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Original Article

Evaluating the Effects of Utilitarian and Hedonic Drivers on Milk Consumption: A Structural Equation Modeling Approach

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ABSTRACT

The study investigated the utilitarian and hedonic motives driving consumer milk consumption in the TRA1 region, and analyzed their direct and total impacts on their consumption satisfaction. Primary data were collected from 765 households in the TRA1 region. Structural interactive regression model was applied to examine the relationships among the factor dimensions validated by Confirmatory Factor Analysis. The structural models demonstrated acceptable fit based on established criteria. The results of the study indicated that the hedonic motives of reliability and brand image, influenced by consumer concerns regarding hygiene, reliability, and milk source, explained 33.4% of the variance in milk consumption satisfaction and had a 36.6% total effect. The utilitarian drivers of hygiene, milk source and content, and sensory quality, were influenced by concerns related to reliability, hygiene, milk source and content, and brand image. These utilitarian factors explained 72.7% of the variance in satisfaction and exhibited a 44.5% total effect within the SIRMs.

Key words: Brand image, Climate change, Concern attribute, Sensory motive, Structural interavtive regression model

Faydacı ve Hazcı Motiflerin Süt Tüketimi Üzerindeki Etkilerinin Değerlendirilmesi: Yapısal Eşitlik Modelleme Yaklaşımı

ÖZ

Bu çalışma, TRA1 bölgesinde süt tüketimini etkileyen faydacı ve hedonik motivasyonları incelemiş ve bunların tüketim memnuniyeti üzerindeki doğrudan ve toplam etkilerini analiz etmiştir. Birincil veriler, TRA1 bölgesindeki 765 haneden toplanmıştır. Doğrulayıcı Faktör Analizi ile geçerliliği kanıtlanmış faktör boyutları arasındaki ilişkileri incelemek için Yapısal Etkileşimli Regresyon Modeli kullanılmıştır. Yapısal modeller, belirlenmiş kriterlere göre kabul edilebilir düzeyde uyum göstermiştir. Çalışmanın sonuçları, tüketicilerin hijyen, güvenilirlik ve süt kaynağına ilişkin endişelerinden etkilenen güvenilirlik ve marka imajı gibi hedonik motivasyonların, süt tüketim memnuniyeti varyansının %33,4'ünü açıkladığını ve %36,6 toplam etkiye sahip olduğunu göstermiştir. Güvenilirlik, hijyen, süt kaynağı ve içeriği ve marka imajı ile ilgili endişelerden etkilenen hijyen, süt kaynağı ve içeriği ile duyusal kalite gibi faydacı faktörler, memnuniyet varyansın %72,7'sini açıklamış ve SIRMs dahilinde %44,5 toplam etki ortaya çıkarmıştır.

Anahtar kelimeler: Marka imajı, İklim değişikliği, Endişe niteliği, Duyusal motif, Yapısal interaktif regresyon model

INTRODUCTION

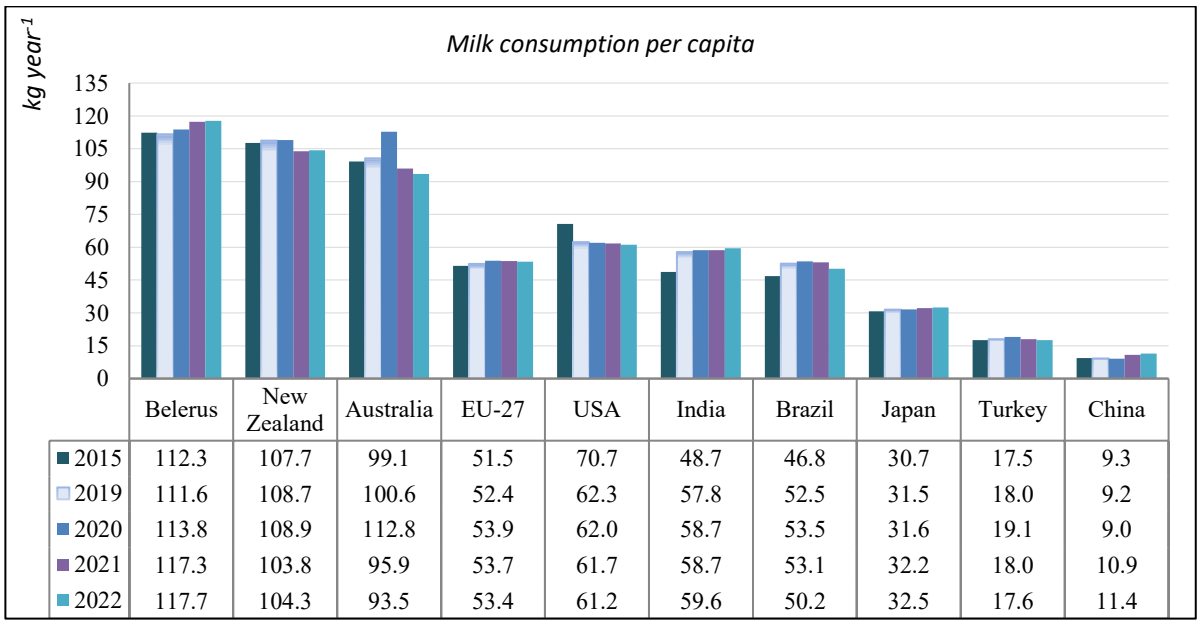
Food safety and security triggered by global climate change have adversely created on consumers' access to food products and their consumption patterns for the last decade (Li et al., 2022; Topcu and Elmi, 2023; Topcu, 2024; Parveen et al., 2025). The last researches showed that the animal-based food production and consumption were of much more negative impact on global climate change by increasing their ecological footprint that not

only resulted from land use change, feed production, manure emits, water and energy sources used in livestock farms and food industries, but also caused by carbon emission released in the animal products' consumption (Ritchie et al., 2018; Parveen et al., 2025). In other words, animal production (milk and milk product, meat and meat products) has considerably increased the ecological footprints, and then it has been constantly contributed to CO2 emission raise at their processing, marketing, retailing and consumption stages (Harguess et al., 2020; Topcu and Elmi, 2023; Topcu, 2024).

The relationship between milk production and consumption, and climate change has led to significant shifts in consumers dietary preferences over the last decade. Consumers have been increasingly favoring fruit and vegetable-based products over animal-based products (Ritchie et al., 2018; Li et al., 2022). This trend has been reflecting in dietary instructions in developed countries, which advocate for a shift from animal-based to plant-based diets as a strategy to mitigate environmental issues and combat climate change.

Dietary guidelines now emphasize the importance of mixed diets that prioritize plant-based foods while reducing animal-based products. This approach aims to minimize the negative impact on the environment. As a result, plant-based milk alternatives, such as soy, coconut, hemp, rice, pea, peanut, and oat milk, have been gaining popularity as substitutes for animal milk (Ritchie et al., 2018; Topcu, 2024). The past few years, therefore, have witnessed the emergence of sustainable consumption patterns, with a growing emphasis on mixed plant-based diets. In developed country (Australia, New Zealand, USA and EU-27), per capita consumption of animal-based milk has gradually declined since 2020. However, in developing and underdeveloped countries (China, India and Belarus) where traditional diets are prevalent, individual milk consumption has generally increased as mentioned in Figure 1 (Ritchie et al., 2018; TEPGE, 2023; CLAL, 2024).

Under intertwined impacts of climate change and the Covid-19 outbreak, milk consumption perception and purchasing patterns of developed and developing societies have completely differed from each other, and thus it has been exhibited reginal purchasing attitudes on milk consumption. It was also reported that the animal-based milk consumption was increasing in developing countries as compared to the developed countries, as well (Burnier et al., 2021; Topcu and Elmi, 2023; Topcu, 2024; Parveen et al., 2025). This increasing consumption of milk in developing countries is mainly correlated with rising urbanization, changing income and living styles, varying eating practices and consumer priorities triggered by utilitarian and hedonic motivation (Neima et al., 2021).



	Belerus	New Zealand	Australia	EU-27	USA	India	Brazil	Japan	Turkey	China
2015	112.3	107.7	99.1	51.5	70.7	48.7	46.8	30.7	17.5	9.3
2019	111.6	108.7	100.6	52.4	62.3	57.8	52.5	31.5	18.0	9.2
2020	113.8	108.9	112.8	53.9	62.0	58.7	53.5	31.6	19.1	9.0
2021	117.3	103.8	95.9	53.7	61.7	58.7	53.1	32.2	18.0	10.9
2022	117.7	104.3	93.5	53.4	61.2	59.6	50.2	32.5	17.6	11.4

Figure 1. Annual milk consumption per capita (kg year^{-1})

These concurrent crises have considerably reshaped consumers' attitude and purchasing patterns with the relative importance of traditional utilitarian and hedonic motivators. In other words, consumers' milk consumption satisfaction is more complex and multifaceted phenomenon driven by utilitarian needs (functional benefits: health, nutrition, practicality, content, knowledge, nutritional value, food quality and safety, convenience and durability, health concern, sensory appeal), hedonic desires (pleasure derived from consumption: taste, enjoyment, emotional connection, brand, label, information, prestige, comfort, affection, ambition, emotion, appeal, pleasure, familiarity, mood, hunger and thirst, reliability, and habits), and global

challenges (climate change and the Covid-19 epidemic: the sustainability of milk production, environmental impact, awareness of health and food safety and security) introducing new dimensions to consumer decision-making (Picot et al., 2021; Li et al., 2022; Shin et al., 2023; Topcu and Elmi, 2023; Putritamara et al., 2025).

The results of previous researches related to the consumption of milk products also highlighted that consumers' psychological factors (attitude and value, knowledge, skill, emotional and cognitive sensibility, taste and flavor) and ecological factors (natural sources and environment variables) impacting on their consumption perceptions and purchase attitudes were of a much more important than socioeconomic factors (culture and belief, social norm and status) and the external factors related to food marketing such as economic, political and legal factors by being the major drivers of utilitarian and hedonic motivation (Li et al., 2020; Ouyang et al., 2021; Topcu and Elmi, 2023).

According to FAO (2013) report, it was reported that major reason of increasing animal food demands in the early 2000s was created the motive impacts on communities' diet selection via various campaigns being applied individual utilitarian and hedonic motivation drivers (Gerber et al., 2013). Today, however, it has been focused on moderate mixed planted-based diets instead of animal-based diets through decision makers' various diet campaigns to be mitigated the negative impacts on climate change and ecological environment, and thus they have intensively tried to canalize consumers' utilitarian and hedonic motivational drives to this direction.

Analyzing the effects of sharp tactical changes in societies' consumption policies under the influence of climate change and epidemic diseases on consumers' utilitarian and hedonistic motivation is of great importance for future milk consumption planning and strategies. In this context, the aim of the study was to determine utilitarian and hedonic motives triggering on consumers' milk consumption in TRA1 region, and then to analyze their direct and total effects on their consumption satisfaction.

MATERIALS AND METHODS

Material

The research used data collected from households consuming milk in TRA1 Region (Erzurum, Erzincan and Bayburt). The data was gathered through a questionnaire approved by Ataturk University Ethics Committee with 2021/13 number. Secondary data was also used from registered data of several institutions and organizations, along with scientific books, journals, and research reports.

Method used in sample size calculation

The sample size was determined using the Simple Random Sampling Method, accounting the ratios of the main mass (Erzurum 75%), Erzincan 80%, and Bayburt 85%). The sample size for the TRA1 Region was calculated as 302 households for Erzurum, 258 for Erzincan, and 205 for Bayburt, totaling 765 households, as shown in Equation 1 (Churchill, 1995; Malhotra, 1996).

$$n = \frac{Z^2 \cdot p \cdot (p-1)}{c^2} \qquad (Eq.1)$$

Where,
n: sample size
Z: Z table value (1.96 for %95 confidence interval)
p: Milk consumption rates (Erzurum 75%, Erzincan 80%, and Bayburt 85%)
c: deviance from the mean (±0.05)

Method used in data collection

The scale, designed based on the results of Exploratory Factor Analysis (EFA) from researches conducted by Topcu (2019), Topcu (2019a), Topcu and Sarı (2019), Topcu and Sarı (2019a) and Topcu (2023) on milk purchasing attitudes, was structured as a questionnaire using a five-point Likert Scale (Table 1). This questionnaire was then used to collect the data from target consumer groups.

Table 1. Variables names and encodes related to milk consumption

Item codes	Item names	Item codes	Item names
M1	Taste and smell	M16	label information
M2	Flavor	M17	Promotion
M3	Color and fatness of milk	M18	Packaging
M4	Hygiene in animal feeding	M19	Manufacturer brand
M5	Hygiene at retail level	M20	Local brand
M6	Hygiene in milking	M21	Retailer brand
M7	Hygiene in milk processing	M22	Advertisement
M8	Trust to farmer	M23	Price-quality relation
M9	Trust to manufacturer	M24	Ecological footprint concern
M10	Trust to retailer	M25	Covid-19 concern
M11	Protein content	M26	Antibiotic residual and hormone concern
M12	Vitamin content	M27	Artificial milk concern
M13	Mineral matter content	M28	Sheep milk
M14	Calcium content	M29	Goat milk
M15	Fat ratio		

Methods used in statistical analyses

CFA model validity measurement

Convergent and discriminant validity of the CFA measurement model were evaluated for each factor dimension using standard metrics: Construct Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and Average Shared Square Variance (ASV). To ensure construct validity within the CFA model, CR should be 0.70 (or higher), and AVE should exceed 0.50. Additinally, to establish discriminant validity, both MSV and ASV must be lower than AVE (Hair et al., 2014; Gürbüz, 2019; Civelek, 2020; Topcu, 2024). These measurements indicated adequate structural validity for each factor dimension in Table 2.

Table 2. MSV, ASV, AVE, CR measurement values and requirement conditions for each factor dimension.

Factor dimension	MSV		AVE		CR	AVE		ASV
Sensory	0.232	<	0.521	<	0.764	0.521	>	0.104
Hygiene	0.176	<	0.649	<	0.789	0.649	>	0.126
Reliability	0.117	<	0.591	<	0.741	0.591	>	0.082
Content	0.139	<	0.561	<	0.801	0.561	>	0.056
Brand image	0.129	<	0.492	<	0.823	0.492	>	0.093
Concern	0.118	<	0.561	<	0.833	0.561	>	0.070
Milk source	0.103	<	0.719	<	0.835	0.719	>	0.030

CFA model goodness of fit tests

The *CMIN/df* ratio was used to assess the overall goodness of fit for the structural interactive regression models *(SIRMs)*. Ratios below 3 and 5 were deemed acceptable for overall goodness and acceptable fit, respectively. Multiple indices were considered, including the *IFI, CFI,* and *RMSEA*. The IFI was chosen due to its ability to handle a wide range of problem solution, variation in problem solutions, while the *CFI* and *RMSEA* were considered due to their sensitivity to sample sizes in comparative fit indices. For *IFI* and *CFI* values greater than 0.90 and 0.95, respectively, indicate good and acceptable fit. For *RMSEA*, value below 0.08 and 0.10 indicate good and acceptable fit, respectively (Browne and Cudeck, 1993; Hu and Bentler, 1999; Gürbüz, 2019).

The *GFI* measures the degree to which the *SIRMs*' predicted relationships align with the actual relationships in the data. A *GFI* of 0.90 or higher is considered acceptable. The *RMR/SRMR* evaluates the average difference between the observed and model-implied covariance matrices. An *RMR/SRMR* of 0.08 or lower is often considered acceptable (Marsh et al., 1988; Meydan and Şeşen, 2015; Civelek, 2020).

The factors that demonstrated convergent and discriminant validity and influence consumer milk consumption were included in the *SIRMs*. This model elucidates the linear relationships between unobserved (latent) factors, which are constructed from measurable variables. These variables can be either exogenous/independent or endogenous/dependent (Figure 2). SIRM refers to modelling complex relationships among multiple latent (unobserved) and observed variables. Moreover, it implies the inclusion of interaction terms to model how the impact of one variable depends on another.

The *SIRMs*, therefore, combines the *CFA* and path analysis, similar to multiple regression, and determines the extent to which correlations among exogenous and endogenous factors are consistent with those predicted

in path model. It also assesses the total effects (direct and indirect effects) of the exogenous factors on the endogenous factors (Nunkoo and Ramkissoon, 2011; Meydan and Şeşen, 2015; Civelek, 2020). IBM AMOS 24.0 was used for the *CFA* and the *SIRMs*.

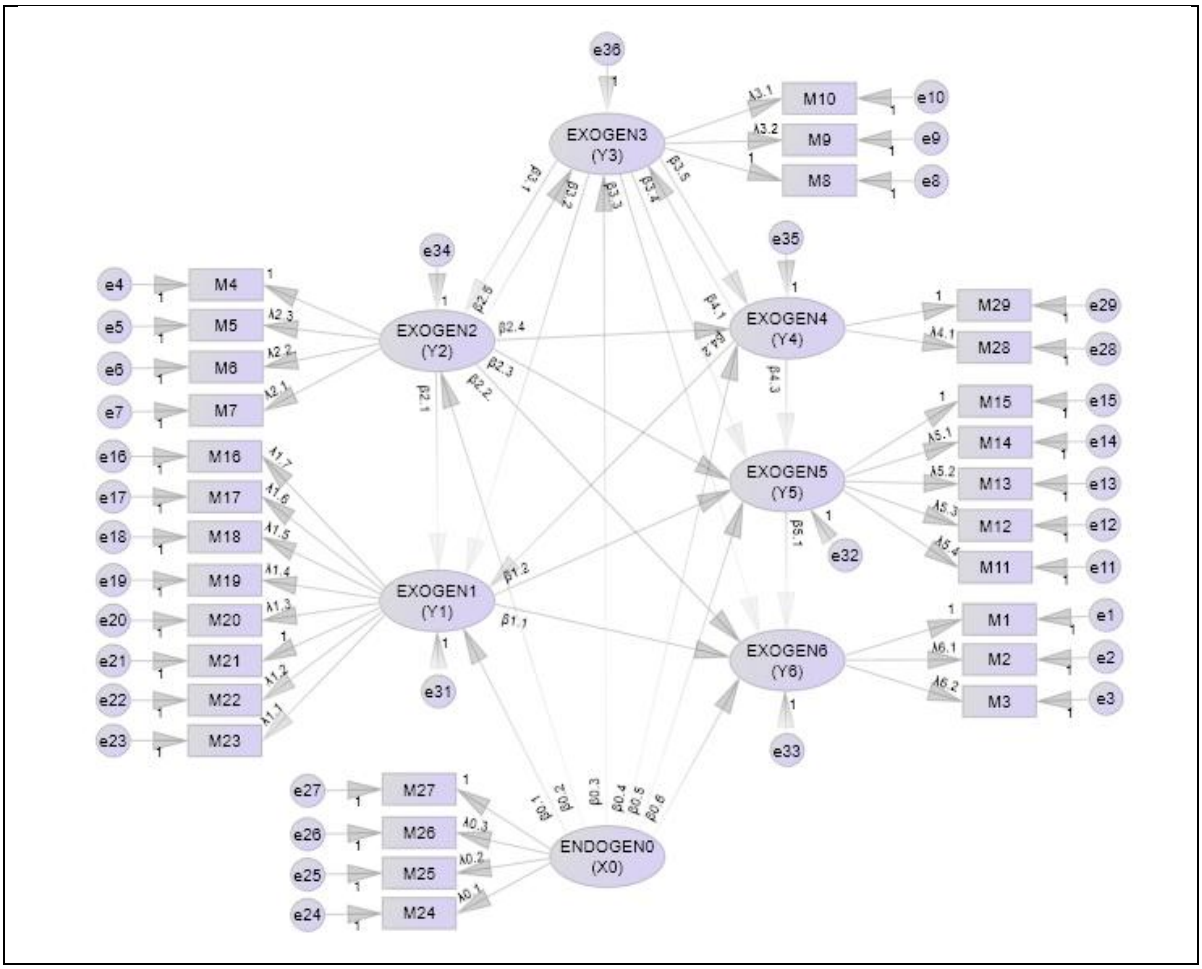


Figure 2. Specification and path diagram of structural interactive regression model *(SIRM)*

The mathematical notation and specifications of the *SIRMs* in Figure 2 were given in the following Equations.

$$Y_3 = \beta_{0.3}X_0 + \beta_{2.5}Y_2 + \beta_{4.1}Y_4 \quad \textit{(Eq. 2)}$$

$$Y_2 = \beta_{0.2}X_0 + \beta_{3.2}Y_3 \quad \textit{(Eq. 3)}$$

$$Y_1 = \beta_{0.1}X_0 + \beta_{2.1}Y_2 + \beta_{3.2}Y_3 + \beta_{4.2}Y_4 \quad \textit{(Eq. 4)}$$

$$Y_4 = \beta_{0.4}X_0 + \beta_{2.4}Y_2 + \beta_{3.5}Y_3 \quad \textit{(Eq. 5)}$$

$$Y_5 = \beta_{0.5}X_0 + \beta_{1.2}Y_1 + \beta_{2.3}Y_2 + \beta_{3.4}Y_3 + \beta_{4.3}Y_4 \quad \textit{(Eq. 6)}$$

$$Y_6 = \beta_{0.6}X_0 + \beta_{1.1}Y_1 + \beta_{2.2}Y_2 + \beta_{3.3}Y_3 + \beta_{5.1}Y_5 \quad \textit{(Eq. 7)}$$

RESULTS AND DISCUSSION

The *SIRMs* diagram and their some statistical results based on the SIRMs related milk consumption satisfaction of consumers were presented in Figure 3. The results of the SIRMs indicated that the factor dimensions, including in sensory quality, hygiene, reliability, content/product information, brand image, concern, and milk supply source demonstrated a fairly good level in terms of overall, absolute, and comparative goodness-of-fit indices. It was analyzed that the *CMIN/df*, *RMSEA*, and *SRMR* values indicated an excellent fit, while the *IFI* and *CFI, GFI and RMR* values indicated an excellent fit. In conclusion, overall goodness-of-fit indices of the *SIRMs* showed that it had a noticeably good fit with the used data and fell within the range of suitable criteria (Table 3).

Table 3. Overall, absolute and comparative fit indices and threshold ranges of the *CFA* model

Fit indices	*Goodness of fit indices*	*Acceptable fit indices*	*CFA measurement model*
CMIN/DF	<3.00	<5.00	2.816
IFI	>0.95	>0.90	0.923
CFI	>0.95	>0.90	0.923
GFI	>0.95	>0.80	0.917
RMSEA	<0.08	<0.10	0.049
RMR	<0.05	<0.08	0.056
SRMR	<0.05	<0.08	0.050

The results of the measurement and the *SIRMs* analyzing consumers' milk consumption satisfaction were presented in Table 3 and 4. The results highlighted that item scores created under sensory quality varied from *β_0=0.66 (p<.001)* to *β_0=0.81 (p<.001),* and taste and smell *(M1)* was the most effective *(β_0=0.81)* and explanatory *(R^2=0.66)* variable (Table 4 and Figure 3).

Variable loadings based to hygiene and reliability on milk consumption satisfaction were found the range from *β_0=0.57* and *0.60 (p<.001)* to *β_0=0.76* and *0.83 (p<.001),* and hygiene in animal feeding at farm level *(M4)* and trust in the manufacturer *(M9)* were evaluated as the strongest *(β_0=0.76 and 0.82)* and explanatory *(R^2=0.58 and 0.68)* items. Similarly, item scores of product content/information varied from *β_0=0.47 (p<.001) to β_0=0.84 (p<.001)*, and protein *(M11)* and vitamin *(M12)* were the most effective *(β_0=0.84 and 0.80)* and explanatory *(R^2=0.70 and 0.64)* variables (Table 4 and Figure 3).

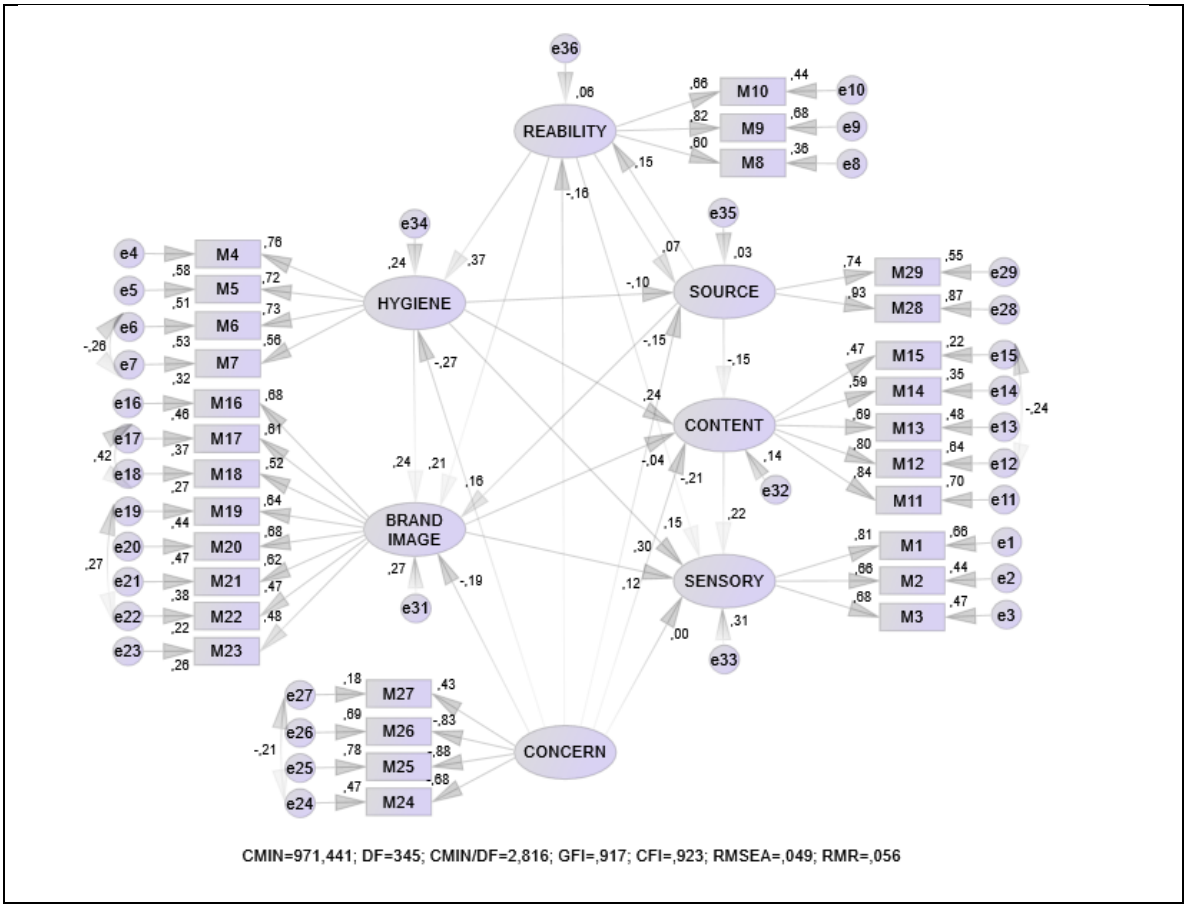


Figure 3. The results and fit statistics of improved structural regression model

The results of the *SIRMs* also shown that variable coefficients of brand image on milk consumption satisfaction changed between *β_0=0.47 (p<.001)* and *β_0= 0.69 (p<.001)*, and that local brand *(M20)*, label information *(M16)* and manufacturer brand *(M19)* were the most impact *(β_0=0.69, 0.68 and 0.64)* and explanatory *(R^2=0.47, 0.46 and 0.44)* items (Table 4 and Figure 3). It was pointed out that the factor of *concern* impacting adversely milk consumption satisfaction varied from *β_0=0.42 (p<.001)* to *β_0=-0.88 (p<.001)*, and that *Covid-19 infection (M25)* and *antibiotic residual and hormone anxieties (M26)* were the most impact *(β_0=-0.88 and -0.83)* and explanatory *($R^2 = 0.78$ and 0.69)* items. In addition, the results of the *SIRMs* indicated that

variable coefficients and relative explanation levels of *sheep milk (M28)* and *goat milk supply sources (M29)* were β_0*=0.93 and 0.75 (p<.001),* and R^2*=0.87 and 0.55* respectively (Table 4 and Figure 3).

Table 4. The measurement model results related to consumers' milk consumption

Items	Path	Factors	β_0	β_1	*S.E.*	*C.R.*	*p*
M1	<---	Sensory	0.812	1.000			
M2	<---	Sensory	0.678	0.989	0.064	15.560	***
M3	<---	Sensory	0.682	0.869	0.055	15.864	***
M4	<---	Hygiene	0.760	1.000			
M5	<---	Hygiene	0.567	0.833	0.063	13.186	***
M6	<---	Hygiene	0.727	0.921	0.053	17.377	***
M7	<---	Hygiene	0.718	0.915	0.050	18.220	***
M8	<---	Reliability	0.601	1.000			
M9	<---	Reliability	0.826	1.437	0.106	13.533	***
M10	<---	Reliability	0.659	1.273	0.096	13.288	***
M15	<---	Content	0.473	1.000			***
M11	<---	Content	0.836	1.417	0.115	12.307	***
M12	<---	Content	0.798	1.370	0.119	11.507	***
M13	<---	Content	0.692	1.308	0.113	11.625	***
M14	<---	Content	0.589	0.992	0.092	10.799	***
M21	<---	Brand image	0.620	1.000			
M16	<---	Brand image	0.682	1.232	0.086	14.270	***
M17	<---	Brand image	0.472	0.899	0.079	11.424	***
M18	<---	Brand image	0.525	0.929	0.079	11.754	***
M19	<---	Brand image	0.644	1.166	0.081	14.327	***
M20	<---	Brand image	0.685	1.283	0.094	13.610	***
M22	<---	Brand image	0.543	1.319	0.110	11.969	***
M23	<---	Brand image	0.482	0.897	0.084	10.732	***
M27	<---	Concern	0.424	1.000			
M26	<---	Concern	-0.830	-2.108	0.184	-11.439	***
M25	<---	Concern	-0.884	-2.300	0.200	-11.477	***
M24	<---	Concern	-0.682	-1.644	0.138	-11.889	***
M29	<---	Source	0.747	1.000			
M28	<---	Source	0.926	1.248	0.110	11.326	***

β_0: Standardized path coefficients *β_1:Unstandardized path coefficients* *$^{***}p < .001$*

Six *SIRMs*, as defined by Equation 2-7, were analyzed to determine the influence of consumer concern (endogenous variable) and other endogenous factors on exogenous variables, considering both total and indirect effects (Table 4 and Figure 3). The results of the research indicated a negative correlation between the concern factor (comprising ecological footprint, Covid-19 contamination, artificial milk production, and chemical residues) and key exogenous variables influencing consumer milk consumption, namely reliability, hygiene, brand image, milk supply sources, and milk content. The total and direct effects of the concern factor ranged from *-0.180 (p<.001)* and *-0.004 (p=.924)* to *-0.339 (p<.001)* and *-0.272 (p<.001)*, respectively.

Numerous studies were shown that concerns regarding the ecological impact of milk and milk products, the Covid-19 pandemic, antibiotic residues and hormones, and artificial milk production claims have negatively affected consumer satisfaction with milk consumption. Additionally, the Covid-19 pandemic and climate change were adversely affected consumer purchasing attitudes in agri-food markets, from dairy farms to food retailers, owing to concerns about food quality and safety, its components, hygiene, and trust in dairy market actors. These concerns about food quality and safety have led to a significant decrease in consumer milk demand across all economic and social systems (Macready et al., 2020; Shamim et al., 2021; Skalkos et al., 2021). In particular, the Covid-19 pandemic, along with growing awareness of the ecological and water footprint of dairy farming and its industrial applications, has contributed to climate change, leading to increasingly negative trends in milk consumption attitudes and behaviors of consumers.

When each *SIRMs* was taken into consideration, the results of the model in Equation 2 indicated that consumers' trust in dairy supply chain actors (reliability factor) as a hedonic driver on their consumption satisfaction was negatively affected by the concern factor with 16% direct and 18% total effect rates *(β_0=-0.160*

and δ_0=*-0.180 (p<.001))*, but it was not found to have significant direct and total effects of the milk supply source factor on the reliability factor in view of economical and statistical theories (Table 5 and Figure 3). Hence, there were negative effects of the concern and milk supply source factors on the reliability factor, and these factors explained only 6.4% of the variation in the reliability factor.

The recent studies (Topcu and Sarı, 2019; Cruz et al., 2021; Skalkos et al., 2021) highlighted the critical role of consumer trust in dairy market actors, particularly concerning food purchase intention and consumption satisfaction during Covid-19 pandemic. These studies indicated that trust in the dynamics of the short food supply chain was a significant predictor of food acceptance, as it mitigates perceived risks, especially regarding potential negative environmental impacts from chemical pollutants. Furthermore, these studies suggested that trust influences consumer purchasing decisions, with greater trust in the dairy product supply chain associated with higher purchase intention and consumption satisfaction. The current research supported these findings, demonstrating that reliability (trust in dairy market actors) was a key factor in consumer milk consumption satisfaction, while hedonic motives were of a comparatively lower impact.

The results of the study showed that hygiene under a utilitarian motive in the processes extending from dairy farms to retailer shelves had a meaningful functional relationship with the concern and reliability factors, which assessed by 24% explanation rate *(R^2= 0.241)* on consumers' milk consumption satisfaction (Equation 3 and Table 5). In these interactions, the direct and total effects of the concern and reliability factors on the hygiene factor were analyzed to be β_0=*-0.272* and δ_0=*-0.339 (p<.001)* and β_0=*0.373* and δ_0=*0.339 (p<.001)*, respectively. The hygiene factor attributing a positive correlation with the reliability factor compared to a negative relationship with the concern factor on consumption satisfaction was, therefore, represented by moderate interactive factors.

Table 5. SIRM model results based on consumers' milk consumption satisfaction

Factors	Path	Factors	δ_0	β_0	β_1	S.E.	C.R.	p
Reliability	<---	Concern	*-0.180*	*-0.160*	-0.209	0.067	-3.143	***
	<---	Source	*0.153*	*0.152*	0.087	0.099	0.883	.377
R^2= 0.064								
Hygiene	<---	Concern	*-0.339*	*-0.272*	-0.431	0.074	-5.818	***
	<---	Reliability	*0.375*	*0.373*	0.453	0.060	7.489	***
R^2= 0.241								
Brand image	<---	Concern	*-0.332*	*-0.193*	-0.323	0.078	-4.141	***
	<---	Hygiene	*0.219*	*0.240*	0.253	0.054	4.680	***
	<---	Reliability	*0.302*	*0.206*	0.264	0.066	4.014	***
	<---	Source	*0.204*	*0.158*	0.116	0.031	3.693	***
R^2= 0.270								
Source	<---	Concern	*-0.129*	*-0.150*	-0,343	0.126	-2.726	***
	<---	Hygiene	*-0.098*	*-0.098*	-0.141	0.077	-1.839	*
	<---	Reliability	*0.029*	*0.066*	0.115	0.305	0.379	.705
R^2= 0.033								
Content	<---	Concern	*-0.259*	*-0.210*	-0.215	0.051	-4.239	***
	<---	Hygiene	*0.246*	*0.240*	0.156	0.033	4.670	***
	<---	Source	*-0.147*	*-0.152*	-0.069	0.019	-3.554	***
	<---	Brand image	*-0.038*	*-0.038*	-0.023	0.031	-0.755	.450
R^2= 0.140								
Sensory	<---	Concern	*-0.233*	*-0.004*	-0.006	0.066	-0.095	.924
	<---	Reliability	*0.321*	*0.154*	0.175	0.057	3.088	***
	<---	Hygiene	*0.380*	*0.302*	0.284	0.050	5.694	***
	<---	Brand image	*0.114*	*0.122*	0.108	0.044	2.438	**
	<---	Content	*0.222*	*0.222*	0.321	0.066	4.855	***
R^2= 0.313								

β_0: Standardized path coefficients (direct effects) *β_1: Unstandardized path coefficients*

δ_0: Total effect (direct effect (β_0)+indirect effect) *$^{***}p < .001$* *$^{**}p < .05$* *$^{*}p < .10$*

Additionally, the study revealed a strong relationship between hygiene (in processes from dairy farms to retail shelves) and both consumer concern and reliability (Equation 3 and Table 5), explaining 24% of the variance in consumer milk consumption satisfaction *(R^2=0.241).* In these interactions, the direct and total effects of concern and reliability on hygiene factor were analyzed, revealing significant associations *(β_0=-0.272* and *δ_0=-0.339 (p<.001)* and *β_0=0.373* and *δ_0=0.339 (p<.001), respectively)*. Notably, hygiene exhibited a positive correlation with reliability and a negative relationship with concern, suggesting that it was influenced by a combination of interactive factors.

The research highlighted a strong correlation between hygiene and reliability factors in consumer satisfaction with milk consumption. It all starts with clean milk production, which relies on health animals and sanitary condition on dairy farms. To prevent contamination, rigorous hygiene must be maintained at every steps; animal care covering proper housing, management, veterinary care, and diseases prevention, milking and processing including in strict sanitary practices during milking, processing, and packaging, distribution and retail consist of safe handing, and storage to maintain quality (Paraffin et al., 2017; Alegbeleye et al., 2018; Willis et al., 2018; Topcu and Elmi, 2023; Topcu, 2024). Thanks to advancements in waste management, distribution, hygienic practices, the dairy industry has significantly reduced contamination risks. Milk processed under these conditions is safe for everyone. Consequently, consumer satisfaction has significantly increased in recent years, driven by innovations in animal care, manufacturing, and retail.

The results of the *SIRMs* in Equation 4 suggested that the direct and total effects of concern, hygiene, reliability, and milk supply source factors on the brand image, satisfying consumer milk consumption, were tested as *β_0=-0.193* and *δ_0=-0.332 (p<.001), β_0=0.240* and *δ_0=0.219 (p<.001), β_0=0.206* and *δ_0=0.302 (p<.001),* and *β_0=0.158* and *δ_0=0.204 (p<.001),* respectively, and their explanatory rate on the brand image as a hedonic motive was 27% *(R^2=0.270).* There was a negative correlation between brand image and concern factor, but positive relationships among the brand image and the others (Table 5).

The last studies on brand image highlighted its pivotal role in influencing consumer products selection and repurchase attitude, thereby establishing it as a key metric for satisfaction and a driver of competitive advantage (Perito et al., 2019; Rihn et al., 2019; Slade et al., 2019; Marchini et al., 2021). The findings of the study also indicated that brand image, encompassing labeling information related to milk content and quality, along with health claims pertaining to sanitary production and trust in market actors, constituted a crucial determinant for consumers. Consequently, it is plausible that brand image, through favorable motivational drivers related to consumption satisfaction and purchase perception, could substantially augment sustainable consumption patterns. Cumulatively, the results underscored that brand image, as a hedonic motive, significantly influenced consumer satisfaction and attitudes, purchase decision, and willingness to pay for dairy products, demonstrating a positive correlation with their consumption satisfaction levels.

In Equation 5 and Table 5, the results of the *SIRMs* revealed that while concern and hygiene factors had statistically significant negative effects *(β_0=-0.150* and *δ_0=-0.129 (p<.001), β_0=-0.098* and *δ_0=-0.098 (p<.10))* on milk supply sources under a utilitarian motive, the reliability factor did not exhibit meaningful impacts *(β_0= 0.066* and *δ_0= 0.029 (p=0.705)).* Notably, it was observed that sheep and goat milk, compared with cow milk, were not commonly preferred by consumers in the research region for milk consumption satisfaction. Consequently, the explanatory impact of other factors on sheep and goat milk sources was calculated to be 3.3% *(R^2=0.033).*

The studies investigating the effects of milk from various species, such as cows, sheep, and goats, on human dietary intake were reported that sheep and goat milk contain higher levels of key macro-nutritional components, essential and trace minerals, protein, vitamins, lipids, and total solids compared to cow's milk. These types of milk, which are not subjected to intensive sanitary applications and chemical and microbiological contamination, could be used as alternatives for those with cow's milk allergies. Consuming sheep and goat milk, therefore, were shown to provide greater benefits to bone health than consuming cow's milk (Burrow et al., 2018; Moatsou and Sakkas, 2019). Contrary to previous studies, it is nearly impossible to find sheep and goat milk in local markets within the research region, and thus, this scarcity might attribute to the prevalence of dairy cow farming under the specific geographical and agro-ecological conditions, as well as consumers' socio-cultural attitudes, economic circumstances, and consumption preferences. It was determined that goat and sheep milk, compared to cow milk, had a much lower impact on consumer satisfaction with milk consumption, even when considering chemical and Covid-19 pandemic contamination. Hence, the impacts of sheep and goat milk sources on milk consumption satisfaction were not found to be positive.

The study's results also indicated that milk content, as a utilitarian motive, was significantly influenced by concerns about hygiene and the milk source *(β_0=-0.210* and *δ_0=-0.259 (p<.001), β_0=0.240* and *δ_0=0.246 (p<.10)* and *β_0=-0.152* and *δ_0=-0.147 (p<.001),* respectively). However, brand image did not have a significant impact *(β_0=-0.038* and *δ_0=-0.038 (p=.450)* in Equation 6 and Table 5. Overall, milk content was explained by a 14% variation rate *(R^2=0.140)* due to other factors.

Experimental research shown that dairy products, widely and frequently consumed in human diets, were a vital source of protein, vitamins, and minerals. Their consumption strengthens the musculoskeletal system, preventing osteoporosis, and could reduce the risk of coronary heart disease, stroke, dental caries, hypertension, and various types of cancer. The studies also indicated that fostering positive consumer attitudes, rather than negative beliefs about milk content, through reliable supply sources and sanitary manufacturing practices, leads to increased positive perceptions and demand (Um et al., 2019; Guo et al., 2020; Perez et al., 2020).

The results of this study, highlighted in Equation 7 and Table 5, demonstrated that sensory quality, as a utilitarian motive, had a significant positive linear correlation with reliability, hygiene, brand image, and milk content factors *(β_0= 0.154* and *δ_0= 0.321 (p<.001), β_0= 0.302* and *δ_0= 0.380 (p<.001), (β_0= 0.114* and *δ_0= 0.122 (p<.05)* and *β_0= 0.222* and *δ_0= 0.222 (p<.001),* respectively), but not with the concern factor *(β_0=-0.004* and *δ_0=-0.233 (p=.924)* in view of statistical and economic theories. These factors explain sensory quality as a strong moderate factor with a 31.3% explanatory rate *(R^2=0.313)*. As there was no widespread effect of sheep and goat's milk consumption on cow's milk consumption, the milk supply source factor did not have a significant effect on the model in Equation 7 and thus was removed from the model.

Prior research on the sensory attributes of milk has established that organoleptic properties (taste, odor, color, flavor) and fat content were major determinants of consumer satisfaction, with a strong positive correlation between purchase intentions and high sensory quality (Topcu, 2015; Rana and Paul, 2017). They found that sensory quality, encompassing milk composition, safety, and hygiene, exerted a strong influence on consumer purchase intentions and attitudes in the USA and Europe, particularly within established brand images. Similarly, Ouyang et al. (2021) emphasized the importance of sensory appeal in dairy products for brand loyalty, highlighting the role of trust in dairy market stakeholders regarding sanitary practices and the direct impact on consumer preferences.

CONCLUSION

To investigate the effects of utilitarian and hedonic motivations on milk consumption satisfaction in the TRA1 Region, under conditions of climate change and the Covid-19 pandemic, data from 765 households were analyzed using the CFA, and the SIRMs. The findings of the study revealed a measurement model consisting of seven factors influencing consumer milk consumption satisfaction: sensory quality, safety, hygiene, health concern, brand image, milk source, and milk composition. The model demonstrated good fit based on overall (CMIN/df), comparative (CFI, IFI, RMSEA, SRMR), and absolute (GFI, RMR) fit indices.

The results of the study also indicated that the concern factor in six SIRMs, which associated with seven factors on consumers' milk consumption satisfaction, negatively affected the other factors, and especially the hygiene, brand image factors in view of total effect. Consumers' trust to the actors at dairy markets (reliability) and brand image factors as the hedonic motives under the effects of the concern, hygiene, reliability and milk supply source factors were of 33.4% explanatory rate and 36.6% total effect on their milk consumption satisfaction. On the other hand, the hygiene, supply milk source and content, sensory quality factors as the utilitarian drivers were affected by the concern, reliability, hygiene, milk supply source and content, brand image factors, and thus their explanatory rate were calculated as 72.7% and 44.5% total effect on those in interactive structural regression models. It was analyzed that, therefore, the utilitarian motives compared with the hedonic drivers satisfying on consumers' milk consumption under climate change and Covid-19 pandemic conditions were much more effective and explanatory.

Consequently, in order to mitigate ecological footprint and the ethical and environmental concerns in milk consumption, it should be encouraged and supported sheep and goat milk farming along with plant-based milk instead of dairy cow farming in milk production. Therefore, it should be focused on the utilitarian motives of dairy products including in sensory quality under sanitary processes and consumer' trust to the market actors at dairy products supply chain as well as milk content with plant-based milk and with milk obtained from sheep and goat species, and then it should be diversified milk under brand images from hedonic motives influencing on target consumers' milk consumption satisfaction.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contributions

***Yavuz TOPCU*:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; software; writing-original draft; writing-review and editing.

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