Ahmed et al. Agricultural and Food Economics (2020) 8:14
https://doi.org/10.1186/s40100-020-00157-1

Agricultural and Food Economics

RESEARCH Open Access

Consumers' preference and willingness to pay for enriched snack product traits in Shashamane and Hawassa cities, Ethiopia

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Abstract

This study investigated the consumers' preference and willingness to pay for enriched snack product traits. Using a choice experiment framework, we generated 8400 observations from a random sample of 700 respondents in Shashamanne and Hawassa city administrations. Taste parameters and heterogeneities were estimated using the generalized multinomial logit (G-MNL) model. The results reveal nutrition and/or health claim labeling is the most influential trait on the consumers' decision to buy enriched snack products followed by mango flavor, sorghum chickpea main ingredient, price, and mixed shape. The WTP estimates show that consumers are willing to pay a premium for nutrition and/or health claim labeling equal to 1.43, 1.6, and 8.03 times higher than for a change in the flavor of the products from tomato to mango, the improvement of main ingredients to sorghum chickpea, and change of the product shape from spherical to mixed shape, respectively. The heterogeneities (variations) around the mean taste parameters were partially explained by sex, family size, and educational levels of the respondents. Generally, the consumers in the study areas prefer buying sorghum chickpea main ingredients, a combination of different shapes (mixed shape), mango flavored, and nutrition and/or health claim-labeled enriched snack products. Therefore, we suggest designing and implementing innovative ways of promoting snack products to urban communities with a deliberate focus on these traits to create a snack with the best combination. Given the high literacy of urban consumers and influential role of nutrition and/or health claim labeling trait on consumers' decision, the trait-based promotion and marketing of the products constitute the right strategy.

Keywords: Choice experiment, Generalized multinomial logit, Preference heterogeneity, Snack products, Willingness to pay

Introduction

Snack food products have a large impact on agricultural production and marketing as well as on agrifood processing business operations, and the products are becoming an important part of human diets as its convenience and availability attract consumers' attention (Nor et al. 2013). Snack foods are commonly foods that are eaten between main meals for pleasure and during relaxation. Snack products are acquiring an important place in the shopping list of upper and middle-class income group (Dean and Joseph 2013). Global snack sales totaled $374 billion annually in 2014 with an annual increase of 2% (Nielsen Company, 2016). Indian ready-to-eat snack market is estimated at more than Rs[1].50,000 crore[2]; having grown at a compounded annual growth rate of around 13% since 1998 till 2014 and expected to grow at a compounded annual growth rate of 22% during 2014–2019 (CARE Ratings 2015). The snack sector in the United States (US) continued to grow both in volume and in retail sales with a compounded annual growth rate of 4.2% and 2.1%, respectively, from 2011 to 2015 (Agriculture and Agrifood Canada 2016).

Ethiopia is endowed with ethnic diversity manifested in cultural diversity and a variety of indigenous knowledge such as traditional foods and beverages' processing practices (Hunduma 2012). Varieties of traditional food products such as *Injera* (leavened pancake from *Teff*, *Eragrostis teff*), *Dabbo* (varieties of bread), *Kocho* (fermented food product of *enset*, *Ensete ventricosum*), and *Wakalim* (fermented meat sausage) are produced through traditional fermentation. Local foods such as *Kollo* (roasted cereals and pulses), *Nifro* (boiled cereals and pulses), *Besso* (roasted and powdered barley),*Genfo* (porridge), *kitta* (unfermented bread), *Chuko* (barley roasted, powdered, and spiced into paste), *Kinche* (coarsely milled barely/wheat, boiled, and spiced), *Ashuk* (roasted and slightly boiled faba bean grain), *Dabbokollo* (wheat dough sliced into pea size and roasted), *Yebekollo Tibs* (roasted green maize cob), *Yebekollo kikil* (boiled green maize cob), and *Yedinch kikil* (boiled potato tuber) (Hunduma 2012) are consumed both as a snack and main meals.

Currently, the idea of agribusiness development and agro-processing had given considerable attention in Ethiopia to provide linkages between agricultural producers and processors and create an opportunity for value addition on agricultural products. Within the manufacturing sector, the agrifood processing is the largest subsector accounting for 36% of the total gross value of production (CSA 2014) and 33% of the national value added (Legesse 2015) of large and medium scale manufacturing industries. Even though no information is available regarding national sales of snack products, the Ethiopian government is emphasizing on small agribusinesses like snack products to contribute to agricultural growth through programs such as "Market and Agribusiness Development" (Quilligan 2018). The country has a lot of potential from the supply side but is poorly organized with respect to connectivity, reliable supply, technology level, and knowledge. However, there are various industries tackling this issue by setting up their own supply chain (Boere 2015).

Many established industries are already developing and launching snack products that aim to appeal to evolving consumer tastes. Like many other successful industries, there is also a severe competition in this industry (Mammadli 2016). Dynamic business environment and growing competition among market players force snack food operators to sustain competitive advantage by utilizing their resources and enhance their operations. One way to achieve that is to constantly strive for improvement, keep up with changing customer needs, perceptions, habits, and expand market share through carefully built marketing strategies.

[1]The Indian currency (Rupee)
[2]Indian word for Ten million

The increasing customer demands and expectations make competition among market players even tougher. Furthermore, several studies (Enz 2010; Parsa et al. 2011; Wood 2015) claim the food industry has the highest business failure rates among other industry sectors. Parsa et al. (2011) further note the poor performance and business failures are the consequence of a misconception of the growing customer demands, needs, and expectations. Production and marketing strategies are determined by consumers' beliefs, attitudes, preferences, and willingness to pay for the products. To implement the appropriate marketing concepts, sellers require information about the characteristics, needs, wants, and desires of their target markets. Therefore, it is necessary for snack food producers and supply chain members to know the consumers' preference and willingness to pay for the product and the main traits that consumers value more to produce the product with preferred traits. Hence, this study analyzed the consumer preferences for enriched snack products and their willingness to pay for each trait of the products and assessed factors affecting the consumers' choice in Shashamane and Hawassa cities.

The choice of food is influenced by a number of factors including demographic characteristics such as age, sex, education level, health status, and income and time constraints. Other factors are the product's attributes such as price, taste, and information obtained from its label (Sunelle et al. 2010). The consumer preference for snack food depends mainly on taste, flavor, and shape (Dean and Joseph 2013). The effects of nutrition consideration in food choice are likely to be related with consumer perceptions of the product attributes, but not necessarily related with their actual product attributes (He et al. 2005). Several studies have examined trait preference and associated willingness to pay in a range of food products over the last years (Evans 2008; Bonilla 2010; Zou 2011; McCluskey, 2013; Zheng, 2014). However, very few studies have undertaken on snack product traits. This study therefore expands the literature on snack product trait preference in a developing country by employing a discrete choice experiment. Most studies have used multinomial logit to account for preference heterogeneity. Fiebig et al. (2010) pointed out that the multinomial logit model is likely to be a poor approximation of scale heterogeneity. This study uses the recent models more for their ability to embed flexible distributions (Hess and Rose 2012) than their capability to disentangle scale heterogeneity.

Data from a choice experiment undertaken by 700 randomly selected consumers in Shashamane and Hawassa city administrations were utilized. The taste parameters, preference heterogeneities, and the implicit prices of enriched snack product traits were estimated by generalized multinomial logit (G-MNL) model (Fiebig et al. 2010).

Research methodology

Description of the study areas

This study was conducted in two cities of southern Ethiopia, Hawassa and Shashamane. Hawassa is located in the Southern Nation's Nationalities and Peoples Region (SNNPR) on the shores of Lake Hawassa in the Great African Rift Valley. It is located at about 275 km south of Addis Ababa along the Ethio-Kenya highway. It serves as the administrative center of the SNNPR and Sidama zone. The city administration has an area of 157.2 km^2 divided into 8 sub-cities and 32 *Kebeles*. The Ethiopian Central Statistical

Agency (CSA 2015) gives the estimated population of the city for 2015 as 351,469, with an annual population growth rate of just over 4%. The population is relatively young with 65% under 25 years of age and around 5.5% over 50 years of age. Shashemane city is located in Oromia National Regional State, West Arsi Zone, on a distance of 250 km from Addis Ababa. The city administration has eight sub-cities and 12 *kebeles*. The total population of the city is 147,800 based on the 2007 census result projection for 2015.

Sampling procedures

The target population of the study was all households and individual consumers belonging to a different socio-economic group in Hawassa and Shashamane cities. According to Cattin and Wittink (1982), the median sample size for consumers' preference studies ranges between 100 and 1000 subjects, with 300 to 550 most typical range. For this study, 700 (400 from Hawassa city and 300 from Shashamane city based on their population proportion) samples were selected to ensure the accuracy and reliability of the estimation.

A multistage sampling technique was employed to select the representative respondents. In the first stage, Shashamane and Hawassa cities were selected purposively based on their potential of urbanization, customer size, and proximity to snack food production plant and study site. Specially, proximity to a snack food-producing plant and the enriched snack food industry's customer size are highly considered in choosing the study areas. Guts Agro Industry, one of Ethiopian snack food producers and which is on the process to produce enriched snack products is located in Hawassa city and most of their customers reside in the same city and Shashamane city which is 25 km North of Hawassa city. In the second stage, four sub-cities were randomly selected from each city. Thirdly, 400 representative respondents from selected sub-cities of Hawassa and 300 representative respondents from selected sub-cities of Shashamane were selected using a systematic random sampling technique. In selecting the respondents for the interview, first, each enumerator chooses the direction for each day by being on a common place in each sub-city, then each enumerator started from the first house and then skip four houses and knock the fifth house for the second respondent and repeat the same procedure. If an enumerator does not get the respondent who fulfills the inclusion criteria from the selected house, he/she would knock the next house and repeat the same procedures for all respondents contacted for this study.

Research design

A mixed research design with a sequential strategy was applied to harness the strengths of both qualitative and quantitative approaches and tackle the disadvantages of both designs. The qualitative data were collected during the product attributes and level determination by participatory market appraisal and key informant interviews with knowledgeable respondents. The quantitative data were collected through face-to-face interviews by using a structured questionnaire and choice experiment cards that depict the alternative respondents have to choose.

Selection of the product attributes and levels

The first step in a discrete choice experiment is to define the product attributes and determine its levels. The selected attributes need to properly reflect the competitive environment of the available alternatives and/or be closely relevant to consumers' decision making (Blamey et al. 2001). Only the attributes relevant to the research questions should be selected (Zou 2011). The information on the relevant attributes and levels of importance could be obtained using focus group discussion with relevant industry stakeholders and a review of relevant literature (Lindlof and Taylor 2002). For this study, after a deep review of the literature (Blamey et al. 2001; Lindlof and Taylor 2002; He et al. 2005; Evans 2008; Bonilla 2010; Zou 2011; Dean and Joseph 2013; McCluskey et al., 2013; Zheng, 2014; Juma et al. 2016), snack food producer industry representatives and academic researchers specializing in agricultural marketing were consulted and involved in the process of identifying important hypothetical product attributes. Using those identified attributes, researchers conducted 3 days of a participatory market appraisal on snack food retail shops in Hawassa and Shashamane cities and selected five major attributes that were observed to highly affect the consumer choice for the products.

Five major selected attributes of the products were the main ingredients, the flavor of the products, price per unit, nutrition and/or health claim labeling, and shape of the products. For these major attributes, the researchers determined the respective levels based on the result of the participatory market appraisal. The main ingredient attribute has three levels (sweet maize, maize-chickpea, and sorghum-chickpea) while two levels were specified for the shape of the products (spherical and mixed). The flavor has two levels (mango flavor and spicy tomato flavor). In this study, nutrition and/or health claim labeling attribute has two levels (labeled and not labeled). According to the observations made on snack supermarkets and retail shops in Hawassa and Shashamane cities, four levels were selected for price attributes. These selected price levels are 2 ETB, 4 ETB, 6 ETB, and 8 ETB per 20 g packet of enriched snack products (Table 1).

Table 1 Enriched snack products' attributes and levels

Attributes	Description	Levels	Code	Reference level
Main ingredients	Main crops from which the products have been produced that accounts for 90% or more of the product contents.	Sweet maize Sorghum-chickpea Maize-chickpea	SM IN1 IN2	Sweet maize
Products shape	The physical appearance of the products which resembles the shape of different things.	Spherical Mixed	SHP	Spherical
Flavor	A particular quality character that gives the product pleasant tastes which were experienced on other natural products.	Tomato Mango	FLV	Tomato
Nutrition and/or health claim labeling	Providing the consumer with factual information on the nutritional values of the food products and its relation to the consumers' health by labeling the food products' packages	Labeled Not labeled	LAB	Not labeled
Price	The amount of money the consumers pay for each 20 g packet of particular snack products.	2 ETB[a] 4 ETB 6 ETB 8 ETB	PRC	

[a]The Ethiopian Currency (Ethiopian Birr), $1~24 ETB at the survey time

Choice experiment design

The full factorial design of five attributes (one four-level attribute, one three-level attribute, and three two-level attributes) contains 96 possible combinations of alternatives ($2^3 \times 4 \times 3$) and was assigned to Ngene Software, and a fractional factorial efficient design consisting 12 choice sets was derived using the Halton (50) sequence. Each choice task has two alternatives (1 and 2) describing different possible combinations of snack attributes and a neither option (alternative 3) to allow respondents' flexibility in the choices. An example of the choice tasks presented to respondents is illustrated in Table 2 below.

Methods of data collection

The primary data was collected through face-to-face interviews with sample respondents. The profile cards were prepared for each choice set and every respondent was shown 12 choice sets and asked to choose one out of the three alternatives that were presented on each choice set. This makes the total number of completed choice situations 8400 (700 × 12) from 700 respondents participated in the study.

Statistical and econometric analyses

Both descriptive statistics and econometric analyses were used to analyze the primary data collected by the choice experiment. Statistics such as simple measures of central tendency, table, frequency, percentages, and chi-square test were employed. NLOGIT 6 (Econometric Software) was used to fit a wide range of G-MNL models. The model was estimated by simulated maximum likelihood using Halton draws with 50 replications.

Discrete choice model

The conditional logit (CL) is the most common model used to analyze data from choice experiments (McFadden 1974). This model is based on random utility theory. The random utility model split the total utility into two parts: a deterministic component based on product attributes j (V_{ij}) and a stochastic or random, unobserved error component (ε_{ij}) (Louviere et al. 2000; Heiss 2002). The resulting utility equation is as follows:

$$U_{ij} = V_{ij} + \varepsilon_{ij}, j = \text{alternative}\, 1, 2, \text{and}\, 3, \tag{1}$$

where U_{ij} is the utility of the ith consumer choosing the jth alternative.

Table 2 Example of one of the choice sets (profile cards) presented to respondents

Choice set			8
Attributes	Alternative 1	Alternative 2	Alternative 3
Main ingredients	Maize chickpea	Sorghum chickpea	I would not purchase any of these snack products
Products' shape	Spherical	Combination	
Products' flavor	Mango	Tomato	
Nutrition and/or health claim labeling	Labeled	Not labeled	
Price per 20 kg packet (ETB)	6	8	
Your choice			

The conditional logit model assumes independent and identically distributed (iid) error terms with a type I extreme value distribution. CL also assumes the independence of irrelevant alternatives (IIA). IIA states that the inclusion or exclusion of an alternative from the choice set will not affect the probability of an alternative being chosen (Hensher et al. 2005). The mixed logit model relaxes the IIA assumption by allowing heterogeneity of preferences for observed attributes. Hence, the utility weight (β_i) for a given attribute will be given as follows:

$$\beta_i = \beta + \Gamma V_i \tag{2}$$

where β is the vector of mean attribute utility weights in the population, Γ is a diagonal matrix which contains σ (the standard deviation of the distribution of the individual taste parameters (β_i) around the population mean taste parameter (β)) on its diagonal, and ν is the individual and choice-specific unobserved random disturbances with mean 0 and standard deviation 1 (Fiebig et al. 2010).

Another improvement over the conditional logit model is the scaled multinomial logit (S-MNL) model. The S-MNL formulation allows the model to accommodate scale heterogeneity; i.e., variance in utility across individuals. The added advantage of S-MNL can easily be seen for the fact that in the simple multinomial (MNL) and mixed or random parameter logit (MIXL) specifications, there is a scale or variance that has been implicitly normalized (to that of the standard extreme value distribution) to achieve identification (Fiebig et al. 2010). In S-MNL, the utility weights are given as follows:

$$\beta_i = \sigma_i \beta \tag{3}$$

The scaling factor σ_i differs across individuals but not across choices. This also implies that the vector of utility weights β is scaled up or down proportionally across respondents by the scaling factor σ_i. Fiebig et al. (2010) and Greene (2012) have developed a G-MNL model that nests MIXL and S-MNL to avoid the limitations observed in MIXL. In G-MNL, the utility weights are estimated as follows:

$$\beta_i = \beta\sigma_i + \gamma\Gamma V_i + (1-\gamma)\sigma_i\Gamma V_i \tag{4}$$

The generalized mixed logit model embodies several forms of heterogeneity in the random parameters and random scaling, as well as the distribution parameter γ, which ranges between 0 and 1. The effect of scale on the individual idiosyncratic component of taste can be separated in two parts: unscaled idiosyncratic effect ($\gamma\Gamma\nu_i$) and scaled by (1-γ) $\sigma_i\Gamma\nu_i$ where γ allocates the influence of the parameter heterogeneity and the scaling heterogeneity. The parameter γ also governs how the variance of residual taste heterogeneity varies with scale in a model that includes both (Fiebig et al. 2010). Several interesting model forms are produced by different restrictions on the parameters. For example, if we set the scale parameter $\sigma_i = \sigma = 1$, the model becomes ordinary MIXL. If $\gamma = 0$ and $\Gamma = 0$, we obtain the scaled MNL model. Fiebig et al. (2010) also present two unique forms of G-MNL. By simply combining 2 (MIXL) and 3 (S-MNL), G-MNL-I is formed whereby the utility weight is given as follows:

$$\beta_i = \beta\sigma_i + \Gamma V_i \tag{5}$$

The other form is called G-MNL-II developed based on MIXL and explicit specification of the scale parameter to yield

$$\beta_i = \sigma_i(\beta + \Gamma V_i) \tag{6}$$

where σ_i captures the scale heterogeneity and $\sigma_i\ \Gamma v_i$ captures residual taste heterogeneity. The difference between G-MNL-I and G-MNL-II is that in G-MNL-I, the standard deviation of Γv_i is independent of the scaling of β, whereas in G-MNL-II, it is proportional to the scale heterogeneity σ_i. G-MNL approaches G-MNL-I as γ approaches 1, and it approaches G-MNL-II as γ approaches 0. In the full G-MNL model, γ ϵ [0, 1] (Fiebig et al. 2010).

Greene and Hensher (2010) proposed including the observable heterogeneity already in the mixed logit model and adding it to the scaling parameter as well. Also allowing the random parameters to be correlated (via the nonzero elements in Γ) produces a multilayered form of the generalized mixed logit model:

$$\beta_i = \sigma_i[\beta + \Delta z_i] + [\gamma + \sigma_i(1-\gamma)]\Gamma V_i \tag{7}$$

Following Kassie et al. (2017), some of the appealing modifications and extensions of the general framework presented by Greene (2012) have been taken into consideration. Greene's specification of the utility weight explicitly shows how heterogeneities are accommodated in the above equation 7. Following the G-MNL model specification in green (Greene 2012), the probability that individual i chooses alternative j from the set in choice task t is given as follows:

$$P(j, X_{\mathrm{it}}, \beta_{\mathrm{ir}}) = \frac{\exp\left(X'_{\mathrm{ijt}}\beta_{\mathrm{ir}}\right)}{\sum_{j=1}^{J_{it}} \exp\left(X_{\mathrm{ijt}}\beta_{\mathrm{ir}}\right)} \tag{8}$$

where $\beta_{\mathrm{ir}} = \sigma_i[\beta + \Delta z_i] + [\gamma + \sigma_i(1-\gamma)]\Gamma V_i$, $\sigma_{\mathrm{ir}} = \exp(\frac{-\tau^2}{2} + \sigma' h_i + \tau w_i)$, v_{ir} and w_{ir} are the R simulated draws on v_i and w_i.

Estimating willingness to pay for snack food products' traits and trait levels

This generalized mixed model also provides a straightforward method of re-parameterizing the model to estimate the taste parameters in willingness to pay (WTP) space which has recently become a behaviorally appealing alternative way of directly obtaining an estimate of WTP (Fosgerau 2007; Scarpa et al. 2008; Train and Weeks 2005; Fiebig et al. 2010; Hensher and Greene 2011; Greene 2012). If $\gamma = 0$, $\Delta = 0$ and the element of β corresponding to the price or cost variable is normalized to 1.0 while a nonzero constant is moved outside the brackets, the following re-parameterized model emerges:

$$\beta_i = \sigma_i\beta_c\left[\left(\frac{1}{\beta_i}\right)^{1}(\beta + \Gamma V_i)\right] = \sigma_i\beta_c\left[\theta_c^{1} + \Gamma V_i\right] \tag{9}$$

This model produces generally much more reasonable estimates of willingness to pay for individuals in the sample than the model in the original form in which WTP is computed using ratios of parameters (Train and Weeks 2005; Greene and Hensher 2010; Hensher and Greene 2011).

Results

Description of demographic and socioeconomic characteristics of respondents

Age and family size of the respondents

The average age of the sample respondents was 27 years (in 14 to 53 age range), whereas it was 27.3 and 26.6 for Shashamane and Hawassa cities, respectively. The total sample had an average family size of about 3 persons with a range of 1 to 9 persons (Table 3).

Gender, marital status, and educational level of the respondents

About 51.1% of respondents were males while the rest 48.9% were females showing a comparable proportion of male and female in the sample respondents. In Hawassa, 52% were female and 48% were male while in Shashamane, 55.3% were male and 44.7% were female (Table 4). Chi-square test indicates no significant difference in the sex of respondents among the cities at 95% level of statistical error. About 59.5%, 40.0%, and 0.5% were married, single, and divorced, respectively, in Hawassa, whereas 53.3%, 44.7%, and 2.0% were single, married, and divorced, respectively, in Shashamane city. For the entire sample, 53.1% married, 45.7% single, and 1.1% divorced (Table 4). This variation in the marital status of respondents among the two study cities was statistically significant at less than 1% level of statistical error.

About 2% of the respondents were illiterate and 7% can only read and write whereas 25% were in elementary schools, 30% in high school, 11% attended technical college, 15% diploma level, and 10% university degree holders (Table 4). The illiteracy level of the respondent was higher in Shashamane than in Hawassa. The result of chi-square test shows the difference in the educational status of the respondents in the two cities that was statistically significant at 1% level of statistical error.

Econometric results

In this section, we present the empirical results of the G-MNL model, the heterogeneity in mean parameters, and the WTP estimates. The empirical results for discrete choice experiment data were estimated by a flexible G-MNL modeling approach that can accommodate scale as well as preference heterogeneity (Fiebig et al. 2010). G-MNL provides a better fit than either MIXL or S-MNL alone. It achieves a log-likelihood improvement over MIXL, and it beats MIXL on all three information criteria (AIC, BIC, and CAIC) (Fiebig et al. 2010).

Mean preference parameters estimate for all attributes have the expected sign and statistically significant at 1% and 5% levels of statistical error in all formulations of the G-MNL model. The significant standard deviations for the random parameters in the G-MNL model show the unobserved heterogeneity in preference coefficients for the

Table 3 Sample respondents' age and family size

Variables	Cities								Total (n = 700)			
	Hawassa (n = 400)				Shashamane (n = 300)							
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Age	26.64	7.319	14	50	27.27	8.208	16	53	26.91	.0485	14	53
F-size	2.90	1.826	1	9	2.56	1.944	1	9	2.75	.0118	1	9

Table 4 Sample respondents' sex, marital status, educational level, and monthly income

Variables	City				Total		Chi-square	Sig.
	Hawassa		Shashamane					
	Freq	%	Freq	%	Freq	%		
Sex							3.690	0.055
Female	208	52	134	44.7	342	48.9		
Male	192	48	166	55.3	358	51.1		
Total	400	100.0	300	100.0	700	100.0		
Marital status the respondents							17.139	.000***
Single	160	40.0	160	53.3	320	45.7		
Married	238	59.5	134	44.7	372	53.1		
Divorced	2	0.5	6	2.0	8	1.1		
Total	400	100.0	300	100.0	700	100.0		
Education level of the respondents							64.664	000***
Illiterate	1	0.2	16	5.3	17	2.4		
Write & read	17	4.2	34	11.3	51	7.3		
Elementary	87	21.8	88	29.3	175	25.0		
High school	114	28.5	95	31.7	209	29.9		
Technical college	47	11.8	27	9.0	74	10.6		
Diploma	83	20.8	21	7.0	104	14.9		
Degree holder	51	12.8	19	6.3	70	10.0		
Monthly income of the respondents (ETB/Month)							124.152	000***
Less than 1000 ETB	93	23.2	99	33.0	192	27.4		
1000–2000 ETB	42	10.5	111	37.0	153	21.9		
2001–3000 ETB	96	24.0	49	16.3	145	20.7		
3001–4000 ETB	79	19.8	34	11.3	113	16.1		
4001–5000 ETB	56	14.0	6	2.0	62	8.9		
5001–10,000 ETB	32	8.0	1	0.3%	33	4.7		
Above 10,000 ETB	2	0.5	0	0.0	2	0.3		
Total	400	100	300	100	700	100		

***Significant at 1% level

choice attributes. In order to prove the explanatory power of the model, the McFadden pseudo R^2 was used as a goodness-of-fit measure. According to Hensher et al. (2005), a McFadden pseudo-R^2 of at least 0.3 represents an appropriate model fit. This study shows the model has a McFadden pseudo R^2 range of 0.43 to 0.45 that implies the model fits well. The different formulations of the G-MNL model resulted in very similar results. In both choice decision and heterogeneity in mean estimations, full G-MNL (with no restriction on γ and τ) has the lowest values for all model selection criteria. Among the choice models, GMNL-II specification performs best whereas G-MNL (τ = 1) specification performed best among the heterogeneity in mean models.

Basic G-MNL model results

The full G-MNL model (no restriction on τ and γ) indicated nutrition and/or health claim labeling, mango flavor, sorghum chickpea main ingredients, and mixed shape which are the traits that have a strong order and positive significant effect on the choice of enriched snack products compared to their respective reference level. Unobserved heterogeneities were also evident around mean taste parameters for shape, flavor, nutrition, and/or health claim labeling and price of the products. All the formulations of the G-MNL model generated comparable results by order and direction of influences on consumers' decision and significance levels. Compared to the full G-MNL model, the unobserved heterogeneity coefficients for mango flavor and nutrition and/or health claim labeling were quite heavier and the unobserved heterogeneity coefficient for the price was quite weaker in G-MNL-II (Table 5).

The coefficients for the mean taste parameters were quite higher in the G-MNL-I model than full G-MNL and G-MNL-II except for the coefficient of the price that was quite smaller than the coefficients in the G-MNL-II model. Unobserved heterogeneity was also evident around mean taste parameters for mixed shape, mango flavor, nutrition, and/or health claim labeling, and the coefficients of unobserved heterogeneity around the mean taste parameters were quite stronger in this model than in full G-MNL and quite weaker than in G-MNL-II model. The fourth model with a restriction on τ (G-MNL ($\tau = 1$)) resulted in slightly different coefficients both for mean taste parameters and standard deviations of random taste parameters (unobserved heterogeneity) compared to the other three models. Coefficients are quite higher than other models except for the shape, which was lesser than the coefficients in the two models and higher than the coefficients in the full G-MNL model. It shows the same mean taste parameters' order and their respective direction of influences on the product choice to other three generalized multinomial logit models. Unobserved heterogeneity

Table 5 Basic G-MNL model results of attributes' choice model

	Full G-MNL		G-MNL-II (γ=0)		G-MNL-I (γ=1)		G-MNL (τ = 1)	
	β	St. err.	β	St. err	β	St. err.	β	St. err.
Taste parameters in utility functions								
Sorghum-chickpea	.584***	.071	.493***	.078	.595***	.085	.796***	.073
Maize-chickpea	− .208**	.086	− .147	.096	− .197**	.087	− .397***	.079
Shape	.205***	.042	.328***	.048	.226***	.047	.213***	.045
Flavor	.681***	.038	.680***	.048	.751***	.056	.958***	.050
Labeling	1.216***	.049	1.024***	.048	1.227***	.072	1.316***	.066
Price	− .260***	.014	− .301***	.015	− .283***	.016	− .307***	.022
Constant	− 4.76***	.123	− 5.12***	.151	− 4.78***	.141	− 4.97***	.149
Heterogeneity in mean (standard deviation)								
Sorghum-chickpea	.083	.108	.051	.077	.033	.089	.035	.058
Maize-chickpea	.005	.159	.057	.118	.057	.060	.158**	.065
Shape	.123***	.042	.111	.319	.161**	.066	.206***	.059
Flavor	.236***	.027	.415***	.069	.343***	.047	.403***	.050
Labeling	.345***	.038	.701***	.050	.432***	.071	.891***	.061
Price	.055***	.018	.027***	.010	.013	.039	.008	.017
Tau (τ)	.735***	.034	.684***	.082	.708***	.055	1.0	Fixed
Gamma (γ)	1.487***	.146	0.0	Fixed	1.0	Fixed	.098	.071
Sigma (i)	.976	.765	.979	.707	.978	.734	.957	1.089
N	8400		8400		8400		8400	
LL function	− 5124.27		− 5065.44		− 5111.37		− 5078.14	
McFadden Pseudo-R^2	.444		.451		.446		.449	
AIC/N	1.224		1.209		1.220		1.212	

The asterisk symbols ***, **, and * imply the significance at 1%, 5%, and 10% level, respectively was also evident around the mean of the taste parameters of all attributes except for the price and sorghum chickpea main ingredients.

Based on the estimates obtained from all formulations of the G-MNL model, nutrition, and/or health claim labeling was the most influential attribute of enriched snack products. The second most important trait in snack product choice decision was the products' flavor. The consumers prefer purchasing mango-flavored snack food products than purchasing spicy tomato-flavored one. The other important trait in influencing consumers' decision to purchase snack products was sorghum chickpea main ingredients which indicate that consumers prefer this ingredient over snack products with sweet maize main ingredients. The shape of the snack products was also an important attribute in influencing consumers' decision to buy enriched snack products. The price has a negative coefficient as expected, which implies that a higher price per packet of the products would decrease consumers' utility, i.e., as the product price increases from its lowest level to its highest level, the consumers' likelihood to purchase the product decreases other things being constant.

Heterogeneities in enriched snack product traits

The estimated coefficients on the attributes are significant and their standard deviations reveal significant unobserved heterogeneity across individual choices for all attributes. In order to obtain information about the sources of individual heterogeneity, socio-demographic variables were interacted with the choice experiment attributes, and sex, family size, and educational levels were found significantly explaining the variations around the average taste preference for the traits (Table 6). All heterogeneity-in-mean model formulations [full G-MNL, G-MNL (γ = 0), G-MNL (γ = 1), and G-MNL (τ = 1)] generated comparable results. Here, our discussion will be on the unrestricted model (full G-MNL). The respondents' educational status was the only significant factor explaining the variations in the coefficients of preference in sorghum chickpea main ingredient trait. The group of respondents with elementary, high school, and diploma educational levels was less interested in sorghum chickpea main ingredients compared to the illiterate respondents. The interest in the shape of the products was positively influenced by the respondents' educational levels, while the variation around the average level of taste preference for flavor was found to be the result of respondents' sex and educational levels. The educational level of the consumers was also identified as another factor explaining the variations in preference coefficients of the products' flavor.

The unobserved heterogeneity in preference around the mean parameter estimates of nutrition and/or health claim labeling trait was also caused by the variation in the respondents' family size and educational levels. As the respondents' family increases their interest in nutrition and/or health claim labeling trait of snack products will decrease, everything else will be the same. The unobserved heterogeneity around the mean of the estimated parameter of the nutrition and/or health claim labeling trait was also explained by the difference in the educational level of the respondents. The respondents with high school and diploma educational levels were negatively related to the trait implying these respondents are less interested in nutrition and/or health claim labeling while respondents with a degree and above educational levels have a positive relation to the trait suggesting their strong interest in nutrition and/or health claim labeling

Table 6 Heterogeneity in mean taste parameter models

	Full G-MNL		G-MNL-II (γ=0)		G-MNL-I (γ=1)		G-MNL (τ = 1)	
	β	St. err	β	St. err	β	St. err	β	St. err
Taste parameters								
Sorghum-chickpea	.477***	.110	.439***	.105	.466***	.106	.667***	.115
Maize-chickpea	.086	.122	.114	.120	.092	.102	− .262**	.111
Shape	.372***	.044	.367***	.043	.259***	.042	.075**	.038
Flavor	.473***	.060	.474***	.056	.483***	.065	.677***	.100
Labeling	1.16***	.084	1.139***	.077	1.192***	.100	1.244***	.107
Price	− .378***	.027	− .379***	.026	− .352***	.027	− .188***	.020
Constant	− 5.16***	.136	− 5.12***	.139	− 5.05***	.147	− 5.01***	.155
Observed heterogeneities								
S-CH*elementary	− .464***	.090	− .456***	.089	− .373***	.107	− .179*	.092
S-CH*high school	− .186**	.079	− .178**	.076	− .164**	.081	− .047	.070
S-CH*diploma	− .666***	.101	− .631***	.096	− .684***	.118	− .136*	.078
M-CH*family size	− .031	.031	− .040	.030	− .026	.024	− .070**	.031
M-CH: elementary	.464***	.125	.464***	.122	.360***	.113	.163	.112
Shape*write & read	.493***	.121	.506***	.111	.556***	.120	.173**	.083
Shape*elementary	.337***	.056	.346***	.055	.316***	.061	.167***	.054
Flavor*sex	− .218***	.045	− .217***	.043	− .238***	.050	.016	.059
Flavor*family size	− .018	.013	− .016	.013	− .004	− .004	− .041**	.017
Flavor*Write & read	− .354***	.077	− .340***	.071	− .266***	.096	− .009	.077
Flavor*high school	.184***	.052	.186***	.048	.165***	.056	.101	.062
Flavor*degree	.539***	.089	.480***	.077	.531***	.111	.264***	.088
Labeling*sex	− .081	.054	− .089*	.051	− .048	.068	.064	.073
Labeling*family size	− .055***	.018	− .046***	.017	− .073***	.020	− .071***	.025
Labeling*high school	− .142*	.073	− .157**	.069	− .167*	.088	− .148*	.089
Labeling*diploma	− .942***	.083	− .909***	.074	− 1.08***	.146	− .098	.110
Labeling*degree	.244**	.113	.221**	.101	.193	.152	.011	.116
Price*family size	.018***	.005	.019***	.005	.022***	.006	− .011**	.005
Price*write & read	− .178***	.054	− .161***	.051	− .294***	.077	− .036	.033
Price*high school	.031	.025	.038	.023	.042*	.021	.691	.018
Price*Tec. college	− .132***	.039	− .129***	.036	− .017	.037	.063**	.030
Price*diploma	− .049	.029	− .053**	.026	− .101***	.036	− .046	.035
Heterogeneity in mean (standard deviation)								
Sorghum-chickpea	.129	.120	.040	.105	.089	.083	.033	.099
Maize-chickpea	.039	.202	.048	.156	.000	.060	.025	.056
Shape	.127**	.063	.130**	.055	.128**	.057	.156***	.050
Flavor	.331***	.029	.321***	.028	.293***	.039	.351***	.054
Labeling	.518***	.037	.510***	.037	.536***	.051	.455***	.114
Price	.084***	.020	.076***	.019	.078***	.020	.031**	.012
Tau (τ)	.564***	.035	.558***	.033	.553***	.030	1.0	Fixed
Gamma (γ)	.621***	.119	0.0	Fixed	1.0	Fixed	.565***	.200
Sigma (i)	.984*	.573	.985*	.566	.985*	.561	.957	1.089
N	8400		8400		8400		8400	
LL function	− 5236.95		− 5243.05		− 5229.90		− 5139.53	

Table 6 Heterogeneity in mean taste parameter models *(Continued)*

	Full G-MNL		G-MNL-II (γ=0)		G-MNL-I (γ=1)		G-MNL (τ = 1)	
	β	St. err	β	St. err	β	St. err	β	St. err
McFadden pseudo-R^2	.432		.431		.433		.443	
AIC/*N*	1.256		1.258		1.255		1.233	

The asterisk symbols ***, **, and * imply the significance at 1%, 5%, and 10% level, respectively
S-CH sorghum-chickpea, *M-CH* maize-chickpea

compared to illiterate respondents. The unobserved heterogeneity around the mean of the estimated parameters of the price trait was the result of the variations in family size and educational levels of the respondents.

Willingness to pay for enriched snack food product traits

Based on the estimates obtained in full G-MNL model formulations, the marginal value also known as the willingness to pay (WTP) or implicit price for a single attribute level was estimated in WTP space (Fiebig et al. 2010; Greene 2012). The WTP for an increase or change in an attribute level is the price increase, which combined with the attribute increase, leaves the deterministic part of the respondents' utility for a profile unchanged and hence the choice probability unchanged (Fiebig et al. 2010).

The WTP method provides a means of interpreting the estimated parameters and identifying the monetary values associated with changes in those attributes. The coefficients estimated in WTP space can be estimated using Bayesian techniques or through maximum simulated likelihood and can be interpreted directly as marginal WTP estimates (Train and Weeks 2005). The absolute figures of willingness to pay (WTP) estimates refer to an extra price premium that consumers are willing to pay as an attribute shows change (improvement) from its base (reference) level. The results of WTP values show that nutrition and/or health claim labeling was more valued than all other traits followed by flavor, sorghum chickpea main ingredients, and shape of the products by the consumers of the study area.

The results indicate that sample consumers are willing to pay a premium for nutrition and/or health claim-labeled snack products that are 1.43 times the amount they are willing to pay for the change in the flavor of the products from spicy tomato to mango. The consumers are also willing to pay for the nutrition and/or health claim labeling 1.6 times the amount they are willing to pay for the improvements in the main ingredients to sorghum chickpea. Similarly, the sample respondents valued nutrition and/or health claim labeling 8.03 times higher than the value they attach to the change in the products' shape from spherical to mixed shape. It shows the relative importance of nutrition and/or health claim labeling trait over all other traits of enriched snack products (Table 7).

Discussions

Snack food products have a large impact on agricultural production and marketing as well as on agrifood processing business operations. The increasing customer demands and expectations make competition among market players even tougher. Production and marketing strategies are determined by consumers' beliefs, attitudes, preferences, and willingness to pay for the products. We employed a choice experiment approach to

Table 7 Willingness to pay for enriched snack product traits in willingness to pay space

	WTP (full G-MNL model)	
	Coefficient	St. error
Taste parameters		
Sorghum-chickpea	2.835***	.2669
Maize-chickpea	− 1.433***	.2574
Shape	.566***	.1252
Flavor	3.177***	.2174
Labeling	4.547***	.2895
Price	1.0	Fixed
Heterogeneity in mean		
Sorghum-chickpea	.204	.4247
Maize-chickpea	.046	.5044
Shape	.605***	.2114
Flavor	.633***	.1492
Labeling	3.157***	.2652
Price	0.0	Fixed
Tau scale (τ)	1.0	Fixed
Gamma (γ)	0.0	Fixed
βWTP	.325***	.0211
S. βWTP	.119***	.0166
Sigma (i)	.957	1.0890
N	8400	
LL Function	− 5084.81	
McFadden pseudo-R^2	.448	
AIC/*N*	1.214	

The asterisk symbols ***, **, and * imply the significance at 1%, 5%, and 10% level, respectively

elicit preferences for traits of snack products and used recent developments in discrete choice modeling to quantify the implicit prices consumers are willing to pay for the traits.

The different formulations of the G-MNL model resulted in very similar results. Based on the estimates obtained from all formulations of the G-MNL model, nutrition and/or health claim labeling was the most influential attribute of enriched snack products. These facts revealed that consumers prefer the existence of nutrition and/or health importance information such as disease prevention claims and risk reduction claims on the packages of the snack food products. These results can help to inform the food manufacturing industries to differentiate their products by labeling with nutrition and/or health importance information in addition to the obligatory food labeling. These findings are coherent with previous studies suggesting consumers would like to see all information (manufactory: expiry dates, and validity dates; nutritive value of food in addition to the health claims and the health warnings) (Washi 2012; Zou 2011) which reported consumers perceive a disease prevention claim as a drug claim and cautious of this claim on food labels. On the contrary, the study by Mojduszka and Everett (2005) indicates that consumers do not value many nutrition and/or health characteristics of frozen meal products.

Other traits are also important in enriched snack product choice decisions. For instance, the products' flavor is an important trait in urban Ethiopia. Given different types of flavor used by snack product industries, the consumers of the study area prefer purchasing mango-flavored snack products to spicy tomato-flavored one. Similarly, sorghum chickpea main ingredient has an important implication in terms of nutrition and/or health contents. The consumers are aware that the sorghum chickpea blend has better nutrition and/or health combination than sweet maize. It shows consumers are more cautious about their health and hence they choose protein-, fiber-, and carbohydrate-enriched snack over carbohydrate-enriched and protein-deficient snack products. The shape of the products was also an important trait in the consumers' decision to buy enriched snack products. The trait has a positive coefficient and significance across all the formulations of the G-MNL model implying that consumers prefer buying snack products with mixed shape to snack products with a spherical shape.

Unobserved heterogeneity was also evident across the means of taste parameters of most traits including price. Sex, family size, and educational levels were found to be the factors that best explain variation around the average taste preference for the traits. The variations in the preference estimates of nutrition and/or health claim labeling were caused by the differences in the respondents' family size and educational level. The average family size was 3 members in a household with a maximum of 9 members and a minimum of 1 person. As the respondents' family increases, their interest in nutrition and/or health claim labeling trait will decrease. This is intuitive that the respondent with small family would certainly be keen on the quality and nutrition and/or health importance of the product by reading its labels while respondents with a large family would be keen more on the quantity of the products and price rather than quality to buy sufficient products for their family. The respondents with high school and diploma educational levels are less interested in nutrition and/or health claim labeling while respondents with a degree and above educational levels have a strong interest in nutrition and/or health claim labeling compared to illiterate respondents. This is interesting and expected simply showing more educated respondents are more sensitive to the labeling of the products by reading the labels on the packages prior to buying the products.

The variations around the average level of taste preference for flavor were found to be the result of respondents' sex and educational levels. Female respondents are more interested in flavor trait than their male counterparts. It might be due to the high interest of male respondents to other traits of the products. The educational level of the consumers was also identified as another factor explaining the variations in preference coefficients of the products' flavor. The respondents with only write/read educational level were less interested in the products' flavor while those with high school and university degree holders were strongly interested in the trait compared to illiterate respondents. This might be due to the high attention given by the respondents with only write/read educational level to another trait like the shape of the products. The respondents with only write/read educational level had shown a strong interest in the products' shape compared to illiterate respondents. Similarly, the respondents with elementary school, who are apparently teenage children, were interested in the shape of the products compared to respondents with other literacy levels. Mostly, the chief consumers of snack products are school children whose decisions are highly affected by the design and shape of the products. Therefore, age-based segmentation of the customers for snack food production and promotion is the right strategy for snack producers.

The preference heterogeneity of the estimated parameters of the price trait was due to the variations in family size and educational levels of the respondents. Family size has a positive relation with the price. The respondents with a large family are highly interested in the trait. It might be due to the high interest of the respondent with a small family to the products' nutrition and/or health quality and high interest of the respondents with a large family to the quantity of the products and price rather than quality to buy sufficient products for their family. The respondents with only write/read and technical college educational levels have a negative relation with the price of the products implying that this group of respondents is less price-sensitive compared to illiterate respondents.

The consumers' WTP value was estimated in WTP space to identify the monetary values associated with change (improvement) in the products' traits. Our findings reveal that consumers are willing to pay the highest premium for nutrition and/or health claim labeling and the least premium for maize chickpea main ingredients while flavor, sorghum chickpea main ingredients, and the products' shape are the second, third, and fourth traits, respectively.

The results indicate consumers are willing to pay a premium for nutrition and/or health claim labeled snack products that is 1.43 times the amount they are willing to pay for the change in the flavor of the products from spicy tomato to mango, 1.6 times the amount they are willing to pay for the improvements in main ingredients to sorghum chickpea, and 8.03 times higher than the value they attach to the change in the products' shape from spherical to mixed shape (Table 7). It shows the relative importance of nutrition and/or health claim labeling trait over all other traits of enriched snack products. This might be due to the high literacy level of the urban communities in Ethiopia. Only 2.4% of the sample respondents are illiterate in the study area. These results are consistent with the findings by Van Wezemael et al. (2014) and Dolgopolova (2016) who reported specific health benefit attribute leads to significantly higher WTP values than all other attributes in their study on consumers' willingness-to-pay for healthy attributes in food products.

The willingness to pay values computed for each attribute shows that changing the products' flavor from spicy tomato to mango is valued 1.12 times higher than a comparable change in main ingredients from sweet maize to sorghum chickpea. The value respondents willing to pay for a mango-flavored snack product is 5.61 times the value they are willing to pay for a product with mixed shape. This implies the flavor of the product is a relatively strong trait that influences the consumers' choice for enriched snack products than the main ingredients and shape of the products. Similarly, the sample consumers are willing to pay a price premium for changes in the main ingredients from sweet maize to sorghum chickpea that is 5 times the amount they are willing to pay for a change in the products' shape from spherical to mixed one. This illustrates the strong influence of the main ingredients on consumers' choice for enriched snack products than the shape of the products.

Conclusions

Snack foods are commonly foods that are eaten between main meals for pleasure and during relaxation that are acquiring an important place in the shopping list. The choice of food is influenced by a number of factors including demographic characteristics such as age, sex, education level, and health status. This study employed a choice experiment approach to elicit preferences for traits of enriched snack products and used recent developments in discrete choice modeling to quantify the implicit prices consumers are willing to pay for the traits. The discrete choice experiment data were estimated by a flexible G-MNL modeling approach that can accommodate scale as well as preference heterogeneity (Fiebig et al. 2010). Using a choice experiment and generalized multinomial logit model, the study estimated consumers' preferences and willingness to pay for enriched snack food product traits in two cities of Ethiopia.

All the formulations of basic G-MNL model both in preference space and willingness to pay (WTP) space, and the formulations of G-MNL-with-mean heterogeneity models consistently shown nutrition and/or health claim labeling, the product flavor, and sorghum chickpea main ingredients are the most important traits in determining the snack food products' choice, respectively, while maize chickpea main ingredient, the product shape, and price are also important with changing order across the models. The respondents' sex, family size, and educational levels were found to be the only socio-demographic factors that significantly explain the variations around the average level of taste preference for the traits. The results of this study would apparently be useful for researchers to clearly set their criteria to prioritize attributes selection activities. Snack food producers will have products with traits preferred by the consumers. This is an important finding for the industry suggesting the urban consumers may be willing to pay more for nutrition and/or health claim labeling. In light of these findings, additional research is needed to explore the rural consumers' preference and willingness to pay for enriched snack food products.

As with any stated preference research, there are limitations to this study. Since the preferences elicited in this study were stated and not revealed, there exists the potential for hypothetical bias. Additional work is needed to examine hypothetical bias mitigation techniques and to determine which enriched snack food product attributes consumers consider when purchasing a product, as this can affect choice model estimates. This study analyzed only consumers' preference and willingness to pay and socio-demographic factors affecting the preference heterogeneity. Additional work is needed to segment the consumers on different socio-economic and demographic variables. Two general levels for nutrition and/or health claim labeling attribute were used as labeled (the labeled information was not specified) and not labeled, but it is better to use the specific nutrition and/or health claim instead of generic term labeled. Therefore, the future researches should have to consider this issue in determining the attribute levels and specify scientifically confirmed nutrition and/or health information labeled on the product packages.

Our findings reveal that among the snack food product traits considered in this study, nutrition and/or health claim labeling has a high preference coefficient (relative importance) over all traits of enriched snack products. The result of the willingness to pay space consistently shows the relative importance of nutrition and/or health claim labeling over all the traits of enriched snack food products. Our findings indicate that the consumers' decision to buy enriched snack food products is influenced by socio-demographic variables such as educational levels, family size, and sex. Considering this, the study concludes that consumers in the study areas prefer the enriched snack products with sorghum chickpea main ingredient, a combination of different shapes (mixed shape), mango flavor, and nutrition and/or health claim labeled. Therefore, the snack food vendors need to focus on these traits besides other product traits to create snack products with the best combination. Therefore, we suggest designing and implementing innovative ways of promoting snack products to urban communities with a deliberate focus on these attributes to create a snack with the best combination. Given the high literacy of urban consumers and the strong influence of nutrition and/or health and/or health claim labeling traits on consumers' decision, the trait-based promotion and marketing of the products constitute the right strategy.

Acknowledgements
We are grateful to the Canadian International Food Security Research Fund (CIFSRF) Project, which is funded by the Canadian International Development Agency (CIDA) and International Development Research Centre (IDRC) for their financial, technical training, and all other supports for the success of this study.

Authors' contributions
JA, TT, and GTK conceptualized and coordinated the study including the attribute selection. TT and GTK designed the study, and JA supervised the field survey and entered, edited, and cleaned the data. GTK performed data analyses, and JA and TT wrote the manuscript. The authors read and approved the final manuscript.

Funding
This work has been funded by the Canadian International Development Agency (CIDA) and International Development Research Centre (IDRC) through the Canadian International Food Security Research Fund (CIFSRF) Project.

Availability of data and materials
The data that support the findings of this study can be obtained from the corresponding author upon request.

Competing interests
The authors declare that they have no competing interests.

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Received: 21 July 2018 Accepted: 22 April 2020
Published online: 28 May 2020

References
Agriculture and Agri-food Canada, 2016. Market Access Secretariat, Global Analysis Report, Sector Trend Analysis of Snack Foods in United States.
Blamey R, Louviere JJ, Bennett J (2001) Choice set design in the choice modeling. Transp Res B 37:837–855
Boere A (2015) Business Opportunities Report Oilseeds and pulses in the series written for the Ethiopian Netherlands business event 5-6 November 2015. Rijswijk, The Netherlands
Bonilla T (2010) Analysis of consumer preferences toward 100% fruit juice packages and labels. MSc. Thesis. Louisiana State University and Agricultural and Mechanical College, p 111
Cattin P, Wittink D (1982) Commercial use of conjoint analysis: a survey. J Mark 46:44–53
Central Statistical Agency (CSA) (2014) Report on large and medium scale manufacturing and electricity industries survey. Central Statistical Agency of Ethiopia, Addis Ababa
Central Statistical Agency (CSA) (2015) Population and housing census report-country. Central Statistical Agency, Addis Ababa
Dean MC, Joseph B (2013) Consumer preferences in purchase of ready to eat snacks-branded potato chips. Glob J Business Manag 7(1):49–58
Dolgopolova I (2016) Consumers' willingness-to-pay for healthy attributes in food products: a meta-analysis. In: Selected Paper prepared for presentation at the 2016 Agricultural & Applied Economics Association Annual Meeting, Boston, Massachusetts, July 31-August 2
Enz CA (2010) Hospitality strategic management: concepts and cases, 2nd edn. Wiley, p 696
Evans CB (2008) Consumer preferences for watermelons: a conjoint analysis. MSc. Thesis. Auburn University, Alabama, p 82
Fiebig DG, Keane MP, Louviere J, Wasi N (2010) The generalized multinomial logit model: accounting for scale and coefficient heterogeneity. Mark Sci 29:1–29
Fosgerau M (2007) Using nonparametric to specify a model to measure the value of travel time. Transp Res A Policy Pract 41: 842–856
Greene WH (2012) Econometric analysis. ISBN 978-0-13-139538-1, 7th edn. Pearson Education publishing. New York University, p 1241
Greene WH, Hensher DA (2010) Does scale heterogeneity across individuals' matter? An empirical assessment of alternative logit models. Transportation 37:413–428

He S, Fletcher S, Rimal A (2005) Snack peanut consumption: type preference and consumption manners. J Food Distribution Res 36(1):7
Heiss F (2002) Structural choice analysis with nested logit models. Stata J 2(3):227–252
Hensher DA, Greene WH (2011) Valuation of travel time savings in WTP and preference space in the presence of taste and scale heterogeneity. J Trans Econ Policy 45:505–525
Hensher D.A., J.M. Rose, and W.H. Greene. 2005. Applied choice analysis: a primer. Cambridge University Press. 742 + xxiv pp. US$60.00. ISBN: 0-521-60577-6. Timothy Johnson (trjohns@uidaho.edu). 72(3): 449-450.
Hess S, Rose JM (2012) Can scale and coefficient heterogeneity be separated in random coefficients models? Transportation 39(6):1225–1239
Hunduma T (2012) Ethiopian indigenous knowledge of traditional foods and beverages processing needs for modern food processing technology and transformations. Ethiopian Institute of Agricultural Research, Ambo Agricultural Research Center, P.O.Box 37, Ambo
Juma CN, Otieno DJ, Kosura WO, Gyau A, Oduol JA (2016) A survey of consumer perceptions and preferences for geographical indication and quality attributes of honey in Kenya. In: A paper submitted for oral presentation at the 5th International Conference of the African Association of Agricultural Economists (AAAE), 23rd - 26th September 2016, Addis Ababa
Kassie GT, Abdulai A, Greene WH, Shiferaw B, Abate T, Tarekegne A, Sutcliffe C (2017) Modeling preference and willingness to pay for drought tolerance (DT) in maize in rural Zimbabwe. World Dev 94:465–477
Amare Legesse. 2015. Central Statistical Agency of Ethiopia. Assessment on the availability of Agro food industry data on the annual Manufacturing industry survey of Ethiopia. Presented in the FAO-UNIDO expert group meeting on Agro-industrial Measurement, 23-24 November 2015, Rome, Italy.
Lindlof TR, Taylor BC (2002) Qualitative communication research methods, 2nd edn. Sage, Thousand Oaks, p 376
Louviere JJ, Hensher DA, Swait JD (2000) Stated Choice Methods: Analysis and Applications. Cambridge University Press
Mammadli A (2016) Consumer perceptions of the fast food industry in Sweden. A quantitative research study. Lund University, p 52 MSc. Thesis
McCluskey JJ, Horn BP, Durham CA, Mittelhammar RC, Hu Y (2013) Valuation of Internal Quality Characteristics across Apple Cultivars. Agribusiness. An Int Peer Rev 29(2). https://doi.org/10.1002/agr.21334
McFadden D (1974) Conditional logit analysis of qualitative choice behavior. In: Zarembka P (ed) Frontiers in Econometrics. Academic Press, New York, pp 105–142 Ningning Zou. 2011. Canadian Consumers Functional Food Choices: Labeling and Reference-Dependent Effects. PhD Dissertation, University of Saskatchewan. 236
Mojduszka EM, Everett RM (2005) Determinants of consumer choices of prepared frozen meals and salted snacks over time. In: Selected Paper Prepared for Presentation at Annual Meeting of the American Agricultural Economics Association Providence, Rhode Island
Nielsen Company. 2016. Consumer confidence. Concern and spending intention around the world. Consumer confidence series 3rd edition. Global consumer confidence report. 19p.
Nor N, Carr A, Hardacre A, Brennan C (2013) The development of expanded snack product made from pumpkin flour-corn grits: effect of extrusion conditions and formulations on physical characteristics and microstructure. Foods. 2:160–169
Parsa HG, Gregory A, Terry M (2011) Why do restaurants fail? Part III: an analysis of macro and micro factors. Dick Pope Sr. Institute Publications, p 21
Quilligan E (2018) Professional report Positioning Dirkosh Crunch for growth in international markets
Ratings CARE (2015) Changing consumer preference driving growth of ready to eat snack food products
Scarpa R, Thiene M, Train K (2008) Utility in willingness to pay space: a tool to address confounding random scale effects in destination choice to the Alps. Am J Agric Econ 90:994–1010
Sunelle JA, de Beer H, Larney M (2010) Adult consumers understanding and use of information on food labels. A study among consumers living in the Potchefstroom and Klerks drorp regions, South Africa. Public Health Nutr 14(3):510–522
Train K, Weeks M (2005) Discrete choice models in preference space and willing-to-pay space. In: Applications of Simulation Methods in Environmental and Resource Economics. Springer Publisher, Dordrecht, pp 1–16
Van Wezemael L, Caputo V, Nayga RM, Chryssochoidis G, Verbeke W (2014) European consumer preferences for beef with nutrition and health claims: a multi-country investigation using discrete choice experiments. Food Policy 44:167–176 https://doi.org/10.1016/j.foodpol.2013.11.006
Washi S (2012) Awareness of food labeling among consumers in groceries in Al-Ain, United Arab Emirates. Int J Marketing Stud 4(1):38–47
Wood RC (2015) Hospitality management: a brief introduction, 1st edn. Sage Publications Ltd., p 208
Zheng Y (2014) Consumer Preference and Willingness-To-Pay for Locally Produced, Organic Food: A Stated Choice Approach. MSc. Thesis Presented to the University of Guelp, p 105
Zou N (2011) Canadian consumers functional food choices: labeling and reference-dependent effects. PhD Dissertation, University of Saskatchewan, p 236

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