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Factors Affecting Consumers' Dairy Products Preferences

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Abstract

Choice models represent a valid approach for the analysis of consumers' preferences as these models offer an opportunity to investigate many aspects that influence consumer behaviour. This study with the purpose of investigating consumers' preferences and their affecting factors were conducted by using the nested logit model in Sari, Iran in 2018. The results revealed that yoghurt, milk and cheese had the most preferences among the dairy products and consumers had more tendencies towards using low fat than full-fat dairy products. The results of factors affecting dairy products choice indicated that price and family cost decreased the probability of products being chosen, and age, education and attention to exercise variables increased this probability. Marketing mixed variables (4p) also had a significant effect on the choice of dairy products.

Keywords

Consumer preferences, nested logit model, marketing mix, dairy products.

Ahmadi Kaliji, S., Mojaverian, S. M., Amirnejad, H. and Canavari, M. (2019) "Factors Affecting Consumers' Dairy Products Preferences", *AGRIS on-line Papers in Economics and Informatics*, Vol. 11, No. 2, pp. 3-11. ISSN 1804-1930. DOI 10.7160/aol.2019.110201.

Introduction

Effective and efficient management of the relationship with customers is one of the most important issues for marketers (Barone et al., 2000). The marketing strategy aims to identify and meet consumer preferences, which drive consumer purchasing decisions. Preferences complement the characteristics and needs of consumers in explaining their behaviour (Spacey, 2016). Marketing managers can increase the competitiveness of their company and guarantee its long-term survival by understanding consumer behaviour towards differentiated and high-quality products (Hanaysha, 2018; Canavari et al., 2010).

Choice models are applied to understand the decision-making process of individuals. Alternative theoretical models, such as utility maximisation, are used in econometrics, marketing, socio metrics and other fields. (CIE, 2001). Discrete choice models represent a valid approach for the analysis of consumers' preferences as these models offer the opportunity to investigate many aspects that influence consumer behaviour, especially if applied in the field of food marketing research (Louviere et al., 2000). Some discrete choice models have been specified for particular purposes. The multinomial logit model is considered

the workhorse of discrete choice models, although its assumptions are quite restrictive. The nested logit model introduces a partial relaxation on assumptions that limit other logit models. In nested logit models, similar alternatives are grouped together into different nests and then arranged in order of rank (Ben-Akiva and Lerman, 1985; Train, 2009). In a nested logit model, the distribution of error components of the choice alternatives could be different. The pattern of classified alternatives into nests with respect to their similarities and tree structure is different from a stochastic valuation of alternatives within the scope of a decision tree (Hensher et al., 2005).

In this study the factors that affect consumers' choice and preferences are analyzed by using a nested logit model. The case study focuses on dairy products. Dairy is one of the most important products of livestock and it can affect people's health (Rahnama and Rajabpour, 2017). Recommendations for consumption of dairy products are 2 to 3 servings or cups of milk or other dairy products per day (Weaver, 2014). Energy, proteins, calcium, vitamins, cholesterol, riboflavin, carbohydrate and other useful nutrients are provided by dairy products (Dror and Allen, 2014). Milk products come from a variety of sources.

A survey of global milk production has shown that about 81 per cent of the world's milk comes from cows.

In 2017 India, China and Turkey were the leading producing countries in Asia, while Iran ranked seventh. Dairy product consumption in Iran reveals that the trend is positive (FAO, 2017). The study is based on data collected in Sari, the most highly populated city in Mazandaran province, in the north of Iran. The Northern areas of Iran are interesting because they have the highest production of dairy products (Beldman et al., 2017). While dairy production is growing, previous studies indicate a decreasing trend in milk consumption in Iran (Beldman et al., 2017).

Consumer buying behaviour of dairy products is becoming an attractive topic for researchers (Samoggia, 2016; Haas et al., 2016). In the literature, consumers' buying behaviour is considered to be closely linked to individual preferences. However, in some studies, also demographic characteristics are shown to affect consumer preference for dairy products (Shokrvash et al., 2015).

In a recent study, Yayar (2012) applied a multinomial logit model to investigate consumer preferences for packed and unpacked fluid milk in Turkish households. Education level of households, number of children, income and household size positively affected the consumption of packed milk. Allen and Goddard (2012) surveyed individual preferences for milk and yoghurt with specific attributes using Ordered Probit regressions. Results showed that purchasing and consumption intentions of milk and yoghurt products are predictable by using some aspects of the Health Belief model and general nutrition knowledge. Investigation of consumption patterns of dairy products by Bousbia et al. (2017) revealed that, regardless of the type of household, pasteurised milk and yoghurt have the biggest share in dairy product purchases. Geographical location, number of children per household, price and monthly income were important factors driving milk consumption in this province.

Bhanu et al. (2017) studied consumers' preferences for dairy products in Trivandrum city (India) and revealed that almost all the households in the sample, irrespective of income level, preferred whole fluid milk. Among the dairy products, curd was preferred by all the sample households. Ice-cream was the second most preferred dairy product, followed by ghee, butter, paneer and cheese. The reasons for preferring whole milk were taste, satisfaction, quality, availability, low price and bulkiness. Assan (2017) found

that in Eastern Cape province, South Africa, consumption patterns of milk and its processed products are influenced by the households' demographic characteristics, such as household size and composition, gender and marital status. Furthermore, income turned out to be more important than the household location for milk products consumption, since its consumption will increase according to income level.

Materials and methods

This research considered consumers' preferences under the Nested Logit model. This model groups similar alternatives into nests and creates a hierarchical structure for decision (Ben-Akiva and Lerman, 1985). Let c denote a dairy product and $P_{c|t}$ be the probability that product c is chosen by someone who decides to purchase a type of dairy product (denote t). This probability is influenced by a number of factors, or independent variables. The consumer demographic characteristics considered in the questionnaire are age, gender, household size, education (based on 7 levels of education degrees), occupational status (based on 6 levels). We also considered economic, attitudinal, and behavioural characteristics, such as average of monthly family costs of living (based on 5 levels) as disposable income, importance level of exercise for consumers (5 levels based on a semantic scale), awareness about importance of dairy products (3 levels), their dairy products brand preferences (rated with scores from 1 to 9), their sensitivity to dairy products price. Finally, in this study we also considered whether the 4 marketing mix elements affect their brand choice. The marketing mix is most commonly implemented through the so-called 4 P's of marketing: **Price**, **Product**, **Place** and **Promotion**. Price is about dairy products value, Product as quality, packing, etc., Place as access to shopping and Promotion as brand reputation, loyalty and advertising. In our model, these four variables are measured as dummy variables (0 or 1), where the value is 0 if the element, according to respondents, does not affect consumer preference and 1 if it does affect it.

Under the usual multinomial logit model, the choice of dairy products (c) conditional on the type of products is (Danaher and Dagger, 2012):

$$P_{c|t} = \frac{e^{\beta_c x_c}}{1 + \sum_{i=1}^C e^{\beta_{c_i} x_{c_i}}} \quad (1)$$

where c ranges from 1 to 16, which is the indicator of the main suggested dairy products in the last level of the tree (such as low-fat and full-fat yoghurt, natural and lactic cheese, see Figure 1). In the nested logit structure we used, the probability of choosing any of these products is given by (Danaher and Dagger, 2012):

$$P_t = \frac{e^{\beta_c x_c + \eta_t}}{1 + e^{\beta_c x_c + \eta_v}} \quad (2)$$

where I_v is the expected maximum utility (known as the inclusive value) that a person derives from purchasing types of dairy products that are defined as (Ben-Akiva and Lerman, 1985):

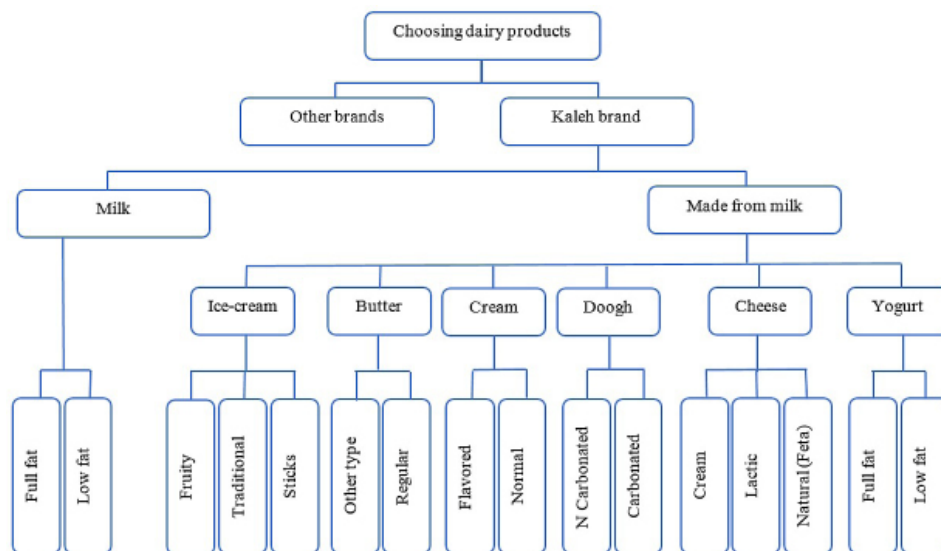
$$I_v = \log\left(1 + \sum_{i=1}^C e^{\beta_{ci} X_{ci}}\right) \quad (3)$$

This parameter is a dissimilarity parameter. It can be considered as a measure of the dissimilarity of alternatives or nests. McFadden (1980) showed that the nested logit model is consistent with the random utility maximisation. Borsch-Supan (1990) revisited the compatibility of the nested logit model with the utility maximisation principle and showed that the nested logit model can still be compatible with a random utility-based choice model for dissimilarity parameters greater than one (Davis et al., 2014) (Table 1).

Independent variables	Describes
Age	Years
Gender	male=1 and female=0
Family size	Count
Education	1-Illiterate, 2-Before diploma, 3-Diploma, 4-Associate, 5-Bachelor, 6-Master, 7-Doctoral
Occupational status	1-Unemployed, 2-Academic student, 3-free job, 4-Farmer, 5-Employee and 6-Other
family costs	1-less than 500 thousand Tomans* (T), 2-Between 500 thousand to 1 million T, 3- Between 1 to 2 million T, 4-Between 2 to 3 million T and 5-More than 3 million T
Exercise importance	Very low=1, Low=2, moderate=3, high=4, very high=5
People awareness about dairy products	Low=1, moderate=2, high=3
Brand preferences	Rating score from 1 to 9
Products price	10 Rials (Tomans)
4P variables	
Product	Affected=1 and not affected=0
Price	Affected=1 and not affected=0
Place	Affected=1 and not affected=0
Promotion	Affected=1 and not affected=0

Source: own processing

Table 1: Description of the independent variables used in this study.



Source: own processing

Figure 1: Suggested Nested Logit tree for the dairy products considered in this study.

The data was collected using a face to face survey administered in winter 2018 in Sari, Iran. To define the sampling method, we used a Cochran's sample size Formula and the simple random sampling method. About 30 pre-test questionnaires were collected to estimate the sample variance, and the calculated variance was 0.179. Based on this value and the Cochran formula, the sample size has been set to 275. To estimate the nested logit model we used the NLOGIT (5) software.

Results and discussion

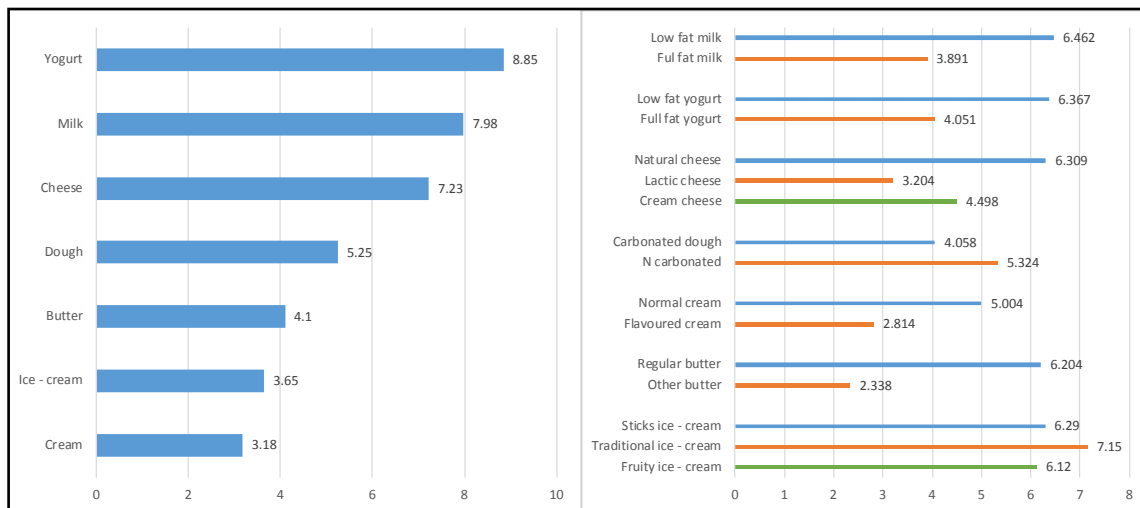
The descriptive statistics shown in Table 2 reveal that the people's average age in the group was about 42 years old. The minimum and maximum of respondents were 20 and 70 years old, respectively. There were more men than women. The average family size was around 3 persons, and the most was 7 persons. The result of education level showed that most respondents had a bachelor degree and government jobs. Family life cost between 1 to 2 million Tomans¹ were the most frequent. Other results indicated that respondents had an average tendency to exercise and their awareness of the importance of dairy products was low. The Kaleh company brand had maximum preferences among other dairy producers' brands. The data about the relevance of marketing mix variables showed that the stated relevance of "product" (that is, questions about quality, packaging, freshness and differentiating with other products) and "price" had more effect on people's choice than the stated relevance of the "place" and "promotion" 4p elements. Survey results of people's dairy preferences revealed that yoghurt, milk and cheese were the most preferred among other dairy products. Comparing low fat and full-fat products showed that, in the case of milk and yoghurt, consumers tend to use low-fat products. Average preferences for low fat and full-fat milk were 6.46 and 3.89, respectively, while preferences for low fat and full-fat yoghurt were 6.37 and 4.05, respectively (Figure 2).

Independent variables	Min	Max	Average	Percent of total
Age	20	70	42.396	
Gender	0	1		
Male				57
Female				43
Family size	1	7	3.294	
Education	1	7		
Illiterate				1.5
Before the diploma				9
Diploma				23
Associate				18
Bachelor				29
Master				12
Doctoral				7.5
Occupational status	1	5		
Unemployed				5
Academic student				10
Non-government				32
Farmer				14
Employee (govern.)				39
Family costs	1	5		
< 500 thousand Tomans				9
0.5 - 1 million T				24
1 - 2 million T				33
2 - 3 million T				23
> 3 million T				11
Willingness to exercise	1	5		
Very low				10
Low				24
Moderate				40
High				21
Very high				5
People awareness	1	3		
Low				64
Moderate				21
High				15
Brand preferences	1	9		
Low (1-3)				13
Moderate (4-6)				40

Source: research findings

Table 2: Descriptive Statistics of the variables used in the model.

¹ Toman= 10 Rials



Source: research findings

Figure 2: Dairy product preferences (1 to 10, 1= very low).

Table 3 shows the estimated results of the model and enabled identification of some of the factors affecting people's preferences. The results indicate that a higher price decreased the probability of choosing dairy products and a 1-unit increase of this variable decreased this probability by 0.31 percentage points. Bhanu et al. (2017), Assan (2017) and Bousbia et al. (2017) also indicated that increasing price negatively affects consumers' preferences for the alternative. Results also show that for every product age, family size, education, exercise and the 4p product variable are statistically significant and increased the probability of choosing milk. The age variable is the most affecting factor. High family living costs decreases the choice probability for low-fat yoghurt, while age and education level variables increase this probability. In other words, according to our results, old people tend to choose low-fat yoghurt more than young people.

Meanwhile, the result for full-fat yoghurt showed that factors such as gender had a negative and significant effect on consumers' choice. It showed that men had a lower tendency than women to choose full-fat yoghurt. The preferences for the Kaleh brand, product and price (as for 4p) variables had positive and significant effects on full-fat yoghurt choice. The "Price" variable, as one of the marketing mix variables, had the most substantial effect on this probability, with a coefficient of 0.43 percentage points. Among the variables that affected the choice of cheese, the family living cost variable decreased the choice probability of natural and lactic cheese, and variables such as gender and price (4p)

decreased the probability of cream cheese choice. Family size and price (4p) increased the probability of choosing natural cheese. Kaleh brand preference increased choosing of lactic cheese and promotion variable (4p) increased choosing of cream cheese. The results for the Doogh product reveal that age, family size, education and product (4p) variables increased choosing probability, while family size had the most effect on this probability. The "gender" variable increased choosing probability for normal cream and family cost and price (4p) variables decreased this probability. The "cost" variable by 0.70 percentage points had the most effect on this probability. In the case of butter products, age, education level, price (4p) variables increased choosing probability of regular butter, and that age variables had the most effect on this. Factors such as gender and family living costs decreased, Kaleh, brand preference and price (4p) increased choosing probability for ice-cream on sticks. In the case of traditional ice-cream, four factors of promotion, education, price and place increased choosing probability.

Results of the estimation of the inclusive value coefficients are illustrated in Table 4. These coefficients are known as dissimilarity parameters, and they can be considered as a measure of the dissimilarity of alternatives or nests. Results indicated that **all of the coefficients were significant and nests were independent**. It confirms our nested structure based on Figure 1.

Products	Variables	Coefficient	Standard deviation	Z	Marginal effect (percent)
Total products	Price	-1.417***	0.593	-2.39	-0.308
Low fat milk	Age	5.655***	2.077	2.72	1.230
	Family size	1.254***	0.323	3.88	0.273
	Education	0.482**	0.247	1.96	0.105
	Exercise	-1.226***	0.247	-4.97	-0.267
	Product (4p)	1.326*	0.789	1.68	0.288
Yogurt low fat	Age	1.261***	0.512	2.47	0.274
	Education	0.927*	0.55	1.69	0.202
	Cost	-1.244*	0.715	-1.74	-0.271
Yogurt full fat	Gender	-4.249*	2.365	-1.80	-0.924
	Brand	1.620*	0.881	1.84	0.352
	Product (4p)	1.768*	1.004	1.76	0.384
	Price (4p)	1.965**	0.918	2.14	0.427
Natural cheese	Cost	4.812***	1.549	3.11	1.047
	Family size	5.111***	1.762	2.90	1.112
	Price (4p)	2.052**	0.989	2.07	0.446
Lactic cheese	Cost	-3.664***	1.005	-3.64	-0.797
	Brand	1.729***	0.518	3.34	0.376
Cream cheese	Gender	-1.431***	0.555	-2.58	-0.311
	Price (4p)	-4.061***	1.276	3.18	-0.883
	Promotion (4p)	1.746**	0.884	1.97	0.380
N-carbonated doogh	Age	0.456***	0.201	2.27	0.099
	Family size	3.132**	1.448	2.16	0.681
	Education	0.792*	0.462	1.72	0.172
	Product (4p)	2.165**	1.027	2.11	0.471
Normal cream	Gender	0.965**	0.505	1.91	0.21
	Cost	-3.212***	1.436	-2.24	-0.699
	Price (4p)	-1.846**	0.884	-2.09	-0.401
Regular butter	Age	4.062*	2.284	1.78	0.883
	Education	2.644***	0.786	3.36	0.575
	Product (4p)	-1.433*	0.764	-1.87	-0.312
	Price (4p)	0.751*	0.414	1.81	0.163
Other butter	Gender	4.026*	2.264	1.78	0.876
Sticks ice-cream	Gender	-6.408*	3.784	-1.69	-1.394
	Cost	-0.782*	0.428	-1.83	-0.170
	Brand	1.335*	0.260	5.12	0.290
	Price (4p)	0.246***	0.076	3.26	0.053
Traditional ice-cream	Family size	2.413***	1.003	2.40	0.525
	Education	1.753***	0.768	2.28	0.381
	Price (4p)	0.761***	0.347	2.19	0.165
	Place (4p)	2.009*	1.138	1.77	0.437
Fruity ice-cream	Family size	7.043*	4.032	1.75	1.532
	Price (4p)	-3.075***	1.246	-2.47	-0.669

Note: ***, ** and * indicate significant at the 1%, 5% and 10% significance level, respectively.

McFadden Pseudo R² = 0.58, Chi squared = 7.44, Log likelihood function = -26.31

Source: research findings

Table 3: Nested logit model estimation results.

	Nest	Coefficient	Standard deviation	Z statistics
Second level	Yogurt	0.852***	0.261	3.26
	Cheese	0.678***	0.279	2.43
	Doogh	0.468**	0.242	1.93
	Cream	0.497***	0.224	2.22
	Butter	0.503*	0.279	1.80
	Ice-cream	0.566*	0.324	1.75
Third level	Milk products	1.428*	0.870	1.64
	Milk final consumption	0.712**	0.368	1.94
Fourth level	Company brand	2.154***	0.923	2.33
	Other brand	1.514***	0.722	2.10

Note: ***, ** and * indicate significant at the 1%, 5% and 10% significance level, respectively.

Source: research findings

Table 4: Estimation results of inclusive value coefficient.

Conclusion

To understand the decision-making process of an individual or stated preferences made in a particular context or contexts, we can use choice models. This study estimated factors that affect consumers' dairy products choice and preferences in Sari, a city in the north of Iran, by using a nested logit model as a choice model. The result of consumers' dairy preferences indicated that yoghurt, milk and cheese had the most preferences among other dairy products and consumers' tended to use low-fat products. The estimation results of affecting factors on consumers' preferences showed that price variable decreased the probability of this choice. Bhanu et al. (2017), Assan (2017) and Bousbia et al. (2017) also indicated that the price variable may be a negative factor, affecting consumers' preferences. This variable had the same effect on dairy consumption in all the cities in Iran (Chizari et al., 2015).

The analysis of factors affecting consumers' preferences showed that, among demographic variables, consumers' age, gender, family size, education level and life cost all had a significant effect on their choice and preferences. Increasing age changed preference for choosing low-fat yoghurt, n-carbonated doogh, regular butter and low-fat milk. This effect could be related to life cost and health concerns. The number of family members affected consumers' preferences when choosing five products of low-fat milk, natural cheese, n-carbonated doogh, traditional and fruity ice-cream. Increasing numbers of children in the household changed their preferences to using other types of ice-cream. The development of education level affected choosing low-fat yogurt and milk. Actually,

higher level of education led to preference for low fat products. Because of the positive correlation between education and the importance of the exercise variable, persons who did more exercise, preferred to choose low fat milk. Living cost had the most effect on choosing natural cheese. This means that' preferences change towards buying lower price cheese. Mousavi et al. (2016) revealed that these variables had the same effect on preferences of dairy consumers in Tabriz (north-west of Iran) and Shiraz (south of Iran). Brand names of dairy products were one of the important effective factors on willingness to consume some dairy products. In our case study, the Kaleh brand preference increased the probability of choosing lactic cheese and promotion (4p) increased choosing of cream cheese. Findings of a previous study in Karbasi and Aghasafari (2017) in Mashhad (north-east of Iran) revealed that the brand of dairy products increased consumption of dairy products. The history and experience of the dairy brand also increased this preference in Tehran and in the North cities of Iran (Mahdavi et al., 2013). The 4p marketing mix show that product (4p) had the greatest effect on choosing n-carbonated doogh brand and price had the most effect on choosing cream cheese brand., especially in the dairy market By using these results Marketing managers can improve their products based on consumers' preferences.

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