Southern Agricultural Economics Association

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Informed but Tempted: Latent Class Analysis of College Students' Food Preferences

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Highlights

Using **latent class analysis (LCA)**, we **classify** survey **participants** based on their food preferences in consumption preference types. Then we triangulate our identified types with BMI, gender, health consciousness level, subjective knowledge of food, and funding status. Identified **two latent groups** of students.

- **Tempted indulgers** - health conscious but overweight and *succumb to temptation*.
- **Temptation restrainers** - health conscious but have normal BMI scores and *control temptation* in food decisions.

We conclude that the **food preferences** of adolescents are **primarily driven by menu-dependent preferences** rather than knowledge of food diet quality

Motivation & Contribution

- **Role of knowledge** about diet quality and visceral feelings in the **formation of food preferences.**
- Determine the relative importance of food diet quality knowledge and menu-dependent cues in identifying latent consumer preference profiles.

Contribution

- **Finite mixture models**[1] to identify latent classes
- **Self-control and temptation measures**[2] to test classifications
- Students' food preferences when facing **low, middle, and high tempted food alternatives.**

Methods

- Incentivized survey - 262 students at a southeastern university
- Menu selection- Restaurants around the university
- Salient calorie differences across different food items, but similar calories for the same food category ~ **300 cal**
  - Healthy
  - Average healthy
  - Unhealthy

- Block 1: **Rating of 9 food menus based on health, taste, temptation, satiety**
- Block 2: Demographic characteristics, Health consciousness, Subjective knowledge of food and Self-control[2] measures

- Model-based clustering approach[1]
  - Finite mixture model

$$f(x_i \Psi) = \sum_{k=1}^{G} \pi_k f_k(x_i; \theta_k)$$

Table1: Presented Food Menu Option

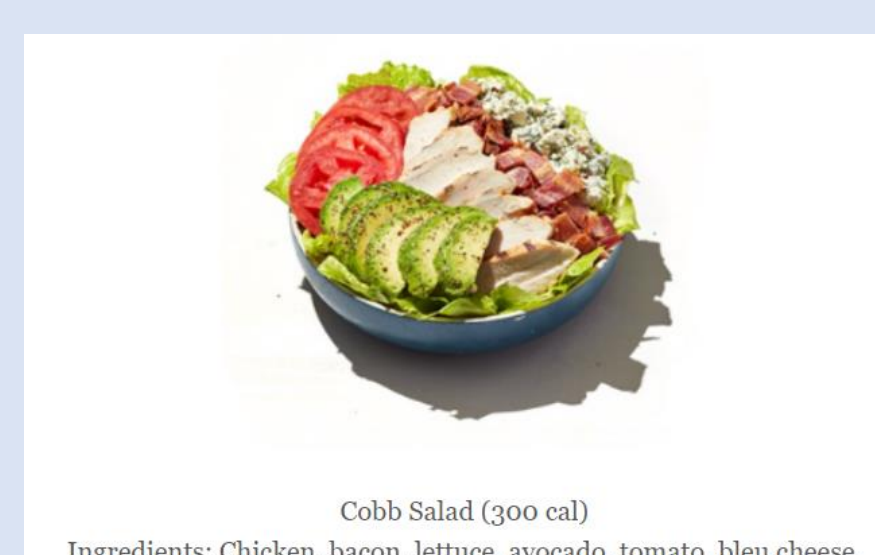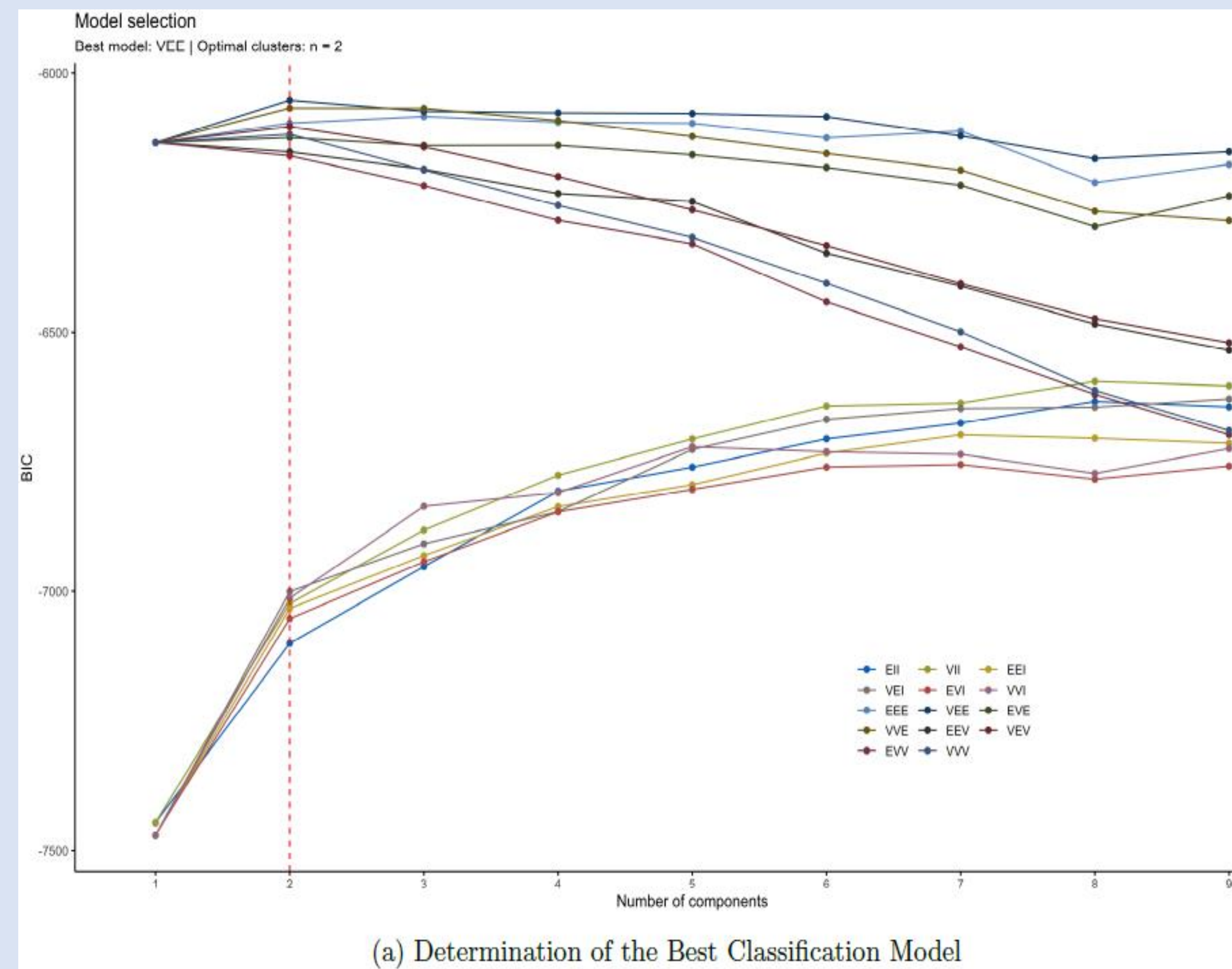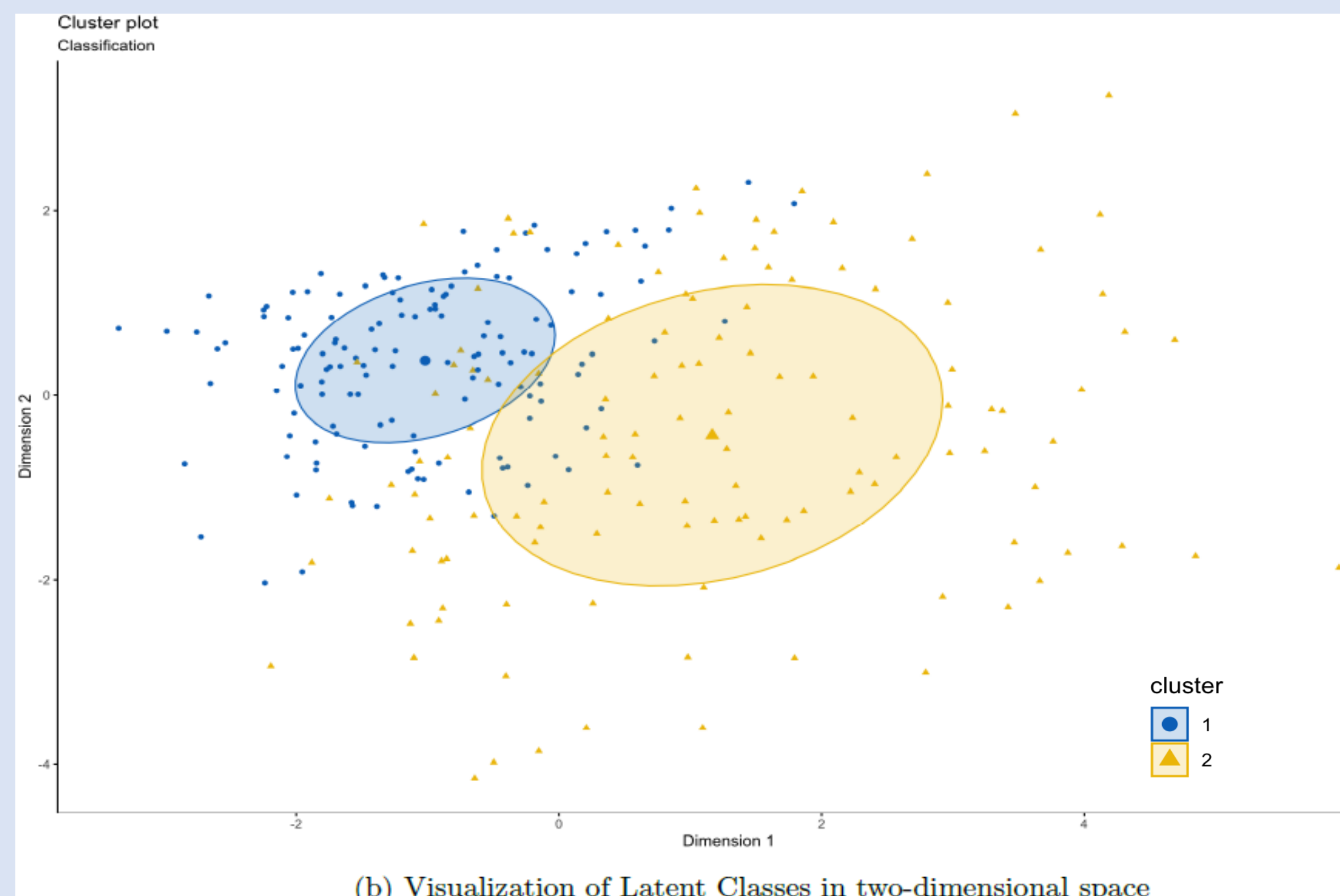| Menu	Food Option	Serving Size	Cal. Content
Salad	Elevated cobb Salad	1 bowl	300
Salad	Chicken-Avocado Salad	1 bowl	305
Salad	Customized Chicken Salad	1 bowl	315
Burrito	Chicken Burrito -Chipotle	1 wrap	600
Burrito	Chicken Burrito	1 wrap	605
Burrito	Black Beans-Rice Burrito	1 wrap	625
Pizza	Backyard BBQ Chicken - large (14")	3 slices	900
Pizza	Chicken-Bacon-Parmersan Large (14")	3 slices	930
Pizza	Buffalo-Chicken -Large (14")	3 slices	960

Cobb Salad (300 cal)
Ingredients: Chicken, bacon, lettuce, avocado, tomato, bleu cheese.

Backyard BBQ Chicken Pizza -Hand tossed - **3 pieces** (900 cal)
Ingredients: Chicken, bacon, onion, bleu cheese, sauce drizzle, crust

Figure 1: Sample of the menu presented

Key Findings

(a) Determination of the Best Classification Model

- VEE mixture model (Volume, Shape, coordinate)
- Two latent preference groups

(b) Visualization of Latent Classes in two-dimensional space

- Spatially distinct latent classes
- Groups represent different sub-populations

Table 2: Sample Characteristics and Mechanisms for Treatment Conditions

Variables	N	Tempted Indulgers N = 140	Temptation Restrainers N = 122	p-value	p-value adjusted
BMI	243	25.8 (5.9)	23.6 (5.7)	0.00	0.00
Male	262	28 (20%)	20 (16%)	0.45	0.62
Salad Satiety	262	6.63 (1.92)	5.81 (2.39)	0.01	0.01
Burrito Satiety	262	8.02 (1.60)	6.91 (2.28)	0.00	0.00
Pizza Satiety	262	8.62 (1.47)	7.60 (1.99)	0.00	0.00
Salad Health	262	3.46 (1.22)	3.21 (1.41)	0.12	0.23
Burrito Health	262	1.98 (1.63)	1.82 (1.65)	0.53	0.62
Pizza Health	262	-2.74 (1.59)	-2.88 (1.62)	0.47	0.62
Salad Taste	262	2.54 (1.53)	0.19 (2.93)	0.00	0.00
Burrito Taste	262	2.75 (1.61)	0.67 (2.66)	0.00	0.00
Pizza Taste	262	3.22 (1.45)	0.69 (2.83)	0.00	0.00
Salad Temptation	262	1.59 (1.79)	-0.48 (2.81)	0.00	0.00
Burrito Temptation	262	2.07 (1.64)	-0.36 (2.47)	0.00	0.00
Pizza Temptation	262	2.72 (1.56)	-0.20 (2.79)	0.00	0.00
Parent Funding	262	98 (70%)	83 (68%)	0.73	0.77
Funding with Scholarships	262	83 (59%)	79 (65%)	0.36	0.59
Funding with Loans	262	45 (32%)	40 (33%)	0.91	0.91
Funding with Pell Grant	262	17 (12%)	23 (19%)	0.13	0.23
Funding with Other Sources	262	24 (17%)	17 (14%)	0.48	0.62
General Health Consciousness	262	0.98 (0.63)	0.92 (0.71)	0.52	0.62
Subjective Knowledge on Food	262	0.00 (0.90)	-0.01 (1.00)	0.71	0.77

Notes: Statistics: Mean (SD) for non-categorical variables; Count (Proportion) for categorical variables. Tests: Kruskal-Wallis rank sum test; Benjamini & Hochberg correction for multiple testing.

- **T. Indulgers** exhibit a **higher level of temptation** feelings toward food alternatives

- T. Indulgers are **over-weight** and have a **higher BMI** than T. Restrainers

- **Intensity of temptation** feelings are **positively correlated** with **BMI** values
  - ✓ LCA using menu-dependent preference measures can **robustly predict BMI** types

- **Menu-dependent preference** measures can **predict consumption habits** with **external validity.**
- Income - informative for identifying latent groups.

- Evidence suggests that differential **consumption habits** of students are **not driven** by knowledge or health consciousness, but **primarily** by **menu-dependent preferences.**

- Temptation, taste and BMI increase the likelihood of being in the Tempted Indulgers class.

- Positive significance of the TI gap re-validates Ameriks et al. (2007).

- Our classification of latent food preference classes has external validity.

Table 3: Probit analysis of Tempted Indulgers

	(1)	(2)	(3)	(4)	(5)
(Intercept)	-1.79**	-2.45***	-2.21**	-4.58***	
	(0.62)	(0.61)	(0.74)	(1.28)	
Salad Satiety	0.07	-0.05	0.08	0.04	0.02
	(0.08)	(0.06)	(0.08)	(0.10)	(0.04)
Burito Satiety	-0.09	0.03	-0.08	-0.05	-0.02
	(0.07)	(0.07)	(0.09)	(0.11)	(0.04)
Pizza Satiety	0.09	0.13	0.10	0.16*	0.06*
	(0.07)	(0.07)	(0.07)	(0.08)	(0.03)
Salad Temptation	0.31***	0.02	0.08	0.03	
	(0.07)	(0.17)	(0.19)	(0.07)	
Burito Temptation	0.35***	0.51*	0.47*	0.19*	
	(0.07)	(0.20)	(0.22)	(0.08)	
Pizza Temptation	0.51***	0.67***	0.66***	0.26***	
	(0.07)	(0.14)	(0.14)	(0.06)	
Salad Taste		0.28***	0.42*	0.40	0.16
		(0.05)	(0.19)	(0.22)	(0.09)
Burito Taste		0.18**	-0.20	-0.18	-0.07
		(0.05)	(0.16)	(0.17)	(0.07)
Pizza Taste		0.35***	-0.14	-0.09	-0.04
		(0.06)	(0.12)	(0.13)	(0.05)
BMI				0.07*	0.03***
				(0.02)	(0.01)
N	264.00	264.00	264.00	243.00	243.00
Log Likelihood	-84.64	-105.40	-75.20	-64.30	-64.30
AIC	183.27	224.81	170.39	150.61	150.61
BIC	208.30	249.84	206.15	189.03	189.03

***p < 0.001; **p < 0.01; *p < 0.05

Notes: The dependent variable is a binary variable and it is "1" if an observation comes from a subject classified as "Tempted Indulger."

Conclusion

- **Two distinct latent food preference classes** were identified:
  - Tempted indulgers
  - Temptation Restrainers

- Identified preference groups are equally informed about the healthiness of the food products,
  - **one group succumb to temptation**

- Temptation, tastes, satiety (Pizza), BMI, and TI gap significantly predicts the likelihood of the tempted indulgers

- Policy Implications
  - behavioral approaches that target temptation would be the most effective ones
- Tempted Indulgers - useful in understanding what types of behavioral strategies are more effective for them

Future Research

- Behavior in **a two-period two selves model**. To **which extent** are their consumption **decisions consistent**?
- Scope for experimental studies with **information treatments** and potential policy proxies
- **Identification of commitment strategies** toward the consumption of unhealthy food.

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