TSU Tokyo Tech
Transport Studies Unit

# Difference of Leisure behavior between sunny day and rainy day

Tokyo Tech Team B

Kamegai, Kikuchi, Shinohara, Tsuru, Mizuguchi

# Introduction

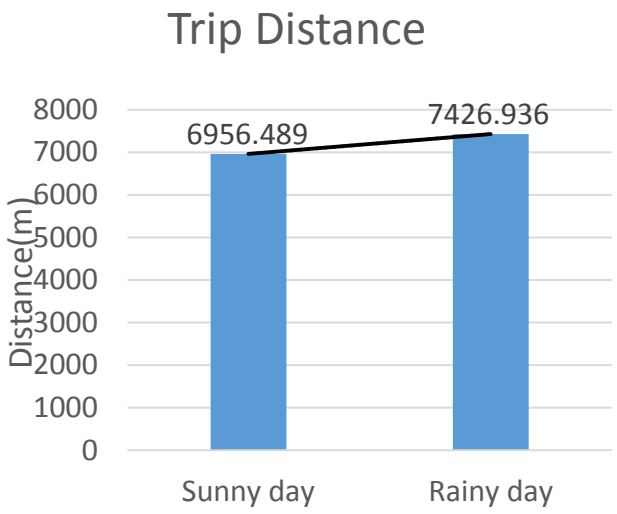
TSU Tokyo Tech
Transport Studies Unit

If rainy, I guess leisure activity is…

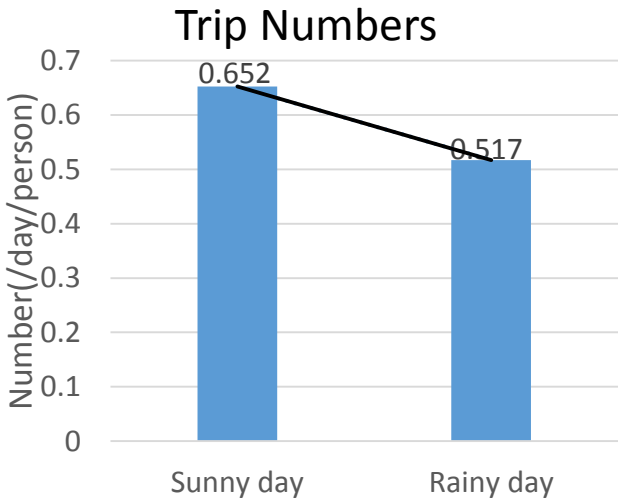
- Go to a place near their house and not go to far place
- Change their means of transport

See the influence on distance for leisure activity caused by weather.

# Basic Analysis




Trip distance is almost equal



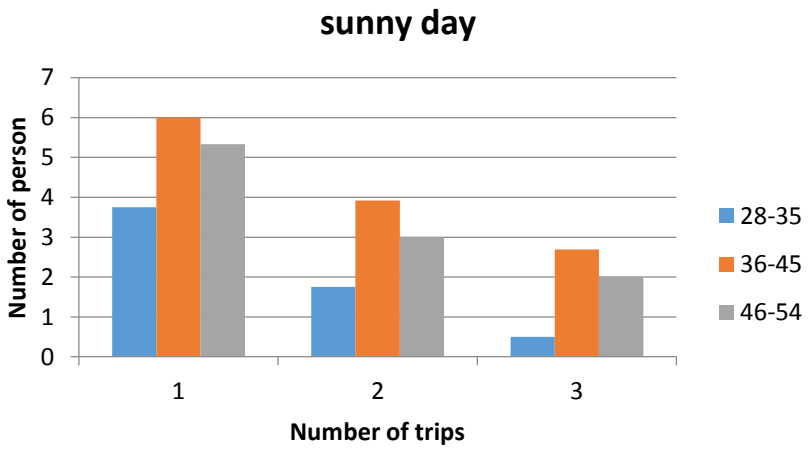

Sunny day: Trip numbers are large

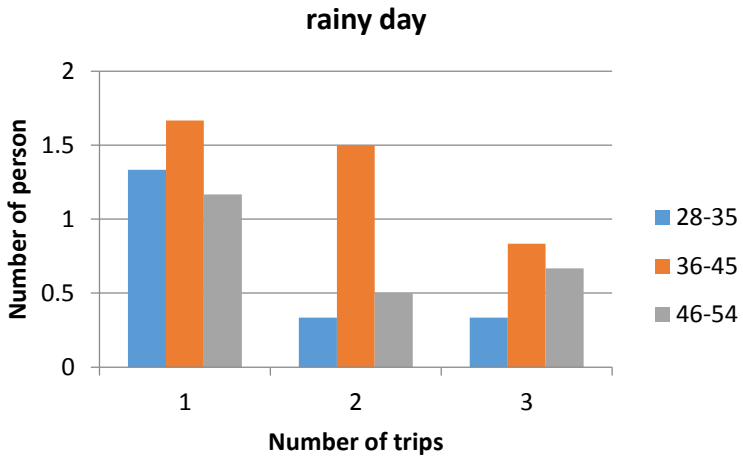
Future works: Research the influence of leisure caused by weather

# Suggest model

TSU Tokyo Tech
Transport Studies Unit

## Age

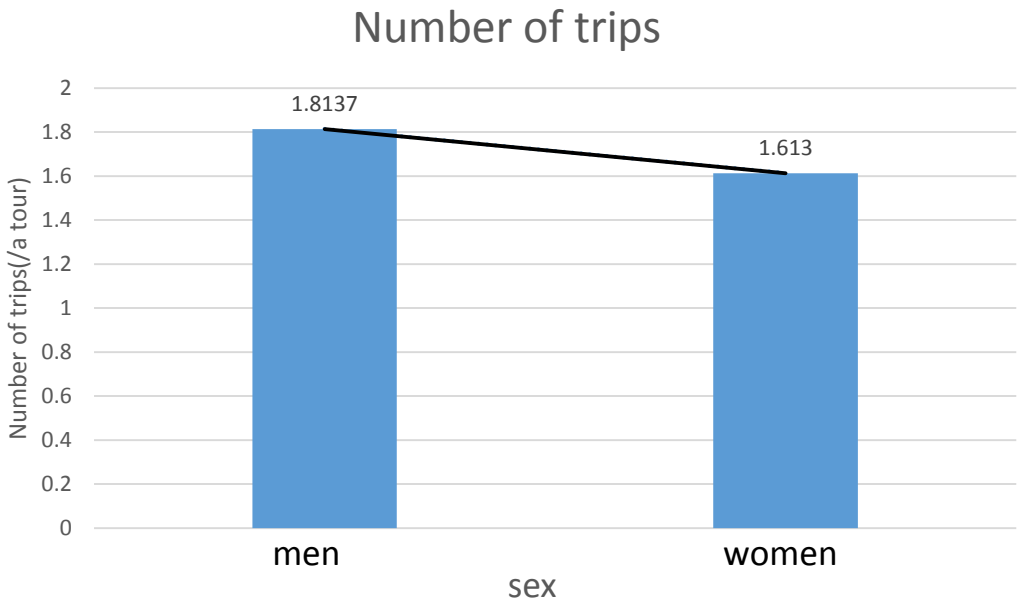



- Most of data are from the middle class(36-45).
- 6 people (20%) are unanswered.
  →Precision is low, and we cannot count them in variable.

# Suggest model

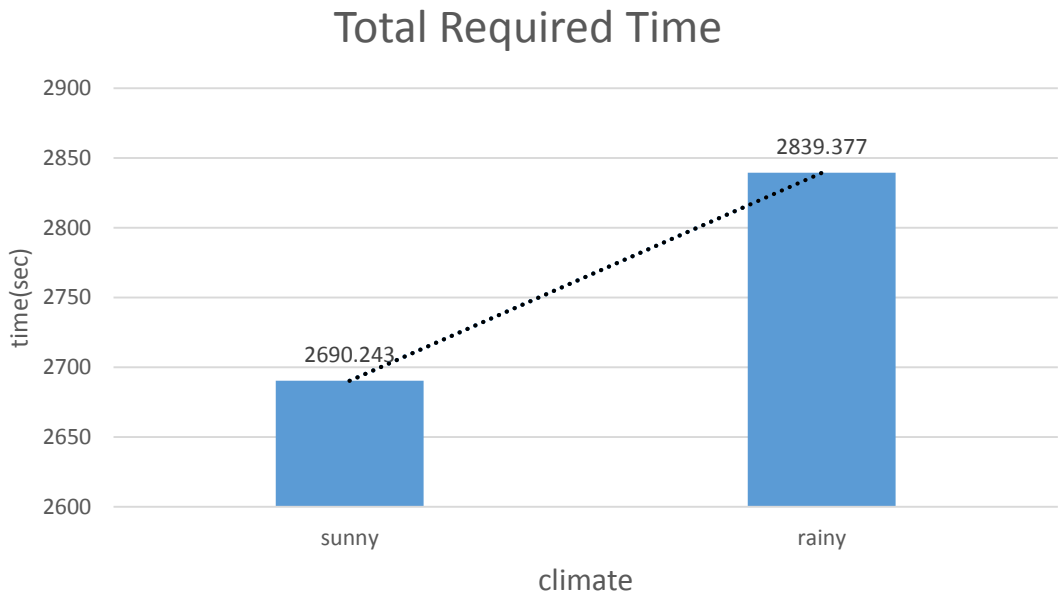
## Sex




A man has more number of the trips per 1 tour than a woman.

# Suggest model

## Total Required Time to arrive at the destination



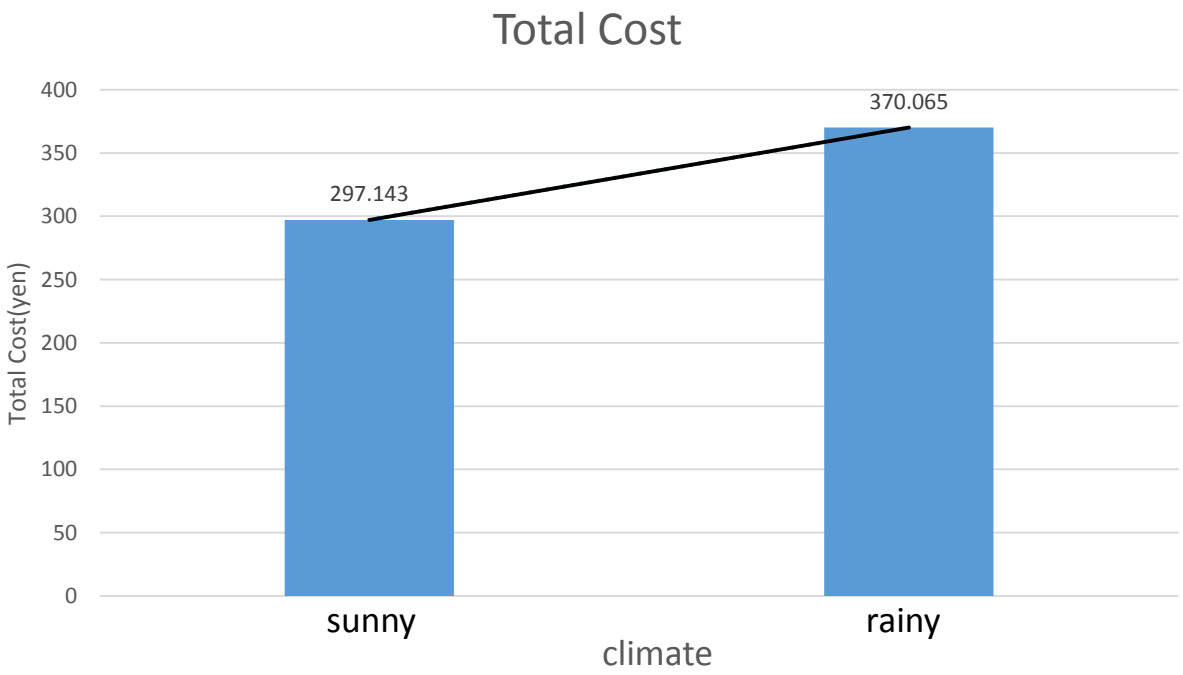

The destination is limited to the available place even on a rainy day.

→Movement distance and total required time get longer.

# Suggest model

TSU Tokyo Tech
Transport Studies Unit

## Total Cost




On a rainy day, we use public transport to avoid rain even if we need to pay money.

→More costly

# Suggest model

TSU Tokyo Tech
Transport Studies Unit

- To utilize the 3 elements of the foregoing as an explanatory variable

Activities are different from weather
→Introduction of "$R_n$"(Rain dummy) as a dummy variable.

$$U_1 = \beta_{SEX1} * S_1 + \beta_{TIME1} * T_1 + \beta_{COST1} * C_1 + \beta_{RAIN1} * R_1$$
$$U_2 = \beta_{SEX2} * S_2 + \beta_{TIME2} * T_2 + \beta_{COST2} * C_2 + \beta_{RAIN2} * R_2$$
$$U_3 = \beta_{SEX3} * S_3 + \beta_{TIME3} * T_3 + \beta_{COST3} * C_3 + \beta_{RAIN3} * R_3$$

| List | Item |
|---|---|
| $S_n$ | SEX (DUMMY) |
| $T_n$ | TOTAL TRAVEL TIME |
| $C_n$ | TOTAL COST |
| $R_n$ | RAIN (DUMMY) |

# Result of estimation

TSU Tokyo Tech
Transport Studies Unit

| | Value | Std err | t-test | P-value |
|---|---|---|---|---|
| $\beta_{RAIN1}$ | 0.854 | 0.397 | 2.15 | 0.03 |
| $\beta_{RAIN2}$ | -0.116 | 0.449 | -0.26 | 0.80 |
| $\beta_{SEX1}$ | 1.83 | 0.285 | 6.43 | 0.00 |
| $\beta_{SEX2}$ | 1.18 | 0.293 | 4.04 | 0.00 |
| $\beta_{COST1}$ | 0.000597 | 0.000305 | 1.96 | 0.05 |
| $\beta_{COST2}$ | 0.000562 | 0.000246 | 2.28 | 0.02 |
| $\beta_{TIME2}$ | -0.0239 | 0.00532 | -4.49 | 0.00 |
| $\beta_{TIME2}$ | -0.0157 | 0.00497 | -3.15 | 0.00 |

In t-test,

RAIN1 is + and that of RAIN2 is - : The weather influences the first action

COST is + : It becomes easy to move so as to take cost

# Policy

TSU Tokyo Tech
Transport Studies Unit

1.Shortening of the movement time：
- Increasing number of service of the public transport
- Increasing facilities which are available on a rainy day

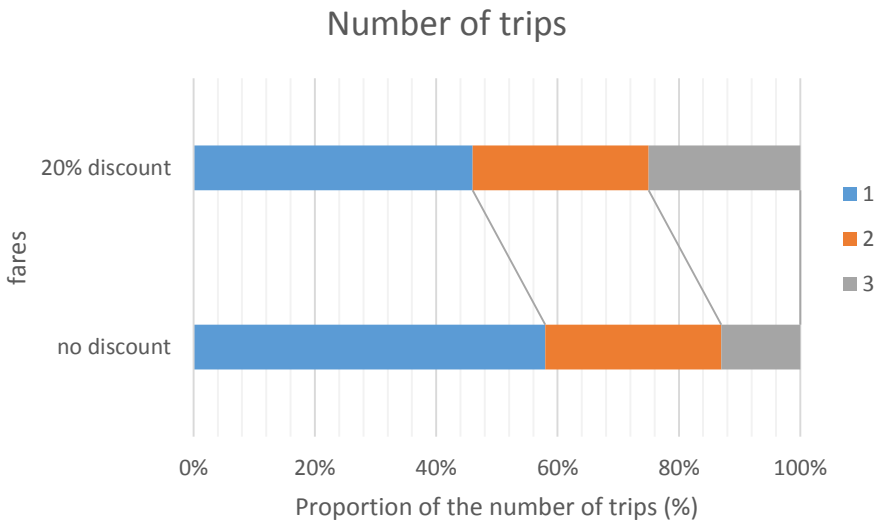
2.Restraint of the movement expense
- Discounting in a destination and public transport

3.Environmental maintenance for women to be easy to go out

# Simulation

TSU Tokyo Tech
Transport Studies Unit

- Will the number of the trips increase if they discount 20% of fares of the railroad?




If they discount 20% of fares of the railroad , the proportion of person with number of the trips per a tour more than 3 doubles.

# Policy

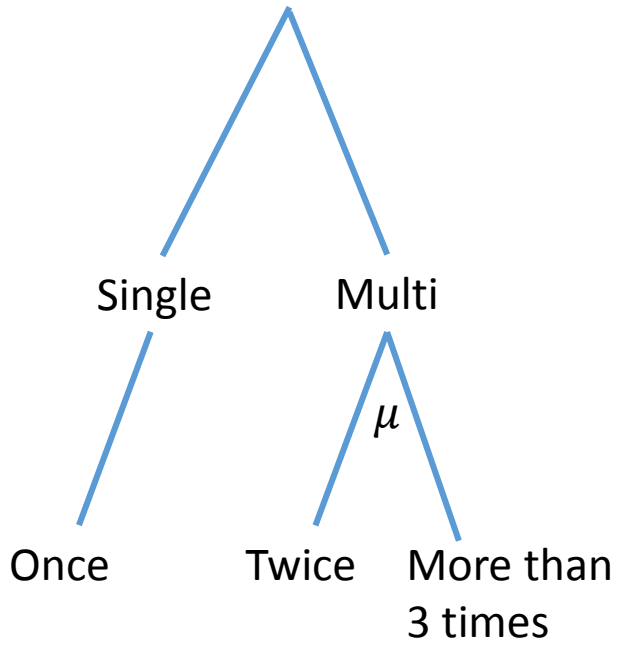
TSU Tokyo Tech
Transport Studies Unit

ex.)Increase flights of buses on a rainy day(遠州鉄道バス)

If the probability of rain tomorrow of the day before 11:00 is more than 50% , they increase flights buses at some routes.

# APPENDIX: Results of Nested Logit

| Name | Value | Std. Error | T-test |
|---|---|---|---|
| $\beta_{rain1}$ | 0.854 | 0.394 | 2.17 |
| $\beta_{rain2}$ | -0.116 | 0.448 | -0.26 |
| $\beta_{rain3}$ | 0 | Const. | |
| $\beta_{sexdummy1}$ | 1.83 | 0.285 | 6.44 |
| $\beta_{sexdummy2}$ | 1.18 | 0.293 | 4.04 |
| $\beta_{sexdummy3}$ | 0 | Const. | |
| $\beta_{totalcost1}$ | 0.000597 | 0.000305 | 1.96 |
| $\beta_{totalcost2}$ | 0.000562 | 0.000246 | 2.28 |
| $\beta_{totalcost3}$ | 0 | Const. | |
| $\beta_{traveltime1}$ | -0.0239 | 0.00532 | -4.49 |
| $\beta_{traveltime2}$ | -0.0157 | 0.00497 | -3.15 |
| $\beta_{traveltime3}$ | 0 | Const. | |
| $\mu$ | 1.00 | $1.8*10^{308}$ | 0.00 |




Parameter result is not appropriate