Study on Travel Purpose Related Mode Choice Behavior in Yokohama City

Team A

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1. Introduction and Background

Objective: To ascertain the signficiant factors which influence transport mode choice, and propose specific mode uses according to travel purpose.

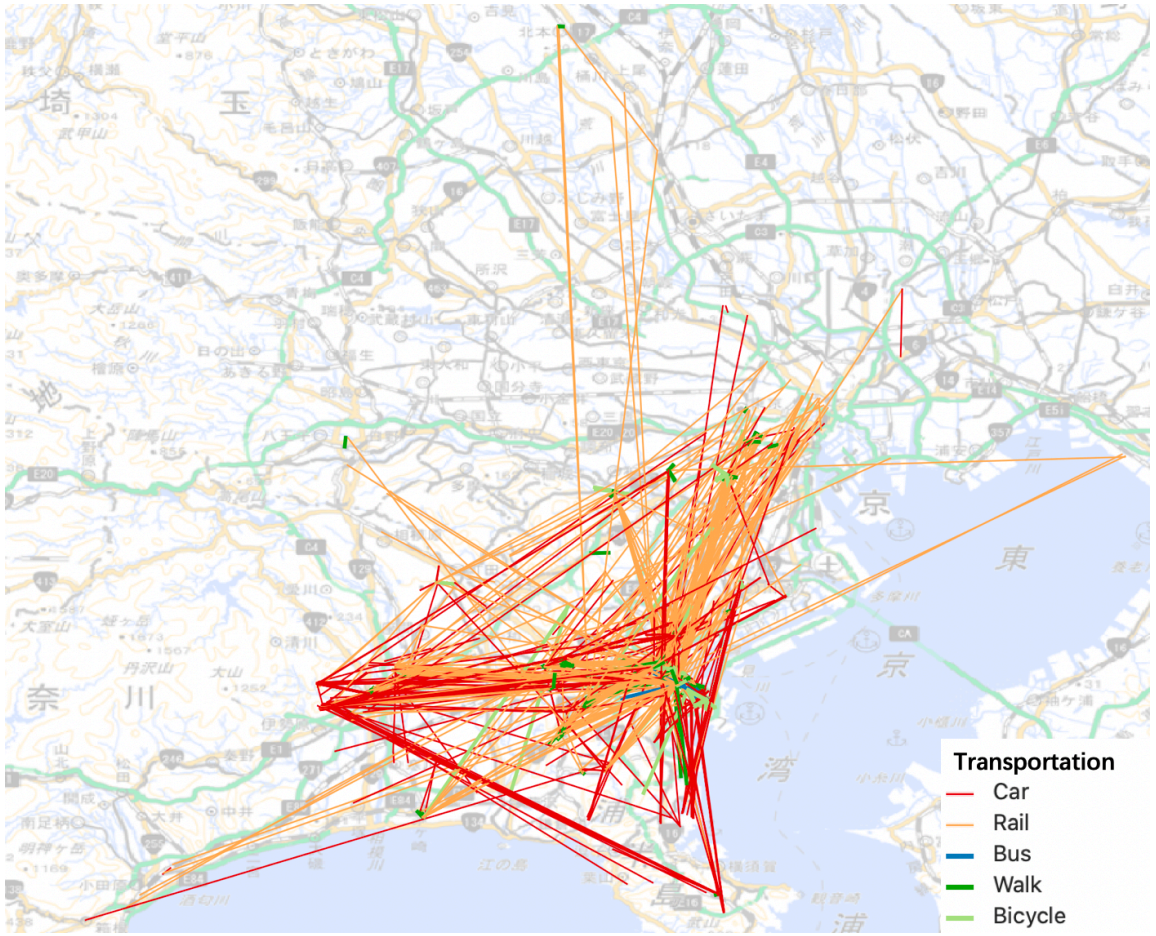
Target City: Yokohama City, Kanagawa Pref.

Dataset: PP data in Yokohama city recorded from 10/29~11/27 in 2009.

1. Introduction and Background

Mode split rate in the dataset:

Mode	Rate(N=1522)
Car	33.64%(512)
Rail	34.69%(528)
Bus	2.69%(41)
Walk	15.11%(230)
Bicycle	13.86%(211)

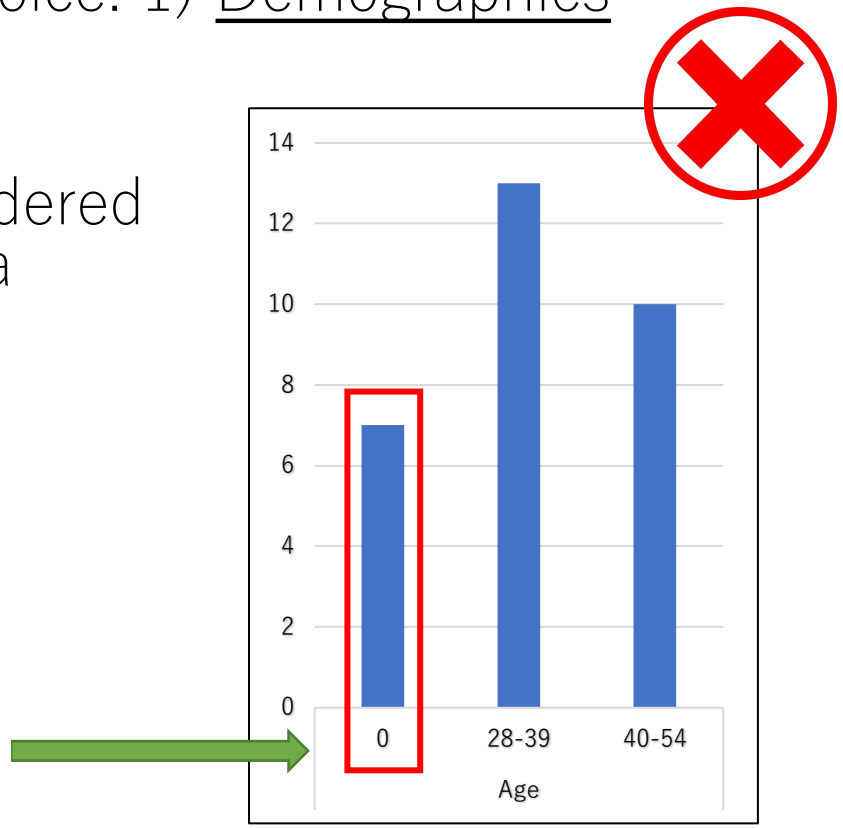


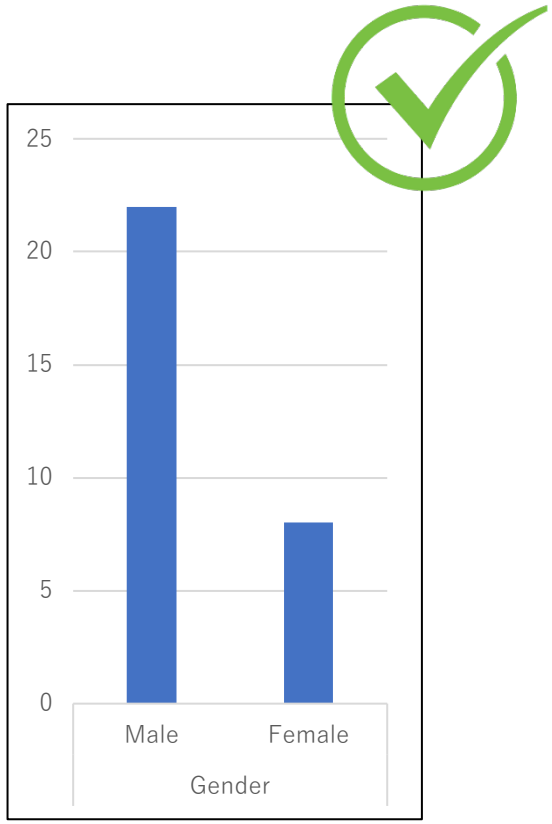
2. Basic Analysis

Variables related to mode choice: 1) Demographics

Gender is considered for the model and age is NOT considered due to some age related data being missing

Some users claim their age to be 0 years.





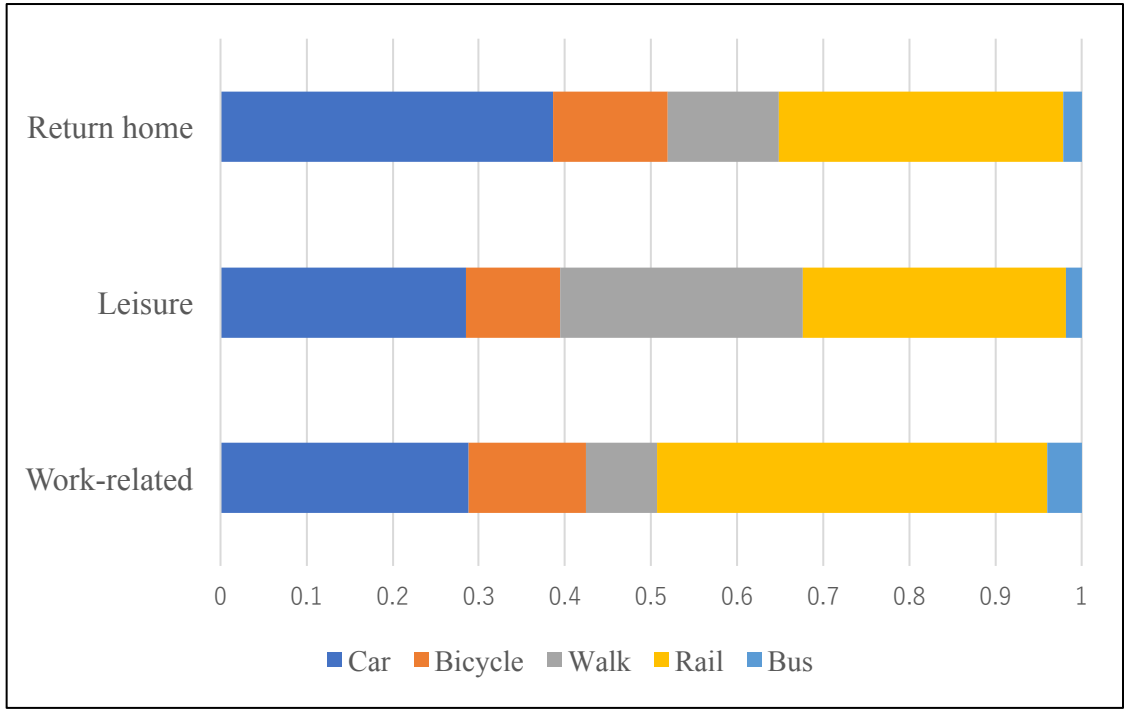
Number of Users: 30

2. Basic Analysis

Variables related to mode choice: 2) Travel Purpose

PURPOSE	Work-related	Leisure	Return Home	Other
Car	129	109	201	67
Bicycle	61	42	69	38
Walk	37	108	67	16
Rail	203	117	172	33
Bus	18	7	11	4
SUM	448	383	520	158
			1351	

Number of Trips: 1351

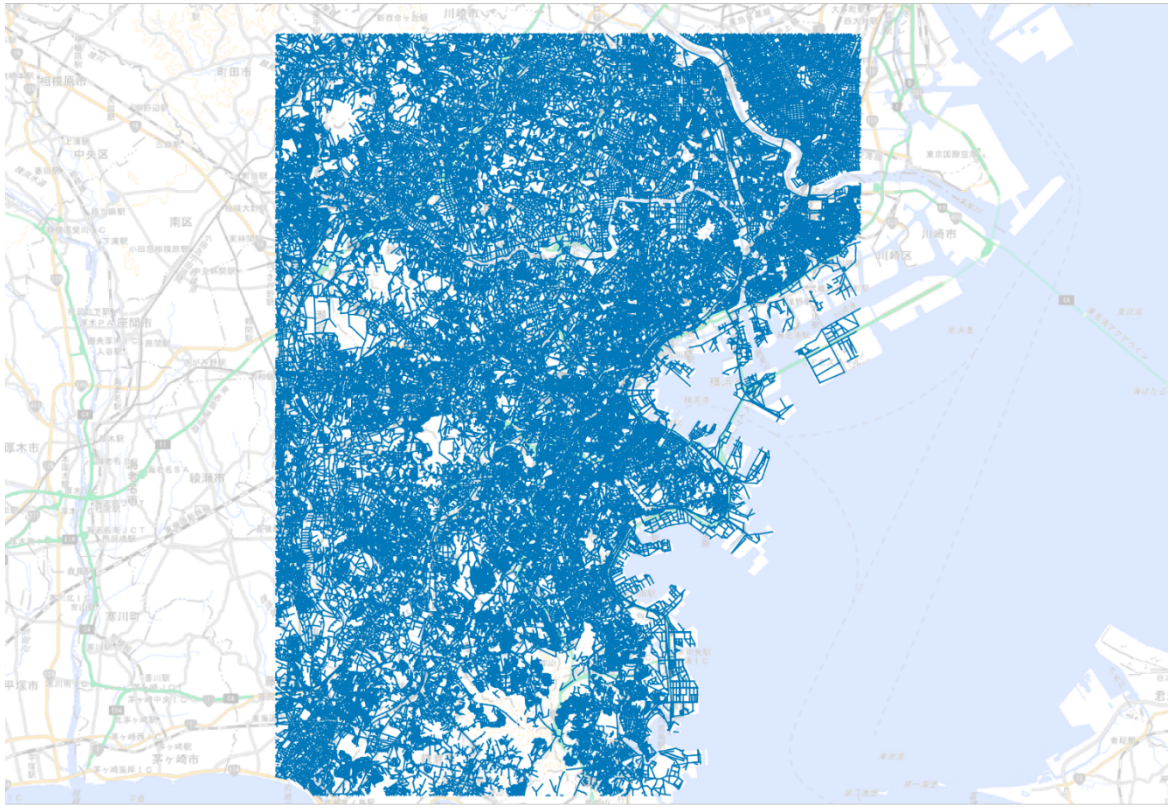


2. Basic Analysis

Variables related to mode choice: 3) Road Network

Yokohama City Road Network

Link Info
- Link ID
- Lane numbers
- Road type
- Max speed
- Motorcar_available
- Foot_available

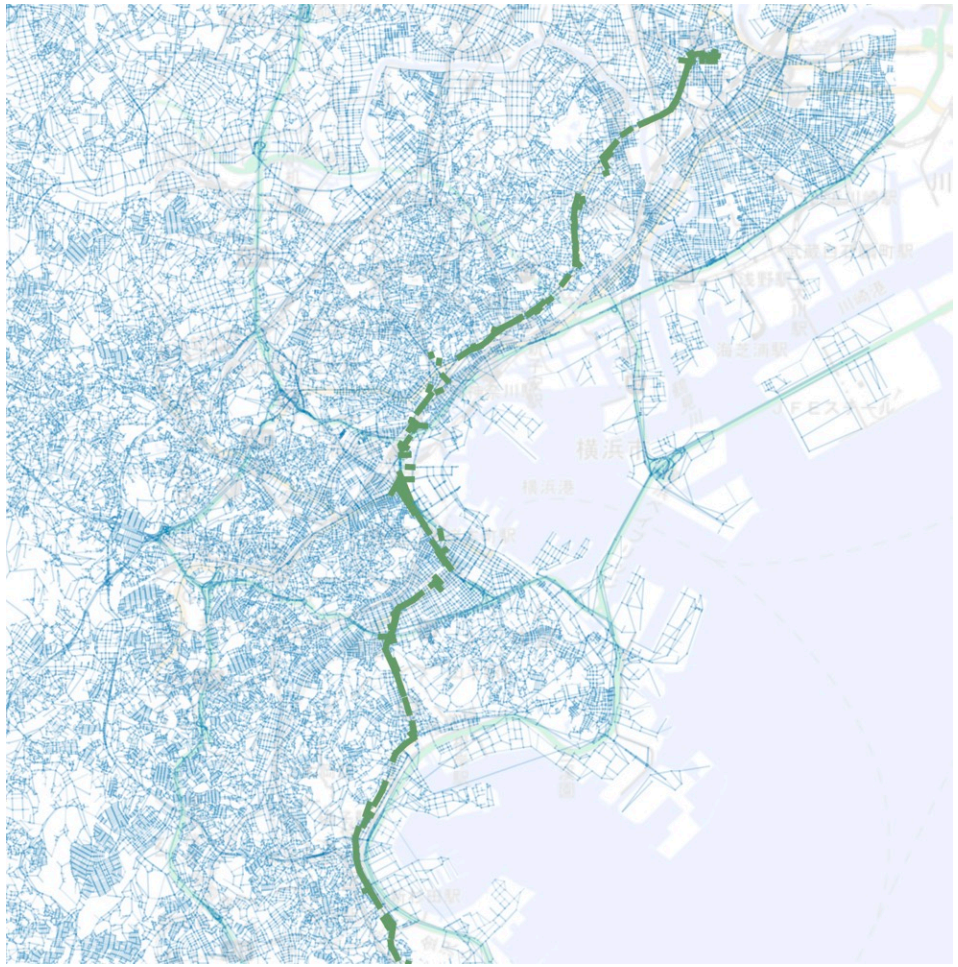


2. Basic Analysis

Variables related to mode choice: 3) Road Network

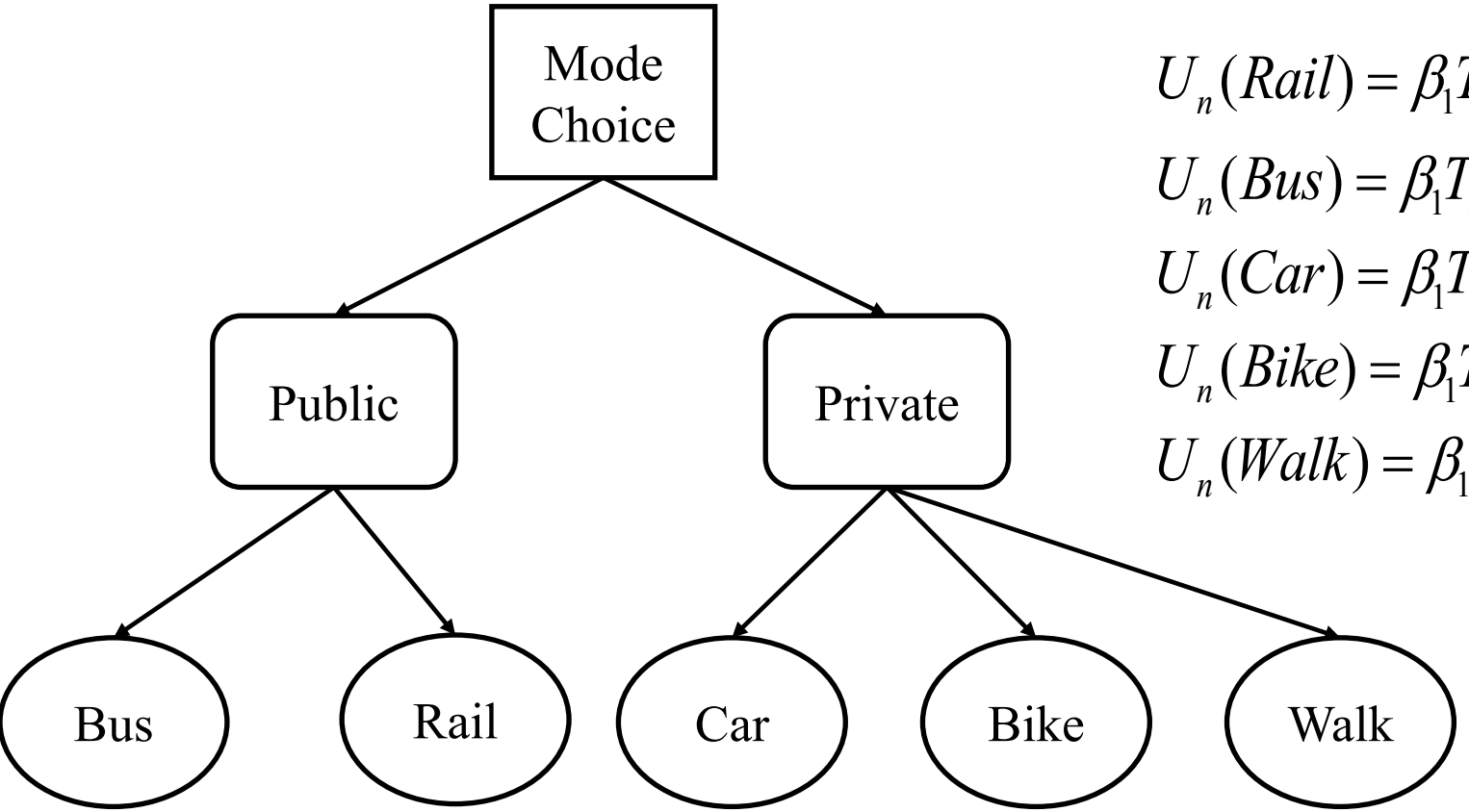
Map Matching

Add link attributes to each trip



Matching result for tripID:257204

3. Model: Nested Logit



Utility function

$$U_n(Rail) = \beta_1 T_{Rail} + \beta_2 N_{change} + \beta_3 C_{Rail} + b_1$$

$$U_n(Bus) = \beta_1 T_{Bus} + \beta_3 C_{Bus} + \beta_4 G + b_2$$

$$U_n(Car) = \beta_1 T_{Car} + \beta_5 S + b_3$$

$$U_n(Bike) = \beta_1 T_{Bike} + b_4$$

$$U_n(Walk) = \beta_1 T_{Walk}$$

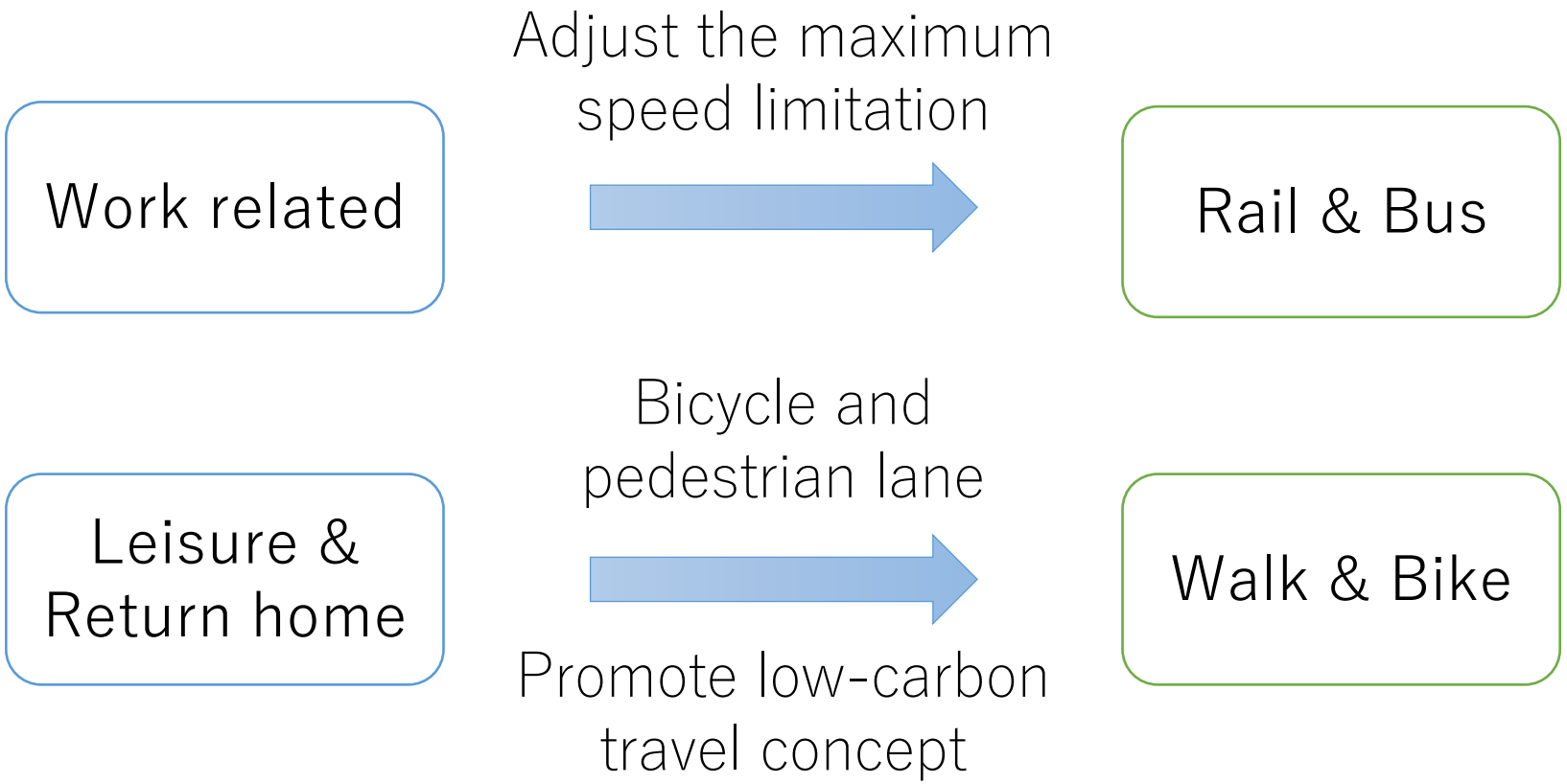
T_i, time for mode *i*,
N_{change}, transfer times of rail
C_i, fare for mode *i*,
G, gender, 1 if male, 0 if female.
S, maximum speed of the link
b_i, constant.

4. Estimation Results

Purpose	All		Work-related		Leisure		Return home	
	Estimation	t-value	Estimation	t-value	Estimation	t-value	Estimation	t-value
Cons1	-2.186	-3.548	1.414	4.265	0.585	0.297	4.918	3.305
Cons2	-0.665	-0.694	-0.907	-0.762	2.422	1.107	5.510	3.298
Cons3	-0.080	-0.735	0.391	0.817	0.320	1.707	0.390	1.326
Cons4	-0.304	-2.967	0.537	1.300	-0.556	-3.027	0.931	5.176
Time	-1.739	-10.942	-3.814	-2.398	-2.139	-7.093	-3.832	-6.875
Numberchanges	3.337	4.095	0.401	1.312	-4.540	-3.747	-1.892	-2.250
Gender	-0.428	-0.819	0.348	0.265	-6.084	-3.060	-3.558	-2.953
Maxspeed	0.024	15.219	0.021	6.549	0.026	8.690	0.036	7.382
Fare	0.674	0.351	-0.632	-0.778	7.903	2.198	-4.981	-2.219
β_{public}	-0.476	-3.762	1.959	2.563	0.184	-	0.529	3.421
$\beta_{private}$	2.710	12.398	1.756	6.258	1.972	7.150	1.885	9.382
L0	-2057.165		-561.628		-541.972		-715.628	
LL	-1065.864		-271.889		-303.261		-305.983	
ρ^2	0.482		0.516		0.440		0.572	
Adjusted ρ^2	0.477		0.496		0.420		0.557	
Observation	1456		430		370		504	
Accuracy	77.06%		71.63%		73.78%		70.24%	

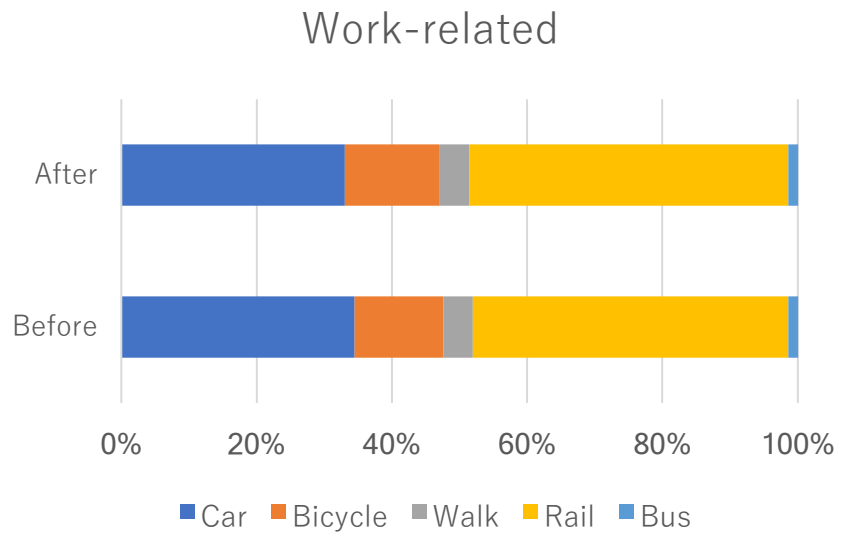
5. Proposed Polices and Changes

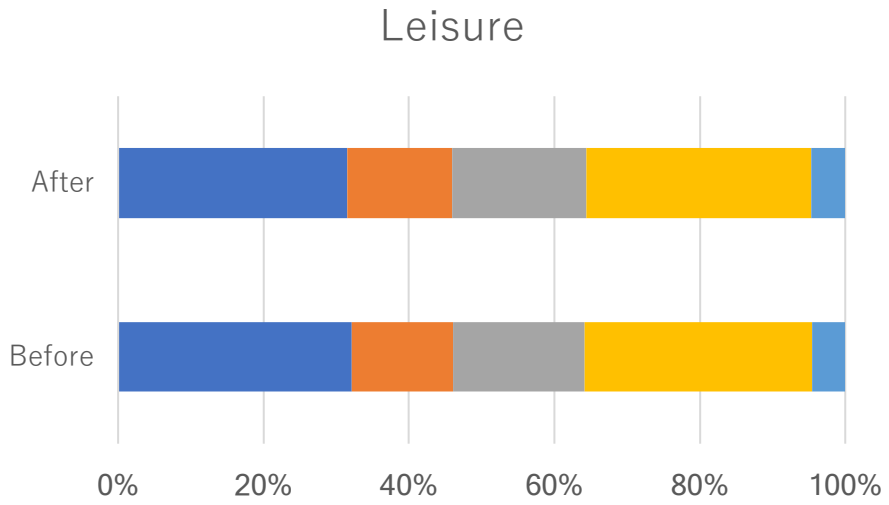
According to different travel purposes:

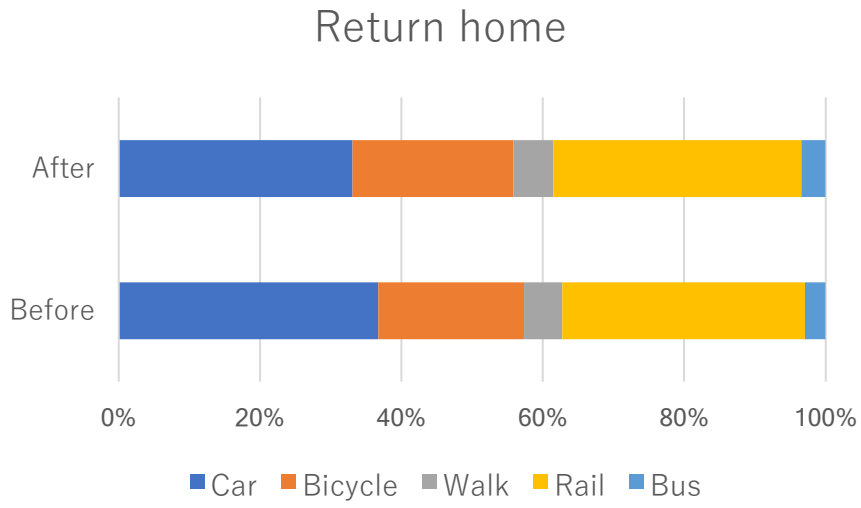


6. Comparison: Before and After Policy

- Adjust the maximum speed to 70%







	Work	Leisure	Return home
Car	-1.48%	-0.61%	-3.67%
Bus&Rail	0.56%	-0.21%	1.16%
Walk&Bike	0.92%	0.82%	2.51%

7. Improvements

- ✓Improving the trip size and integrity of user information, considering carbon emission as an independent variable to get more accurate model.
- ✓Since some trips are not only involved in Yokohama city, larger road network is expected.
- ✓Map matching method shows instability on highway section, which can be further improved.

Thank you