Impact of Regional Coupons on Tourist Consumption Behavior

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Background

- コロナで深刻な影響を受けた観光業に対する政府の需要喚起策

  Japanese government takes measures to recover demand for the tourism industry severely affected by the Covid-19.

  - 旅行代金の割引＋地域共通クーポン(宿泊以外に利用可能)

    discounts on travel + regional coupons(which is only available for accommodation)

- 高級ホテルにのみ効果が偏るとの指摘

  Only luxury hotels benefit from the policy.

  - 旅行代金の割引は宿泊やツアー料金に使途が限定されがちであった

    Discounts on travel tended to be used only for accommodation.

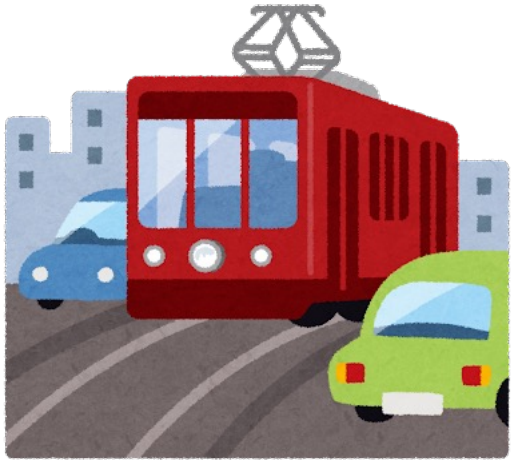
観光事業者を幅広く支援するには、適切な補助制度の設計が必要

Appropriate subsidy system design is needed to support a wide range of tourism businesses.

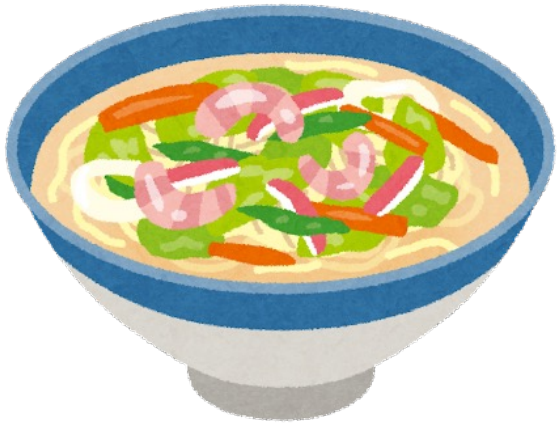
Purpose

地域共通クーポンが宿泊以外の観光業に与える効果を検証

Verify the effect of the regional common coupons on each sector of the tourism industry other than accommodation.



Transportation



Food

Souvenir

Data

道後2017調査（アンケート） Dogo2017-Questionnaire

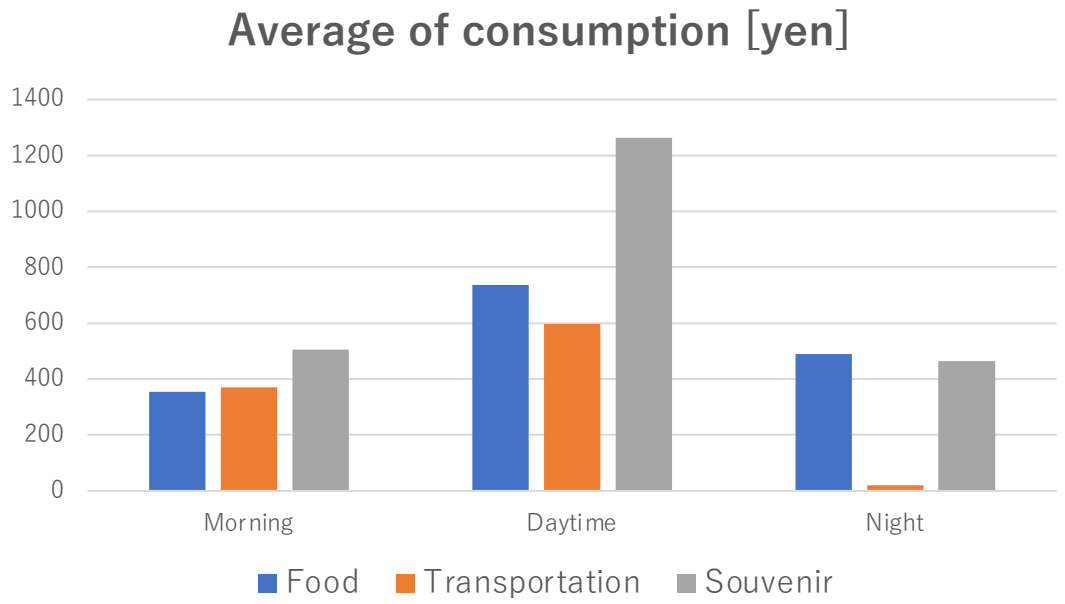
サンプル：道後のホテルに泊まった観光客,有効サンプル197 (松山エリア内で３項目全てで消費行動)
Of the tourists stayed at a hotel in Dogo, valid sample 197 -those who record consumption behavior in all three items within the Matsuyama area

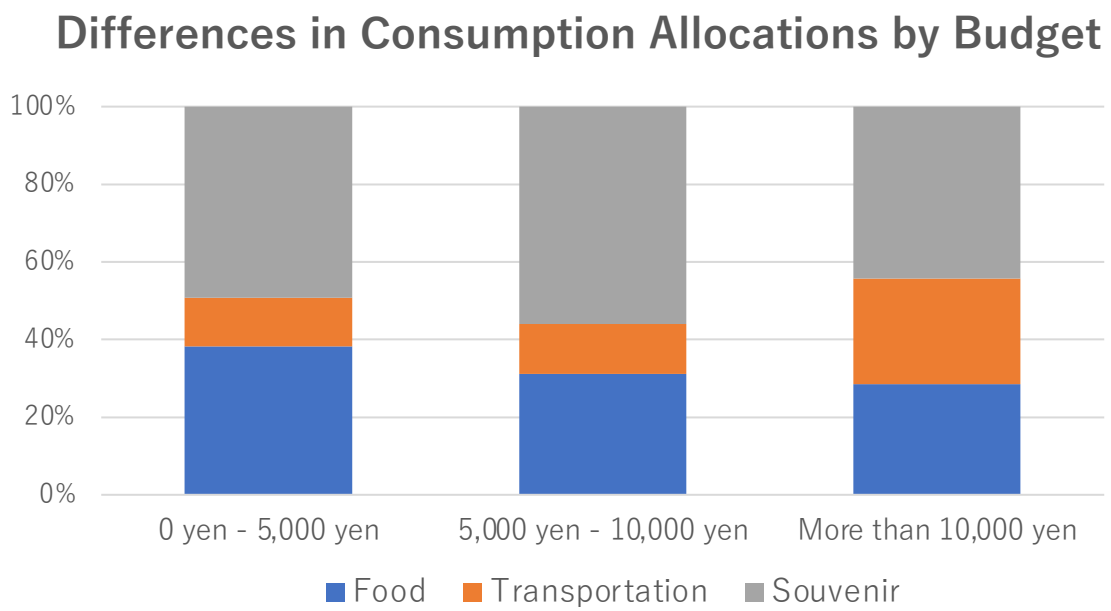
旅程に付随する滞在場所・時間帯・消費項目・消費金額のデータを利用
We used data on location, time of day, consumption categories, and amount spent at each of the destinations visited during the trip.

訪問先1/destination							
場所 location	到着時間 arrival	消費1 consumption1		消費2 consumption2		消費3 consumption3	
		項目 category	金額 amount	項目 category	金額 amount	項目 category	金額 amount
道後温泉 Dogo Onsen	16:50	食事 food	2,000	土産 souvenir	3,500	交通 transportation	400

Basic Analysis

道後2017調査（アンケート） Dogo2017-Questionnaire





カテゴリ・時間帯ごとに消費金額は大きく違う

Consumption varies widely by category and time of day

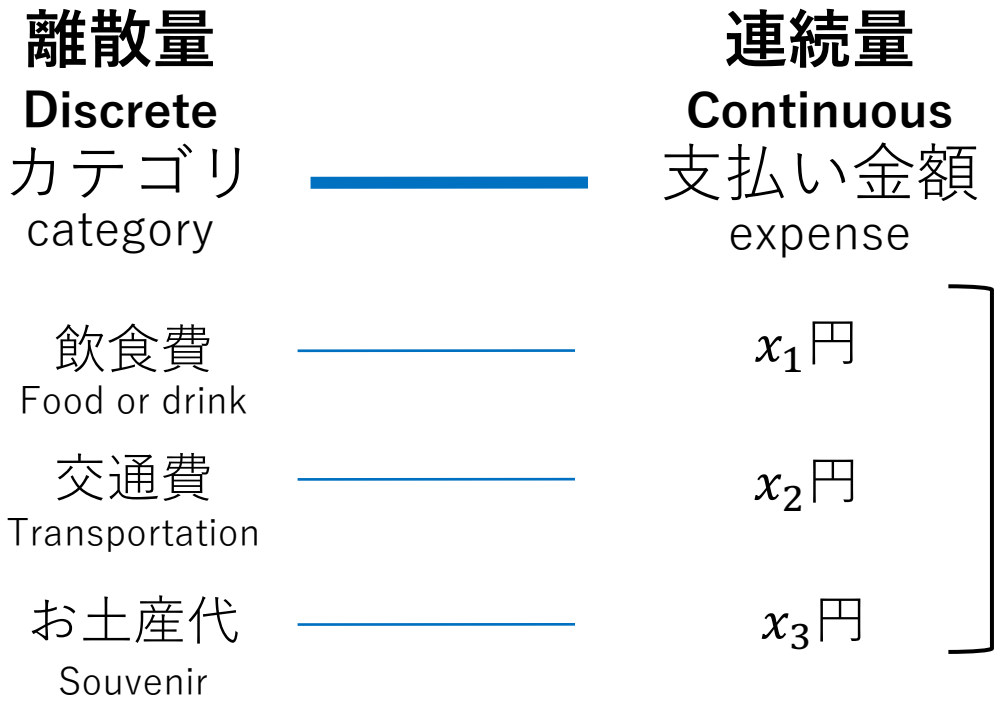
予算ごとに金額割り振りが変わる

Amount allocations vary by budget

Method

離散連続モデル（Discrete-Continuous model）

離散量と連続量を同時に選択し，配分するモデル
A model that simultaneously selects discrete and continuous quantities and allocates



予算制約

$$\sum_k x_k = E$$

の中で効用を最大化する

ように配分

Distribute expense to maximize utility under the budget constraint

Method

MDCEVモデル（MDCEV model）

選択した各カテゴリ(k)に予算(x_k)を配分する．効用関数は以下の通り．
Allocate a budget to each selected category. The utility function is as follows.

$$U(\mathbf{x}) = \sum_k \frac{\gamma_k}{\alpha_k} \exp(\beta z_k + \epsilon_k) \left(\left(\frac{x_k}{\gamma_k} + 1 \right)^{\alpha_k} - 1 \right) \quad (1)$$

Z_k	選択肢固有属性や個人属性などの説明変数（Explanatory variables such as choice-specific attributes and personal attributes）
β	パラメータ(parameters)
ε_k	ガンベル分布に従う確率項(Probability term following a Gumbel distribution)
α_k　γ_k	消費の増大に伴う効用の逓減度合いを表すパラメータ(Parameter representing diminishing utility with increasing consumption)

α_k　γ_kを同時に推定することは難しいため、$\alpha_k \to 0$と固定し、γ_kのみを推定。このとき(1)は
Since it is too difficult to estimate α_k γ_k at the same time, we presupposed $\alpha_k \to 0$ and only estimated γ_k. Then (1) becomes

$$U(\mathbf{x}) = \sum_k \gamma_k \exp(\beta z_k + \epsilon_k) \ln \left(\frac{x_k}{\gamma_k} + 1 \right) \quad (2)$$

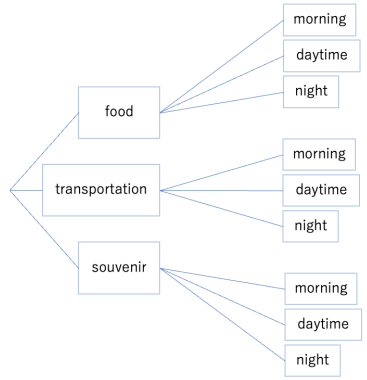
Method

選択構造 Selection Structure

時間帯・支出項目ごとの９つの選択肢

9 alternatives for each time period and category

- Morning-Food
- Morning-Transportation
- Morning-Souvenir
- Afternoon-Food
- Afternoon-Transportation
- Afternoon-Souvenir
- Night-Food
- Night-Transportation
- Night-Souvenir



Why not nested?
→Appendix

Detail of Utility Function

$$V_{morning,food} = \beta_{food}$$

$$V_{morning,souvenir} = \beta_{souvenir} + \beta_{1stvisit,souvenir} \times \delta_{dummy_{1stvist}}$$

$$V_{morning,transpotation} = \beta_{transportation} + \beta_{1stvisit,transportation} \times \delta_{dummy_{1stvisit}}$$

$$V_{afternoon,food} = \beta_{food} + \beta_{afternoon,food}$$

$$V_{afternoon,souvenir} = \beta_{souvenir} + \beta_{afternoon,souvenir} + \beta_{1stvisit,souvenir} \times \delta_{dummy_{1st}}$$

$$V_{afternoon,trasnportation} = \beta_{transportation} + \beta_{afternoon,transportation} + \beta_{1stvisit,transporation} \times \delta_{dummy_{1st}}$$

$$V_{night,food} = \beta_{food} + \beta_{night,food} + \beta_{night,group} \times \delta_{dummy\ 3\ or\ more}$$

$$V_{night,souvenir} = \beta_{souvenir} + \beta_{night,souvenir} + \beta_{1stvisit,souvenir} \times \delta_{dummy_{1st}} + \beta_{night,group} \times \delta_{dummy\ 3\ or\ more}$$

$$V_{night,transportation} = \beta_{transportation} + \beta_{night,transportation} + \beta_{1stvisit,transportation} \times \delta_{dummy_{1st}} + \beta_{night,group} \times \delta_{dummy\ 3\ or\ more}$$

選択肢固有定数項
Alternative Specific Constant

個人属性　Personal Attributes

松山を初訪問
visit Matsuyama for the first time

3人以上のグループ
group of 3 or more

Estimation

Explanatory Variables	Est.	t-val
food and drink γ	5.60	3.76**
souvenir γ	2.76	3.79**
transportation γ	6.80	4.91**
souvenir ASC	0.713	2.26*
transportation ASC	1.31	4.84**
afternoon food and drink ASC	1.02	4.41**
afternoon souvenir ASC	0.682	2.63*
afternoon transportation ASC	0.216	1.10
night food and drink ASC	0.541	1.81
night souvenir ASC	-1.12	-2.20*
night transportation ASC	-0.365	-1.29
first visit souvenir dummy pram	0.244	0.81
first visit transportation dummy param	0.496	1.93
group of 3 or more night dummy param	-0.982	-3.20**

* 5% 有意　** 1% 有意

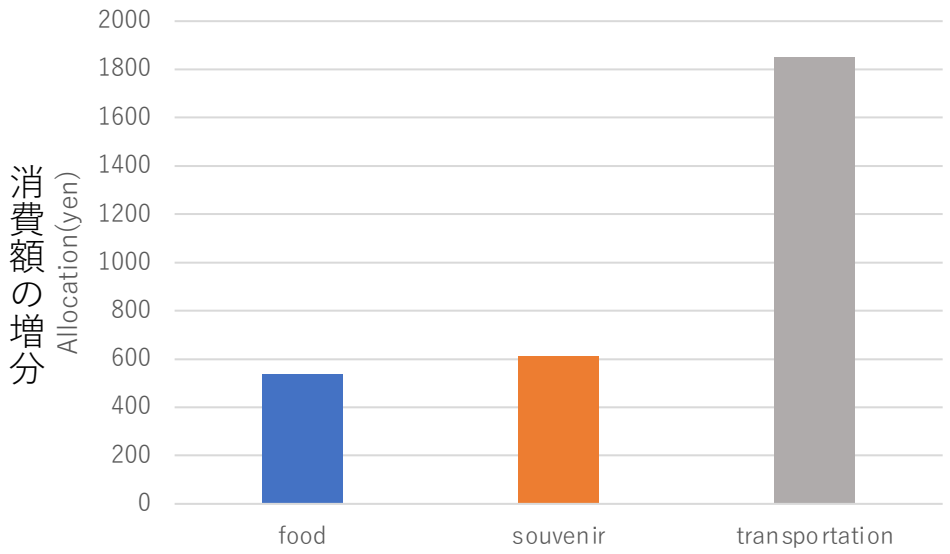
No. observations	197
$\mathcal{L}(0)$	-1121.487
$\mathcal{L}(\hat{\beta})$	-918.340
ρ^2	0.181
$\bar{\rho}^2$	0.194

- 効用の減衰が，お土産代，飲食代，交通費の順に大きい
  The decay of utility is faster for souvenirs, food and drinks, and transportation costs, in that order
  → 旅行先では交通費の増加をいとわない！
  While travel, people are willing to pay more for transportation.
- 初めて訪れた人はお土産，交通にお金を使いやすい
  First-time visitors are more likely to spend money on souvenirs and transportation
- 夜はお土産，交通費と比べて飲食費に使いやすい
  In the evening, visitors are more likely to spend money on food and drink compared to other categories

Simulation

自由に使える3000円クーポンを付与した場合のカテゴリ別消費変化

Change in spending when a ¥3,000 coupon which can be used for every category is given.



仮定
発行したクーポンは全て利用され、
クーポンの使用分だけ予算が増加

Assumption
All coupons issued would be used.
The budget would increase by the amount of coupons used.

クーポン額の多くはsaturation effectが小さい交通費に使われた

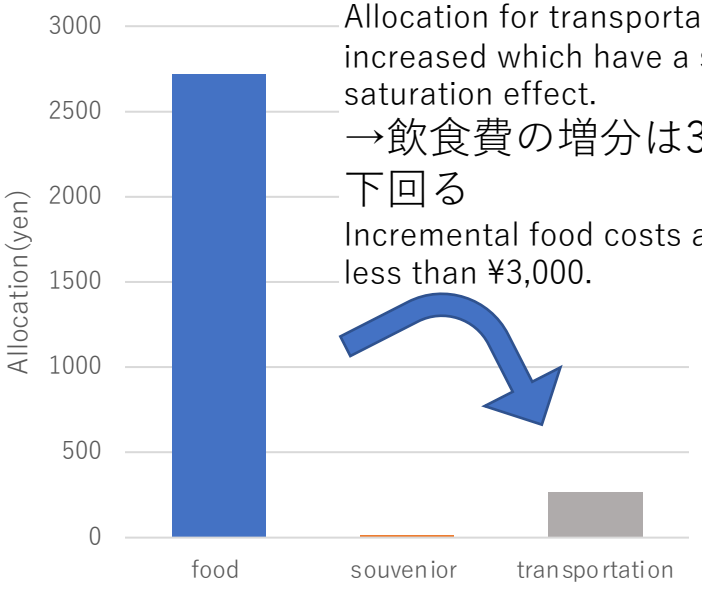
Most of the coupon amount was spent on transportation costs, which have a small saturation effect.

Simulation

各カテゴリ限定の3000円クーポンを付与した場合のカテゴリ別消費額変化

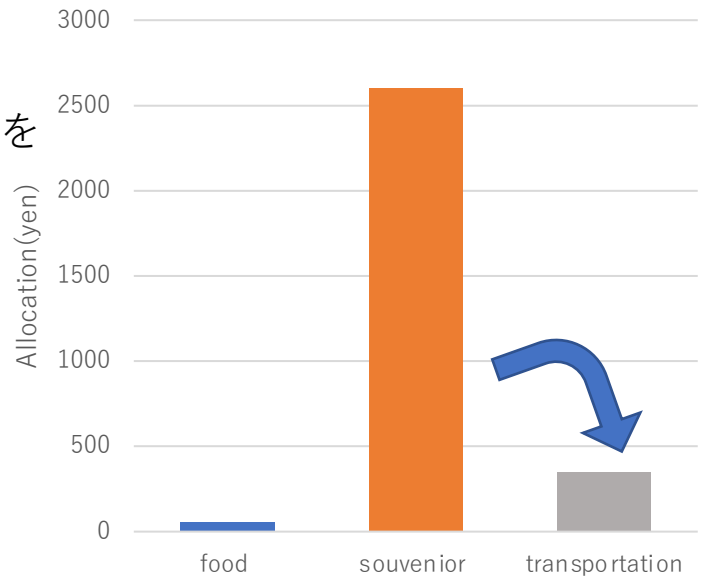
Change in spending by category when a ¥3,000 coupon which is only available for each category is given.

消費額の増分

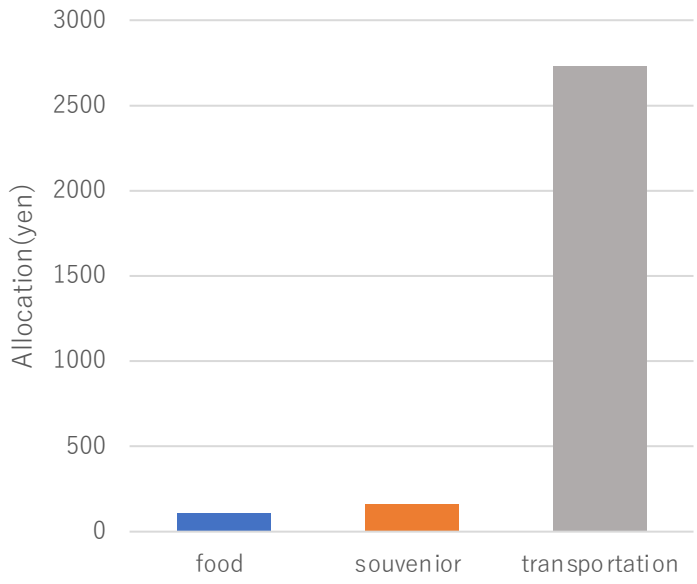


Saturation effect が小さい
交通費の消費も微増
Allocation for transportation increased which have a small saturation effect.
→飲食費の増分は3000円を下回る
Incremental food costs are less than ¥3,000.

飲食費限定の3000円クーポンを配布
Only for food



土産代限定の3000円クーポンを配布
Only for souvenir



交通費限定の3000円クーポンを配布
Only for transportation

Simulation

合計5000円分のクーポンをカテゴリ間で平等に配分されるように設計する

Design the allocations so that a total of 5,000-yen worth of coupons are distributed equally among the categories

1000円単位で離散化し，配分のされ方を全通り検証

Discretize in units of 1,000 yen and verify how the allocation is made in all streets.

ex)

	Subsidy	Allocation
Food and drink	3000円	x_1円
Souvenir	1000円	x_2円
Transportation	1000円	x_3円

平等な配分（＝全てに5000/3 円ずつ）

からどれほど離れているかを評価

Evaluate how far away from equal distribution (i.e., 5,000/3 yen each for all)

$$\text{Minimize} \sum_{k=1}^{3} \left| x_k - \frac{5000}{3} \right|$$

Simulation

合計5000円分のクーポンをカテゴリ間で平等に配分されるように設計する

(食事，お土産，交通)＝(2000円，2000円，1000円)で補助金を出すことが平等配分に最も近くなる

(food，souvenir，transportation)＝(2000yen，2000yen，1000yen) is nearest to equal distribution

γ_kが大きい交通費は，補助金の額が他より低くなる

Transportation costs with larger γ_k have lower subsidies than others

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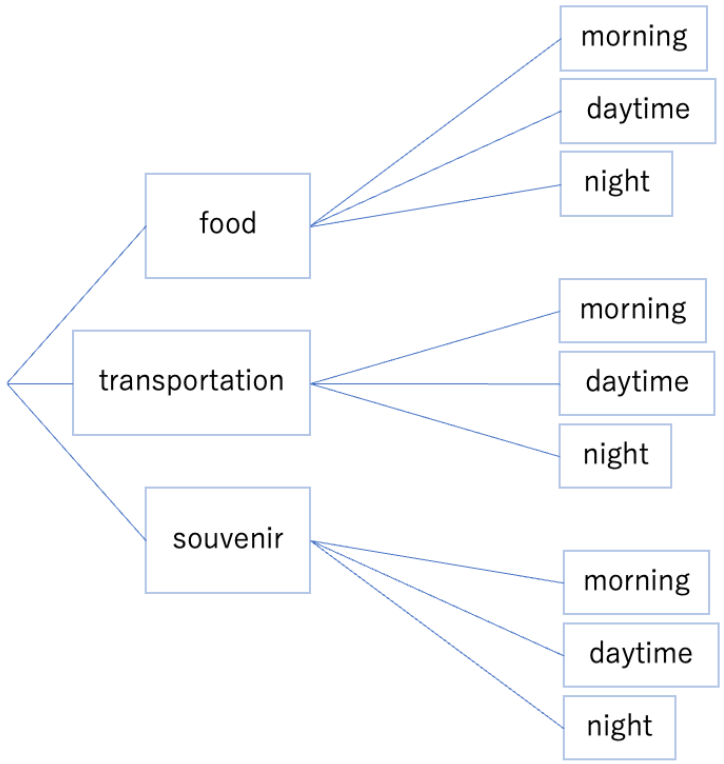
Appendix



当初はネスト構造を仮定したMDCNEVモデルを構築したが、スケールパラメーターが１に張り付いたため、誤差相関がないものとみなしMDCEVモデルとした

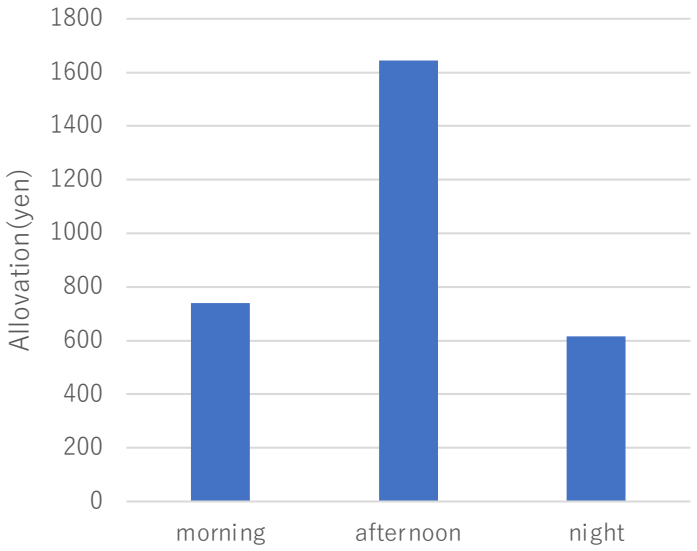
Initially, we constructed MDCNEV model because we presupposed the situation as nested. Since the scale parameter stuck to 1, the MDCEV model was assumed to have no error correlation.

Appendix

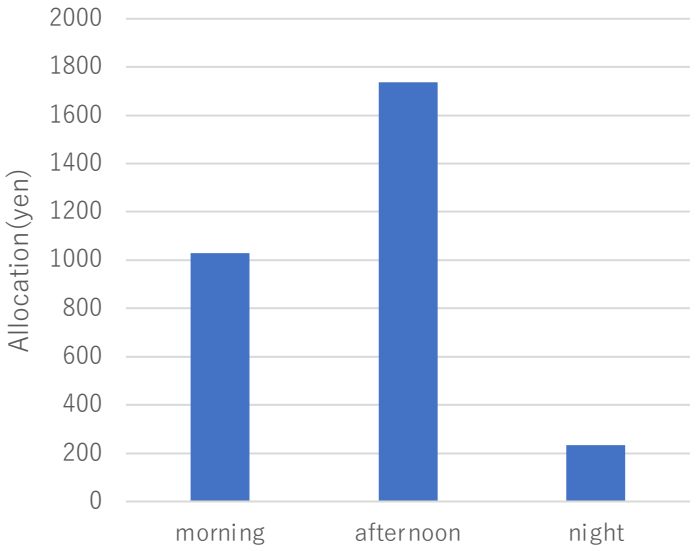
Simulation

各カテゴリ限定の3000円クーポンを付与した場合の時間帯別消費変化

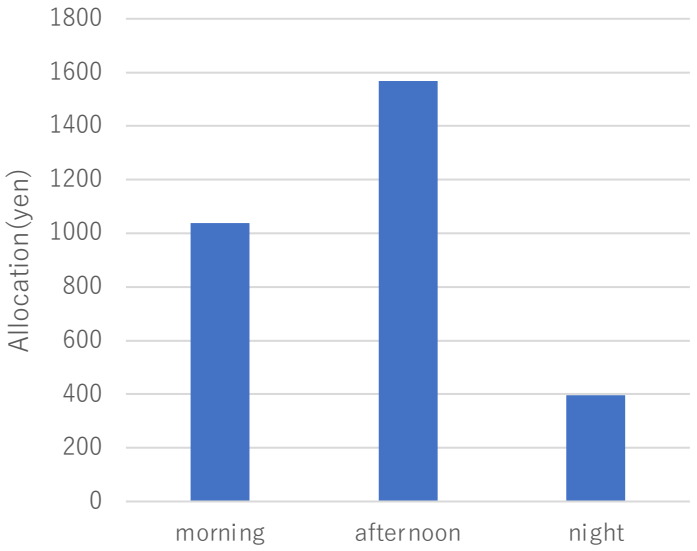
Change in spending by time when a ¥3,000 coupon which is only available for each category is given.



飲食費限定の3000円クーポンを配布
Only for food



土産代限定の3000円クーポンを配布
Only for souvenir



交通費限定の3000円クーポンを配布
Only for transportation