

An Empirical Model of the Acquisition of New Alternatives into Choice Set Combining Information Processing Approach with Cost-Benefit Approach

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1. Objective

Motivation

- Specifying choice set is important and difficult, especially when
 - The number of alternatives is large
 - Introducing a new alternative
- Shopping opportunity around train station is one of the factors to encourage transit use.

How can we make people recognize and consider a new shopping opportunity around train station?

Dynamic aspect of choice set formation

- Cost-benefit approach (Roberts and Lattin, 1991)
 - Introduction of new alternatives is determined by trade-off between expected utility and search cost
- Information processing approach (Engel et al., 1995)
 - External search is carried out only when result of internal search is unsatisfactory

Two approaches are combined and applied to shopping destination choice analysis in this study

Cost-benefit approach

(Roberts and Lattin, 1991)

- Expected maximum utility obtained from choice set C is, assuming multinomial logit model for destination choice,

$$EU(C) = \ln\left(\sum_{j \in C} \exp(u_j)\right)$$

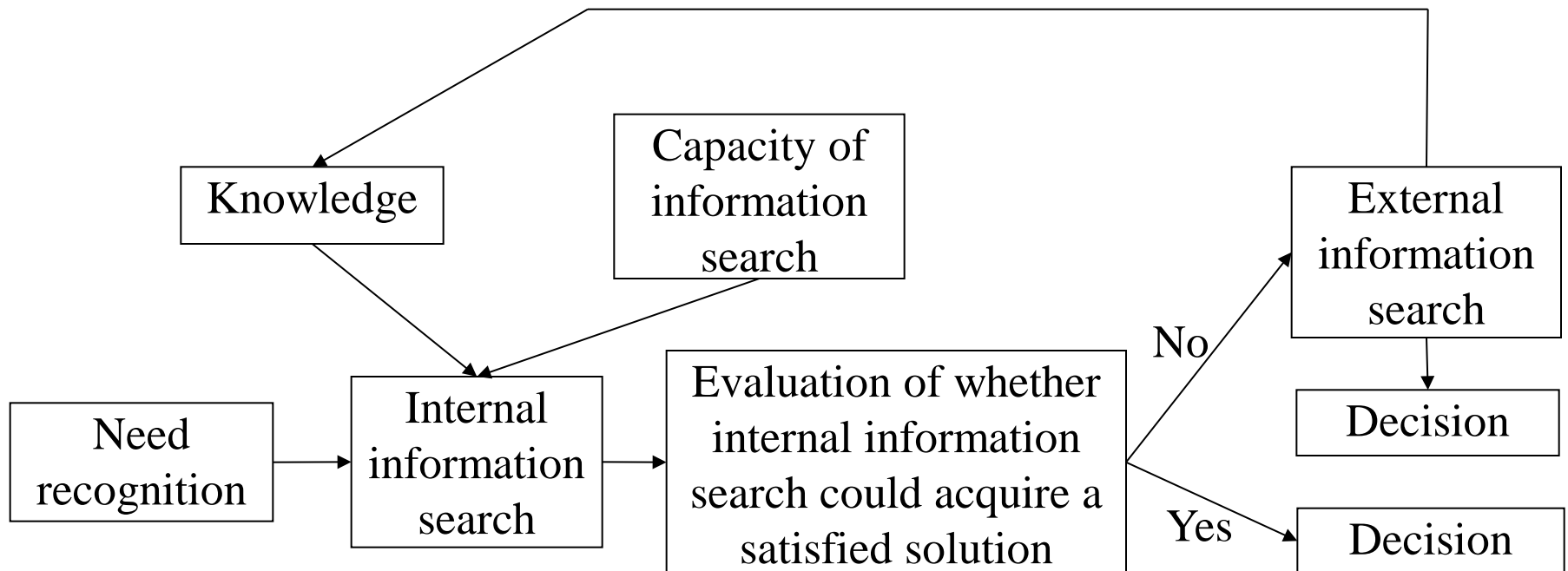
- Thus, benefit of adding a new alternative i is

$$\textit{benefit}(i) = EU(C \cup i) - EU(C)$$

Information processing approach

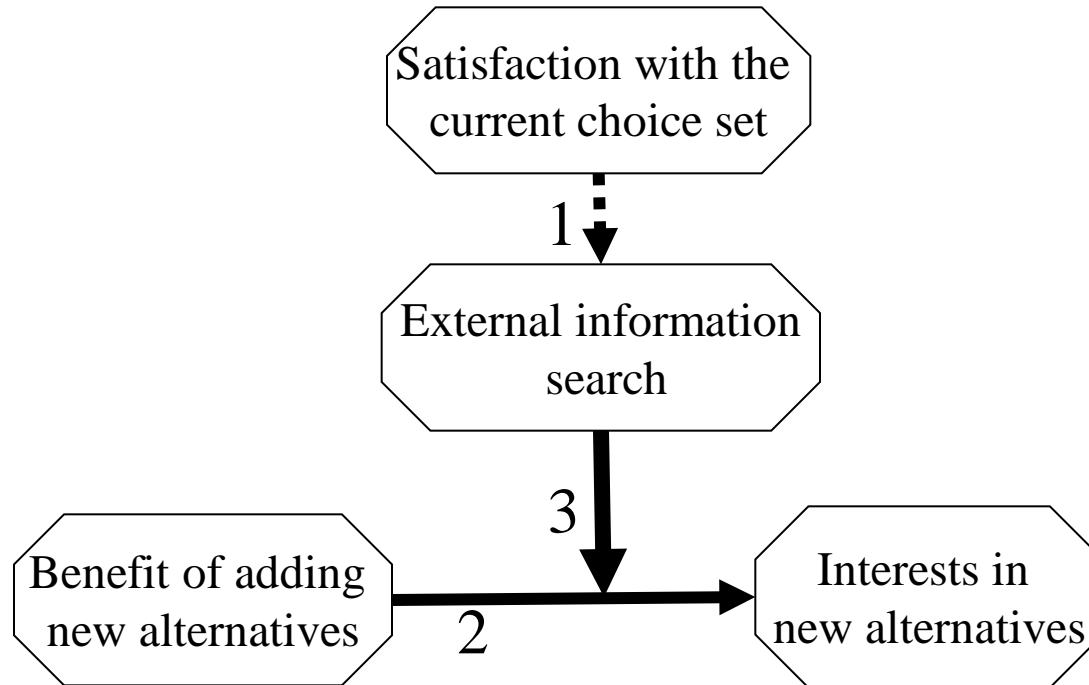
(Engel et al., 1995)

Information Search Process



Modified from Takemura (1997)

Structure of our hypothetical model



Benefit of adding new alternatives affects interests in new alternatives only for those who actively search external information

2. Empirical analysis

2.1 Data

Data

Supplier : East Japan Marketing & Communications, Inc.
(JR Higashi Nihon Kikaku)

Details :

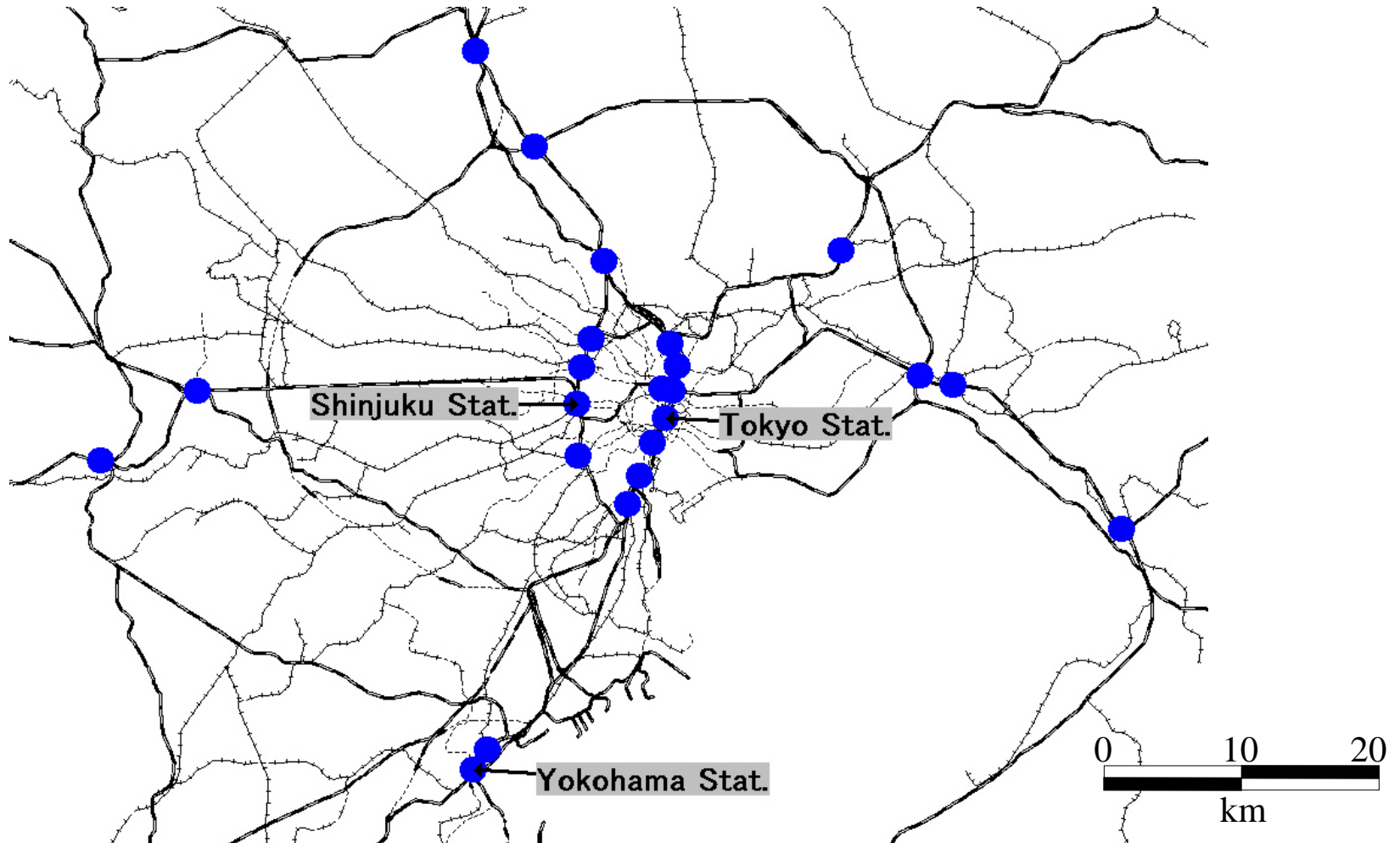
Type: mail-in survey

Contents:

- Images and frequency of use toward shopping areas in Tokyo metropolitan
- One week trip and shopping log
- Socio-economic attributes

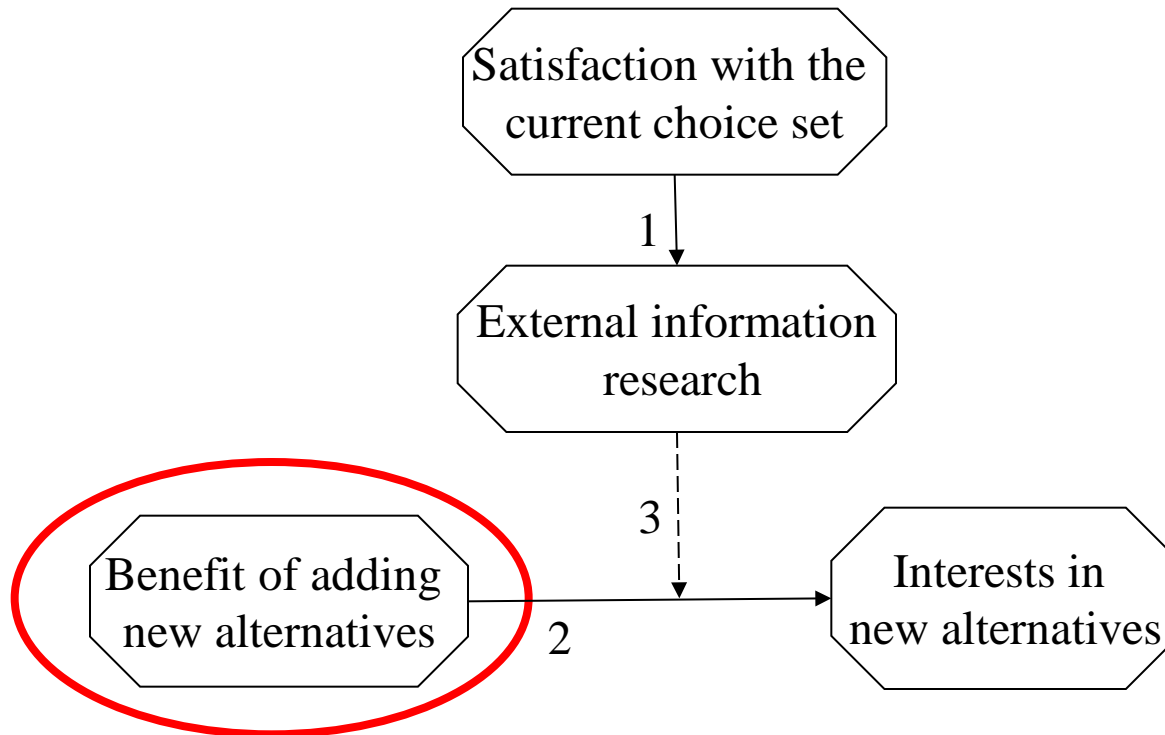
***The shopping areas used in the survey are 23 large railway terminals and 16 famous leisure areas.

Locations of 23 large terminals around Tokyo



2.2 Sub-model

Sub-model to estimate utility function of destination



Model: Multinomial Logit Model of Shopping Destination Choice

Subject: Railway commuters; **Items:** clothes, souvenirs and groceries

Setting alternatives in the model

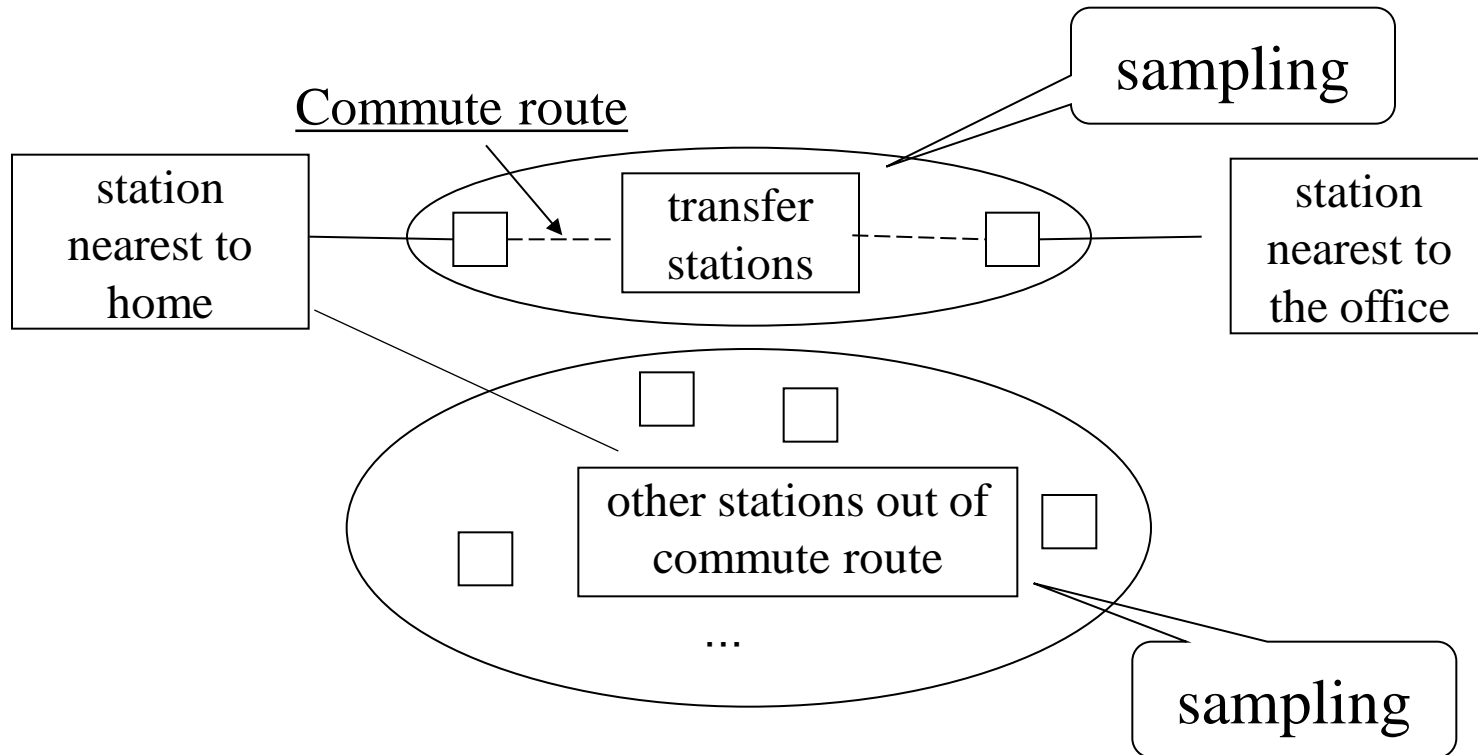


Image of the construction of choice set

Sampling of alternatives is applied for estimation which provides consistent estimates for multinomial logit model

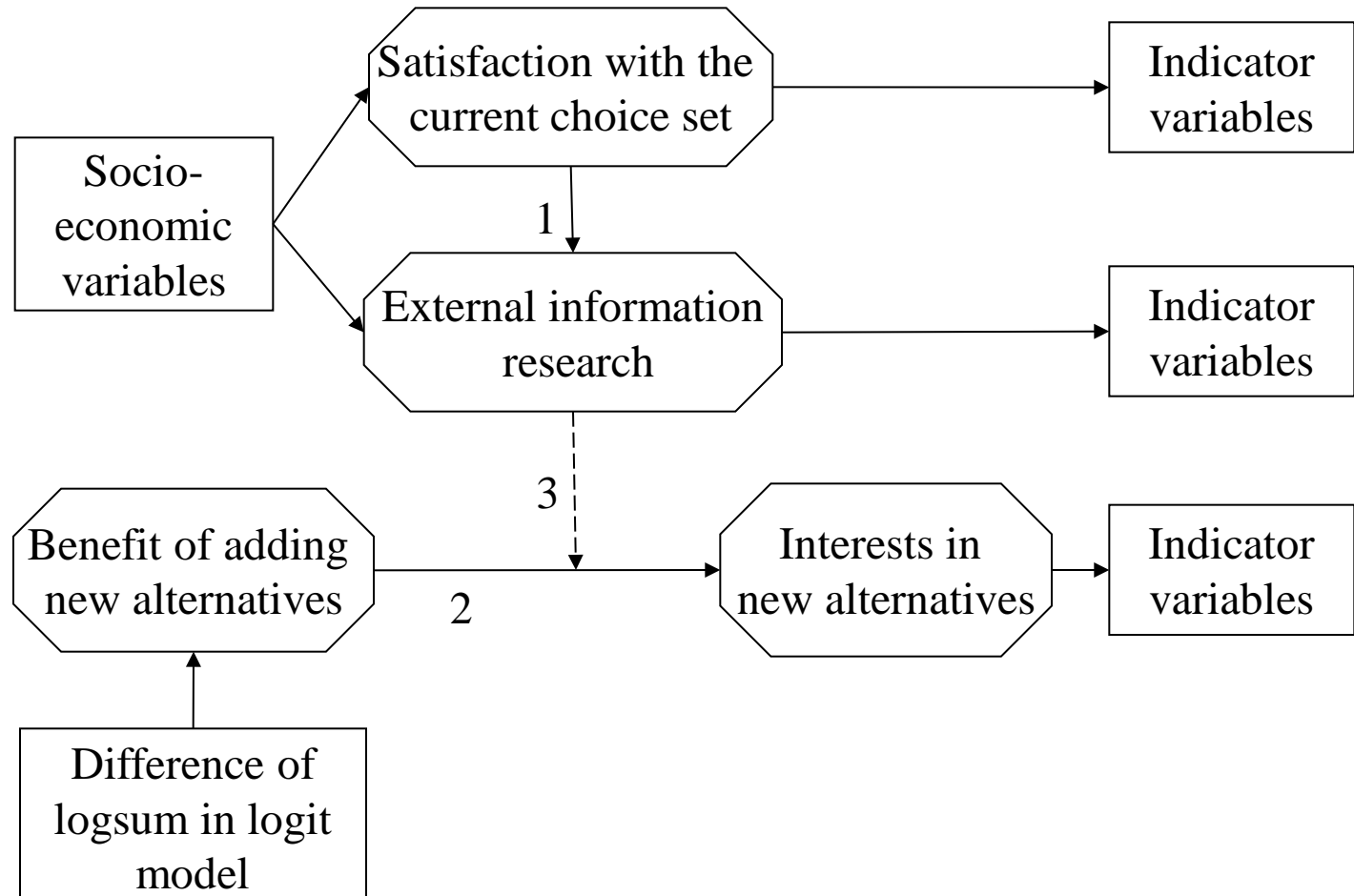
Multinomial logit model of shopping destination choice

Variable	Coef.	t-stat.
Station nearest to office constant	-0.954	-5.10
Transfer station constant	-0.309	-1.25
Other station constant	1.13	6.81
Floor space of non-daily commodity stores (ha) (specific to home station, transfer station and office station)	0.502	4.23
Access time (hour) * weekday dummy (specific to other stations)	-2.25	-4.97
Habitual purchase of daily items dummy	0.871	2.14
Waiting time at transfer station (hour) (specific to transfer station)	0.408	3.11
Male dummy (specific to other station)	0.532	2.16

Sample size:397 L(0):-480.4 L(b):-371.2

2.3 Main model

Structural Equation Model with Mixing Distribution



Calculating benefit of adding new alternatives

$$\textit{benefit} (\bar{C}) = EU(C \cup \bar{C}) - EU(C)$$

- Possible total destinations ($C \cup \bar{C}$): 23 major terminals and 16 major commercial areas
- Current choice set (C): all the destinations which had been used during the last year

Indicators for latent variables

- Satisfaction with current choice set
 - Average number of positive images per train terminal in current choice set
 - Average number of positive images per commercial spot in current choice set
- External information search
 - Frequency of watching posters at train stations
 - Frequency of watching posters in the train
 - Frequency of information search by cell phone
- Interests in new alternatives
 - Average number of positive images per train terminal not included in the choice set
 - Average number of positive images per commercial spot not included in the choice set

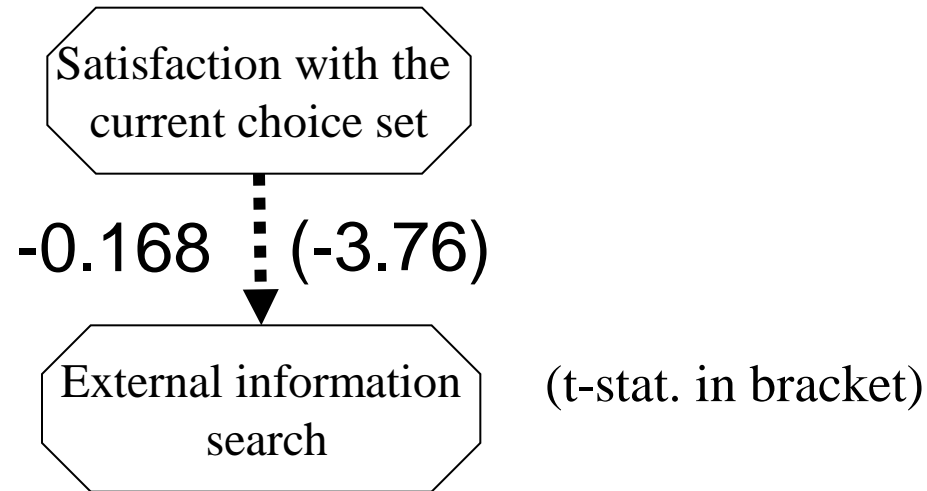
2.4 Results

Software package Mplus is used to estimate the main model

Estimation Results of the Measurement Model

Variable	Coef.	t-stat.
<i>Indicators to satisfaction with the current choice set</i>		
Average number of positive images per train terminal in the choice set	1*	--
Average number of positive images per commercial spot in the choice set	0.757	3.45
<i>Indicators to information search</i>		
Frequency of watching posters at train stations	1*	--
Frequency of watching posters in the train	0.657	5.76
Frequency of information search by cell phone	0.401	3.94
<i>Indicators to interests to new alternatives</i>		
Average number of positive images per train terminal not included in the choice set	1*	--
Average number of positive images per commercial spot not included in the choice set	0.906	8.26

Effect of “satisfaction” on “information search”



The information search is statistically significantly negatively related to the satisfaction with the current choice set.

Population share of active/inactive classes of information search and effect of benefit on interests

	Active class of information search	Inactive class of information search
Share	86.6%	13.4%
Effect of benefit on interests	0.11 (2.47)	0 (---)

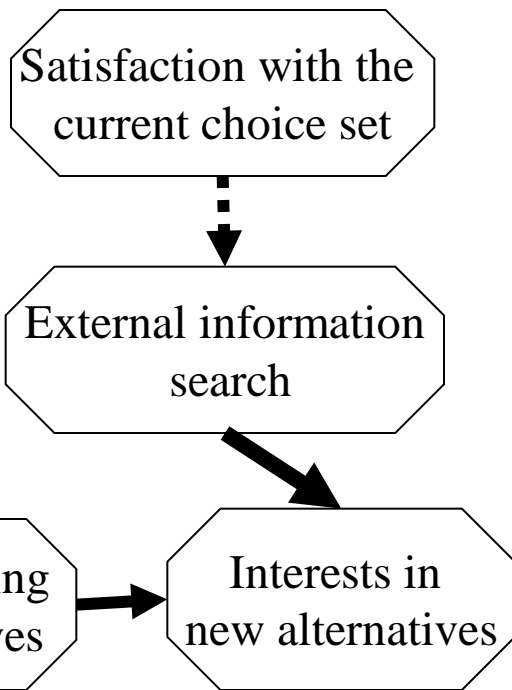
(t-stat. in bracket)

Only for those who actively search external information, larger benefit induces higher interests to new alternatives

Goodness-of-fit statistics of comparative models

Unconstrained mixture model

	Active class	Inactive class
Effect of benefit on interests	0.13 (2.72)	0.25 (1.33)



Non-mixture model

<i>Proposed mixture model</i>	
AIC	5510
BIC	5647
<i>Unconstrained mixture model where the effect of benefit on interests is not fixed as 0 for inactive search class</i>	
AIC	5510
BIC	5650
<i>Non-mixture model assuming the effect of benefit on interests regardless of information search</i>	
AIC	8237
BIC	8327
RMSEA	0.048
CFI	0.946

Effects of exogenous variables on latent variables

(t-stat. in bracket)

Exogenous variable		Satisfaction	Search	Interests
Young (under 20 yrs.)		0.362	-	
		(2.92)		
Self evaluation of personality:	Having own style	-	0.063	
			(2.15)	
	Sensitive to information	-	0.064	
			(2.20)	

Promising to apply these insights for enhancing advertisement effects or specifying the target of public relation activities.

3. Conclusions

Conclusions

- Offered a theoretical framework combining the information search approach and cost-benefit approach.
- Estimated the mixture structure equation models using data set containing revealed shopping behavior and attitudes.

We empirically found in the context of shopping destination choice

Lower satisfaction with current set provokes external information search, and only for those who actively search external information, larger benefit induces higher interests to new alternatives

Future research

- The modeling effort using data set from more global level of consumers, not restricted to train commuters is left for future work.
- The effects of various advertisement should be empirically examined for choice set generation of shopping destination choice.