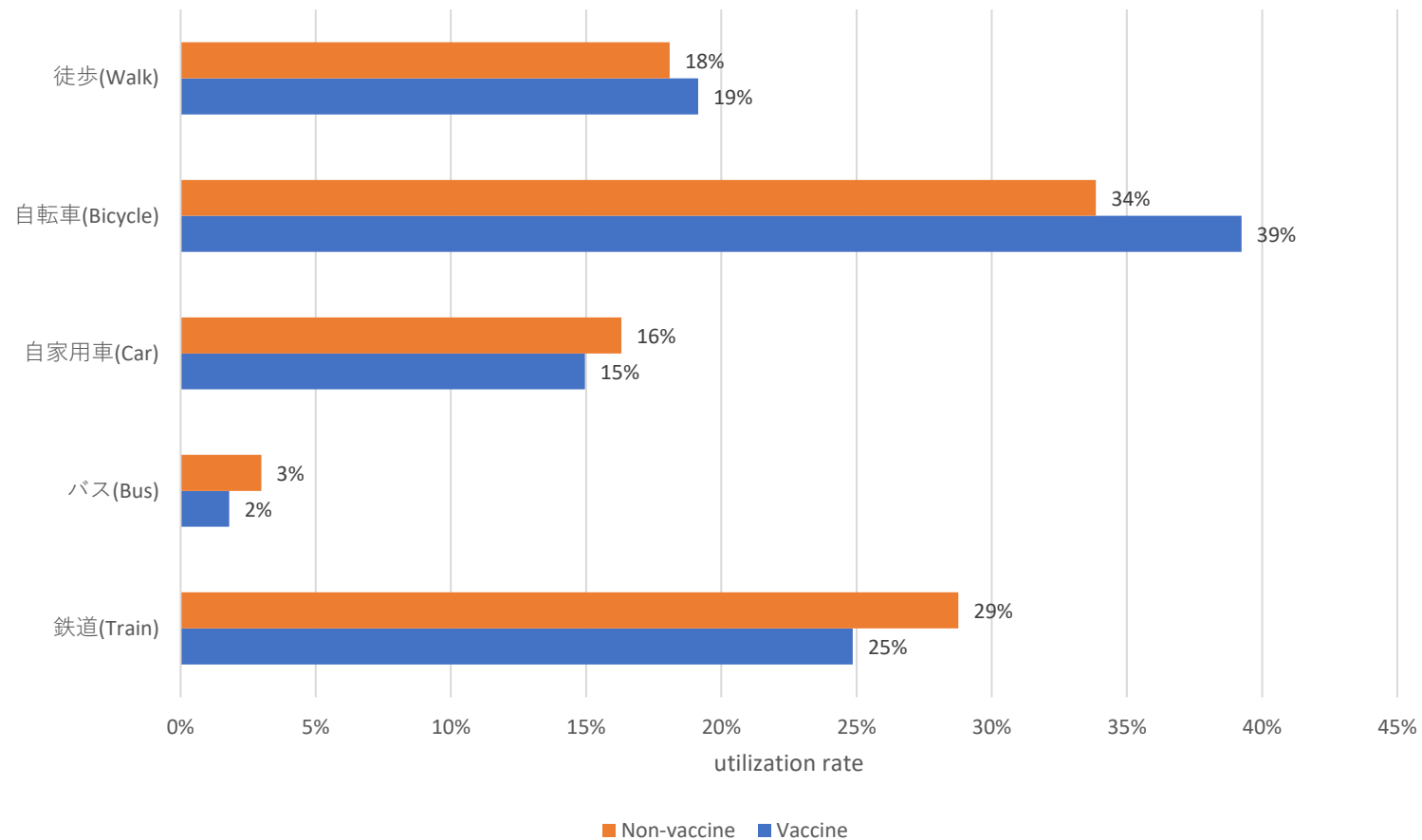
テレワークの推進により決まった予定のトリップが減少していると考えられる。  
またステイホームで自宅で料理をする機会が多かったためか買い物を含むothersの項目が増えていると考えられる

It can be seen that the number of trips with fixed schedules has decreased due to the promotion of telework.  
There is also an increase in the number of others, including shopping, probably due to the fact that there were more opportunities to cook at home in the stay home.



# ③ ワクチン接種によるモード選択の比較

Comparison of mode choice by vaccination



ワクチン接種者の方が公共利用を利用しない傾向にあることが分かる  
Vaccinated people are more likely to be less likely to use public

# ⑤ Estimation Table (MNL)

多項ロジットモデルを用い最尤推定法でパラメータを推定する。  
各モードの選択効用は以下のように設定する

The parameters are estimated by the maximum likelihood estimation method using a multinomial logit model.  
The selection utility of each mode is set as follows

$$V_{train} = \beta_1 cost_t + \beta_3 ODdist + \beta_7 age + \beta_{11} purpose + \beta_{15} vac \times sex + \beta_{19} vac \times old + \beta_{23}$$

$$V_{bus} = \beta_1 cost_b + \beta_4 ODdist + \beta_8 age + \beta_{12} purpose + \beta_{16} vac \times sex + \beta_{20} vac \times old + \beta_{24}$$

$$V_{car} = \beta_1 cost_c + \beta_5 ODdist + \beta_9 age + \beta_{13} purpose + \beta_{17} vac \times sex + \beta_{21} vac \times old + \beta_{25}$$

$$V_{walk} = \beta_2 time_{walk} + \beta_6 ODdist + \beta_{10} age + \beta_{14} purpose + \beta_{18} vac \times sex + \beta_{22} vac \times old + \beta_{26}$$

$$V_{bike} = 0$$

$\beta_1 \sim \beta_{26}$ : Parameters to be estimated

$cost_i$ : Cost of selecting i

ODdist: OD間距離

$$age = \begin{cases} 1 & \text{if } -20s \\ 2 & \text{if } 30s \\ 3 & \text{if } 40s \\ 4 & \text{if } 50s \\ 5 & \text{otherwise} \end{cases}$$

$time_i$ : walking time

$$vac = \begin{cases} 1 & \text{if Vaccinated} \\ 0 & \text{otherwise} \end{cases}$$

$$sex = \begin{cases} 1 & \text{if man} \\ 0 & \text{otherwise} \end{cases}$$

$$old = \begin{cases} 1 & \text{if over 60} \\ 0 & \text{otherwise} \end{cases}$$

purpose	purpose
Commuting to work or school	1
Business	1
Returning to work or school	1
Returning home	1
Shopping	3
Going out to eat	2
Going out for a lesson	1
Going to hospital	3
Leisure	2
Sightseeing	2
Strolling	2
Picking up or seeing off someone	3
Waiting time	3
Other	3
Unknown	-

$$P_i = \frac{\exp(V_i)}{\sum \exp(V)}$$

# ⑤ Estimation Table (MNL)

	Co-efficient	t-statistics
cost.train	-0.244	-8.77
time.walk	-2.994	-5.25
ODdist.train	0.495	32.67
ODdist.bus	0.357	17.76
ODdist.car	0.486	30.47
ODdist.walk	-0.323	-2.21
age.train	0.072	2.32
age.bus	0.472	6.93
age.car	0.388	11.5
age.walk	0.232	8.44
purpose.train	1.014	17.96
purpose.bus	1.207	10.55
purpose.car	0.038	0.63
purpose.walk	-0.333	-6.08

sex*vac.train	-0.193	-5.22
sex*vac.bus	-0.213	-2.71
sex*vac.car	-0.564	-14.23
sex*vac.walk	-0.030	-0.95
old*vac.train	-0.752	-6.82
old*vac.bus	-0.910	-4.45
old*vac.car	-0.382	-3.73
old*vac.walk	-0.545	-6.3
constant train	-0.281	-1.62
constant bus	-3.501	-12.06
constant car	-1.007	-6.2
constant walk	0.793	7.86
Goodness of fit statistics		
LL (at convergence)		-24551.98
LL (constants only model)		-18326.84
Rho-square		0.253

- 公共交通機関の選択は**scheduled** と **lesure**によって差がみられる
- 高齢者は、ワクチンを打った人のほうが公共交通を避ける傾向にある
- 若い人は、公共交通を使うことに抵抗を感じていないと思われる

Public transportation choice differs between scheduled and schedule.

Older people are more likely to avoid public transportation if they have been vaccinated.

Younger people are less likely to be reluctant to use public transportation

# Summary & Policy

- ・ コロナ前の2018年に比べ、コロナ禍の2021年では公共交通利用割合が減少傾向にあることが明らかとなった。

Compared to 2018 before Corona, in 2021 after the Corona disaster, the percentage of public transportation use The results show a decreasing trend.

- ・ 特にワクチン接種済みの人は公共交通の利用を避ける傾向にあり、これは感染への危機感の高さからみられると考えられる。

In particular, people who have been vaccinated tend to avoid using public transportation, which is This is thought to be due to a heightened sense of urgency about the risk of infection.

- ・ 特に移動目的別ではscheduledに比べてleisure目的での公共交通の効用が低い傾向にあった。

In particular, people who have been vaccinated tend to avoid using public transportation, which is This is thought to be due to a heightened sense of urgency about the risk of infection.

## leisureを目的とする人々への公共交通機関利用の促進

Promoting the use of public transportation for people who intend to leisure

### ●鉄道運賃に変動制を導入

(休日などで割引を実施)

### ●駅ビル・駅近の商業施設

### ●ファミリー向けの娯楽施設の充実によりレジャートリップの生成を拡大

Promoting the use of public transportation for people who intend to leisure

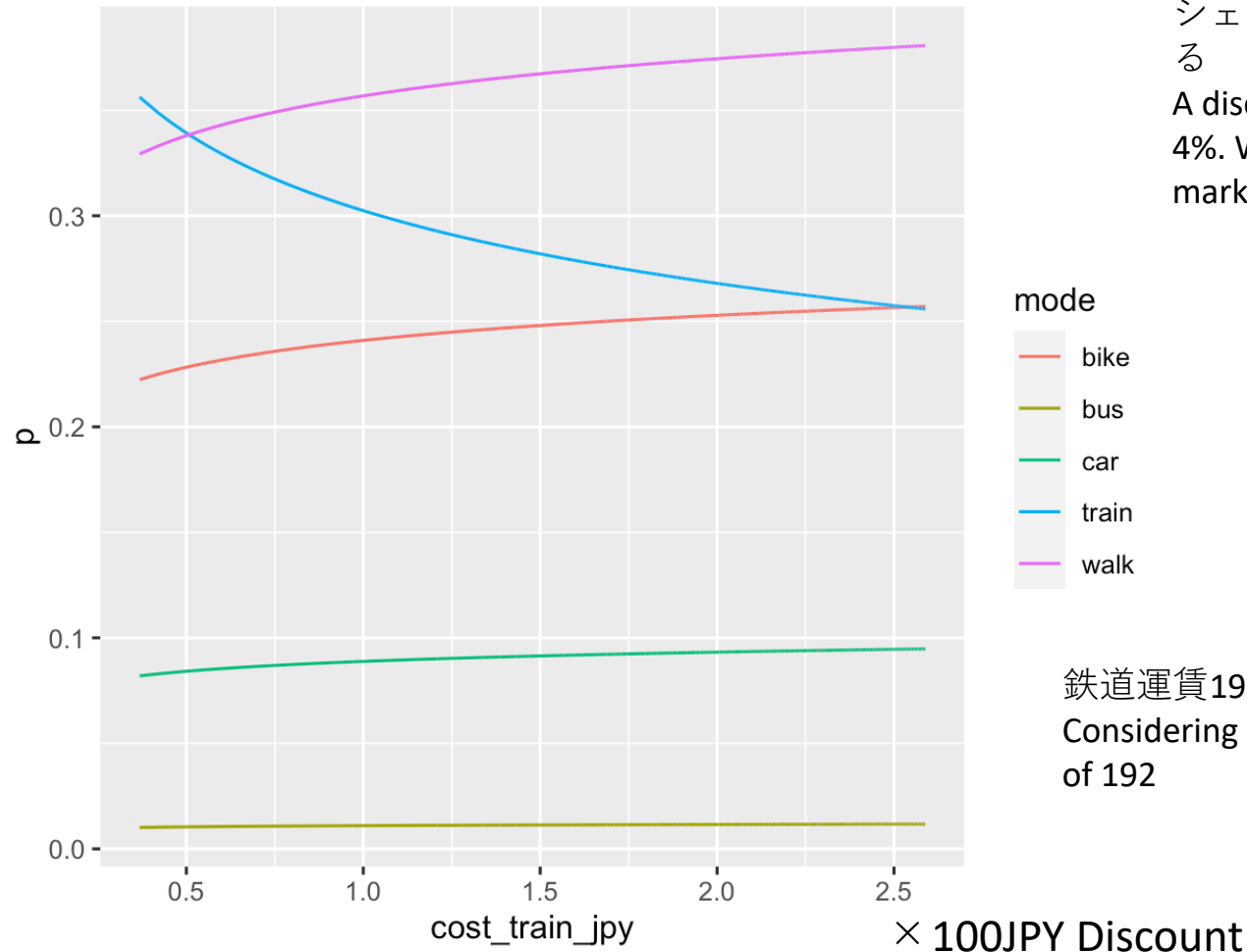
- Commercial facilities near station buildings and stations

- Expand generation of leisure trips by enhancing entertainment facilities for families

# Summary & Policy

## 鉄道運賃割引時の交通分担率の変化予測

Predicted changes in traffic sharing rates when rail fares are discounted.



50円の割引で4%程度のシェアを増やすことができる

A discount of 50 yen is about 4%. We can get a share of the market.

鉄道運賃192円からの割引を考慮  
Considering discounts from rail fares of 192

# Future Issues

- テレワークの普及率に注目したシナリオ分析

Scenario analysis focusing on telework penetration

- 接種回数や経過期間を考慮した、選択行動の変化の把握  
(パネルデータの利用の必要)

Understanding changes in selection behavior, taking into account the number of vaccinations and elapsed time

- **Nested logit model**を用いた段階的な分析の必要

Need for stepwise analysis using Nested logit model