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# Snack Peanut Consumption: Type Preference and Consumption Manners

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Nuts have been a staple food of human being for thousands of years, providing vital nutrients such as protein and vitamin (He, Florkoski, and Elnabheeb 1998). The importance of nuts in the human diet today is partly reflected in the fact that they are classified as a part of the USDA Food Guide Pyramid's Meat/Meat Alternative Group. In addition to their nutritional value, scientific researches have provided evidence for their contribution to health, such as reducing the risks of heart diseases (Dreher, Maher, and Kearney 1996; Sabate 1993). With a growing awareness of the benefits of nut consumption, it is likely that consumption of nuts may increase.

Many kinds of nuts are consumed in the United States, such as peanuts, pecans, cashews. Peanuts enjoy the lion's share of the U.S. nut market, accounting for about 80% of the nut market. The popularity of peanuts are due to various factors, including nutritional attributes and price advantage. Peanuts are a nutritious food, rich in vital nutrients such as protein, vitamins, and beneficial unsaturated fat. They are a healthy food, with evidence from scientific research attesting to their effects on reducing heart diseases and diabetes (Jiang et al. 2002) and on lowering weight and cholesterol level (McManus, Antinoro, and Sacks 2001). Furthermore, peanuts are much cheaper than most of the other nuts.

Peanuts can be used for various purposes, of which the dominant use in the United States is food use. Domestic food use of peanuts plays such an important role in U.S. demand for peanuts that it is considered to be the primary factor determining U.S. peanut production (Rimal and Fletcher 2002). Domestic food use of peanuts takes many forms. Of the various forms of domestic food use of peanuts, snack food is a major form of consumption, accounting for approximately 25% of the domestic

food use of peanuts. This study explores factors influencing consumer preference for various types of snack peanuts, aiming to obtain useful information for food-policy makers to better understand and more thoroughly exploit the snack peanuts market. Such information is urgently needed because snack peanuts have been experiencing a declining trend and a dwindling market share in the past two decades.

## General Demand Trend

Snack peanuts have been popular in the United States for a long time, but the market for snack foods in the United States is very competitive and snack peanuts are facing fierce competition from other kinds of snack foods such as popcorn, pretzels, and chips. The market share of snack peanuts in the U.S. domestic snack-food market has dwindled in the past two decades (Rimal and Fletcher 2002).

Domestic total demand for snack peanuts experienced sharp fluctuations with a general declining trend in the 1980s and 1990s. In 1995, when peanut sales were at their lowest, only 275 million pounds of snack peanuts were consumed, a sharp drop from the 400 million pounds recorded in 1985. Apart from the potential impact of fierce competition from other kinds of snack foods, a main driving force behind the dramatic decrease in snack peanut consumption is consumer concern about health risks associated with a high intake of fat. Peanuts are known to be rich in fat and at that time the public tended to think a high fat intake is harmful to health, no matter what kind of fat. The fact is that a high intake of saturated fat is indeed harmful to health, while a high intake of unsaturated fat is usually beneficial to health. The negative effect of the unfounded health risk concerns on consumption of snack peanuts was mitigated by the release in 2000 of the results of the studies of Mediterranean diets and the "peanut butter" diets, which touted the health benefits of a diet of high unsaturated fat, known as "good fat." Snack peanut consumption has been on the rise since then. With a growing

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consumer interest in a diet of low-carbohydrate but high “good fat,” together with the improvement of consumer knowledge about the nutritional attributes of peanuts and peanut products, demand for snack peanuts may increase.

### Some Consumption Behaviors

Where are snack peanuts usually consumed? Are they usually consumed as morning snacks, afternoon snacks, after-dinner snacks, or at meals? What beverages do people drink when they eat snack peanuts? Answers to these questions provide useful information for food producers and retailers. In a nationwide consumer survey on peanut consumption from which the data in this study were collected, a set of questions was designed to obtain such information.

With the advantage of use convenience, snack peanuts can be consumed wherever food is allowed. According to the results of the survey, snack peanuts are most frequently consumed at home. About 82% of the respondents had and 29% had eaten snack peanuts at someone else's home. Snacks are often eaten at working site and around 17% of the respondents had eaten snack peanuts at work. Peanuts are frequently served as snacks on airplanes, but only 14% had eaten the products as snacks on an airplane. A possible explanation is that not everybody has traveled by air. Snack peanuts were also consumed in many other places or events, including bars (10%), cars (10%), sporting events (9%), parties (8%), and restaurants (5%).

Snack peanuts are usually eaten with beverages. According to the survey results, soft drinks are the favorite companions of snack peanuts. About 61% of the respondents usually drank soft drinks when they ate snack peanuts. Beer was also a favorite companion; roughly 14% of respondents drank beer when they ate snack peanuts. Around 5% of respondents indicated they usually drank water when they ate snack peanuts. Other types of beverages were mixed drinks (2%), wine (2%), tea/iced tea (2%), fruit juice (2%), milk (1%), and coffee (1%).

Understandably, snack peanuts are mainly eaten as snacks. But some consumers also eat them at meals. According to the survey, snack peanuts are rarely eaten for breakfast, with less than 1% of the respondents having ever eaten them at breakfast. Neither are they frequently consumed for lunch or dinner, with a little more than 3% of the respondents

having ever eaten snack peanuts at lunch and less than 3% at dinner. Snack peanuts are favorites for mid-afternoon snacks and after-dinner snacks. More than 35% of the respondents had eaten snack peanuts for mid-afternoon snacks, and 49% for after-dinner snacks. Surprisingly, only 3% of the respondents had eaten snack peanuts as mid-morning snacks. It is not clear whether people have mid-morning snacks less frequently than they do mid-afternoon and after-dinner snacks, or if they tend to have other kinds of snack foods as mid-morning snacks.

### Type Preference

As a result of a growing consumer demand for varieties, product differentiation has become an important strategy to increase market share. This is especially true with the snack-food market, where many types of snack peanuts have been developed over the years to meet consumer demand for variety. Examination of consumer preference for specific types of snack peanuts may provide useful information to better understand and hence more thoroughly exploit the market for snack peanuts.

Type preference is a specific consumption behavior. In this study, the concept of type preference can be conveniently formulated on the basis of consumption choice. With more types available, consumers have more choices. Facing a set of available choices, an individual may consume any specific type or types of snack peanuts according to his tastes and preferences (non-participants were excluded from the survey). Obviously, it is not necessarily true that if an individual consumes two or more types of snack peanuts, he would consume them with the same frequency. On the contrary, he is likely to consume one specific type of snack peanut more frequently than other types. The type consumed most frequently is likely to be the most-preferred type, *ceteris paribus*.

Consumer tastes and preferences are known to be affected by personal characteristics such as age, gender, ethnic status, and education. For example, elderly people tend to avoid hard-to-chew foods because their teeth are generally not as good as young people's. Information on the relationships between consumer type preferences and such personal characteristics can help to more effectively exploit the market, especially useful for retailers to meet the needs of subgroups of consumers with specific demographic characteristics.

Apart from a set of demographic characteristics commonly considered in studies of food consumption, individual idiosyncrasy also affects food consumption. For instance, individuals with high blood pressure tend to avoid high sodium intakes, while consumers with diabetes tend to avoid excessive sugar intakes. Data on individual idiosyncrasy are difficult to obtain, but indirectly related information is usually available, such as whether an individual usually takes sugar, salt, or fat into consideration when choosing food to consume. Insights about the relationship between type preference and such factors are also useful. For example, whether a person who usually takes sugar content into account in food choice is less likely to prefer honey-roasted snack peanuts is a useful piece of information.

The relationship between type preference and such factors as personal characteristics can be examined by analysis of a statistical model, with type preference being the dependent variable. In this study, given the nature of the dependent variable, an unordered multiple-choice model is appropriate. The results from estimation of such a model provide information about the effects of explanatory variables on the probability that a consumer tends to prefer a certain type of snack peanuts considered in the study.

**Econometric Model**

In the survey, respondents were asked to indicate, from a set of given types, the type of snack peanuts they consumed most frequently. Responses to this question were used as the dependent variable in this study. Given the unordered multiple-choice nature of the dependent variable, a multinomial logit model is appropriate for the data.

In the real world, an individual prefers a specific type of snack peanuts over other types in accordance with his tastes and preferences. In the formulation of a corresponding statistical model, we specify the probability that an individual would prefer a specific type as a function of a set of variables. Denoting the J+1 unordered alternative types of snack peanuts considered in the study by 0, 1, 2, ..., J, then, the probability that an individual consumes a specific type of snack peanuts most frequently can be expressed as

$$1) \text{ prob}(Y_i = j) = \frac{e^{\beta_j x_i}}{\sum_{k=0}^J e^{\beta_k x_i}}$$

where  $Y_i$  denotes the preferred type of the  $i^{\text{th}}$  individual;  $j = 0, 1, \dots, J$  and  $k = 0, 1, \dots, J$  indicate snack peanuts types;  $X_i$  is a vector of explanatory variables; and  $\beta_0$  and  $\beta_j$  are vectors of parameters to be estimated. The solutions to the set of equations provide a set of probabilities for the J + 1 choices for an individual with characteristics of  $X_i$ . Obviously, there is the problem of indeterminacy in the model. A commonly used method to solve the problem is to set  $\beta_0 = 0$  (Greene 1997). With the problem of indeterminacy solved by a convenient way of normalization, the choice probabilities can be expressed as

$$2) \text{ prob}(Y_i = 0) = \frac{1}{1 + \sum_{k=1}^J e^{\beta_k x_i}}$$

and

$$\text{prob}(Y_i = j) = \frac{e^{\beta_j x_i}}{1 + \sum_{k=1}^J e^{\beta_k x_i}} \quad \text{for } j = 1, 2, \dots, J.$$

The multinomial logit model is commonly estimated using the maximum-likelihood method. The log-likelihood is (Greene)

$$3) \ln L = \sum_{i=1}^N \sum_{j=0}^J d_{ij} \ln \text{prob}(Y_i = j),$$

where N is the total observations in the sample and  $d_{ij} = 1$  if the  $i^{\text{th}}$  individual consumes the  $j^{\text{th}}$  alternative type of snack peanuts most frequently and 0 otherwise.

**Survey and Data**

The data are from a telephone survey of U.S. households on consumption of peanuts and peanut products conducted by the Gallup Organization Inc. in 1997. A sample of 2800 households was randomly selected nationwide for the survey. In order to enhance the reliability of the survey, an adult of the household was required to complete the survey. Those who did not consume peanuts or peanut products were excluded from the survey.

Efforts were made to reduce sample-selection biases. A potential problem with a telephone consumer survey is the respondent-availability bias. For example, when a call is made during work hours requiring an adult of a household to complete a survey, those who are fully employed are usually unavailable. To mitigate the problem, an adult of the household who had the most recent birthday was required to complete the survey. Furthermore,

to reduce the bias in favor of those easy to reach by telephone, up to five call-backs were made.

The survey was designed to obtain information on factors affecting consumption of peanuts in three major forms, including snack peanuts, peanut butter, and in-shell peanuts. For a specific form, information was obtained on consumer perception of the products; consumption participation; consumption frequency; type preference; consumption manners such as where and when to consume the product; and nutrition consideration in food choices, including consideration of cholesterol, sodium, sugar, vitamin, and protein in food choices. All the respondents were requested to provide information on their demographic characteristics and on efforts made to maintain good health, represented by their physical-exercise frequency.

Information on consumer type preference was obtained using a multiple-choice question. Respondents were asked to indicate, from a set of listed alternative types, which type of snack peanuts they consumed most frequently. The results show that roasted peanuts were the most-preferred snack peanuts among all the listed types. More than 37% of the respondents consumed dry-roasted snack peanuts most frequently, while more than 16% indicated that they preferred honey-roasted peanuts over other types of snack peanuts. The fact that the majority of the respondents favored roasted peanuts is consistent with the findings of a previous study (Moon et al. 1999). After roasted peanuts come cocktail peanuts in terms of popularity. More than 18% of the respondents consumed salted cocktail peanuts most frequently, while roughly 7% preferred peanuts in a cocktail nut mix over other types of snack peanuts. More than 4% of the respondents indicated that peanuts in a trail mix were their favorites. The rest preferred other types of snack peanuts listed in the survey, but none of them were consumed most frequently by more than 2% of the respondents.

Information on consumer nutrition consideration in food choice was obtained using a set of multiple-choice questions. For a specific nutrition attribute, respondents were asked whether they never, seldom, sometimes, frequently, or almost all the time take it into consideration when making food-choice decisions. The survey results show that nutrition consideration plays an important role in food choice. More than 42% of the respondents frequently or almost all the time take cholesterol into

consideration when they chose food to eat. About 37% frequently or almost all the time take sodium into consideration in food choice. The percentages for sugar, vitamins, and protein are 34, 32, and 31, respectively.

### **Econometric Estimation Results**

A multinomial logit model was estimated using the maximum-likelihood method to explore factors affecting consumer preference for specific types of snack peanuts. The dependent variable reflects consumer preference for six major types of snack peanuts, including dry-roasted peanuts, salted cocktail peanuts, honey-roasted peanuts, peanuts in a cocktail nut mix, peanuts in a trail mix, and other kinds of snack peanuts. Originally, fifteen types of snack peanuts were considered in the survey, but consumer preferences were highly concentrated on several well-known types, with more than 82% of the respondents preferring either dry-roasted peanuts, salted cocktail peanuts, honey-roasted peanuts, peanuts in a cocktail nut mix, or peanuts in a trail mix over other types. None of the other types was considered to be the favorite type by a significant portion of the sample. In addition, some of the other types of snack peanuts considered in the survey are similar in product attributes. To reduce the possibility of violating the well-known "independence of irrelevant alternatives" assumption inherent in the structure of a multinomial logit model, we grouped all the other types into one alternative as "other types." To eliminate the indeterminacy of parameter estimates, we normalized the probability equations in Equation (2) by setting the parameters associated with the "other types" to zero.

Table 1 provides a detailed description of the explanatory variables included in the model. In addition to a set of demographic and economic factors commonly considered in food-consumption studies, consumer consideration of nutritional attributes in food choice, including cholesterol, protein, sodium, sugar, and vitamins, were also specified as explanatory variables in the model.

The estimation results are presented in Table 2. Among the set of demographic characteristics, age is found to be an important factor affecting consumer preference for the selected types of snack peanuts. Age is found to be adversely related to the probability that a respondent would consume salted cocktail peanuts, honey-roasted peanuts,

**Table 1. Description and Summary Statistics of Explanatory Variables.**

Variable	Description	Mean
Age	1 = 18 to 24, 2 = 25 to 34, 3 = 35 to 44, 4 = 45 to 54, 5 = 55 to 64, 6 = 65 or older.	3.454
Education	1 = college education, 0 otherwise.	0.389
Race	1 = white, 0 otherwise.	0.832
Sporty	1 = do physical exercise every day, 0 otherwise.	0.157
LowIncome	1 = \$34,000 or under, 0 otherwise.	0.370
Highincome	1 = \$75,000 or over, 0 otherwise.	0.144
Cholesterol	1 = frequently take cholesterol into consideration in food choice, 0 otherwise.	0.420
Sodium	1 = frequently take sodium into consideration in food choice, 0 otherwise.	0.371
Vitamin	1 = frequently take vitamin into consideration in food choice, 0 otherwise.	0.323
Protein	1 = frequently take protein into consideration in food choice, 0 otherwise.	0.307
Sugar	1 = frequently take sugar into consideration in food choice, 0 otherwise.	0.34

and peanuts in trail mix most frequently. The coefficient on the age variable also has a negative sign for dry-roasted peanuts, but the effect is statistically insignificant. On the other hand, older consumers tend to prefer peanuts in cocktail nut mix. Education is also found to be an important determinant of type preference. College-educated individuals tend to prefer honey-roasted peanuts and peanuts in trail mix. White people tend to consume peanuts in cocktail nut mix more frequently than other types of snack peanuts. The race effect may be due to differences in food-consumption tradition between white people and people of other races. Compared with those whose annual household income is between \$35,000 and \$75,000, low-income (less than \$35,000) individuals are less likely to consume salted cocktail peanuts most frequently, while

high-income (more than \$75,000) individuals are less likely to prefer peanuts in a cocktail nut mix over other alternatives. Income is also found to be adversely related to the probability of consuming peanuts in trail mix most frequently.

Consumer consideration of nutritional contents in food choice is found to affect type preference. Those who frequently take cholesterol into consideration when choosing food to eat are less likely to consume either salted cocktail peanuts or honey-roasted peanuts most frequently. Frequent consideration of sodium in food choice is positively related to the probability of preferring peanuts in trail mix over other types of snack peanuts. Vitamin consideration in food choice has a positive effect on preference for peanuts in a cocktail mix, while consideration of protein has a negative effect on

**Table 2. Results of Multinomial Logit Analysis of Consumer Preference for Selected Types of Snack Peanuts.**

Variable	Salted cocktail peanuts	Peanuts in Cocktail nut mix	Dry-roasted peanuts	Honey-roasted peanuts	Peanuts in trail mix
Constant	0.6855 (1.61)	-2.4412*** (-3.78)	0.6702* (1.85)	1.8890*** (4.44)	-1.8081** (-2.41)
Age	-0.1252* (-1.68)	0.1661* (1.69)	-0.0055 (-0.09)	-0.3899*** (-4.71)	-0.2243* (-1.70)
Education	0.0614 (0.26)	0.3051 (0.99)	0.0809 (0.40)	0.8041** (1.98)	1.2340*** (3.19)
Race	0.4381 (1.46)	0.8582* (1.79)	0.2420 (0.98)	-0.1132 (-0.41)	0.4281 (0.89)
Sporty	0.0793 (0.28)	-0.4004 (-0.99)	-0.0799 (-0.33)	-0.5228 (-1.58)	-0.8735 (-1.36)
LowIncome	-0.4250* (-1.77)	-0.1474 (-0.47)	-0.0251 (-0.12)	-0.2967 (-1.20)	-0.3805 (-0.94)
HighIncome	-0.3122 (-0.98)	-0.8131* (-1.70)	-0.3040 (-1.10)	-0.4316 (-1.28)	-1.0159* (-1.81)
Cholesterol	-0.4555 (-1.84)*	-1.0295 (-0.40)	-0.1015 (-0.48)	-0.4220* (-1.65)	0.1846 (0.45)
Sodium	0.0806 (0.31)	-0.0151 (-0.05)	0.1080 (0.49)	-0.0982 (-0.37)	0.7486* (1.79)
Vitamin	-0.3170 (-1.16)	0.6117* (1.82)	0.2077 (0.93)	-0.1467 (-0.53)	-0.0839 (-0.20)
Protein	-0.2587 (-0.96)	-0.3101 (-0.90)	-0.4993 (-2.20)**	0.1277 (0.47)	0.6060 (1.46)
Sugar	-0.1459 (-0.577)	0.0099 (0.031)	-0.0199 (-0.094)	0.0018 (0.007)	0.0727 (0.179)

t-values are in parentheses.

\* denotes significant at the 0.1 level, \*\* denotes significant at the 0.05 level, \*\*\* denotes significant at the 0.01 level.

preference for dry-roasted peanuts. The effects of nutrition consideration in food choice are likely to be related with consumer perceptions of the product attributes of the alternative types, but not necessarily related with their actual product attributes. For instance, frequent consideration of cholesterol in food choice may be due to an intention to avoid excessive intake of cholesterol. But the negative effect of cholesterol consideration on type preference for salted cocktail peanuts does not mean this type of snack peanuts actually contains more cholesterol than other types of snack peanuts. However,

consumers may think so because of their lack of knowledge about the nutritional contents of these types of snack peanuts.

Frequent consideration of sodium and sugar in food choice may be due to an intention to avoid excessive intake of these nutrients. Therefore, sodium consideration was expected to have a negative effect on preference for salted cocktail peanuts while sugar consideration was expected to have a negative effect on preference for honey-roasted peanuts. But the estimation results are not consistent with our expectations regarding these nutrition considerations.

## Conclusion

Given the important role they play in the snack-food market, the decrease in domestic demand for snack peanuts has caused growing concern that it may result in a shrinkage of the peanut industry. Facing such a situation, relevant experts have made great efforts to investigate the snack-food market, especially to explore factors affecting demand for snack peanuts (e.g., Rimal and Fletcher 2002). While such studies may provide useful information to better understand the market for snack foods, a study of consumer preference for various types of snack peanuts provides more specific and detailed insights about the consumption of the goods. This study has identified a set of factors influencing consumer preference for selected types of snack peanuts.

The insights obtained in this study is useful for better exploiting the market for snack peanuts. Specifically, information on the relationship between consumer demographic characteristics and type preference can help producers and retailers better meet the need of consumers with specific characteristics. Furthermore, the message that frequent consideration of sodium and sugar in food choice would not affect consumer preference for salted peanuts and honey-roasted peanuts is surely an important piece of information for producers and retailers.

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