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RESEARCH ARTICLE

Consumer Choice of Ice Creams : A Binary Logit Model of Analysis

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ABSTRACT

The most popular flavors of ice cream are vanilla, chocolate, butter pecan, strawberry, neapolitan, chocolate chip, french vanilla, cookies, and cream, etc., Fruity ice cream includes vanilla, fresh fruits, etc. etc. The specific objective of this studyis to investigate whether the socio-economic characteristics and the marketing mix (4P's) affect the consumer choice and preferences of ice creams (fruity and traditional) or not. The sample size in this research paper was 120. A binary logit model, was used to investigate factors affecting the consumer choices and preferences of ice creams. Results obtained that women prefer fruity ice cream tomen. Likewise, men prefer traditional ice cream towomen. Premium price affects the choice preferences towards both the ice cream. Product attributes like taste, quality, etc., and promotional activities like advertisement and sales promotion attracted the customers towards the ice cream.

Keywords : *Consumer choice; Dairy product; Place; Promotion ; Marketing mix*

INTRODUCTION

The main sectors comprising of the Indian food processing industry are fruits and vegetables, dairy products, marine and fish, meat and poultry, edible oils, staples, alcoholic and non-alcoholic beverages, bread and bakery, confectionery and packaged foods, among others. Trends in food consumption patterns obviously show the declining trend in cereals and increased consumption of vegetables, fruits, milk, meat, egg, fish, and edible oil (Balaji *et al*.,2019). Ice cream is the favorite dairy product for all, especially kids. It helps to relax the mind of human beings. Ice creamis a sweetened frozen food typically eaten as a snack or dessert. It may be made from dairy milk or cream and is flavored with a sweetener, either sugar or an alternative, and any spice, such as cocoa or vanilla. It can also be made by whisking a flavored cream base and liquid nitrogen together. Colorings are usually added, in addition to stabilizers. The mixture is stirred to incorporate air spaces and cooled below the freezing point of water to prevent detectable ice crystals from forming. The result is a smooth, semi-solid foam that is solid at very low temperatures (below 2 °C or 35 °F). It becomes more malleable as its temperature increases. Ice cream may be served in dishes, for eating with a spoon or licked from edible cones. Ice cream may be served with other desserts, such as apple pie, or as an ingredient in ice cream floats, sundaes, milkshakes, ice cream cakes, and even baked items, such as Baked Alaska. Fruity ice cream includes vanilla, fresh fruits, etc. The traditional ice cream here was from the olden days. Some of the benefits of ice cream are sources of vitamins, especially vitamin A, B-6, B-12, C, D, and K, sources of minerals such as calcium and phosphorous stimulates the brain, provides energy, etc., Most popular flavors of ice cream are vanilla, chocolate, butter pecan, strawberry, neapolitan, chocolate chip, french vanilla, cookies, and cream, etc., Understanding consumer choice is one of the complicated tasks because it involves a heterogeneous and critical type of individuals who may choose the products as per their own wishes. The marketing mix (4Ps) such as product, price, promotion, and place plays an effective role knowingly and unknowingly. The lack of marketing mix awareness in the market destroys the sales of the particular firm. Using the marketing mix concept will help increase sales in an effective manner. The specific objective of this paper is to investigate whether the socio-economic characteristics and the marketing mix (4P's) determinants will affect the consumer choice or not.

Guleria and Parmar. (2015) mentioned the definition of consumer preferences in article, such as measured by utility. Consumer preferences are defined as personal individual tastes of diverse

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bundles of products. They help the customer distinguish certain products bundles as per the levels of utility they offer the user. Consumer preferences are irrespective of product sales and costs. The right to buy products does not indicate the likes or dislikes of consumers. Marken. (2003) stated that two broad categories such as individuals in terms of personality, perception, learning, attitude, etc. The socio socio-cultural determinants like reference group, relatives, friends, sub culture, mass culture, etc., influenced the choice behavior of the consumer. Bennett. (1997) defined marketing mix asthe conversion of scheduling into daily routine in marketing.

Ares *et al.* (2010) conducted the research work about the influence of Non-sensory factors on consumer choice of functional yogurt over regular yogurt. He studied the three non-sensory factors such as brand, price, and health. He used choice-based conjoint to analyze the consumer choice. Finally, he concluded that consumers were health-conscious because they were more interested in keeping themselves very healthy and hygienic. Choices for consumers to price and brand were very less sensitive only. (Akbay and Tiryaki, 2008) attemptedconsumer preferences and patterns towards packed and unpacked fluid milk in Turkey. He used a multinomial logit model to analyze and collected data using across-sectional survey. He brought about that a maximum number of households consume unpacked milk from this study. Using the multinomial logit model, he found that unpacked milk had the positive relationship with household size, income of the family and age of the household head. Likewise, pasteurized and sterilized packed fluid milk had the positive relationship with income and education of the family.

MATERIAL AND METHODS

Primary data were collected from the 120 sample respondents of Tirupur district through -structured pre-tested interview schedulesin the urban area. Urban area people were more and more familiar with both fruity and traditional ice cream and also their frequency of buying these ice creams were also more This was the reason for selecting these types.

A binary logit model was used for investigating the choice preferences of ice creams. The dependent variable should be in binomial values “1” and “0”. The dependent variables used were fruity ice cream and traditional ice cream (i.e: prefer or notprefer). If the respondents prefer means “1” otherwise, it is “0”.

$$\text{Logit} = \log(P/1\text{-}P)$$

Where,

If P = Probability

Then, P/(1 − P) is the corresponding odds

The logit of the probability is the logarithm of the odds.

The independent variables as per the objectives were socio-economic and demographic characteristics such as age, family size, family income, gender, education, and the marketing mix variables such as product, price, place,andpromotion. Age, family size, and family income were the continuous variables. Gender, education, marketing mix variables such as product, price, promotion, and place were the categorical variables which werecollected in the form of affected or not affected types. If the consumer choice was varied because of that variable, it is “ affected” otherwise “not affected,” which was described in Table 1

Table 1: Variables and Description

Independent variables	Description of variables
Age	Age (years)
Family size	Number of members in the family
Family income(Rs.)	Average Monthly income of the family
Gender	Male=1, Female=2
Education	Illiterate:1, Primary:2, High school:3, Graduated:4, PG:5, Diploma:6
Marketing mix(4P’s) Product	Affected=1, Not affected=0
Price	Affected=1, Not affected=0
Place	Affected=1, Not affected=0
Promotion	Affected=1, Not affected=0

$$Y = a_1 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9$$

Where,

Y = consumer choice preferences of dairy products.

a_1 =Constant,

x_1 = Age,

x_2 = Family size,

x_3 = Family income,

x_4 = Gender,

x_5 = Education,

x_6 = Product,

x_7 = Price,

x_8 = Promotion,

x_9 = Place.

b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8 and b_9 = Coefficients

RESULTS AND DISCUSSION

Age plays a major role in preferring ice creams. Youngsters and middle aged adults prefer ice cream more than aged persons. Likewise, increasing children in the family also increases the buying frequency of ice cream. Increasing average monthly family income also increases the preference for different and creative types of ice cream products. Gender plays a major role in preferring ice creams because females usually prefer fruity ice creams and males prefertraditional ice creams. Highly educated people prefer nutritive products and they are mainly concerned about their health. Marketing mix variables also affect the choice of individuals' behavior (Ahmadi Kalijiet *al.*(2019). The figure 1 describes about the age, family size, family income, gender, and education characteristics of the sample respondents.

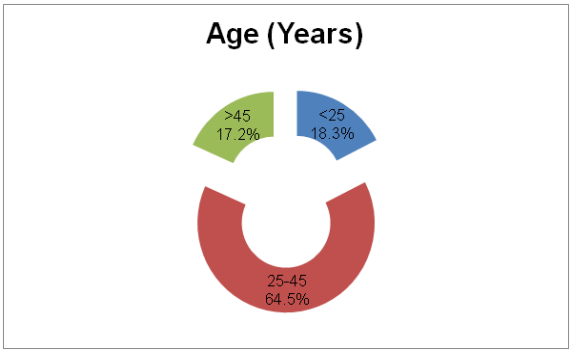

Figure 1. Age of the sample respondents described in years

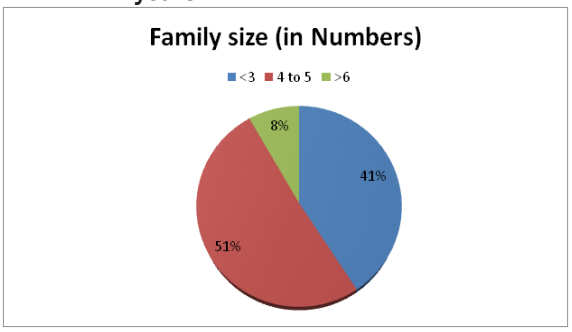

Figure 2. Total number of members in the family

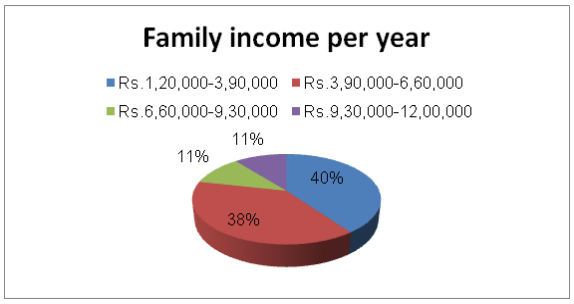

Figure 3. Annual family income (Rs/year)

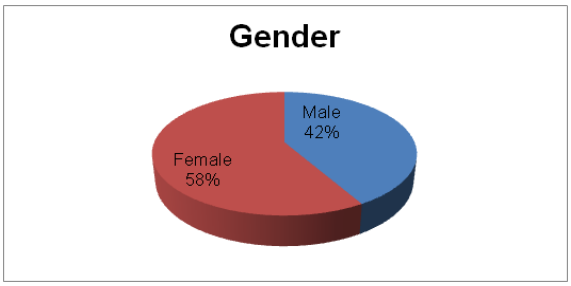

Figure 4. Gender type of the sample respondents

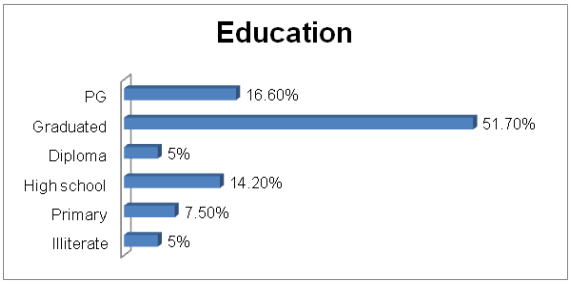

Figure 5. Educational qualification of the sample respondents

The above figures from 1 to 5, describe the socio-economic and demographic characteristics such as age, family size, family income, gender, and education. It could be inferred thatthe majority 64 per cent of the respondents, fell under the 25-45 year age were followed by the above 45years of age (18.3 per cent). Regarding family size, 51 per cent of respondents had 4-5 numbers in their family followed by <3 members (40.80 per cent). Nearly 40.00 per cent of respondents' family income came under the range of Rs 1, 20,000 to 3, 90,000 followed by those with family income of Rs 3, 90,000 to 6, 60,000 (38.40 per cent)., The majority of the respondents, were female 58.30 per cent. Nearly 52 percent of respondents were graduated, followed by Post Graduate (16.60 per cent) and secondary school education completed (14.20 per cent). The variables that influenced the choice and preferences of fruity ice cream and traditional ice cream were analyzed using the binomial logit model described in the following tables.

Choice preferences of Fruity Ice creamusing Logit Model

The variables which were influencing the choice and preferences of fruity ice cream were displayed in the table 2.

$$CoCh_{FRUITY\ ICECREAM} = CONSTANT_{7.7264} + AGE_{-0.3035} + FAMILY\ SIZE_{3.8755} + FAMILY$$

$$INCOME_{0.0000} + GENDER_{-5.6545} + EDUCATION_{0.0799} + PRODUCT_{10.2331} +$$

$$PRICE_{-5.6549} + PROMOTION_{3.3480} + PLACE_{7.1384}.$$

Table 2. Choice preferences offruity ice cream using Logit Model

	Fruity Ice cream		
Variables	**Coefficient**	**P>|z|**	**Marginal effect**
Constant	7.7264	0.278 ^{NS}	
Age	-0.3035	0.043**	0.0000
Family size	3.8755	0.062*	0.0122
Family income	0.0000	0.484 ^{NS}	0.0000
Gender	-5.6545	0.046**	-0.0048
Education	0.0799	0.921 ^{NS}	0.0000
Product	10.2331	0.046**	0.0084
Price	-5.6549	0.062*	-0.0016
Promotion	3.3480	0.079*	0.0013
Place	7.1384	0.050**	0.0022
Loglikelihood= -17.895188			
Prob> chi^2= 0.0059***			
Pseudo R^2= 0.5413			

(***, ** and * significant at 1%, 5% and 10%, ^{NS}- Not significant)

From table2, it could be inferred from the logit model that the p-value of 0.0059 and Pseudo R square of 0.5413 indicates the goodness of the overall model fit is statistically significant and also it predicts the better outcome. It explains the proportion of variables by 0.54 points in the dependent variable to the predictor of independent variables. The log-likelihood of fruity ice cream was -17.895188.

Age, gender, place, and product were significant at a 5% level of significance, followed by family size, price and promotion were significant at a 10% level of significance. The socio-demographic characteristics such as age, gender, and family size had significant relation with fruity ice cream. Among the marketing mix variables, product, price, promotion, and place had asignificant relation with fruity ice cream. Age, gender, and the price had anegative and significant relation with fruity ice cream. Family size, product, promotion, and place had asignificant and positive relation with fruity ice cream.

Age had a negative and significant effect on fruity ice-cream indicates that one unit increase of age will decrease the probability of choosing fruity ice cream by 0.000 per cent points. According to this, young age people prefer more fruity ice cream than old age people. Family size had positive and significant relation with fruity ice cream which indicates one unit of family size increase will increase the probability of choosing fruity ice cream by 0.012 per cent points. It shows that increasing the family size also increasesthe preference level of fruity ice cream. Gender had a negative and significant impact on fruity ice cream by 0.004 per cent points. It indicated that females preferred and were attracted to the fruity ice cream.

The product also had apositive and significant effect on fruity ice cream indicates that one unit increase of product will increase the probability of choosing this product by 0.008 per cent points. The result indicated that people preferred well quality ice cream parlors over others even though the price was high. Price also had anegative and significant effect on fruity ice cream which indicates that one unit increase of price will decrease the probability of choosing fruity ice cream by 0.001 per cent points. The result indicated that high prices decrease the probability of preferring the products. The promotion had a significant and positive relation with fruity ice cream which indicates that one unit increase of promotion will increase the probability of choosing fruity ice cream by 0.001 per cent points. It indicates that television related ice cream advertisements will attract the customer towards the product. Place had significant and positive relation with fruity ice cream which indicates that one unit increase of place will increase the probability of choosing fruity ice cream by 0.002 per cent points. It indicates that people prefer only short distance travel (nearby shop).

Dairy products vary with age. Family size increased the choice of choosing cheese dairy products Ahmadi Kaliji *et al.*(2019). A high price was the major constraint in purchasing milk products. Media was an important source for creating awareness of aroma milk products. Dhanya *et al.* (2018). The place also influenced the probability of consumer choice in choosing traditional ice cream Ahmadi Kaliji *et al.* (2019).

It was very clear that young aged and female consumers prefer more ice cream than old aged and male consumers. Increasing family size will increase the preference level. But increasing price also affects the preference level. Advertisement plays a major role in motivating consumers to prefer ice cream. Consumers prefer ice cream parlorsto get morevarieties in ice cream. Maintaining the advertisement and increasing the frequency of advertisement also enhance the sales of ice cream.

Consumer Choice preferences of Traditional Ice cream using Logit model

The traditional ice cream was nothing but which were used from the earlier period onwards as per peer-reviewed article (Ahmedi *et al.*,2019). The variables that influenced the choice and preferences of traditional ice cream were displayed in Table 3.

$$CoCh_{TRADITIONAL\ ICECREAM} = CONSTANT_{-7.9847} + AGE_{0.0176} + FAMILY\ SIZE_{0.2732} + FAMILY$$

$$INCOME_{-4.6251} + GENDER_{0.9358} + EDUCATION_{0.3382} +$$

$$PRODUCT_{1.4041} + PRICE_{-1.3026} + PROMOTION_{4.9346} + PLACE_{-0.1900}.$$

Table 3. Choice preferences oftraditional ice cream using logit model

	Traditional Ice cream		
Variables	**Coefficient**	**P>|z|**	**Marginal effect**
Constant	-7.9847	0.119	
Age	0.0176	0.582 ^{NS}	0.0043
Family size	0.2732	0.249 ^{NS}	0.0674
Family income	-4.6251	0.010***	-0.3454
Gender	0.9358	0.040**	0.2310
Education	0.3382	0.098*	0.0835
Product	1.4041	0.007***	0.3364
Price	-1.3026	0.024**	-0.3146
Promotion	4.9346	0.009***	0.0389
Place	-0.1900	0.728 ^{NS}	-0.0467
Log likelihood= -63.523356			
Prob> chi^2=0.0102***			
Pseudo R^2=0.2324			

(***, ** and * significant at 1%, 5% and 10%, ^{NS}- Not significant)

It could be inferred from the logit model of table 3, regarding ice cream, the p-value of 0.0162 and Pseudo R square of 0.2324 indicates the goodness of overall model fit is statistically significant and also it predicts the better outcome. It explains the proportion of variable by 0.23 points in the dependent variable to the predictor of independent variables. Family income, product, and promotion were significant at a 1% level of significance followed by gender and prices were significant at a 5% level of significance, and education was significant at a 10% level of significance. The socio-demographic characteristics such as family income, gender, and education had asignificant relation with preference of traditional ice cream. Family income had a negative relation with traditional ice cream. Among the marketing mix variables, product, price and promotion had apositive significant relation with traditional ice cream.

Family income had negative and significant with traditional ice cream. Family income decreased the probability of choosing traditional ice cream by .345 per cent points. Family income affected the choice of traditional ice cream. Gender had positive and significant relation with traditional ice cream which indicates one unit of product quantity increase will increase the probability of choosing traditional ice cream by 0.231per cent points. It shows that men prefer traditional ice cream tofemale. Education of product had positive and significant relation with traditional ice cream which indicates one unit of education increase will increase the probability of choosing traditional ice cream by 0.083 per cent points. It shows that all types of educated people preferred traditional ice cream.

The product had a significant and positive relation with traditional ice cream which indicates that one unit increase of product variable will increase the probability of choosing traditional ice cream by 0.336 per cent points. It indicates that people preferred the low-cost and high-quality products. The promotion had a significant and positive relation with traditional ice cream, which indicates that one unit increase of promotion will increase the probability of choosing ice cream by 0.389 per cent points. It indicates that television-related ice-cream advertisements will attract the customer towards the product. However, the price had negative and significant effect on traditional ice-cream indicates that one unit increase of price variable will decrease the probability of choosing traditional ice cream by 0.314 per cent points. According to this, high price decrease the probability of preferring the products.

According to the study of Ahmadi Kaliji *et al.*(2019), concluded that family living costs had negative and significant relation with stick ice cream. The ice cream was mostly preferred by the middle-level income group followed by the high-income group Bhavyabhanu *et al.* (2017). Quality and taste werethe most key factors in preferring dairy products by consumers Ahila and Boopathi. (2015).A high price was the major constraint in purchasing aroma milk products.Media was an important source for creating awareness of aroma milk products. Dhanya *et al*.(2018).

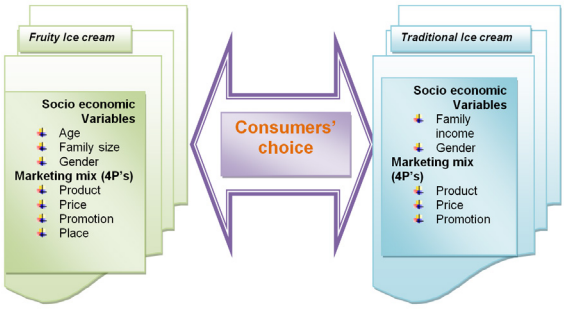

Fig 6. Consumer Choice Preference Model

CONCLUSION

Young aged and female consumers prefer more ice cream than old aged and male consumers. Increasing family size will increasethe preference level. But also increasing price also affects the preference level. Advertisement plays a major role in motivating the consumers to prefer traditional ice cream. Consumers prefer nearby shop for getting more number of varieties ofice cream. Maintaining the advertisement and increasing the frequency of advertisement also enhance the sales of ice cream. All types of educated consumers prefer traditional type of ice cream especially for relaxation, relieving stress, etc. Men had a higher tendency to prefertraditional ice cream than females. The good taste of ice cream and the good taste of ice cream

will enhance the customers to prefertraditional ice cream. Premium price affects the choice of consumer towards traditional ice cream. Maintaining the quality of the product and also affordable price will increase the sales and preference level of all consumers. By comparing the fruity and traditional ice creams, the result showedthat women prefer fruity ice cream tomen. Likewise, men prefer traditional ice cream towomen. Premium price affects the choice preferences towards both the ice cream. Product attributes like taste, quality, etc., and promotional activities like advertisement, and sales promotion attracted the customers towards the ice cream.

REFERENCES

Ahila, D. and Boopathi, C. 2015. Consumer behavior on Aavin milk and dairy products in Pollachi taluk of Tamil Nadu. *Inter.J of commerce, business, and mgt.,* **4**:774-778.

Ahmadi Kaliji, S., Mojaverian, S.M., Amirnejad,H., and M. Canavari 2019. Factors affecting consumers' dairy products preferences.*AGRIS on-line Papers in Eco and Informatics.,***11** (665-2019-4000):3-11.

Akbay, C., and Tiryaki G.Y. 2008. Unpacked and packed fluid milk consumption patterns and preferences in Turkey.*Agrl Economics.,***38 (1)**:9-20.

Ares, G., Giménez,A., and Deliza,R. 2010. Influence of three non-sensory factors on consumer choice of functional yogurts over regular ones.*Food quality and preference.,* **21 (4)**:361-367.

Balaji ,P.,.Karthikeyan,C., and Shakthirama,V. (2019). Retailers and Consumers Perspectives towards Food Retail. *Madras Agric. J.,* **106(1-3)**: 130-136

Bennett, A.R. 1997. The five Vs-a buyer's perspective of the marketing mix.*Marketing Intelligence & Planning.,***15(3)**, 151-156.

Bhavyabhanu, P., Pandian,A., Vinothini,P., and Mathanghi,S. 2017. Analysing the Consumer Preference for Dairy Products in Trivandrum City, India. *Inter J of Sci, Environ and Techn.*, **6, (1)**: 650-654.

Dhanya *et al.*, 2018. An Overview Of Consumer Buying Behavior Towards Aroma Milk Products In Coimbatore District, Tamil Nadu.*Inter. J of Advances in Agrl Sci and Tech.*, **5 (7)**: 109-123.

Guleria, D., and Parmar,Y.S. 2015. A study of consumer preference for smartphone: A case of Solan town of Himachal Pradesh. *International J of manage research & review*.**,5 (3)**:193-200.

Marken, G.A. 2003. Emotional branding: how successful brands gain the irrational edge. *Public Relations Quarterly* **48 (2)**:12.

https://en.wikipedia.org/wiki/Ice_cream