Potential Consumers in Consumer Behavior Models

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INTRRODUCTION

- Economists have long been interested in understanding consumer behavior, in particular consumer preferences and acquisitions.
- Plenty of past research are trying focused on developing models to explain different consumer segments and consumer behaviors given limited information. i.e. Shonkwiler and Shaw (1996) and Harris and Zhao (2007) each examined a situation where consumer has positive desire to consume, but does not consume the product during a given period.
- Based on the consumers' desire and acquisitions, consumers are defined into three groups : non-participants, potential-consumers, and consumers (Harris and Zhao, 2007)
- However, most of the previous models fail to observe the participation intention from their acquisition variables. If we could identify appropriate structural reasons explaining their participation decision and consumption decision, we will be able to better classify the markets into three types: non-participants, potential consumer and current consumer.

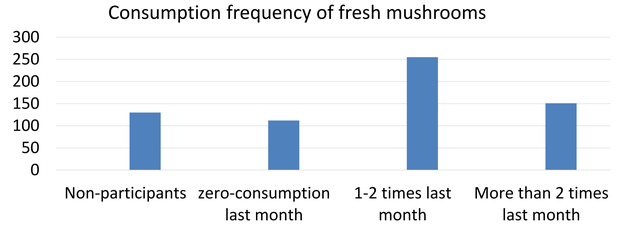
❖ **Research goals:**

- Design a consumer survey which allow us to observe consumers' participation intention and acquisition through a purchase history and purchase frequency
- Analyze the consumer behavior of three groups: non-participants, potential consumer and current buyer by using two-stage selection models.
- In this case, we use fresh mushroom as an example, thus this study will provide information about the characteristics of fresh mushroom consumers, potential-consumers and non-participants, which will help the mushroom industry's decision of production and marketing strategies

Data

- An online survey about consumer's behavior about mushroom from September 17, 2012 to September 20, 2012.
- A total of 1217 responds were collected, and 648 respondents completed the survey and met the screening questions.
- Consumption frequency was employed as a measurement of consumption amount.
- Survey design allows us to differentiate non-consumers from potential consumers

Have you ever purchased fresh or processed mushroom before → whether they had purchased fresh or processed mushroom last month → how many times they purchased



Category	Percent	Category	Percent
Percent Female	54.9	Employment Status	
		Full-time	36.1
Age		Part-time	15.5
18-29	22.5	Student	5.8
30-39	18.9	Retired	16.8
40-49	21.4	Not employed	19.2
50-69	31.2	Other	6.7
69+	5.3		
		Income level	
Diet		$24,999 or less	27.0
Vegetarian	6.5	$25,000-$34,999	10.7
Non-vegetarian	93.5	$35,000-$49,999	15.3
		$50,000-$74,999	21.5
Ethnicity/Race		$75,000-$99,999	10.6
White/Caucasian	75.5	$100,000 or more	14.9
African American	11.1		
Hispanic	7.4	Education level	
Asia	7.7	High school graduate or less	23.0
Other	2.7	Some College or higher	77.0
Awareness of mushroom benefits		Food budget per week	
Yes	18.5	Less than$49	12.2
No	81.5	$50-$99	36.3
		$100-$149	32.7
Knowledge about mushroom towards immunity		$150-$199	10.8
Yes	11.0	$200-$249	3.5
No	89.0	$251 and above	4.5

Model

Theoretical Model

- Survey respondents first need to make a decision on whether to participate or not (binary choice), then only participants need to make the second choice on how much to purchase (ordered choice with zero), thus we can use a model incorporating a split binary selection and an ordered probit model in this case.
- The split binary model is expressed below

$$R_i^* = X_i'\alpha + u_i \quad R_i = \begin{cases} 1 \; if \; X_i'\alpha + u_i > 0 \\ 0 \qquad otherwise \end{cases}$$

Where R_i^* the latent variable measuring consumers' propensity for participation to purchase mushrooms, and R_i is a dichotomous variable of observation indicating whether or not consumers decided to participate. X is the vector of explanatory variables; u is the error term

- Conditioning on participation (R=1), The ordered probit equation is expressed as follows where D is an ordered response:

$$D_i^* = W_i'\beta + \varepsilon_i, \quad \text{if } R_i\text{=1; } D_i = \begin{cases} 0 \; if \; D_i^* \le 0 \\ 1 \; if \; 0 < D_i^* \le \alpha_1 \\ 2 \; if \; \alpha_1 < D_i^* \le \alpha_2 \\ and \; so \; on \end{cases}$$

Assume the joint distribution function of (u_i, ε_i) is Gaussian, with the zero means, unit variances, and correlation coefficient defined as ρ. Then the probabilities of the possible outcomes can be expressed

$$\Pr(R = 0) = 1 - \Phi(X_i'\alpha)$$

$$\Pr(R=1, D=d) = \Phi_2(X_i'\alpha, \gamma_j - W_i'\beta; -\rho) - \Phi_2(X_i'\alpha, \gamma_{j-1} - W_i'\beta; -\rho)$$

Model Specification

- Covariates in selection equation: {individuals' characteristics including income, age, gender, race, education, food budget, diet, awareness of mushroom benefits, knowledge about mushrooms(immunity &symptom}
- Covariates in ordered probit equation: {individual's characteristics, mushroom characteristics including taste, price, safety, convenience, availability}

FINDING

Estimated Results of the sample selection and ordered probit model

	Participation Stage		Consumption Stage	
	Coefficients	Standard Error	Coefficients	Standard Error
male	0.13	(0.13)	0.031	(0.10)
college	**0.34***	**(0.14)**	-1.40	(0.13)
age	**0.12*****	**(0.04)**	**-0.86***	**(0.03)**
income	0.05	(0.03)	0.03	(0.03)
hispanic	-0.40	(0.27)	**0.92*****	**(0.30)**
black	**-0.55*****	**(0.18)**	0.18	(0.21)
asian	**0.71****	**(0.33)**	0.26	(0.20)
otherrace	5.65	(5.42)	0.27	(0.33)
knowledge_immunity	0.16	(0.19)	-0.12	(0.18)
knowledge_symptom	**0.46*****	**(0.14)**	0.17	(0.15)
awareness	**0.44****	**(0.19)**	**0.30****	**(0.16)**
budget	**0.16****	**(0.06)**	**0.12*****	**(0.05)**
vegan	0.01	(0.28)	-0.47	(0.21)
taste	-		**0.09****	**(0.05)**
price	-		0.05	(0.05)
convenience	-		0.06	(0.05)
mushroom_health	-		**0.09****	**(0.04)**
diversity	-		0.00	(0.05)
Constant	**-0.99*****	**0.32**		
Cut1	-5.55	6.16	0.65	0.55
Cut2			**2.14****	**0.63**
Rho	-0.46	0.47		
LR test ($H_0: rho = 0$), $X_2(1)$			279.23***	
Log likelihood			-758.32	
Observations			648	

Estimated Probabilities for fresh mushroom consumption

	Mean	Min	Max
Prob(R=0)	0.01	0.0028	0.024
Prob(R=1, D=0)	0.26	0.0014	0.875
Prob(R=1, D=1)	0.45	0.067	0.54
Prob(R=1, D=2)	0.28	0.004	0.93

Marginal effect for different levels of consumption

	Pr(R=0)	Pr(R=1, D=0)	Pr(R=1,D=1)	Pr(R=1,D=2)
male	-0.037	-0.009	-0.001	0.010
	(0.058)	(0.040)	(0.002)	(0.032)
college	0.006	0.041	0.002	-0.043
	(0.067)	(0.121)	(0.097)	(0.043)
age	0.025	0.025	0.001	**-0.027***
	(0.019)	(0.072)	(0.006)	**(0.012)**
income	**-0.026***	-0.009	-0.000	0.009
	(0.015)	(0.026)	(0.002)	(0.009)
hispanic	-0.488	-0.271	-0.014	**0.285****
	(0.552)	(0.762)	(0.060)	**(0.099)**
black	-0.027	-0.054	-0.003	0. 057
	(0.157)	(0.163)	(0.014)	(0.068)
asian	0.059	-0.077	-0.004	0.081
	(0.091)	(0.224)	(0.016)	(0.059)
otherrace	**-1.747*****	-0.080	-0.004	0.084
	(0.205)	(0.246)	(0.017)	(0.099)
knowledge_immunity	**-0.241*****	-0.080	0.002	-0.037
	(0.070)	(0. 246)	(0.008)	(0.056)
knowledge_symptom	-0.027	0. 035	-0.003	0.054
	(0.066)	(0. 111)	(0.010)	(0.043)
awareness	**-0.060****	**-0. 088***	**-0.006***	**0.092****
	(0.028)	**(0. 045)**	**(0.004)**	**(0.045)**
budget	**-0.060*****	**-0. 035***	-0.002	**0.038****
	(0.024)	**(0. 016)**	(0.008)	**(0.015)**
vegan	-1.699	0.013	0.001	-0.014
	(4.482)	(0.073)	(0.004)	(0.065)
taste	-	-0.027	-0.001	**0.029****
		(0.079)	(0.006)	**(0.014)**
price	-	-0.015	-0.001	0.015
		(.045)	(0.003)	(0.015)
convenience	-	-0.017	-0.001	0.017
		(0.050)	(0.006)	(0.016)
mushroom_health	-	-0.026	-0.001	**0.027****
		(.075)	(0.001)	**(0.013)**
diversity	-	-.000	-0.000	0.000
		(.014)	(0.005)	(0.014)

Conclusion

- There are different reasons driving non-participants (consumers who will not participate in the market) and potential consumers (consumers with zero purchase frequency)
- The potential buyers share many similarities with less frequent consumers (instead of with non-participants, with whom they are often combined in previous research)
- Health information influences new consumers to the market as well as purchase frequency. Increasing programs that focus on the health benefits of mushrooms may be an effective way to increase purchases.

Reference

1. Harris, M. N., & Zhao, X. (2007). A zero-inflated ordered probit model, with an application to modelling tobacco consumption. *Journal of Econometrics*,141(2), 1073-1099.
2. Shonkwiler, J. S., & Shaw, W. D. (1996). Hurdle count-data models in recreation demand analysis. *Journal of Agricultural and Resource Economics*, 210-219.
3. De Luca, G., & Perotti, V. (2010). Estimation of ordered response models with sample selection.
4. Shi, L., House, L., & Gao, Z. (2011, July). Consumer Structure of the Blueberry Market: A Double Hurdle Model Approach. In *American Agricultural Economics Association Annual Meeting.*