Consumer Perceived Value to Traceability System in Food Supply Chains: iGeneration vs Millennials*

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Abstract

Consumers perceptions hold a vital role in any development concerning the food supply chains especially, new generational consumer cohorts like iGeneration and Millennials that will shape tomorrow's food supply chains. This study focuses on these consumer segments and aims in investigating what features influence their perceived value towards a traceability system in food supply chains. Results showed that concerns about health, food safety and trust are key elements which affect consumers perceived value on traceable foods with some differences between the studied cohorts. Several implications in the agri-food sector are discussed, from both a supply chain management and policy-making perspective.

Keywords: *logistic regression, willingness to pay, sustainability, Generation Z, consumer-driven supply chains, Greek agri-food sector*
JEL classification: Q1, Q25, M31.

Introduction

The outbreak of foodborne illnesses further increases consumer concerns over the safety and quality of food. As a consequence of food scandals and incidents, customers call for high-quality food with integrity, safety guarantees and transparency (Trienekens and Zuurbier, 2008; Bertolini et al., 2006; Beulens et al., 2005). Traceability is applied as a tool to assist in the assurance of food safety and quality as well as to achieve consumer confidence (Aung and Chang, 2014).

The food industry is becoming more customer-oriented and needs faster response times to deal with food scandals and incidents. Effective traceability systems help to minimize the production and distribution of unsafe or poor-quality products, thereby minimizing the potential for bad publicity, liability, and recalls (Aung and Chang, 2014). To supply top quality, safe and nutritious foods, as well as rebuild public confidence in the food chain, the design and implementation of whole chain traceability from farm to end-user have become an important part of the overall food quality assurance system (Opara, 2003). Apparently, managing food safety and quality is a shared responsibility of all actors in the food chain including governments, industry and consumers.

Producers and key food supply chain stakeholders should provide consumers with a reason to choose or purchase their products (Kuo et al., 2009), for example, by enhancing perceived value. Consumer perceived value of a product is a reflection on the performance of the provider in delivering the product offering to its target customers (Slater, 1997). Hence, an understanding of consumer perceived value of traceability food is imperative to better understand consumer expectations concerning the

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traceability of food, which, in turn, aids in the formulation of better-informed marketing strategies for traceable food producers and other stakeholders (Yuan et al., 2020).

Thus, research on consumer willingness to pay (WTP) should be more thorough by looking into consumers' perception and reaction towards different information and benefits provided by traceability systems. This study examines the factors that drive consumer perceived value and its impact on consumer purchase intention towards foods with traceability systems. The main aim is to investigate what features influence consumer perceived value towards a traceability system in food supply chains. However, in literature, less attention has been given in examining consumers' perceived value towards a traceability system in food chains and even lesser attention in exploring specific cohorts of consumers on the topic.

Notably, the importance of generations in marketing research is well acknowledged due to cohorts' similar characteristics. For instance, iGeneration or Generation Z cohort, people who born after 1994, includes the most educated, mobile, and connected consumers to date (Williams et al., 2010). Generation Z is also socially conscious, tech-savvy, particularly innovative and permanently looking for a change. They have also access to more information than any other generational cohort (Kardes et al., 2014) and are the persons who will shape the sustainable consumption and development policies of future societies (Kamenidou et al., 2019).

On the other hand, Millennials or Generation Y was born during 1977-1994, is characterised by their high level of education, intense use of technologies (Valentine and Powers, 2013), green-product orientation (Lu et al., 2013), and concern about food safety and environmental sustainability (Ivanova et al., 2019). This generation is the segments companies prefer to approach with their marketing strategy, especially since their number worldwide is very large, and both their purchasing power (Loroz and Helgeson, 2013; Viswanathan and Jain, 2013). Consequently, the significance of focusing on specific generations (e.g. iGeneration and Millennials) relies on the fact that this way we can track and forecast changes in the marketplace emerging from the entrance of new cohorts with a new value system, wants, and needs (Schewe and Noble, 2000).

Literature review

Food crises, scandals, and uncertainty around food quality in the past two decades forced consumers demanding more information about their foods (Galati et al., 2019; Gan et al., 2016). Despite the various standards available, there is still a possibility that consumers are worried that these are not effectively applied. This multiplies their concerns for food safety resulting in increased uncertainty about food quality (Mazzocchi et al., 2009). One of the most essential tools in providing food safety and quality information to consumers is the food traceability systems (Jin and Zhou, 2014). Novel food traceability techniques (e.g. molecular methods, next-generation sequencers, bio-captors, isotopic analysis) and recent technological developments on new traceability systems (Montet and Ray, 2017), have a positive impact on the concept of traceability.

Nonetheless, effective implementation of such systems requires acceptance and primarily collaboration from all the stakeholders involved end-to-end in the food supply chain (Kher et al., 2010). Grasping the concept of traceability and sharing information among stakeholders across the entire supply chain is essential in adopting such a system

(Mattevi and Jones, 2016). In this holistic supply chain approach, the consumers hold a vital role (Simons, 2014). Consumer-driven supply chains could create a very strong competitive advantage that is not easily copied by competing products (Anastasiadis and van Dam, 2014). Therefore, the consumers' involvement in food supply chains is essential and must also shift towards a more active engagement direction. Supporting this argument, a study shows that consumers value a bi-directional relation to the food supply chain (Herbing et al., 2018), especially concerning traceability systems (Qian et al., 2020).

Key benefits consumers link with traceability are about health, quality, safety, trust and confidence (van Rijswijk et al., 2008). Nonetheless, consumers' willingness to pay (WTP) a premium for food safety information also indicates their perceived value on traceability systems, showing enhanced intention to purchase traceable food (Yuan et al., 2020). Generally, consumers are willing to pay a premium for traceable food products (Sun et al., 2017); several studies support that exploring also their WTP about different customer characteristic, information attributes and types of products. For example, consumers are more willing to pay for the information attributes of pork quality inspection with ex-ante quality assurance compared to ex-post traceability. The same study also indicated that income and education are positively related to WTP a premium for attributes with pork safety information (Hou et al., 2019). Consumers WTP for traceable animal food products in China can differ upon the degree of their trust in the government's supervision (Liu et al., 2019). Rodriguez-Salvador and Dopico (2020) suggest that even though consumers have a low level of knowledge on fishery products traceability, they perceive it as necessary. A study in France and Italy highlights the role of product type, intention to buy traceable chicken is higher compared to traceable honey (Menozzi et al., 2015).

Demographic characteristics have also been examined concerning food safety perceptions, indicating the importance of age and particular of certain generational cohorts on the topic. A study in the United States shows that the average food safety perceptions of millennials were significantly higher than those of generation X (Yu et al., 2017). Similarly, another study argues that millennials and female consumers show higher risk perceptions compared to other demographic groups and that millennials were more willing to pay a premium for fresh-cut produce with lower foodborne illness risk (Yu et al., 2018). A study analysing the millennials' perception of sustainability identified four distinctive groups, one of which was the "info-supporters" with a particular interest in labelling and warranty systems (Bollani et al., 2019). Fibri and Frøst (2020) studied Indonesian millennial consumers' perception of tempe, revealing the importance of food-related information and the vital effect of transparency about products' origin and production methods.

Millennials (1977 – 1994) are followed by iGeneration or Generation Z (1995 - 2010) and from a demographic perspective, these two groups of consumers will shape the future food sector (Bumbac et al., 2020). Several studies comparing the perceptions of these two generations, for example on novel foods such as edible insects (Sogari et al., 2019), underscore their significance. Analysing the US sustainable food market, a recent study identified the following Generation Z segments: the sustainable activists and sustainable believers, emphasising more on eco-friendly and healthy product attributes, and the sustainable moderates emphasising more on price and convenience (Su et al., 2019). A substantial literature on Millennials' and iGeneration's food

perceptions has not yet been developed. Furthermore, the review of these studies revealed a gap concerning their perception of traceability in the food sector. The objective of this study is to offer some contribution to the debate among food supply chain stakeholders on driving choices based on new consumption directions, aligning consumer preferences (and request) with supply chain actors business strategy (and motives).

Methodology

A research was conducted in Greek consumers and specifically, in two generational cohorts (iGeneration and Millennials) to achieve the objectives of this paper. It is important to mention that the survey instrument, a structured questionnaire, was pre-tested through focus groups (ten participants in each of two focus groups) and personal interviews (ten) with consumers, too. From an architectural point of view, the survey questionnaire is divided into three parts. These parts consisted of variables about: (1) Consumers' attitude and behaviour, (2) Willingness to pay for a food traceability system, (3) Demographic and socioeconomic characteristics of the respondents. The first part focused on issues related to: (i) health, (ii) quality, (iii) production process, (iv) price, (v) trust, (vi) nutritional value and (vii) food safety. Most of these questions were framed in five-point Likert scale intervals to encourage participation and minimize the cognitive burden on respondents. Data were collected via an online survey (Ilieva et al., 2002) in 2019 (from May to October) which led to a sample of 1841 valid questionnaires (n_1=917 for iGeneration and n_2=924 for Millennials).

Data were evaluated using descriptive statistics and multivariate statistical analyses. The methodological procedure involved several steps. First, the validity and reliability of the variables included in the questionnaire were assessed through the implementation of Exploratory Factor Analysis using the principal components extraction method (varimax rotation) and Cronbach's alpha, respectively. Logistic regression was employed to identify those factors that positively or negatively influence consumer's (iGeneration and Millennials) perceived value towards a traceability system in food supply chains.

The binary logistic regression model is used to estimate the probability of a binary response based on one or more predictor (or independent) variables (Norusis, 2012; Hosmer and Lemeshow, 2000). This type of regression is useful and is suited to models where the dependent variable is dichotomous. Logistic regression does not assume that the relationship between the explanatory variables and the dependent variable is a linear one. However, a binary logistic regression has to meet some assumptions to provide a valid result: (i) should exist a linear relationship between the continuous independent variables and the logit transformation of the dependent variable; (ii) there should be no multicollinearity; and (iii) no existence of significant outliers, leverage or influential points. One method that can be used to check the assumption of "linearity in the logit" is the Box-Tidwell procedure, which was developed for linear regression, but is also appropriate for logistic regression models (Fox, 2016). It is one of several methods recommended to assess whether a continuous independent variable is linearly related to the logit of the dependent variable (Hosmer and Lemeshow, 2000).

Results

The sample comprised of 1841 consumers and in particular, 917 participants belong to iGeneration and 924 are Millennials. Participants in this research were mainly females, unmarried with a high educational level. The majority of iGeneration had annual household income less than 8000€, while the Millennials had between 8000€ and 14999€. The percentage of Willingness to Pay (WTP) for a traceability system in food supply chains by participants was high (75.6%) and only 24.4% of the respondents were not willing to pay. The profile of each generational cohort is illustrated in Table 1.

Table 1. Profiles of the generational cohorts

Variables	iGeneration	Millennials
Sample	49.8% (917)	50.2% (924)
Gender:		
Male	24.6% (226)	31.2% (288)
Female	75.4% (691)	68.8% (636)
Marital status:		
Single	99.0% (908)	55.5% (513)
Married	1.0% (9)	44.5% (411)
Education level:		
High school	8.5% (78)	10.7% (99)
University	87.5% (802)	39.9% (369)
MSc	4.0% (37)	36.3% (335)
PhD		13.1% (121)
Annual household income:		
<8000€	39.4% (361)	20.6% (190)
8000€-14999€	25.0% (229)	39.4% (364)
15000€-24999€	18.0% (165)	24.2% (224)
25000€-39999€	13.5% (124)	11.6% (107)
40000€-59999€	3.3% (30)	2.7% (25)
>60000€	0.8% (8)	1.5% (14)
Non-WTP	24.4% (224)	24.4% (225)
WTP	75.6% (693)	75.6% (699)

An exploratory factor analysis was applied to investigate the validity of the structure (or conceptual construction) of the questionnaire statements. This method was used to identify the components of consumers concerns and attitudes, summarizing most of the original information to a minimum number of factors for predictive purposes. The results of Exploratory Factor analysis and Reliability analysis are presented in Table 2. Factor analysis indicated five factors: *Quality-Nutritional value*, *Trust*, *Food safety*, *Health* and *Price*, accounting for 60.2% of the total variance. All variables had loadings higher than 0.50 in each attribute of these factors which indicates a good fit. Reliability analysis confirmed that the scale is reliable (Cronbach's alpha coefficients were ranged from 0.729 to 0.868), exceeding the minimum standard of 0.60 suggested by Malhotra (2007).

Table 2. Results of Exploratory Factors analysis and Reliability analysis

Factors	Attributes	Reliability of the factor
(1st) 25.3% of total variance	Quality-Nutritional Value	0.868
(2nd) 12.4% of total variance	Trust	0.787
(3rd) 9.2% of total variance	Food safety	0.818
(4th) 7.6% of total variance	Health	0.759
(5th) 5.7% of total variance	Price	0.729
Total variance explained: **60,2%**		Total Cronbach's alpha: **0.821**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0.860;		
Bartlett Test of Sphericity: Approx. Chi-Square=16646.655; df=253; Significance=0.000		

Logistic regression in each generational cohort was employed to reveal the factors that influence the consumer perceived value towards a traceability system in food supply chains. The results of binary logistic regression according to iGeneration and Millennials are shown in Table 3 and Table 4, respectively.

First, it is notable that there is no multicollinearity (high tolerance and low VIF values) in both models. Then, the linearity of the continuous variables for the logit of the dependent variable was assessed via the Box-Tidwell procedure. This procedure to determine whether the continuous independent variables are linearly related to the logit of the dependent variable indicating that the assumption of linearity is failed in both models. It has been recommended to apply a Bonferroni correction based on all terms (including the intercept) in the model when assessing this linearity assumption (Tabachnick and Fidell, 2014). Thus, a Bonferroni correction was applied using all terms in the model resulting in statistical significance being accepted when $p < (0.05/n)$, where n=number of comparisons. Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable (WTP) in both models. Moreover, both models have standardized residuals less than ±2, which indicate that there are no significant outliers.

Table 3. Results of Logistic Regression related to iGeneration

Dependent variable	Independent variables	Coefficient B	Wald statistic	Sig.	Exp(B)
WTP	Quality-Nutritional value	0.187	1.371	0.242	1.206
	Food Safety	0.348	11.669	0.001*	1.416
	Trust	0.498	8.120	0.004*	1.646
	Price	0.162	1.418	0.234	1.176
	Health	0.209	3.060	0.080**	1.233
	Constant	-3.985	15.674	0.000	0.019
-2LL (Log Likelihood)=980.332; Hosmer & Lemeshow= 0.220;					
Percentage of Correct Predicted=76.4%					
**, ** denote statistical significance at the 1% and 10% levels, respectively*					

According to iGeneration (Table 3), the logistic regression model was statistically significant, $\chi^2(5) = 39.294$ (p=0.000) and the Hosmer and Lemeshow test is not statistically significant (p=0.220), which means that the model is a good fit. The model correctly classified by 76.4%. The results of Logistic regression indicated that the variables *Food Safety*, *Trust* and *Health* are the most significant factors which positively

affect consumer's WTP towards food traceability systems, which is line with previous study (van Rijswijk et al., 2008). The coefficients B show the change in the log odds that occur for a one-unit change in an independent variable when all other variables (independent) are constant. However, the odds ratios of each of the independent variables, Exp(B), give information about the change in the odds for each increase in one unit of the independent variable. Increasing *food safety*, *trust* and *health* were associated with an increased likelihood of WTP by iGeneration.

Table 4. Results of Logistic Regression related to Millennials

Dependent variable	Independent variables	Coefficient B	Wald statistic	Sig.	Exp(B)
WTP	Quality-Nutritional value	0.010	0.003	0.956	1.010
	Food Safety	0.040	0.124	0.725	1.041
	Trust	0.099	0.357	0.550	1.104
	Price	0.043	0.112	0.738	1.044
	Health	0.414	12.357	0.000*	1.513
	Constant	-1.212	2.102	0.147	0.298

-2LL (Log Likelihood)=1009.330; Hosmer & Lemeshow= 0.332;
Percentage of Correct Predicted=75.6%
** denotes statistical significance at the 1% level*

As regards the Millennials (Table 4), the logistic regression model was statistically significant, $\chi^2(5) = 16.473$ (p=0.006) and the Hosmer and Lemeshow test is not statistically significant (p=0.332), indicating that the model is a good fit. The overall correct prediction rate is 75.6%. The results of Logistic regression showed that the variable *Health* is the most significant factor which has the highest positive effect on consumer's WTP towards food traceability systems which is consistent with previous related study (van Rijswijk et al., 2008). Thus, the odds of WTP are 1.513 times greater for people who are more aware and concerned about their health.

Conclusions

This study examined the features which influence consumer perceived value towards a traceability system in food supply chains. Specifically, two generational cohorts are studied, iGeneration and Millennials, to identify those factors which positively or negatively affect their willingness to pay for a food traceability system. For this purpose, survey research was carried out in a large sample of Greek consumers who belong to Generation Z and Y cohort. Dataset was analysed using descriptive statistics and multivariate statistical analyses.

Results indicated that health is a significant factor in both cohorts. However, key differences between those generations are the importance of food safety and trust by iGeneration. Such behaviour towards traceability is consistent to previous studies (van Rijswijk et al., 2008) but, revealing the perceptions of generational cohorts towards food traceability systems is a new set of findings and the main contribution of our study to the existing literature. These results could lead to new strategies from a managerial and policy-making perspective. In particular, all key stakeholders of food supply chains should be collaborated under a traceability scheme to enhance traceability information taking into account the emerging and different needs of consumers. An end-to-end supply chain reconfiguration based on these distinctive consumer segments could

improve significantly the efficiency and the sustainability performance of the entire supply chain. Responding effectively on customers' requests increases their loyalty thus, affecting positively every supply chain actors' revenue. Furthermore, this consumer-driven response from the supply chain results in a direct adaptation of a traceability system. Thus, the food safety of the entire supply chain is secured, the food recalls are minimised (and better handled) and the food waste is also reduced. In a similar direction, policy-makers should examine the possibility to regulate traceability and improve food supply in terms of safety and quality, considering the acceptance and the perceived value of consumers towards food traceability systems.

Limitations of the study, that also could be used as recommendations for further research, are about the variety and types of products involved and the national character of the sample. More studies about different products (e.g. dairy and meat) at a cross-national level could generalise even more the results and also be used in forecasting future market trends.

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