

RISK WHEN BUYING FOOD BY E-COMMERCE: WHAT FACTORS INFLUENCE THE CONSUMER'S PERCEPTION OF RISK?

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Abstract:

Risk is a key aspect to be considered when analysing economic decisions. This investigation is one of the first to review the risk that a person perceives when making the decision to buy food using electronic commerce as their purchase channel. It was possible to determine that convenience associated with ease of use and hedonic motivations represent the impulses with the greatest influence on this perception. A virtual food shopping experiment was conducted for 30 weeks, and 223 responses were obtained from shoppers with different demographic characteristics. The results were modelled through variance analysis where statistically significant differences were found (p -value $< 0,05$) for exogenous and endogenous variables. It was determined, among other findings, that the perception of risk in the virtual purchase of food is lower compared to other purchase channels such as supermarkets and farmer's markets.

Keywords: Risk, electronic commerce, structural equations, food.

JEL Codes: D12, C31, D91, D47.

1. Introduction

The level of risk is one of the main motivators that are taken into account when considering economic alternatives. For the case of e-commerce (EC) various authors have investigated important aspects related to the perception of risk and confidence, where numerous works can be located everywhere between initial conducts regarding the manners in which consumer behaviour responded in this context of commerce even more recently, risk perception when using transport sharing platforms (Shao et al., 2020).

Particularly, for risk as a conduct of economic behaviour of individuals, the classic works of Tversky and Kahneman (Tversky and Kahneman, 1974) show that mental procedures that exist at the moment of constructing decision-making schemes under risk conditions do not follow, in multiple occasions, patterns associated with the real dimension of reality. Therefore, it is supposed that a part of economic decisions considered on behalf of the food product consumer, could be biased by these factors.

In this sense and specifically for agri-food goods, different approaches can be found in literature that analyse risks in economic decisions. In the work developed by Grunert (2005) the perception on quality and food safety that the consumers have in order to approximate the risk of this economic transaction is addressed. Other authors have taken into account the risk that food supply chains could imply and the consequences for human health (Williams et al., 2004) in important areas such as the development of liver cancer and other illnesses.

For the case of investigations that consider the way in which individuals perceive the risk of making food transactions through EC, few references are found which have tackled aspects of the logistics of the commerce system (Fritz & Canavari, 2008; Yoo et al., 2015; Zhang et al.,

2019) whereas purchasing channels that the food consumer could use in order to make the buying decision have not been particularly covered.

The scarce scientific discussion about this topic leaves space for specific questions, for example: ¿how could traditional food product's purchase channels influence risk perception when buying these goods through EC? Out of the motivations that the consumer has when purchasing online food products: ¿which ones are more related with risk perception when buying through EC? Finally: ¿how could risk perception when buying food products online affect the economic utility of the consumer?

Due to the above, the main objective of this article is to analyse, through a case study, the variables associated with the perception of risk for the food product consumer when making purchases through virtual channels.

The article is organized as follows: in the next section the theoretical framework is detailed, emphasizing the economic approach taken into consideration to analyse the results. In the Materials and Methods section, the methodological strategy is presented. Furthermore, the obtained results are given. Finally, the conclusions that were possible to gather contain various elements of economic behaviour of EC food consumers.

2. Theoretical Framework

As a starting point it must be said that the economic approach for the evaluation of the perception of risk was based on the tenets of Behavioural Economics (BE). In this sense, (Cartwright, 2014) defines behavioural economics as:

"Behavioural economics is about the application of ideas through laboratory experiments, psychology and other social sciences in economics."(Cartwright, 2014, pp. 4)

The premise that BE implies is the assumption that people will make the best decisions with better amount of possible information, with the intention to maximize their utility ($u(x)$). This exemplifies the particular difference indicated by Cartwright (2014) between BE and the classic model: the dependent reference of utility that would be achieved. This definition established as:

$$u^r = \eta u(x) + v(x - r) \quad (1)$$

Where the interpretation that the author (Cartwright, 2014, pp. 48) gives is that the utility (u) that the individual will have when using a good or service (x) will depend on a parameter " η " and " r ", which will be the value of the point of reference and " v " represents the function of value¹ when using the good or service subtracted from the value of reference. In this sense, this formula represents a powerful tool to establish the utility that people (conceptualizing the subject as *homo sapiens* and not as *homo economicus*) could present for the use of any good and/or service of diverse typologies. In this investigation the components of Equation (1) are used to argue what could be predicted for said function of utility, this in the case of the food consumer that uses EC for the purchase of these goods and in reason of the perception of risk that would exist by using this purchase channel in comparison to traditional ones such as supermarkets or farmer's markets.

To support this proposition, the revision of literature shows different application spaces of this economic approach, where the point of attention varies with the characterized behaviour. BE is used in many areas of knowledge that evaluate economic conducts, in the same line other authors add neurosciences (Kao & Velupillai, 2015), or moreover towards cognitive processes that are used to define actions that people could take (Tversky & Kahneman, 1974).

In the last 40 years many articles have been published with a variety of objects of study, and from a general point of view some examples can be cited. The case of patients and

pharmacological substance use (Hursh & Roma, 2016), hypothetical purchases in non-agricultural goods and services (Roma et al., 2016) have also been reported. In greater regard to the internet space, analysis on internet use that people have (Broadbent & Dakki, 2015) as in broader economic spaces such as the determination of strategies that define prices in real estate markets (Northcraft & Neale, 1987) have been made.

Neurosciences represent another field of study where investigations have been made with direct application of BE. One study effectuated in 2011 (Levy & Glimcher, 2011) found that people maintain an aversion towards risk that is stimulated in different areas of the brain depending on the type of good or reward obtained by its use, for example, in the case of food, subjective stimuli of people when consuming food tends to converge in the hypothalamic region of the brain. Other works determined that the structure of the human brain permits the establishment of preferences that a person can assume towards economic decisions under risk schemes (Gilaie-Dotan et al., 2014); where a confident biomarker exists to establish the level of risk that individuals are prone to take: the higher the volume of the cortical area of the posterior parietal lobe, the higher risk tolerance that the person will have when making economic decisions.

A relevant case for this investigation is the treatment for reference points that people employ when taking decisions, where the diversity of topics that have been published on BE have taken into consideration diverse elements of methodological order where some investigations have evaluated the way in that people make a mental accounting of economic variables (Shafir & Thaler, 2006), where it is possible to establish potential decisions that consumers could make in the presence of changes for the environment that would make them revise their initial positions of, for example, reference prices of a particular good. Another relevant investigation that brings context for economic variables is related with anchorage values that people establish in accordance with some point of reference (Ariely et al., 2003) that result as of considerable importance to understand the flexibility with which people may change their purchase habits (or in this case, the means to purchase food products) in virtue of the scheme to which they are referenced.

Now, one of the considerations made from behavioural economics towards e-commerce is the importance that confidence occupies as a motivator in food products purchase through EC (Monge, 2021). In this sense, consumer conduct has evolved during the last 15 years if the lack of confidence is taken into consideration when buying through the internet, previously, this was based on preoccupations related to means of payment and confidence in businesses that used the internet as a payment method and the lack of clarity on private information management policies (Gefen, 2000).

Changes in motivations that generated reluctance in consumers in the beginnings of the XXI century have taken place, particularly in confidence when acquiring goods (books at least) and virtual services. Confidence, understood as the moral obligation of fulfilling a promise (Hosmer, 1995), becomes into a relevant motivation in the sense of knowing the way in which this could influence as part of the associated decisions between agri-food products and virtual suppliers of these goods. Other works have delved into the subjacent confidence of the valuations that online consumers make (Wan & Nakayama, 2014) where the anchorage effect^{2/} (Cartwright, 2014, pp. 43) has been found to produce a distortion on interpretations. In this investigation, the approach by Ariely et. al (2003) is followed where the decisions presented before changes in economic behaviours depends on the point of reference or preference that the consumer has.

3. Methodology

The data was collected through the experiment design where the website of the project Agroferia of the Universidad de Costa Rica (UCR) was used. This development virtually offered agri-food goods for 30 weeks in the period of February-November 2019, the website was employed as a virtual lab where the purchasing of agri-food products was exercised.

Experiment characteristics

The public of interest was integrated by university staff that maintain an active position in the Universidad de Costa Rica. Each person that is part of this population disposes of a personal identification in an institutional data base, that permits access validation to the different information systems under the university's administration. For access to <https://agroferia.ucr.ac.cr> the identification represented the filter for access to the system, this with the intention to guarantee security aspects related to each user's information management.

Once the person has entered their personal access information, he or she enters and checks the design and content characteristics of the website. Those characteristics were:

- Information on product catalogues by type,
- Marquee-type ads with brief information for on sale products,
- Search tool for quick finding of the products,
- Shopping-cart with the selected product's information and the total amount to pay (in Costa Rican colons),
 - Billing module in which information on delivery address, authorized person for reception, means of pay (payroll deduction or in physical money), additional indications on delivery were asked,
 - Description on each product regarding ingredient and adequate storage information,
 - Sale price depending on presentation,
 - Two images per product,
 - Other consumer's commentaries that have bought and previously used the product,
 - Available inventory of the product when accessing the site,
 - Support information for making the purchase in the section, "¿How to buy?",
 - Information on the web site's use conditions in the section, "Terms and Conditions",
 - Information of the user's account in the section, "My account",
 - Information on the agri-food projects that participate as vendors,
 - Contact information on the web site's administrators in the section "Contact us".

During the 30 sale sessions products of the following types were offered: grains, fresh fruits and vegetables, agri-food products with a certain level of processing such as coffee, bee honey, marmalades, among others.

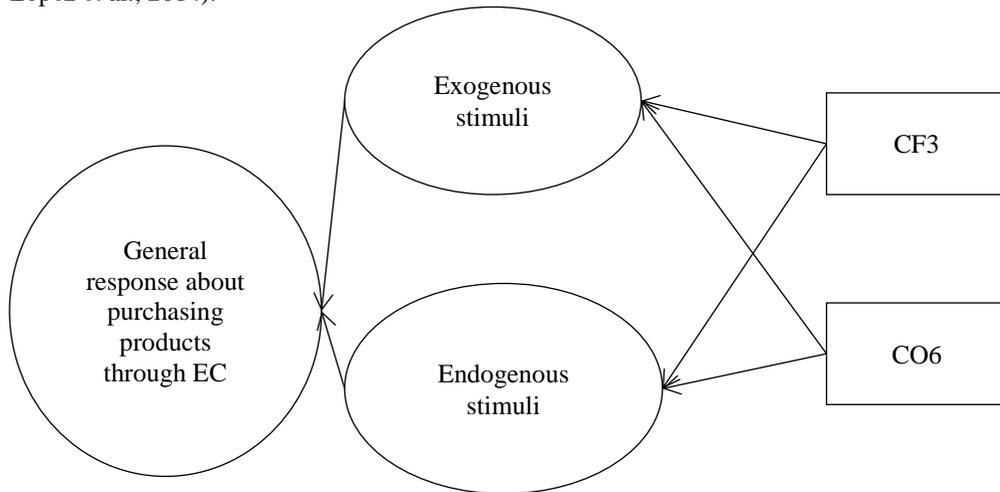
In attention to the survey, a button identifying the access to the questionnaire was strategically positioned on the previously established interface at the end of the billing module for the Agroferia UCR website. This button redirected the buyer to a website where the questionnaire was situated (LimeSurvey was used as the survey app, see Annex).

During the 10 months of field work, 421 people made purchases in the site from which 223 (81,2% were female and 95,8% were inside the age range of 26-65 years) completed the survey based on purchase motivations of these goods that were made through this virtual channel.

Analysed Stimuli

In the following figure the general model with the evaluated stimuli used to determine consumer's risk perception when buying agri-food products by EC is presented.

The previous model was used based on the information indicated in the columns "Observable variables" of Tables 1 and 2. This process of recollection of the information (anonymous) followed the logic demonstrated by previous studies made on the subject of EC (Floh & Madlberger, 2013; Kim et al., 2012; Liao et al., 2011; Lin et al., 2011; Martínez-López et al., 2014).



Note:CO6=Perception of risk when purchasing food products through EC, CF3=Tranquillity when buying food products through EC.

Figure 1. Modelled Relationships for Risk Perception by the Consumer when Buying Food Products through EC.

Two approaches associated with food product consumer's perception of risk and tranquillity while buying through EC were included. The statements were: a) "Purchasing food through ecommerce sites is riskier than buying those same products in other ways such as the farmer's market or supermarkets (code CO6)" and b): "Purchasing through ecommerce sites gives me more tranquillity because of the quality and satisfaction promise that the site establishes (code CF3)". Both were valued using a Likert scale between one and five (three meaning the value of indifference), applying a scale from "Completely in disagreement (1)" until "Completely agree (5)".

Based on the resulting information, a variance analysis (ANOVA) for variables CO6 and CF3 by exogenous and endogenous factor of the variables that were included in the analysis was made. For the management of the information, the SPSS® software version 25 was used to render the ANOVA with a post hoc Tukey test.

4. Results

4.1 Results of Risk Perception with Exogenous Variables of the Model

The perception of risk when using EC to make food product purchases was evaluated directly by the received answers to the questions CF3 and CO6. This perception is oriented

towards the confidence on the deal of quality offered by the web site as well as the own perception of risk by purchasing food products through EC, respectively.

The results demonstrate that only the preference of using supermarkets as the main purchase channel for food products, presented differences lesser than 5% in comparison to the averages for the rest of exogenous variables for the question CO6 (see Table 1), meanwhile for question CF3 no statistically significant differences were found for the response averages in none of the socioeconomic variables.

Table 1. Variance Analysis for Variables CF3 and CO6 Contrasted with the Exogenous Latent Variables of the General Model

LATENT EXOGENOUS VARIABLES	OBSERVABLE EXOGENOUS VARIABLES	OBSERVABLE VARIABLES ASSOCIATED WITH RISK PERCEPTION ^{1/} (Average)	
		CO6	CF3
SOCIOECONOMIC STATUS	Age	1,60-1,80	1,54-1,90
	Schooling years	2,95-3,56	2,93-3,38
	Core family monthly income	2,43-3,19	2,23-3,17
DECISION MAKING IN FOOD PRODUCT PURCHASE	Sex	1,11-1,33	1,15-1,26
BACKGROUND ON FOOD CONSUMPTION	Food products purchase frequency	1,55-2,25	1,77-2,11
	Core family size	2,69-3,18	2,47-3,20
	Individual's decision on the purchase of food products	3,36-4,00	3,69-4,00
EXPERIENCE ON INTERNET USE	Internet use for leisure	1,71-2,03	1,32-2,17
PREFERRED CHANNEL FOR PURCHASE OF FOOD PRODUCTS	Preference of purchasing food products in farmer's market.	1,75-2,52	1,71-2,58
	Preference of purchasing food products in supermarkets.	1,00-2,53**	1,25-1,89
	Preference of purchasing food products by internet.	2,10-2,67	2,28-2,60

Note: **=statistically significant differences with p-value<0,05. In a scale where 1=Completely in disagreement, 2=In disagreement, 3=Does not agree nordisagrees, 4=Agree, 5=Completely agree.

For the case of variables related to the preference of buying food products in supermarkets, the Tukey test presented statistical significance for the group of people whose answers were completely in disagreement in response to buying food products through ecommerce sites is riskier than buying those products in other ways such as the farmer's market or supermarkets and that have supermarkets as their main purchase channel for food products, this group presented preference averages statistically different with those of the consumer's group that were well in agreement with the statement in CO6, where the group exhibited an average preference of using supermarkets as their main purchase channel located between a second and third place of preference.

Table 2. Variance Analysis for variables CF3 and CO6 compared to the Endogenous Variables of the General Model

LATENT ENDOGENOUS VARIABLES	OBSERVABLE ENDOGENOUS VARIABLES	OBSERVABLE VARIABLES ASSOCIATED WITH RISK PERCEPTION ^{1/} (Average)	
		CO6	CF3
CONFIDENCE	Confidence in the commentaries of other buyers	3,30-3,60	3,10-3,70
	Confidence in the quality promise offered by the web site	3,10-3,90	-
	Confidence in knowing information about the producer	3,70-4,20	3,40-4,30**
	Confidence in the suggestions made by the web site	3,40-3,90	3,20-3,60
CONVENIENCE	Improvements on the quality of life	3,80-4,40	3,00-4,50**
	Abundant information of the product through EC	3,10-4,10**	2,70-4,00**
	Easiness of buying food products through EC	3,60-4,70**	3,50-4,60**
	Buying food products through EC is worth it	3,70-4,60**	3,30-4,60**
	Risk perception	-	2,80-3,60
HEDONIC IMPULSES	The time invested was pleasant	3,60-4,20	3,10-4,40**
	The site is pleasant not only because of the purchased products	3,20-3,90**	3,00-4,00**
	Pleasantness when visiting the web site	3,70-4,10	3,20-4,20**
ECONOMIC IMPULSES	Money saving	2,70-3,90**	2,20-3,60**
	Costs of searching for information	2,70-3,40**	2,40-3,00
	Ability to buy food products through EC	3,80-4,10	3,70-4,30
	Learning required to purchase food products through EC	4,10-4,50	3,80-4,60**
GENERAL CONSUMER'S RESPONSE	Future probability of continuing buying food products through virtual channels	3,70-4,70**	3,50-4,70**
	General satisfaction of the purchasing experience	3,90-4,60	3,80-4,50**
	Perception of spending made through virtual channels	3,00-3,60	3,00-3,70

Note: **=statistically significant differences with a p-value<0,05. ^{1/1}In a scale where 1=Completely in disagreement, 2=In disagreement, 3=Does not agree nor disagrees, 4=Agree, 5=Completely agree.

4.2 Results of Perceived risk with Endogenous Variables of the Model

A comparison was made for both questions with all the other endogenous variables of the used model, the obtained results are shown in Table 2.

For the case of CO6 the variables associated with the convenience of purchasing through EC and the economic impulses that motivate the purchase of food products through the virtual channel grouped more cases with differences in their averages. For CF3, the variables associated also with convenience as well as the hedonic impulses of buying food products through the web and the general purchase response by this medium group presented the greatest quantity of cases with differences in their averages.

For both explicative variables, risk perception presented similar response ranges in various of the consumer's motivations. For the case of risk perception associated with convenience, the average response ranges were located between the cases of consumers with a certain level of ambiguity (close to the value of 3) up until consumers very in agreement with the idea that the easiness of using EC to buy food products diminishes risk perception, even regarding other purchase channels or because of the tranquillity that the promise of quality the website offers.

Similarly, this follows with risk perception associated to the satisfaction that the consumer obtains when using EC not only because of the food products that he or she can purchase, where it was possible to find that the response range located consumers with ambiguous values and consumers with answers close to a value of 4 (in tone with the idea that the satisfaction of buying food products through EC diminishes risk perception).

5. Discussion

Why does having a supermarket format as a main purchase channel could be influencing on EC consumer's risk perception?

The variety of food products purchase channels in Costa Rica presents different management models for food safety and product presentation, whereas supermarkets offer more controlled environments to prevent the contamination of these goods. It is a highlight that in the obtained results, this purchase channel was the only one with statistically significant differences in the consumer's responses on risk perception regarding EC. In a study made in 2007 (Krystallis et al., 2007) the authors found that for the particular case of purchasing food products through supermarkets (different types of meat) the consumer's perceptions were most sensitive when asked about food hygiene and safety, those of mid-age (between 30-50 years) did not present statistically significant differences. In our work the age range was broader (26-65 years) and found a difference that in the general response of risk perception associated with the channel of preference (supermarkets) did find statistical differences in the response averages.

This could be since consumers, for the effects of this investigation, use standards that are implemented in Costa Rican supermarkets as a proxy value to define personal standards of food hygiene and therefore the associated risks regarding the subject. If this was as such, the virtual offering channels, should consider, for standards perceptions and food safety protocols, the practices that supermarkets have in the present time; all this meanwhile said commerce format continues as the main sales channel of food products in Costa Rica.

What meaning do endogenous variables that do not present static differences in the response averages associated with risk perception have?

The food product consumer seems not to associate some variables with the risk of making purchases through EC. In the case of the latent variable "Confidence", it could be said that because in this work no statistically significant evidence was found related to risk perception that could be associated, even with the commentaries of other fellow consumers or with the suggestions that the web site could make to the individual, that these variables represent a

motivation that must be tackled in further studies, in order to verify the validity of the result or on contraire confront it with new findings.

For the case of the confidence about knowing information of the food producer that offers their products through EC it can be implied that most notably confident consumers are such because of the tranquillity that the promise of quality offered by the EC site would be more in agreement with the security that can be related to the possibility of acquiring food products since they have knowledge of the producer's information.

The abovementioned coincides with the results obtained by recent studies for face-to-face means of commerce (Michel-Villarreal et al., 2020) regarding the attention that in actuality producers as well as consumers give to short marketing circuits (SMC)², where more direct formats are searched for food product commerce. For the Costa Rican case, the characteristics and conformation of the productive units that attend the domestic market suppose a quasi-perfect symmetry with said concept for the case of the farmer's market.

In a complementary manner and for the case of the latent variable "Convenience" only the risk perception variable associated with tranquillity that the promise of quality gives, does not present evidence for statistical differences smaller than 5%. None the less, for the other variables considered for "Convenience" it was possible to find significant evidence. This suggests that to assign value to the food product consumer through risk perception of EC, could be achieved relating it to the perception that he or she has on the easiness of using these channels when buying food products adding to the improvements in her or his quality of life by using these types of purchasing formats.

The previously mentioned results coincides with different works made for face-to-face formats of food products commerce, where in a particular case analysis for food product sales in convenience shops, group purchasing values were relevant to the consumer (Hartmann-Boyce et al., 2018). Other works imply that to the effects of the food product consumer he or she can locate the convenience of consuming based on the experience of using said good (Grunert, 2005; Moser et al., 2011), however, in both studies the evaluation of the purchase channel was not considered in the same way as for our work.

Finally, the variables associated with the perception of spending in food products through EC and the easiness to develop abilities to make purchases through this channel do not present statistical significance, the first case could be due to the unclear associations on the consumer's side between behaviours related with the costs of effectuating these types of transactions through EC, this is in concordance with the results indicated in another complementary work (Villalobos Monge et al., 2020). Regarding the easiness of developing abilities, based on the results obtained for the question associated with the variable "Necessary knowledge in order to buy food products through EC" the existence of divergent appreciations on the opinions of the interviewed consumers is presumed, where new investigation must be developed to comprehend on a more precise manner the considerations of this particular result.

6. Conclusions

Does the economic utility of the food product consumer increase when risk perception while buying said goods through virtual channels decrease?

The literature review indicated that when risk perception decreases this generates conditions that improve the economic utility of the consumer. When revising the Equation 1 where the "r" component constitutes the reference on the individual's risk perception, when decreasing the value of said component (assuming *ceteris paribus* conditions for the rest) a greater value will be obtained for the utility achieved by the individual. In this work the evidence suggests that this perception is smaller for the case of purchasing food products through EC in comparison to other purchasing channels such as supermarkets and farmer's markets.

From the above it can be affirmed that the food product consumer perceives an additional benefit when purchasing these goods through EC, where the risk is assumed as smaller in relationship to other purchase channels due particularly to the fact of convenience by the easiness of employing EC to acquire these products. It is adequately considered that future investigations are made on this matter to analyse if effectively, other consumer groups different to the ones used for our work will attribute a smaller risk perception when purchasing food products through virtual channels opposed to other purchase channels.

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Footnotes:

1/ This valuation will be in function of if it is a utilitarian “use” or a hedonic value that the person makes of the good or service in question.

2/ The author defines it as the influence that a certain signal or previous anchor has on a person's choice.

3/ United Nations Economic Commission for Latin America and the Caribbean (ECLAC) defines SMC as follows: “The proximity circuits or short circuits are a way of commerce based on the direct sale of fresh and/or seasonal produce with no intermediary -or lowering the mediation to a minimum- between producers and consumers. The proximity circuits bring close together farmers and consumers, promote human interaction, and its products, because they are not being transported long distances nor they are packed, generate a lower environmental impact”. Available at <http://www.fao.org/in-action/territorios-inteligentes/articulos/colaboraciones/detalle/es/c/410218/>