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Consumer behaviour towards dairy products: a cross-cultural analysis of products from three origins in Ghana and Senegal

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Abstract

The growing exports of European dairy products to West Africa is raising concerns globally with regards to its role in the retarded growth of the dairy sectors in recipient nations. This study examines consumer behavior in Ghana and Senegal by specifically identifying factors influencing the choice of dairy products from local, domestic, and imported origins. A mixed methods approach was used to analyze the data gathered from 312 and 532 households in Ghana and Senegal respectively. Focusing on yoghurt as the sole product coming from these three origins, we find a minimal influence of consumer attitudes and perceptions on product choice. Although ethnocentric attitudes were exhibited, it did not limit purchases to local yoghurts, contrasting literature. Purchase decision as we find is rather largely influenced by product availability encouraging the consumption of domestic and imported products. Considering the crucial role of imported dairy products in ensuring a reliable access to affordable dairy products in developing countries, their imports are encouraged.

1. Introduction

The end of the European Union's milk production quotas in 2015 coupled with other factors in the global milk markets has resulted in an expansion of the operations of European dairy companies in developing nations, particularly in West Africa. The fast-growing dairy sector in this region makes it one of the most important among other sectors. Products including cheese, ultra-pasteurized milk, evaporated milk, ice creams, yoghurts, and milk powder are imported (Boimah, Weible, & Weber, 2021). Besides, the processing industry that relies on milk powder has seen a significant growth over the last two decades (Corniaux, 2018; Oppong-Apane, 2016) and an increase is expected in consumer preferences for more diversified dairy products implying further growth of the sector (e.g. Boimah, Weible, & Weber, 2021; Broutin, Levard, & Goudiaby, 2018). In contrast, local milk production in these developing nations developed slightly or remained stagnant over the years (Zamani, Pelikan, & Schott, 2021). The poor state of the local dairy sectors in these developing nations has drawn the attention of some international organizations and civil society activists who have associated the retarded growth of the local dairy sectors to the operations of European dairies in the region (e.g., Magnani, Ancey, & Hubert, 2019; Broutin, Levard, & Goudiaby, 2018; Orasmaa, Duteurtre, & Corniaux, 2016).

Researchers over the years have also placed emphasis on analyzing the dairy value chains in West Africa such as Boimah, Weible, & Weber (2021), Guri, Ameleke, & Karbo (2018) and Oppong-Apane (2016) in Ghana; Corniaux (2018) in Senegal; Corniaux (2017) in Burkina Faso; Corniaux & Duteurtre (2014) and Duteurtre & Corniaux (2013) in West Africa. In their studies, several constraints and challenges of the local milk production and processing sectors are identified, which indicates that the supply of the countries with dairy products will not be possible without imported milk powder

in the future. These studies neglect consumers who are located far downstream the value chain but play a critical role in the success of actors upstream, particularly in the case of the local dairy value chains. While food choice is a routine activity for most individuals, and driven by socio-economic factors such as income, age and gender, it is also influenced by additional factors of consumers' food environment and the whole food system (Forbes-brown, Micheels & Hobbs, 2015; Rani, 2014; Colonna, Durham, & Meunier-Goddik, 2011; Johansen, Næs, & Hersleth, 2011; Krešić et al., 2010; Bytyqi et al., 2008). Dairy consumption in West Africa is diversified with a more or less segmented market with three different types of products; (i) those made from fresh local milk, (ii) domestically processed products from imported milk powder, and (iii) imported products. In view of the growing criticisms of European dairy exports and a highly competitive world market, it is of interest to analyze consumption habits with respect to the three different types of dairy products in West Africa and compare these behaviour as well as their determinants. In view of this, we consider Ghana and Senegal, two West African countries with high volumes of import and processing, as our case study countries. We chose two countries because according to Gedikoglu & Parcell (2014), geographical location has a high probability of influencing a variation in consumer behaviour (perceptions and preferences). This implies that the same product can be perceived differently by consumers in two different locations. Furthermore, we focus the analysis on yoghurt because in both countries it is the main dairy product with three origins, i.e., it is produced with local milk, processed domestically with imported powder or purely imported. In the first stage of our analysis, we identify the frequency at which yoghurt in general is consumed in these two countries and the factors that subsequently determine these consumption rates. To verify the influence of origin on consumer behaviour, in the second stage, we identify not only socio-demographic characteristics but also consumer attitudes and perceptions that determine the consumption of local, domestic, and imported yoghurt. Moreover, we assess the results from the two countries to see if notable differences exist in consumer behaviour towards local, domestic, and imported yoghurt. We believe the results will serve as a useful evidence to guide the debate on the role of imports in developing economies.

The rest of the paper is organized as follows; section two gives a brief review of the influence of product origin on consumer behaviour while section three details the type and method used for gathering the data, as well as the methods for analyzing the data. Section four documents result from the analysis and discusses the findings. The last section, five, concludes by highlighting the key findings and recommendations.

2. Influence of product origin on consumer behaviour: a review

Consumer behaviour reflects the conduct of an individual when it comes to buying and/or consuming goods and services. Hoyer et al. (2017) defines it as the totality of a consumer's decisions regarding the acquisition, consumption, and disposition of goods, services, activities, experiences,

people and ideas by human decision-making units. In a highly developed and technologically advanced world, consumers are exposed to products from different origins. Several authors, out of curiosity have explored the significance of product origin on consumer valuation of product attributes and differentiation (e.g., Nguyen & Alcantara, 2022; Norris & Cranfield, 2019; Berbel-Pineda, Palacios-Florencio, Santos-Roldán, & Ramírez Hurtado, 2018; Abraham & Patro, 2014; Profeta, Balling, & Roosen, 2012). Others such as Balcombe et al. (2016), Kaya (2016), Sckokai et al. (2014), Abraham & Patro (2014), and Holdershaw, Gendall, & Case (2013) have likewise demonstrated the importance of product origin as an important extrinsic credence attribute influencing consumer perceptions.

According to Smith (2007), Fishburn (1970), and Morgenstern & von Neumann (1944) a strong correlation exists between consumer perceptions, preferences and product choice. This relationship thus reinforces the role of origin in the process of decision-making, considering its impact on perception formation. Nevertheless, the value attached to a product by agents (e.g., individuals, households, etc.) can vary based on several factors. First of all, consumer decision-making (Dewey, 1910; Kotler & Keller, 2012) involves a five-stage process; need recognition, information search, evaluation of alternatives, purchase decision (choice), and post-purchase evaluation (outcome). According to Block & Roering (1976), demographic and geographic factors specific to a consumer influence the first four stages of the decision-making process proposed by Dewey. Also, Gedikoglu & Parcell (2014), Rani, (2014), and Profeta (2008) from their separate studies and review identify socio-demographic and cultural variations as factors that affect a product‘s judgement. Moreover, Profeta (2008) identifies that the extent to which “origin” influences consumer purchases largely depend on other intrinsic and extrinsic factors such as attitudes and socio-demographic characteristics of the consumer. For instance, origin as an indicator of food quality (Holdershaw et al., 2013) is found to be more pronounced among consumers in developing countries (Xu, Yang, & Wu, 2020; Clipa, Danileț, & Clipa, 2017; Chung Lo, Tung, Yuan Wang, & Huang, 2017) than in the developed world, where products originating from the west are mostly considered as superior to local products. Moreover, origin affects other perceived product attributes such as brand, taste, and safety (Boimah & Weible, 2021; Yang, Ramsaran, & Wibowo, 2018; Barbarossa, De Pelsmacker, Moons, & Marcati, 2016; Rezvani et al., 2012). Consumers evaluate the most important attributes of a product and choose the one which is superior to its alternatives (Kurz-Milcke, & Gigerenzer, 2007).

3. Data and Methods

3.1 Data

The study dwelt on primary data collected in March 2021 in Ghana and from January to February 2022 in Senegal. A multistage sampling procedure was used in gathering the data. First, three regions were identified in both countries based on the high pattern of dairy consumption and also due to the ethnic diversity of its inhabitants. In Ghana, the Greater-Accra, Ashanti, and Northern regions were selected, and in Senegal, Dakar, Thiès, and Kolda. The capital city of each region was

purposively chosen for the data collection because the intention of the study is to collect data from places where imported and local products compete with each other. In Ghana, these cities are Accra, Kumasi and Tamale respectively, and in Senegal, Dakar, Thiès, and Kolda. In the third stage, three districts were randomly chosen from each city, while a community each was chosen from the selected districts in the fourth stage. The fifth and final stage involved a random selection of dairy consuming households, except in Dakar where the selection was based on recommendation of community leaders due to the resistant of consumers to participate in surveys. In all, 312 and 532 households were interviewed in Ghana and Senegal respectively. The interviews begun with general questions on the consumption of dairy products and later narrowed to questions on preferences and choices and factors influencing them. Questions regarding consumer attitudes and perceptions towards dairy products from the three different origins were answered on a five-point likert scale with items ranging from 1 - "strongly disagree" to 5 - "strongly agree".

3.2 Methods

In achieving the objectives of this study, we use both descriptive and quantitative methods in the analysis of the data. The descriptive statistics used include frequencies, means, and standard deviations. The ordered probit and logit models were used to identify factors influencing the frequency of overall yoghurt consumption and the factors influencing the consumption of local, domestic, and imported yoghurts. Prior to the estimation of the models, exploratory factor analysis using Principal Component Analysis (PCA) and the Varimax rotation with Kaizer normalization were used to reduce the statements regarding consumer attitudes and perceptions into unrelated factors and included in the econometric models.

Modelling factors influencing the frequency of yoghurt consumption: the ordered probit model

The frequency of consuming yoghurts in general varies from one household to the other and depends on certain factors specific to each household. The frequency of consumption in the sample in this case is discrete and ordinal, $0,1, \dots, n$. In literature, ordinal or categorical dependent variables such as those in this study are usually modelled with an ordered logit or probit model, which are an extension of the binary models. Pioneered by McKelvey & Zavoina (1975), the ordered probit model is now widely in use for modelling ordinal categorical dependent variables. According to Greene & Hensher (2010) the ordered probit model provides an efficient approach to recover the model parameters. It estimates the probability of an outcome as a linear function of the selected independent variables in addition to the predicted threshold values. For consumer $i(i = 1, \dots, j)$, let y_i^* represent the unobserved continuous dependent variable so that;

$$y_i^* = x_i'\beta + \varepsilon_i \qquad (1)$$

Where x_i is a matrix of known values of the independent explanatory variables for consumer i, β is a vector of parameters reflecting the relationship between y_i^* and the variables in x_i, and ε_i is an unobserved random variable assumed to be independent and identically distributed with a standard normal distribution that is $\varepsilon_i \sim N(0,1)$. The continuous variable, y_i^*, is unobserved. However, the indicated frequency of consumption, y_i, with S categories is observed. The probability that individual i has a consumption frequency in outcome $j (j = 0,1,2, \dots, J)$ is given as;

$$P(y_i = 0|x_i) = \Phi(-x_i'\beta)$$

$$P(y_i = 1|x_i) = \Phi(\mu_1 - x_i'\beta) - \Phi(-x_i'\beta)$$

$$P(y_i = 2|x_i) = \Phi(\mu_2 - x_i'\beta) - \Phi(\mu_1 - x_i'\beta)$$

$$\vdots$$

$$P(y_i = n|x_i) = 1 - \Phi(\mu_{J-1} - x_i'\beta) \quad (2)$$

Where the parameters $\mu_j, j = 1, \dots, J-1$ are the cut points or unknown threshold parameters defining potential ordered outcomes for y_i and $\Phi(.)$ is a standard normal cumulative density function. The probabilities enter the log-likelihood function and the thresholds μ_j are estimated simultaneously by an iterative procedure of the maximum likelihood estimation (MLE) method, which is expressed as;

$$Log\ L = \sum_{i=1}^{n} \ln[P(y_i)] = \sum_{i=1}^{n} \ln\left[\Phi(\mu_j - x_i'\beta) - \Phi(\mu_{J-1} - x_i'\beta)\right] \quad (3)$$

Maximizing the likelihood function provides estimates of the parameters β along the threshold parameters $\mu_1, \mu_2, \mu_3, \dots, \mu_{J-1}$.

Factors influencing local, domestic, and imported yoghurt consumption: the logit model

We assume that the consumer tries to maximize his/her utility subject to a constrained budget and that the *i*th household obtains maximum utility (*U*) from consuming yoghurt from a specific origin given a set of attributes of the household and a random term intended to capture the factors that affect utility but are omitted. The binary model is rooted in the threshold theory of decision-making (Hill & Kau, 1973). Based on utility maximization, the choice of yoghurt from an origin yields a reaction threshold (y_i) of one (1) if the consumer chooses the product and zero (0) if otherwise and is expressed as;

$$y_i = \beta x_i + u_i \quad (4)$$

This means $y_i = 1$ if x_i is greater than or equal to a critical value, x^* and
$y_i = 0$ if x_i is less than a critical value, x^*
x^* represents the combined effects of the independent variables (x_i) at the threshold level.

Equation (4) can be expressed as;

$$\text{Prob}(y_i = 1) = F(\beta' x_i) \quad (5)$$

$$\text{Prob}(y_i = 0) = 1 - F(\beta' x_i) \quad (6)$$

The function, F, may take the form of a normal, logistic or probability function taking on values from 0 to 1. The logit model uses a logistic cumulative distributive function to estimate P which is expressed as;

$$P(Y = 1) = \frac{e^{\beta' x}}{1+e^{\beta' x}} \quad (7)$$

$$P(Y = 0) = 1 - \frac{e^{\beta' x}}{1+e^{\beta' x}} = \frac{1}{1+e^{\beta' x}} \quad (8)$$

According to Greene (2008) the probability model is a regression of the conditional expectation of y on x giving:

$$E\left(y/x\right) = 1[F(\beta' x)] + 0[1 - F(\beta' x)] = F(\beta' x) \quad (9)$$

The relative effect of each of the independent variables on the probability of opting for yoghurt from a specific origin is obtained by differentiating equation (9) with respect to x_i resulting in equation (10) (Greene, 2008):

$$\frac{\partial P_i}{\partial x_i} = \left[\frac{\lambda^{\beta' x}}{(1+\lambda^{\beta' x})^2}\right]\beta = F(\beta' x)[1 - F(\beta' x)]\beta \quad (10)$$

We chose the logit over the probit model because of its mathematical convenience and simplicity (Greene, 2008). The maximum likelihood method is used in the estimation of the parameters. The empirical model for the logit estimation is specified as;

$$Z_i = log(P_i/1 - P_i) = \beta_0 + \beta_i x_i + \varepsilon_i \quad (11)$$

Where Z_i denotes choice of yoghurt from origin *i* (i.e., local, domestic, and imported), β_0 is the intercept term, β_i is the coefficient of the explanatory variables, x_i is the set of explanatory variables influencing the choice of yoghurt, and ε_i is the error term capturing omitted variables.

Furthermore, we use the binary logit model to identify and compare socio-demographic factors influencing the consumption of local, domestic, and imported yoghurt in both countries. A binary model is chosen over a multinomial one in this case because some households consume yoghurt from the three different origins. We therefore assess individually the influence of socio-economic variables on the choice of the different products. The means and standard deviations of socio-economic variables used in the logit and ordered probit model are described in Table 1.

Table 1 Description of socio-economic variables used in the binary Logit and Ordered probit models

		Ghana N=312		Senegal N=532	
Variable	**Description**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
Gender	Gender of respondent (1 = male; 0 = otherwise)	0.31	0.47	0.29	0.46
Age	Age of respondent in years	38.96	11.6	41.70	13.69
Married	Marital status (1 = married; 0 = otherwise)	0.68	0.47	0.82	0.39
Tertiary	Post-secondary education or higher (1 = yes; 0 = otherwise)	0.42	0.49	0.28	0.45
Child<18yrs	Children less than 18 years in the household (1 = yes; 0 = otherwise)	0.76	0.43	0.88	0.33
Household size	Number of persons living in a household	6.38	4.54	10.24	5.12
Low income	1 = if monthly household income is in the range: 288.8-550.1€ (Ghana); 76.4-152.7€ (Senegal)	0.62	0.49	0.36	0.48
High income	1 = if monthly household income is in the range: >551€ (Ghana); >168€ (Senegal)	0.04	0.19	0.02	0.16
Employed	Respondent is gainfully employed in a full or part-time, in the private or public sector (1 = yes; 0 = otherwise)	0.45	0.49	0.87	0.33

Source: field survey, March 2021 (Ghana), Jan-February 2022 (Senegal)

4. Results and discussion

4.1 Frequency of dairy consumption and products consumed by households

Dairy products are generally consumed on a daily basis in Ghana and Senegal either at breakfast, lunch time or at dinner. However, the data shows a much more significant proportion of Senegalese households (91.2%) who consume them four times or more per week compared to Ghanaians (52.56%) (Table 2). Apparently, milk is a traditional component of most Senegalese diets (Lefèvre, 2014), and this could explain why more people consume them frequently compared to the rate of consumption in Ghana. As shown in figure 1, evaporated milk seems to be the most consumed product in Ghana, however, milk powder is also consumed by the majority (90.7%), and in Senegal emerge as the most consumed by 99.1% of the sample.

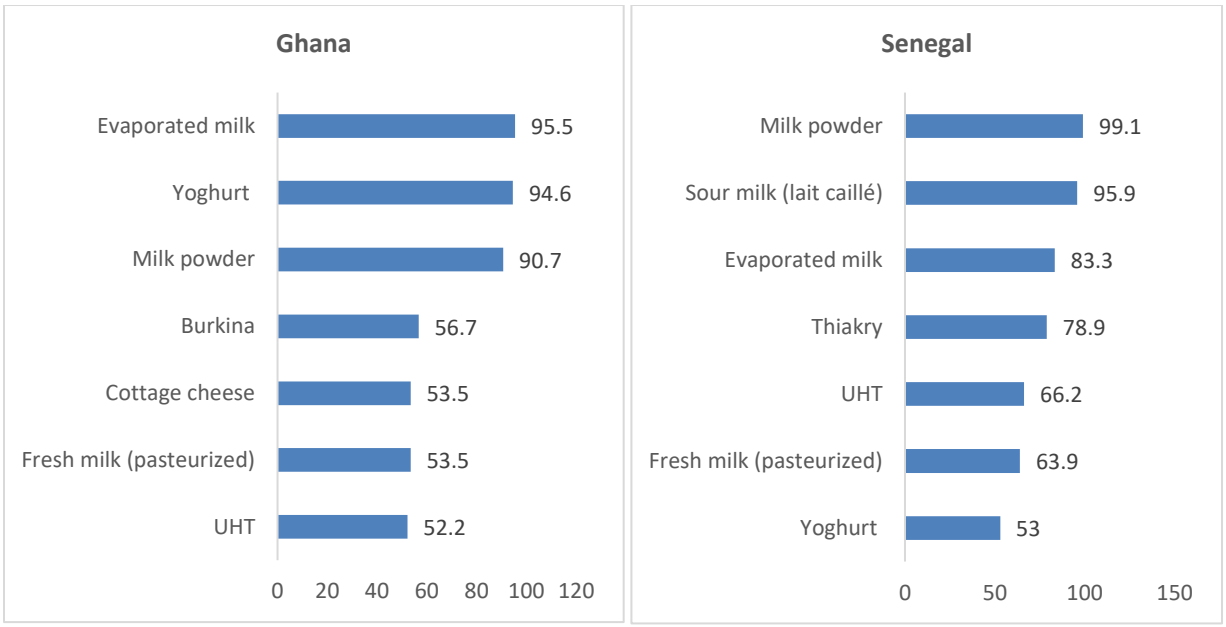
Table 2 Dairy consumption frequency in households

	Ghana	Senegal
Frequency	**%**	**%**
Four times a week or more	52.6	91.2
2-3 times a week	23.4	6.6
Once a week	5.4	1.7
2-3 times a month	5.1	-
Once a month	3.5	-
Occasionally	9.9	0.6
Never	-	-
Total		

Source: field survey, March 2021 (Ghana), Jan-February 2022 (Senegal)

The popularity of milk powder in both countries is because it is cheaper and can be stored for longer periods of time compared to other dairy products. In a country like China, milk powder is gradually becoming an inferior product in urban centers (Fuller, Beghin, & Rozelle, 2007) because it is an economy in transition with a higher per-capita income compared to the per-capita incomes of Ghana and Senegal. The attitude of Chinese consumers is therefore consistent with "consumer behavior theory" (Varian, 2014) which states that as income levels rise, demand for inferior goods (cheaper goods) decreases and vice versa". Besides, products such as yoghurt, evaporated milk, UHT milk, and Thiakry (yoghurt mixed with millet or rice couscous) are consumed (Figure 1).

Figure 1 Dairy products consumed by households in percentages (%)

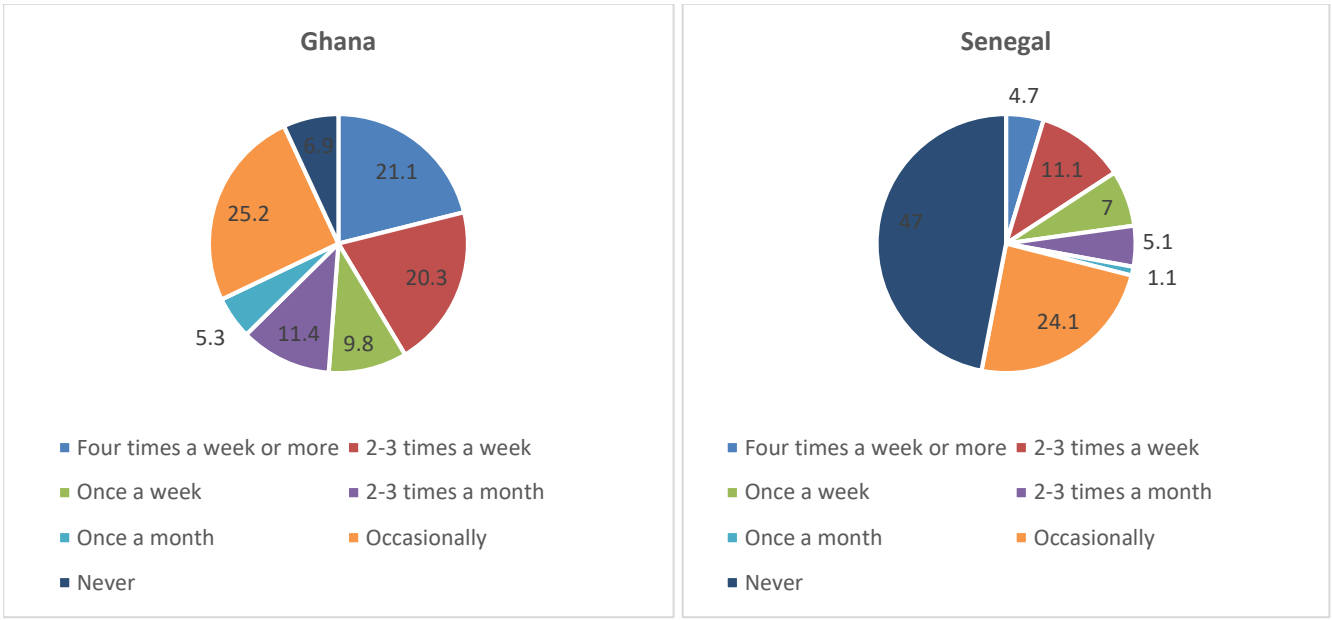


Source: field survey, March 2021 (Ghana), Jan-February 2022 (Senegal)

4.2.1 Frequency of yoghurt consumption

With regards to yoghurt, the picture shows that it is more consumed in Ghana (94.6%) compared to Senegal (53.0%) (Figure 1). Furthermore, yoghurts are consumed more frequently in Ghana compared to the consumption frequency in Senegal (Figure 2). For Senegal, sour milk (lait caillé) made by curdling milk with an edible acidic substance such as lemon juice, vinegar, or the curd itself, is similar to yoghurts and is consumed by the majority (95.9%) of Senegalese. Consumption of the different origins of yoghurt in both countries are presented in Table 3. Even though most Ghanaians consume yoghurts, about 43.2% of them have never consumed local yoghurts compared to 13.9% of Senegalese.

Figure 2 Yoghurt consumption frequency by households



Source: field survey, March 2021 (Ghana), Jan-February 2022 (Senegal)

Table 3 Yoghurt consumption frequency based on origin

	Ghana			Senegal		
	Local	**Domestic**	**Imported**	**Local**	**Domestic**	**Imported**
Frequency	**%**	**%**	**%**	**%**	**%**	**%**
Four times a week or more	1.5	14.2	4.4	1.8	2.1	1.4
2-3 times a week	6.8	28.8	10.5	6.1	13.2	10.0
Once a week	5.8	8.5	3.4	19.6	13.2	6.0
2-3 times a month	6.5	8.8	6.1	8.9	7.8	7.8
Once a month	6.5	8.1	7.5	6.8	2.8	2.5
Occasionally	26.2	27.8	30.3	42.9	47.7	54.1
Never	43.2	3.7	37.8	13.9	13.2	18.1
Total no. of respond.	295			281		

Source: field survey, March 2021 (Ghana), Jan-February 2022 (Senegal)

4.3 Exploratory factor analysis of consumers' attitudes and perceptions

The exploratory factor analysis using Principal Component Analysis (PCA) with varimax rotation to identify respondents' attitudes and perceptions on local, domestic, and imported products yielded 12 items for Ghana and 13 items for Senegal. Prior to the factor analysis, a test was performed to identify inter-item correlation where items with low coefficients below the acceptable threshold of 0.30 (Hair, Black, Babin, & Anderson, 2010) were not included in the analysis. A total of 5 and 7 factors each were retained for Ghana and Senegal. However, 2 and 3 factors respectively for Ghana and Senegal with Cronbach's alpha (α) values below the acceptable threshold of 0.6 (Bland & Altman, 1997) were dropped. Items retained for each factor are those with Eigen values above 1 and with loadings of 0.5 and above. Tables 4 and 5 present the Kaiser Meyer Olkin (KMO) values,

items regarding consumer attitudes and perceptions with their respective factor loadings, percent of explained variance, mean values and Cronbach's alpha scores.

The factors in table 4 explain 50.8% of the error variance. The first factor is made up of four statements relating to the unhygienic conditions of local milk handling, processing and marketing in Ghana and therefore named "*local dairy products unhygienically produced and unsafe"*. The second factor is made up of four items relating to consumer ethnocentrism that is, consumers stated to prefer local products over imported ones and are willing to pay extra for them. Thus, this factor is named "*ethnocentrism and willingness-to-pay for local dairy products*". The third factor "*low value added and diverse local products*" consists of four items which deal with concerns relating to low value addition to local fresh milk produced in Ghana as well as to poor packaging and a less diverse product range.

Table 4 Exploratory factor analysis of consumers' attitude and perceptions: Ghana

Items	Mean	Factor loadings	% of variance explained	Cronbach's alpha
Factor 1: hygiene and safety concerns of local dairy products (safety and hygiene concerns)			18.62	0.7117
Dairy products from local fresh milk are produced under unhygienic conditions	3.59	0.79		
Dairy products from local fresh milk are often sold at unhygienic locations	3.56	0.77		
Dairy products from local fresh milk are not safe for consumption	2.99	0.74		
Dairy products from local fresh milk have a pungent smell	3.38	0.56		
Factor 2: ethnocentrism and willingness-to-pay for local dairy products (local advocates)			17.89	0.6810
My conscience disturbs me when I buy imported products	2.63	0.61		
If I have the option, I will always purchase products from local fresh milk	3.73	0.75		
I prefer local products because of its good taste and freshness	3.83	0.77		
I will pay extra for processed local fresh milk products	3.31	0.69		
Factor 3: low value addition and less diverse local products			14.27	0.6197
Packaging of domestically produced dairy is poor and unattractive	3.64	0.52		
Products from local fresh milk are not certified	3.42	0.57		
Value addition to local fresh milk is minimal	3.85	0.75		
There is less diversity in local dairy products	3.83	0.66		
Kaiser-Meyer-Olkin test for sampling adequacy = 0.7150				
Bartlett's test of sphericity: Approx. χ^2 = 796.955, df = 66; Significance = 0.000				

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization. *Note: only factor loadings of 0.50 and above were retained

The four factors retained in table 5 explain 68.6% of the error variance. Factor 1 just like the case of Ghana is made up of 4 items on the unhygienic conditions of local milk handling, processing and

marketing in Senegal and therefore also named "*local dairy products unhygienically produced and unsafe"*. Factor 2 is composed of 3 items relating to a less diverse product range and low value addition to local fresh milk in Senegal. This factor is named "*low value addition and less diverse local products*" analogous to factor 3 in Table 3. The items in factor 3 comprise statements relating to ethnocentrism, and thus named "*ethnocentrism and willingness-to-pay for local dairy products*". Factor 4 is named "*comparatively expensive and scarce local dairy products*" because it is composed of 3 items on affordability of imported and domestic products as well as the scarcity of local dairy products in Senegal.

Table 5 Exploratory factor analysis of consumers' attitude and perceptions: Senegal

Items	Mean	Factor loadings	% of variance explained	Cronbach's alpha
Factor 1: hygiene and safety concerns of local dairy products (hygiene and safety concerns)			22.04	0.8513
Dairy products from local fresh milk are produced under unhygienic conditions	2.52	.867		
Dairy products from local fresh milk are often sold at unhygienic locations	2.47	.899		
Dairy products from local fresh milk are not safe for consumption	1.84	.788		
Dairy products from local fresh milk have a pungent smell	2.21	.725		
Factor 2: ***low value addition and less diverse local products***			16.92	0.8134
Value addition to local fresh milk is minimal	3.05	.796		
There is less diversity in local dairy products	3.26	.889		
There is more diversity in imported dairy products	3.59	.836		
Factor 3: ethnocentrism and willingness-to-pay for local dairy products (local advocates)			16.22	0.7828
If I have the option, I will always purchase products from local fresh milk	3.98	.814		
I prefer local products because of its good taste and freshness	4.00	.874		
I will pay extra for processed local fresh milk products	3.50	.808		
Factor 4: comparatively expensive and scarce local dairy products (high accessibility and affordability of imported products)			13.45	0.6044
Imported dairy products are cheaper	2.98	.800		
Domestic products from imported milk powder are cheaper compared to fresh milk products	3.21	.847		
It is difficult to find products from local fresh milk on the markets	3.42	.551		

Kaiser-Meyer-Olkin test for sampling adequacy = 0.723

Bartlett's test of sphericity: Approx. χ^2 = 2625.129, df = 78; Significance = 0.000

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization. *Note: only factor loadings of 0.50 and above were retained

4.4 Results of the Ordered Probit models

Factors influencing overall yoghurt consumption in Ghana and Senegal from the univariate ordered probit model are presented in Table 6. The models are statistically significant (prob.> χ^2 = 0.0000). However, the non-linearity of the probit model makes it difficult to interprete its estimated coefficients directly (Agresti & Tarantola, 2018; Zelner, 2009; Hoetker, 2007). A better measure for interpretation are the marginal effects (Table 7 and 8) which are expressions of how the predicted probability outcomes (dairy consumption) change with a change in the explanatory variables.

Table 6 Results of the ordered probit models: Ghana and Senegal

	Ghana	**Senegal**
VARIABLES	Freqyogh	freqyogh
gender	-0.033(0.131)	0.005(0.040)
married	0.065(0.138)	0.197(1.560)
tertiary	-0.509(0.153)***	-0.116(-0.960)
age	-0.007(0.005)	-0.002(-0.510)
employed	0.393(0.138)***	0.056(0.380)
income	-0.210(0.103)**	-0.323(-4.410)***
Childless18	0.027(0.156)	-0.533(-3.120)**
Hhsize	0.011(0.014)	0.011(0.990)
/cut1	-1.164(0.228)***	-2.217(-7.200)***
/cut2	-0.500(0.226)**	-1.522(-5.300)***
/cut3	-0.252(0.225)	-1.266(-4.400)***
/cut4	0.051(0.225)	-1.104(-3.880)***
/cut5	0.224(0.225)	-1.070(-3.770)***
/cut6	1.410(0.248)***	-0.416(-1.480)
Wald chi2	34.49(8)	36.26(8)
Prob > chi2	0.0000	0.0000
Log pseudolikelihood	-548.0861	-765.578
Observations	312	532

Note: standard errors in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels respectively

Respondents with **higher education (tertiary)** in Ghana have a higher probability of consuming dairy products frequently, 2-3times a week by 6.1% points or four times a week or more by 13.7% points (Table 7). Guiné, Florença, Carpes, & Anjos (2020) in their study in Brazil and Portugal, and Fuller, Beghin, & Rozelle (2007) in China obtain similar results where highly educated household heads influenced the consumption of yoghurt. Households with **high income levels** have a high probability of consuming dairy products frequently, four times per week or more by 5.6% points. Tekea (2021) finds similar results in Ethiopia where higher income households consume more dairy products compared to low-income ones. **Employed** households in Ghana consume yoghurts less frequently, once a month by 1.0% or occasionally by 10.0% points.

Table 7 Predicted probabilities and marginal effects of factors influencing overall yoghurt consumption frequencies-Univariate Ordered Probit moded: Ghana

	4x/week and more	2-3x/week	once/week	2-3x/month	once/month	Occasionally	Never
Pred. Prob.	0.20	0.22	0.10	0.11	0.06	0.26	0.05
gender	0.009	0.004	0.003	-0.001	-0.001	-0.008	-0.006
married	-0.017	-0.008	-0.001	0.001	0.002	-0.016	0.007
tertiary	0.137**	0.061**	0.005	-0.010	-0.013*	-0.130**	-0.050**
age	0.002	0.001	0.001	-0.002	-0.001	-0.002	0.001
employed	-0.105**	-0.047**	-0.004	0.008	0.010*	0.100**	0.038*
High income	0.056*	0.025	0.002	-0.004	-0.005	-0.054*	-0.020
Childless18	-0.007	-0.003	-0.001	0.001	0.001	0.008	-0.001
Hhsize	-0.003	-0.001	-0.001	0.002	0.002	0.003	-0.002

Note: ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels respectively

high-income earning households in Senegal have a significantly high probability of consuming dairy products occasionally by 1.9% points or more frequently by 2.9% points compared to households with low incomes. Saheeka, Udugama, Jayasinghe-Mudalige, & Attanayake (2013) find similar results in Sri-Lanka where high income households tend to consume more yoghurts compared to lower income ones. **Children (less than 18years) additionally** contribute to the frequency of dairy consumption in Senegalese households either daily (4.7%), 2-3 times per week (7.7%) or at least once a week (3.3%). Fuller, Beghin, & Rozelle (2007) find similar result where children influence positively the consumption of dairy products in households.

Table 8 Predicted probabilities and marginal effects of factors influencing overall dairy consumption frequencies-Univariate Ordered Probit moded: Senegal

	4x/week and more	2-3x/week	once/week	2-3x/month	once/month	Occasionally	Never
Pred. Prob.	0.05	0.11	0.07	0.05	0.01	0.24	0.47
gender	-0.001	-0.001	-0.002	-0.001	-0.002	-0.003	0.010
married	-0.018	-0.029	-0.012	-0.001	-0.001	-0.012	0.073
tertiary	0.010	0.017	0.007	0.004	0.001	0.007	-0.046
age	0.001	0.002	0.001	0.006	0.001	0.001	-0.012
employed	-0.005	-0.008	-0.003	-0.002	-0.004	-0.003	0.025
High income	0.029***	0.046***	0.019***	0.011***	0.002*	0.019**	-0.126***
Childless18	0.047**	0.077**	0.033**	0.019**	0.003	0.032*	-0.211**
Hhsize	-0.001	-0.002	-0.001	-0.004	-0.002	-0.003	0.013

Note: ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels respectively

4.6 Factors influencing local, domestic and imported yoghurt consumption

Ghana

Results from the binary Logit models are presented in Table 9. Households with heads or decision makers with **tertiary level education** have a significantly high likelihood of consuming local,

domestic and imported yoghurts in Ghana. Guiné, Florença, Carpes, & Anjos (2020) in their study in Brazil and Portugal, and Fuller, Beghin, & Rozelle (2007) in China obtain similar results where higher education of members of a household influenced positively the consumption of yoghurts. **High-income** households are more likely to consume local, domestic and imported yoghurts compared to low income households. In Ghana, dairy products including yoghurts are considered as a luxury especially by poorer households and so are not purchased often. These results are consistent with the findings of Fuller, Beghin, & Rozelle (2007) and Wu, Shang, and Chen (2021) in China, and Saheeka, Udugama, Jayasinghe-Mudalige, & Attanayake (2013) in Sri-Lanka where high income households tend to consume more yoghurts compared to lower income ones.

Age has a significant and positive influence on the consumption of local yoghurt. Older people are more traditional and accustomed to local foods compared to the modern younger generations. Boniface & Umberger (2012) find similar results in Malaysia where age has a positive influence on the consumption of local dairy products. **The presence of children less than 18years** in the household negatively influences the consumption of local yoghurt. However**, larger households** in Ghana are observed to have a high likelihood of consuming local yoghurt compared to smaller households. **People who are gainfully employed** have a lower likelihood of consuming domestic yoghurts compared to the unemployed, violating our expectations. **Consumers who perceive local dairy products as unhygienically produced and unsafe** have a lower tendency of consuming local yoghurts. These consumers are cautious about the risks of exposure to food-borne diseases which is reflected in their consumption behaviour. In contrast, the results show that consumers advocating and expressing a willingness-to-pay for local (dairy) products do not significantly consume more often local yoghurt. **Ethnocentric attitudes** are said to lead to the objection of imported products (Sharma, Shimp & Shin, 1995; Shimp & Sharma, 1987), nevertheless, as results of this study show, ethnocentrism has a high influence on the choice of domestic and imported yoghurts. This is similar to findings of Alshammari & Williams (2018) in Saudi Arabia and Clipa, Danileț, & Clipa (2017) in Romania where positive perceptions towards local products did not have an influence on the purchase decisions of imported goods. Respondents who perceive local dairy products as having low value addition and less diverse **have a** lower likelihood of consuming local yoghurts. Local dairy products sold in Ghana are largely not certified, and are poorly packed with no traceable information (Boimah, Weible, & Weber, 2021). To be on the safe side, cautious consumers will prefer not to patronize products whose production histories are missing.

Senegal

The regression results show that **married households** have a lesser likelihood of consuming domestic yoghurts compared to unmarried homes. **Households with High income** levels are more likely to consume all three origins of yoghurt compared to low-income ones. **The presence of children less than 18 years** in the household significantly increase the likelihood of consuming yoghurts from all three origins in Senegal consistent with findings of Fuller, Beghin, & Rozelle (2007). Dairy products are vital to the growth of children, considering their rich source of calcium. It is

therefore highly recommended worldwide for infants, toddlers, and young children. Even though Senegalese respondents are skeptical about the **hygienic and safety standards** of local milk handling, processing and marketing, the likelihood of purchasing local yoghurts is significantly high in contrast to the behaviour of concerned Ghanaians who exhibit a lower likelihood of consuming local yoghurt. Boimah & Weible (2021) find similar results from their focus group discussion study in Senegal where consumers exhibit a very strong preference for local products over domestic and imported ones. In addition, consumers with hygiene and safety concerns regarding local dairy products, have a high tendency of consuming domestic and imported yoghurts. Chung Lo, Tung, Yuan Wang, & Huang (2017) identify consumer ethnocentrism as an important factor in product evaluation in developing countries. According to Sharma, Shimp & Shin (1995) the reason why people prefer and choose local goods is because they want to support domestic industries. However, similar to Ghana, **ethnocentric** tendencies result in a high likelihood of purchasing domestic and imported yoghurts in addition to local yoghurt.

Consumers with **concerns about minimal value addition** to local milk are less likely to consume local yoghurts but have a high likelihood of consuming domestic and imported yoghurts. This finding is similar to Ghana, where local yoghurts are not well packaged and do not have traceable information. Tekea (2021) and Bytyqi, Muji, & Rexhepi (2020) in their separate studies in Ethiopia and Kosovo find traceable information as an important attribute considered by consumers in their choice of dairy products. The variable "**comparatively expensive and scarce local dairy products**" stands for consumers who perceive imported dairy products as cheaper and local dairy products as scarce in Senegal. This variable has a significantly positive influence on the likelihood of consuming all three origins of yoghurt. Local milk and its products as Boimah & Weible (2021) find are perceived as more expensive and scarce in Senegal. In cases where they are available consumers buy them. However, availability and lower prices especially of domestic yoghurts influence its purchase. Ilie, Lădaru, Diaconeasa, & Stoian (2021) similarly find price and store availability as key factors influencing the purchase of dairy products in Romania.

Table 9 Results of the logit model

VARIABLES	Local	Domestic	Imported		Local	Domestic	Imported
gender	0.306(0.295)	-0.167(0.275)	0.226(0.322)		0.036(0.232)	0.037(0.231)	0.052(0.233)
married	0.186(0.311)	0.134(0.313)	-0.307(0.314)		-0.333(0.275)	-0.474(0.273)*	-0.145(0.261)
tertiary	1.329(0.343)***	0.731(0.319)**	1.360(0.327)***		0.271(0.243)	-0.040(0.237)	0.226(0.244)
Age	0.024(0.0116)**	-0.014(0.0119)	0.018(0.0128)		0.001(0.00760)	8.180(0.0077)	-0.010(0.0075)
employed	-0.458(0.318)	-0.774(0.308)**	-0.296(0.305)		-0.089(0.333)	-0.246(0.325)	-0.157(0.325)
High-income	0.477(0.241)**	0.446(0.230)*	1.210(0.354)***		0.276(0.161)*	0.353(0.152)**	0.269(0.160)*
Childless18	-0.609(0.300)**	-0.259(0.359)	-0.181(0.351)		0.968(0.323)***	0.976(0.335)***	1.079(0.336)***
Hhsize	0.123(0.0434)***	0.002(0.0440)	0.001(0.0332)		-0.016(0.0208)	0.006(0.0204)	-0.002(0.0207)
Hygiene and safety concerns	-0.501(0.129)***	0.256(0.134)*	0.079(0.140)		0.357(0.104)***	0.329(0.0998)***	0.462(0.104)***
Local advocates	0.134(0.139)	0.037(0.123)	0.483(0.147)***		0.267(0.0940)***	0.210(0.0956)**	0.187(0.0961)*
Low value added and diverse local products	-0.376(0.139)***	0.054(0.129)	-0.066(0.143)		-0.440(0.103)***	0.499(0.105)***	0.382(0.104)***
Affordability and accessibility of imported products					0.616(0.106)***	0.691(0.111)***	0.729(0.112)***
Constant	-1.784(0.487)***	1.438(0.538)***	-0.732(0.557)		-0.679(0.554)	-0.815(0.531)	-0.875(0.552)
Wald chi2(11)	54.19	18.06	62.38	Wald chi2(12)	86.48	89.37	94.90
Prob > chi2	0.0000	0.0801	0.0000		0.0000	0.0000	0.0000
Log-pseudo like.	-178.50025	-182.86967	-171.06157		-320.07994	-315.15289	-313.35106
Pseudo R2	0.1722	0.0504	0.1914		0.1304	0.1393	0.1381
Observations	312	312	312		532	532	532

Standard errors in parentheses. Note: ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels respectively

5. Conclusions

This paper investigates consumer perceptions and preferences for local, domestic and imported yoghurts in Ghana and Senegal with an aim of providing a better understanding on the influence of origin on consumer behavior in the context of developing countries. The study is timely, considering the growing criticisms of European dairy exports to developing nations. Our study shows that dairy products are consumed on a regular basis, particularly in Senegal.

Overall, the consumption of yoghurt from the three different origins are largely determined by socio-demographic factors and consumer perceptions and attitudes. Nevertheless, the influence of socio-demographic factors on the consumption of yoghurt from the three origins is more pronounced in Ghana than in Senegal, while attitudes and perceptions strongly influence yoghurt consumption in Senegal. Milk and its products are a traditional part of the diet of Senegalese and could explain why socio-demographic factors do not largely influence the consumption of local, domestic and imported yoghurts compared to the influence on consumption in Ghana. Consumers' negative perceptions with regards to hygiene and safety of local dairy products did not have a negative influence on local yoghurt consumption in Senegal as expected. This shows that food safety indicators play minimal roles in food choice in some developing countries. From the study of Boimah & Weible (2021) in Senegal, local dairy products are strongly preferred to domestic and imported brands because consumers consider them as natural, fresher, and tastier. However, proper handling of fresh milk all through the value chain is essential in preventing foodborne illnesses. Safeguarding consumers in both countries mean a significant improvement in local milk handling, processing and marketing which must be enforced by the responsible authorities.

Even though domestic and imported dairy products are to a large extent certified and safer, consumers may likely choose local products over them considering the strong preference exhibited towards local products. Nevertheless, the positive influence of ethnocentrism on the consumption of domestic and imported yoghurts implies that final purchase decisions go beyond perceptions and preferences. In both countries, "product availability" emerge as the main factor influencing consumer choice which favours domestic and imported dairy products. As mentioned by the consumers, imported and domestic dairy products are more available and affordable. This is consistent with findings of Boimah & Weible (2021) in Senegal. From a broader lens, imported dairy products especially milk powder contributes to ensuring food security in developing countries as the processing industries rely largely on it as the main input for the end products churned out. In the case of Senegal where most traditional dishes are milk based, milk powder and its products are an option to scarce local milk. Increasing imports particularly of milk powder to developing countries should therefore not be blamed entirely on EU exporters but should be considered as a "necessary evil" in meeting consumer demands. Moreover, consumers would prefer to have more high value-added local dairy products with quality packaging and labelling that meets the standards of imported and domestic dairy products. The local dairy value chain actors should consider it as

an opportunity to increase revenues and hence profits noting that consumers are willing to pay higher prices for local products.

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