Consumers' concern on food safety for domestic fresh tomato and its socio-economic factors in Albania-a multinomial regression approach

Myslym Osmani[1*], Mira Andoni[2] and Arben Kambo[1]

[1]*Agricultural University of Tirana, Department of Economics and Rural Development Policies, Tirana 1000, Albania*
[2]*Business University College, Department of Economics, Tirana, Albania, Tirana 1000, Albania*
[*]*Corresponding author:* mosmani@ubt.edu.al

Abstract

Osmani, M., Andoni, A. & Kambo, A. (2021).Consumers' concern on food safety for domestic fresh tomato and its socio-economic factors in Albania-a multinomial regression approach. *Bulg. J. Agric. Sci., 27 (1)*, 3–11

    The goal of this research is to assess the level and factors of the consumers' concern on food safety risks of locally produced tomato in Albania. Data are collected through a survey of 824 randomly selected individuals in the metropolitan area of the Tirana city. Descriptive statistics are used but the key analytical tool is the multinomial logistic regression. Results show that the general level of concern is pretty high, 4.7, perceived benefit from the consumption of tomato is 3.6 and the perceived risk is 6.71 on a measurement scale from 0 to 10. Perceived benefit and risk are found to be major factors that determine the consumers' concern level. Other factors affecting consumers' concern are the household's income and size, as well as the religious affiliation of the consumers. Other factors, such as gender, educational level and age of the consumer do not have significant effects on the concern level, though females, more educated and younger people tend to have higher levels of the variable as compared to other categories of people. Education and information of consumers, as well as improved public risk management, are some recommendations to improve consumers' perceived concern and confidence in tomato food safety.

Keywords: tomato; food safety; consumers' concern; perceived risk; perceived benefit; multinomial model

Introduction

    Understanding consumer's concerns about various food safety issues is of crucial importance if effective food safety policy and risk communication are to be developed and implemented (Frewer et al., 2009). This might be even more critical in the case of the tomato in Albania, where tomato is one of the most popular vegetables in both terms of production and consumption. Referring to 2018, tomato accounts for 25% of the vegetable area and 37% of total vegetable production; tomatoes in greenhouses account for 52% of total greenhouse area with vegetables, and 56% of vegetable greenhouse production; 24% of the tomato area is in greenhouses while tomato production in greenhouses accounts for 48% of total tomato production (INSTAT, 2019). Tomato yield also has been continuously increasing, due to farmers' increase of knowledge and experience, but also because of adoption of new technologies and increased use of chemicals, such as pesticides and herbicides.

Research Problem

    This study is rooted in this special and at the same vague reality about tomato safety and in conditions where the relevant research and information is either scarce or completely absent. In this context, the consumer concern about tomato food safety could arise and might be unreasonably high. Thus, it is important, if not an emergency, to learn about the

consumer concern about food safety or the dangers of tomato consumption, and its associated factor. The results of this study could be valuable not only for farmers but also for consumers and policymakers in Albania.

Goal

Based on this, the perception-based assessment of the consumer concern on locally produced tomato safety and its associated factors is the goal of the study.

Objectives

Objectives of this study are:
- Perform a general assessment of the consumers' level of concern for the domestic tomato
- Investigate how the interplay between the risk of and benefit from consuming affects the consumer concern about food safety of domestic tomato.
- Assess some of socio-demographic and economic factors affecting the consumer concern about food safety of domestic tomato.

Theoretical Framework and Review of Literature

Food safety refers to all those hazards, whether chronic or acute, that may make food injurious to the health of the consumer; hazard is an agent in, or condition of, food with the potential to cause harm (FAO-WHO, 2003). There are three generally recognized categories of hazards that are associated with all foods, including fresh produce: biological, chemical and physical (FAO-WHO, 2003; UN, 2007).

Food safety can be in a narrow sense and in a wider sense. In the narrow sense, food safety is the opposite of food risk, i.e. as the probability of not contracting a disease as a consequence of consuming a certain food. In the broader sense, food safety can be viewed as also encompassing nutritional qualities of food and more wide-ranging concerns about the properties of unfamiliar foods (Grunert, 2005).

Food safety could be subjective or objective. Objective food safety is a concept based on the assessment of the risk of consuming a certain food by scientists and food experts. Subjective food safety is in the mind of the consumer (Grunert, 2005). Social scientists have rejected the notion of real or objective risk, arguing that risk is inherently subjective (Slovic, 1992).

Quality is not the same as food safety. Quality includes all other attributes that influence a product's value to the consumer, in addition to food safety (FAO-WHO, 2003). As research shows, when the general consumers' perception on food safety is positive, the consumers' food safety perception may not significantly affect their purchase and quality

is among primary reasons that consumers purchase a food product (Yu et al., 2017).

The traditional definition of risk is the possibility of loss or injury, also the degree of probability of such loss. Based on the Albanian Law of Food (2008) the risk is the possibility of an adverse effect on health and severity of this effect, as a consequence of the presence of one or more damaging elements in food.

Risk is a pivotal element in consumer behavior because the choice is central to the theory of consumer behavior. Any choice involves uncertainty about the outcomes and uncertainty in consequences. The first can be handled by using the information and the other by reducing the amount of purchased food or by putting off the choice. The risk can be interpreted as loss; in psycho-social terms or in functional or economic terms. Some authors do not see any difference between risk and uncertainty, but others do; the latter uses the term of risk when the probability is known, and they do use the term of uncertainty when the probability is not known (Taylor, 1974).

Risk is a social construct meaning different things to different people, thus to address risk only based on science is not enough, while cultural factors should also be considered. According to Slovic (1987) and Finucane (2005), risk perceptions have many dimensions, which can be grouped into two categories: i- unknown factor and ii- dread factor. And understanding the social and cultural context of risk is important for improving risk communication and public policy (Finucane, 2005).

Perception is a process of receiving, selecting and interpreting environmental stimuli involving the five senses. Through perception, we define the world around us and create meaning from our environment (Kardes et al., 2011).

Risk perception is an important part of the consumers' decision process. The consumer decision process is composed of five stages which are problem recognition, information search, evaluation of alternatives and purchase decision and post-purchase behavior. Perceived risk can influence consumers' behavior and as such, it should not be ignored by managers or policymakers. Perceived risk influences every stage of the consumer decision-making process (Mitchell, 1992).

Risk perception is the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome (Sjöberg et al., 2004). And risk appears to mean different things to different people.

Risk perceptions are consumers' intuitive risk judgments, consumers make when deciding to choose and buy a prod-

uct. Expert judgment about risks might be prone to intuition when information is lacking (Slovic, 1987). Perceptions about food safety risk are what the individual believes would be the amount of health risk from consuming a food product. Risk perception is important because consumers are more motivated to avoid mistakes than to maximize utility in purchasing (Michell, 1999).

Risk attitudes are how willing a person is to accept risk. Based on that, people can be risk-averse, risk-neutral and risk-seeking (Schroeder et al., 2007).

The risk may be acceptable when it is voluntary, under control, beneficial, natural, and familiar, when affecting adults and when it is from a reliable source. Risks are more unacceptable when they are involuntary, controlled by others, of little or no benefit, unfairly distributed, man-made, catastrophic, from unknown sources, unfamiliar or exotic, or when risk affects children.

There is an inverse relationship between risk and benefits from consuming a good; activities or technologies that are judged high in risk tend to be judged low in benefit and vice-versa (Alhakami & Slovic, 1994). Research showed also that risks and benefits are not evaluated independently from each other, and that people make affectively congruent judgments of risk and benefits (Frewer et al., 2009). But research has also shown that consumers can reduce consumption of product due to safety concerns (Nicole et al., 2013).

People tolerate high risks for products they see as highly beneficial (Slovic, 1987). Research shows that the public perception of food safety depends on how well the risk can be managed (Starr, 1969). Research also shows that consumers under-prevent risk. Under-prevention might be because of moral hazard (Arrow, 1963) or might be caused by misperceived probabilities (Baillon et al., 2018).

Food safety risks may cause serious concerns for consumers. Concern is an uneasy state of mind usually over the possibility of an anticipated misfortune or trouble, anxiety, or worry.

The individual judges the likelihood of a future event by the similarity of the present evidence to it. There is a tendency to ignore both prior information and the quality of the present evidence (Arrow, 1981). An important determinant of risk perceptions associated with foods is the extent to which the potential hazards are perceived to have technological or naturally occurring origins (Kaptan et al, 2017).

Empirical research shows that significant determinants of risk perceptions are socioeconomic and behavioral variables, such as educational level, household income, gender, and age. But findings from different researchers show that their influence on consumers' risk perceptions is not always significant, nor it is always positive.

The most consistent finding, supported by a multitude of studies, is that women perceive risks to be higher than do men (Dosman, et al., 2001; Tonsor et al., 2009). According to Baker (2003), gender is significantly affecting risk, while education and income have an insignificant effect.

In a study to identify the primary drivers of consumer responses to food safety risk perceptions Shroeder et al. (2007) found that females, older adults, and more educated people tend to be more risk-averse about consuming beef. Trust in food safety information obtained from family physicians and dieticians affects consumers' risk perceptions. However, caution is needed because information may in some cases increase confusion and consumer concern (Grunert, 2005).

Women are more likely to have high levels of concern about food safety than are men. Also, the level of concern increased with age (Knight & Warland, 2004).

Ability to prepare food at home, reliance on observable attributes of the food product, reliance on credence attributes, trust in doctors, lower consumption, family member or self been sick at least once in their life, personal and indirect food safety experiences, trust in alternative food safety information sources affect risk perceptions of consumers; education, trust in industry, grocer and government, and in researchers and consumer groups do not affect risk perception (Tonsor et al., 2009).

Kafka et al. (1994) have assessed factors of the degree of concern for food safety. They found that the degree of pessimism is the most important determinant of the concern for food safety. With growing pessimism concern about food is increasing. With an increasing degree of environmental concern, concern about food is growing; general technology acceptance. With a decreasing acceptance of technology, the degree of concern about food is increasing. They also discovered that with growing concern the demand for information is increasing. Assessing trust on communicators, they found that mostly trusted were the consumer advice centers, followed by the medical doctor and the family members. Communicators mostly distrusted were the food industry, followed by the press, radio, and television.

Research Hypotheses

Based on the above literature review and the goal of our research, the following hypotheses need to be tested in the case domestic of tomato consumption:

- ✓ Consumers' concern for tomato safety is positively related to the degree of the perceived food safety risk of tomato and perceived benefit from consuming tomato.
- ✓ Consumers' concern for tomato safety is negatively related to educational level and gender.

✓ Consumers' concern for tomato safety is negatively related to age.
✓ Consumers' concern for tomato safety is not related to the religious affiliation of the consumer.
✓ Consumers' concern for tomato safety is positively related to income and the household's size.
✓ Consumers' concern for tomato safety is positively related to the number of household's members.

Data and Method

Primary data collected by means of a specific survey were used in the study. A random sample of 824 consumers has been interviewed using ready-made questionnaires. The variables for which data were collected for each individual and their measurement scale and categories are shown in Table 1.

Concern about tomato safety is the key variable of interest and the dependent variable, while the others are the supposed independent, explanatory or factor variables.

Nominal regression, the ordered logistic regression (Ologit), and the unordered multinomial logistic regression have been used.

If Y is the dependent multinomial variable with M categories the general form of the unordered multinomial logistic regression with k independent variables or factors is the following:

$$p_j = \frac{\exp(a_j + b_{1j}X_1 + ...b_{kj}X_k)}{1 + \sum_{i=2}^{J} a_i + b_{1i}X_1 + ...b_{ki}X_k)}, \text{ for } j = 2,3,...M$$

Here p_j are non-cumulative probabilities, or probabilities of an individual to be in the j category for given values of the factors X. The multinomial logistic model has the disadvantage of ignoring the ordering of the categories.

Another form of the unordered multinomial logistic regression is the following:

$$\frac{p_j}{p_1} = \exp(a_j + b_{1j}X_1 + ...b_{kj}X_k), \text{ for } j = 2,3,...M$$

This model gives the odds, relative chances, or the ratio of the probability of being in the category *j* with the probability of being in the base category. The exponentiated coefficients *Exp (B)* are multipliers of the odds and indicate how many times increase the odds if a specific independent variable X is increased by one unit, the other X's remaining constant. Odds are increasing if the regression coefficients are > 0, one (constant) if the coefficient is zero, and decreasing if the regression coefficients are < 0.

The general form of the ordered logistic regression with *k* independent variables or factors is the following:

$$P_j = P(Y \leq j) = \frac{\exp(a_j - BX)}{1 + \exp(a_j - BX)} \text{ for } j=1,2,...M$$

Here P_j are cumulative probabilities; they are probabilities of an individual to be in the jth or previous categories for given values of factors X. Regression coefficients are the same for each category but the free parameter is specific for each category. Based on this, the probability p_j of an individual to be exactly in the category *j* is the difference between the cumulative probabilities of being in category *j* and category *(j-1)*:

$$p_j = P_j - P_{j-1} \text{ for } j = 2,...M-1$$

For the last category $p_M = 1-P_{M-1}$, while for the first category $P_j = p_j$.

Exponentiated coefficients Exp (B) of the ordered model are partial odds ratios for being in the higher rather than the

Table 1. Variables, their code and measurement scale

Variables	Code of the variable	Measurement Scale	Categories
Risk of consuming tomato	RISK	Ordinal	0 to 10
Benefit from consuming tomato	BENEFIT	Ordinal	0 to 10
Concern about tomato safety	CONCERN	Multinomial	Not concerned, Concerned Very much (or Absolutely) concerned
Age	AGE	Ratio	–
Education	EDU	Multinomial	Elementary, Secondary, High
Gender	GENDER	Binomial	Female, Male
Household's size	SIZE	Ratio	–
Household's Income (ALL)[1]	INCOME	Ratio	–
Religious affiliation	RELIGION	Multinomial	Muslim, Christian, Other

[1] Albanian currency 1 Lek = 0.00813 Euro

lower half of the dichotomy. In the case of one dependent variable with M=3 categories, two dichotomies could be formed:

Lower dichotomy: Not concerned vs. (Concerned or Very much concerned)

Higher dichotomy: (Not concerned or Concerned) vs. Very much concerned

Controlling for the other explanatory variables, an increase in X by one unit is associated with 1-exp (B))*100 increase (if B > 0) or decrease (if B < 0) in odds of giving a response that indicates higher levels of concern.

To estimate the models the MLE estimator should be used. The model and the coefficients can be tested using the t (Student) test method, and the F (Fisher) test. To test whether adding new variables in the model improves it, Likelihood ratio (LR) test could be used. In this case:

The null hypothesis is H_0: Adding a new variable does not improve the model, or the model with one more variable (model 2) is not better than the model without it (model 1).

Then likelihood ratios for each model are calculated (LR1 and LR2). Finally, the likelihood ratio test statistic D = (−2logLR1) − (−2logLR2) and p-value for tests statistic from $\chi 2$ distribution are calculated (with degrees of freedom equal to the difference in the degrees of freedom in the two models (i.e. the number of extra parameters in the larger model).

Nominal explanatory variables, such as gender, education and religious affiliation, have been dummyfied by using for each variable as many dummy variables as the number of categories minus one. The dummyfication is shown in Table 2.

More technical details on nominal models could be found in (Wooldridge, 2013; Benoit, 2012).

Results

Calculations based on the primary data show that the average level of concern is 4.7, the average level of benefit is 3.6 and the average level of risk is 6.7 on a score scale from 0 to 10. Thus, the general level of consumers' concern though pretty high, is much lower than the level of perceived risk because of associated benefits.

The estimated multinomial model is shown in Table 3. The coefficients *B* in Table 3 can help to calculate the expected probabilities, or probabilities to be in certain concern group, for each individual given their specific characteristics (factor values). Values of EXP (B) in the last column are odds ratios. The sign of the coefficient denotes increasing odds when it is positive and decreasing odds when it is negative. If we focus on the variable size in the category "Very much concerned" the coefficient 1.139 denotes that if the number of members in the household is increased by one, the odds of an individual to be very much concerned increase by 13.9% (calculated 1.1398*100-100) compared to the base level (not concerned) upon the condition that all the other factors remain unchanged. And, if the level of perceived risk is increased by one, the odds of an individual to be very much concerned increase by 8.2% (calculated 1.082*100-100) compared to the base level (not concerned) upon the condition that all the other factors remain unchanged. See Benoit (2012) for more details about interpreting the odds.

Following the estimation of the model we performed the LR test. Based on the LR test, the model with all variables included model results significant with a significance level less than 0.001. Table 4 summarizes the results of the likelihood ratio tests performed for each variable, beginning with the model with the constant only.

These tests help to reveal which of the factors is significantly associated with the level of concern and which is not. Variables income, number of family members, perceived benefit level, religious affiliation and level of risk are significantly associated with the level of concern, while age education and gender are not.

As an analysis option, we estimated also the ordered logistic model. Table 5 shows the estimated ordered logistic model.

The sign of the coefficients in Table 5 denotes a positive relationship between degree of concern and the factor coefficient is positive and a negative relationship when it is negative. Thus, with increased income and benefit the level of concern tends to be lower; for bigger households and when perceived risk is higher the level of concern tends to be higher; for Drel-2 the coefficient is negative, so "Christian" tend to have lower degree of concern as compared with "Muslim"

Table 2. Dummies for the education and the religious affiliation

Dummies for the education	Dummies for the religious affiliation
Dummy 1:Dedu-1	*Dummy 1:Drel-1*
DEdu-1 = 1 if primary	DRel-1 = 1, if Muslim
DEdu-1 = 0 otherwise (secondary, high)	DRel-1 = 0, if otherwise (Christian, Other)
Dummy 2:Dedu-2	*Dummy 2:Drel-2*
DEdu-2 = 1, if secondary	DRel-2 = 1, if Christian
DEdu-2 = 0, if otherwise (primary, high)	DRel-2 = 0, if otherwise (Muslim, Other)

and the "Other" category of believers; education does not significantly affect the level of concern.

Discussion

Based on the results of the study, the consumers' concern for tomato safety correlates positively and significantly with the level of perceived risk, negatively and significantly with the level of perceived benefit from tomato consumption, so hypothesis (a) is not rejected. This result is all the more meaningful because the decision to buy and consume tomatoes, as with any other product, comes after a risk-benefit confrontation, with people tolerating higher risks when benefits are seen as highly beneficial (Slovic, 1987; Frewer et al. 2009); thus the level of concern is a consequence of both risk and benefit assessment at the same time.

Table 3. Multinomial Logistic model, for the three category dependent variable Concern, Base category "Not concerned"

Concern		B	Std. Error	Wald	df	Sig.	EXP(B)
Concerned	Intercept	-0.082	0.579	0.02	1	0.888	
	AGE	-0.003	0.006	0.251	1	0.616	0.997
	INCOME	0	0.001	0.004	1	0.952	1
	SIZE	0.114	0.064	3.215	1	0.073	1.121
	BENEFIT	-0.019	0.03	0.408	1	0.523	0.981
	DEdu-1	0.173	0.31	0.31	1	0.578	1.189
	DEdu-2	0.058	0.206	0.078	1	0.779	1.059
	DRel-1	-0.952	0.371	6.584	1	0.01	0.386
	DRel-2	-0.966	0.386	6.28	1	0.012	0.381
	GENDER	0.086	0.177	0.235	1	0.628	1.09
	RISK	0.08	0.034	5.491	1	0.019	1.083
Very much concerned	Intercept	0.783	0.609	1.655	1	0.198	
	AGE	0.001	0.007	0.016	1	0.9	1.001
	INCOME	-0.003	0.001	14.42	1	0.000	0.997
	SIZE	0.13	0.068	3.651	1	0.056	1.139
	BENEFIT	-0.251	0.035	52.203	1	0.000	0.778
	DEdu-1	0.012	0.322	0.001	1	0.971	1.012
	DEdu-2	-0.177	0.216	0.669	1	0.413	0.838
	DRel-1	-0.479	0.409	1.372	1	0.241	0.619
	DRel-2	-0.649	0.429	2.287	1	0.13	0.523
	GENDER	-0.155	0.188	0.683	1	0.408	0.856
	RISK	0.079	0.035	5.188	1	0.023	1.082

Table 4. Likelihood Ratio Tests for the three category dependent variable Concern

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	1623.690	2.704	2	.259
AGE	1621.407	.421	2	.810
INCOME	1640.864	19.877	2	.000
SIZE	1625.687	4.701	2	.095
BENEFIT	1689.942	68.956	2	.000
DEdu-1	1621.372	.385	2	.825
DEdu-2	1622.243	1.256	2	.534
DRel-1	1628.119	7.132	2	.028
DRel-2	1627.735	6.748	2	.034
GENDER	1622.686	1.700	2	.427
RISK	1627.999	7.013	2	.030

Table 5. Ordered Logistic model, for the three category dependent variable Concern

		Estimate	Std. Error	Wald	df	Sig.	EXP(B)
Threshold	[Concern 1.0]	-1.372	0.429	10.242	1	0.001	-
	[Concern = 2.0]	0.141	0.426	0.11	1	0.74	-
Location	AGE	-0.001	0.005	0.041	1	0.839	0.999
	INCOME	-0.002	0.001	9.62	1	0.002	0.998
	SIZE	0.099	0.049	4.123	1	0.042	1.104
	BENEFIT	-0.175	0.024	54.371	1	0.000	0.839
	DEdu-1	0.024	0.233	0.01	1	0.919	1.024
	DEdu-2	-0.112	0.156	0.515	1	0.473	0.894
	DRel-1	-0.39	0.268	2.115	1	0.146	0.677
	DRel-2	-0.472	0.283	2.786	1	0.095	0.624
	GENDER	-0.074	0.135	0.297	1	0.586	0.929
	RISK	0.047	0.025	3.652	1	0.056	1.048

The consumers' concern for tomato safety is not statistically significantly related to education level or gender. Thus, hypothesis (b) on the negative relation between them is rejected. This may be due to the fact that higher education groups have better access to information sources and are more knowledgeable about food safety issues, thus they may quote a high level of concern when there is room for concern and vice versa. While the lower education group, being less knowledgeable and having poor access to information may suffer from ignorance syndrome and become anxious about what is happening with food safety and what are its levels. Concerning education, the literature indicates instances where the level of education is significantly associated with the level of concern (Shroeder et al., 2003; Slovic, 1987) and instances where education has no significant effect (Baker, 2003). Regarding gender, the literature is more consistent, with women having a higher level of concern for food safety issues, so our result is not in line with findings from the literature.

Regarding age, the study shows that this factor has no significant impact on the level of concern; hypothesis (c) is rejected. This result is partly in line with findings from the literature, where some authors find it significant (Tonsor et al., 2009), and others find it insignificant (Baker, 2003). This may be due to the fact that younger people are more aware of food safety issues because of better access to information sources (media, internet).

Religious affiliation of the consumer results to significantly affect the level of concern, with Christian and Muslim people tending to have lower concern compared to other groups, thus hypothesis (d) cannot be refuted. This result might be due to a difference in religious values, differences in the group structures in terms of gender, education, and income across religious affiliations, but discovering real causes needs a special investigation. We were not able to find any reference on the impact of religious affiliation on the level of concern or risk of food safety.

Household's income resulted to be a significant factor affecting negatively the consumer's level of concern, thus hypothesis (e) cannot be refuted. Figure 8 also shows this quite clearly. Higher-income households have a better choice because they can afford higher prices, i.e. they can buy better quality, shift from domestic to imported tomato when necessary because it is perceived to be of higher quality, thus might not show high concern about risks coming from eating an unsafe domestic tomato. Findings from the literature show instances that income has a significant effect (Dosman et al., 2001; Tonsor et al., 2007), but also cases where income has resulted insignificant (Baker, 2003).

Regarding the total number of family members, it results that this factor positively and significantly affects the level of concern. Figure 6 as well shows this clearly, so hypothesis (f) is not rejected. One hypothesis for this result could be that with larger households the risk effect would be really harsh, so they are more cautious when it comes to making a purchase decision. Another explanation of this result may be that larger families tend to have larger numbers of children and in this case, literature shows that people are more sensitive to food safety issues.

We want to argue that, however, that the effect of the same factor in different countries, times, and communities of individuals also depends on the social, cultural, demographic and economic specifics of the different countries and communities, the type of the product under study, as well as the interplay of these specifications and the factors themselves. The degree of public awareness of food safety and its environmental concern may be other factors that interfere with and influence the assessment of the degree of concern and effect of factors of interest.

Limitation of the Study

This study uses consumers' risk perceptions which might be subjective and depends on how much are informed the consumers. As such the results might suffer from some bias, which being the sample enough large, we believe do not touch the substance of the results.

Conclusion

This study focuses on the level and determinants or factors affecting the consumers' concern on food safety risks in the case of domestic tomato in the metropolitan area of Tirana city, Albania. Data on a sample of more than 800 hundred consumers have been collected through a field survey. The data relate to several variables of socio-economic and demographic character. The multinomial logistic model has been used to investigate the role and effect of these variables on the consumers' level of concern on food safety risks.

As expected, the effect of household's income, number of household's members, or the size of the family and perception on the level of risk associated with the consumption of the domestic tomato affect positively, and significantly the level of consumers' degree of concern; with the increase of all these three consumers tend to have higher level of concern on food safety risk for tomato.

Perceived benefits derived from the consumption of tomato have a strong negative effect on the level of concern; thus, even if high risks are perceived, when at the same time high benefits also are perceived, the level of concern is lowered.

The level of perceived risk associated with the consumption of tomato has a significant effect on the consumer's concern. High levels of risk, when other factors including benefit remain constant, tend to increase the level of concern. However, the effect of one unit of increase in the perceived benefit out-passes the effect of one unit of increase in the perceived risk.

Religious affiliation of the consumers also has a significant on consumers concern, with Christian and Muslim believers being less risk-averse.

Gender, education, and age did not show any significant effect, though slight effects have been noticed, with females, younger and higher education people being more concerned.

Knowledge of consumer concern for food safety is critical, both for those who produce food (farmers in this case), other actors in the food chain and policymakers, especially those involved in public health policy. All of them need to know their food safety concerns and how consumers think and react to risk. Otherwise, productive or commercial decisions, as well as public policies, might be ineffective. Effective risk communication also is closely related to understanding consumer concern about food safety. On this basis some recommendations would be i-as Slovic (1987) points out it is important to improve communication between policy-makers and the public; ii- improve consumers' education and awareness related to food safety; iii-improve risk management, for example by adopting new risk management strategies (improving regulations, provision of information about substitute products, etc.); iii-improving product-specific and general food safety-related information for consumers, to help them form real perceptions about food safety risks and make better purchase decisions.

Scope for Further Research

Food safety is an immense and complex area of study; thus much more can be studied, especially for Albania. Thus, it may be of interest to include in study other variables relevant to shaping consumer perceptions of food safety risk. Then, disaggregating the results by who makes the purchase (by gender, education, employment, etc.) would be another study aspect. It could be of great use an in-depth analysis of the purchase decision, regarding the product-related attributes that consumers evaluate when buying tomatoes. Last but not least, given that perceptions are the result of receiving and processing information by the consumer, it would be of interest especially in the case of Albania to investigate the role and effectiveness of information in shaping public perceptions of risk and concern about food safety.

References

Albanian Law on Food (2008). Albanian Law on Food, Nr.9863, 28.1.2008. http://aku.gov.al/wp-content/uploads/2016/06/Ligji-Nr-9863-dat%C3%AB-28.-1.-08-i-ndryshuar-me-26.03.20013.pdf

Alhakami, A. S. & Slovic, P. (1994). A psychological study of the inverse relationship between Perceived Risk and Perceived Benefit.*Risk Analysis*, *14 (6)*. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1539-6924.1994.tb00080.x

Arrow, J. K. (1981). Risk perception in psychology and economic fluctuations, Technical Report No. 351, a Report of the Center for Research on organizational efficiency, Stanford University. https://apps.dtic.mil/dtic/tr/fulltext/u2/a111671.pdf

Arrow, K. J. (1963). Uncertainty and the welfare economics of medical care. *The American Economic Review, LIII (5),* 941-973.https://web.stanford.edu/~jay/health_class/Readings/Lecture01/arrow.pdf

Baillon, A, Bleichrodt, H., Emirmahmutoglu, A. & Jaspersen, J. G. (2018). When risk perception gets in the way: Probability weighting and under-prevention. *SSRN Electronic Journal,* January 2018. DOI: 10.2139/ssrn.3199867https://www.researchgate.net/publication/326470871_When_Risk_Percep-

tion_Gets_in_the_Way_Probability_Weighting_and_Under-prevention

Baker, G. A. (2003). Food safety and fear: Factors affecting consumer response to food safety risk. *International Food and Agribusiness Management Review, 6 (1).* https://pdfs.semanticscholar.org/965d/3fc788c77ac7b-58636c193f12df21113585e.pdf

Benoit, K. (2012). Multinomial and Ordinal Logistic Regression. https://kenbenoit.net/assets/courses/ME104/ME104_Day8_CatOrd.pdf

Dosman, D. M., Adamowicz, W. L. & Hrudey, S. E. (2001). Socioeconomic determinants of health- and food safety-related risk perceptions. *Risk Analysis*, *21 (2),* 307-317.https://www.ncbi.nlm.nih.gov/pubmed/11414539.

FAO-WHO (2003). Assuring Food Safety and Quality: Guidelines for Strengthening National Food Control Systems, FAO Food and Nutrition Paper 76. http://www.fao.org/3/a-y8705e.pdf

Finucane, M. L. & Holup, J. L. (2005). Psychological and cultural factors affecting the perceived risk of genetically modified food: an overview of the literature. *Social Science and Medicine*, 1603-1612.http://www.ask-force.org/web/Ethics/Finucane-Psychsocial-Cultural-Factors-2005.pdf

Frewer, L., De Jonge, J. & Van Kleef, E. (2009). Consumer perceptions on food safety. In: *Medical Sciences, 2 ,* 244-264, *EO-LSS Publishers/UNESCO.*

Grunert, K. G. (2005). Food quality and safety: consumer perception and demand. *European Review of Agricultural Economics, 32 (3),* 369–391 doi:10.1093/eurrag/jbi011

INSTAT (2019). http://databaza.instat.gov.al/pxweb/sq/DST/START__BU/

Kafka, C. & Alvensleben, R. V. (1994). Consumer perceptions of food-related hazards and the problem of risk communication. https://www.uni-kiel.de/agrarmarketing/publikum/ahus3.pdf.

Kaptan, G., Fischer, A. R.H. & Frewer, L. J. (2017). Extrapolating understanding of food risk perceptions to emerging food safety cases. *Journal of Risk Research*, DOI: 10.1080/13669877.2017.1281330 http://dx.doi.org/10.1080/13669877.2017.1281330

Kardes, F. R., Cronley, M. L. &Cline, Th. W. (2011). Consumer behavior. South-Western, Cengage Learning.

Knight, A. & Warland, R. (2004).The Relationship between socio-demographics and concern about food safety issues. *The Journal of Consumer Affairs*, *38 (1),* 107-120. https://www.jstor.org/stable/23860003

Mitchell, V. W. (1992). Understanding consumers' behavior: Can perceived risk theory help? *Management Decision, 30 (3).* http://dx.doi.org/10.1108/00251749210013050

Mitchell, V. W. (1999). Consumer perceived risk: Conceptualizations and models. *European Journal of Marketing, 33 (1/2),* 163–195. http://dx.doi.org/10.1108/03090569910249229

Nicole, J., Widmar, O., Melissa McKendre, G. S., & Croney, C. C. (2013). Consumer preferences for and perceptions of livestock production process attributes: Animal Welfare and Food Safety Attributes. https://meatscience.org/docs/default-source/publications-resources/rmc/2013/rmc-2013-nicole-widmar.pdf?sfvrsn=e6b6bab3_2

Schroeder, T., Tonsor, G., Pennings, J. M. E. &Mintert, J. (2007). Consumer risk perceptions and attitudes about beef food safety: Implications for improving supply chain management. *Contributions in Economic Analysis & Policy, 7 (1),* 1848-1848. DOI: 10.2202/1935-1682.1848. ·

Sjöberg, L., Bjørg-Elin, M.&Rundmo, T.B-E.(2004). Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research. Rotunde Publikasjoner, Rotunde no. 84. http://www.svt.ntnu.no/psy/Torbjorn.Rundmo/Psychometric_paradigm.pdf

Slovic, P. (1987). Perception of risk. *Science, 236,* 280–285. http://www.heatherlench.com/wp-content/uploads/2008/07/slovic.pdf

Slovic, P. (1992). Perception of risk: Reflections on the psychometric paradigm. In: S. Krimsky & D. Golding (eds.), Social theories of risk (117-152). New York: Praeger. http://hdl.handle.net/1794/22510

Starr, C. (1969), Social benefit versus technological risk. *Science*, *(165),* 1232-1238. https://science.sciencemag.org/content/165/3899/1232

Taylor, J. W. (1974). The role of risk in consumer behavior. *Journal of Marketing, 38(2),* 54-60. DOI: 10.2307/1250198. https://www.jstor.org/stable/1250198

Tonsor, G. T., Schroeder, T. C. &Pennings, J. M. E. (2009). Factors impacting food safety risk perceptions. *Journal of Agricultural Economics*, *60 (3),* 625–644.doi: 10.1111/j.1477-9552.2009.00209.x

UN (2007). Improving the Safety and Quality of Fresh Fruits and Vegetables: A Training Manual for Trainers. https://unctad.org/en/docs/ditccom200616_en.pdf

Wooldridge, J. M. (2013). Introductory econometrics: A modern approach. 4th edition, South Western Cengage Learning.

Yu, H., Gibson, K. E., Wright, K. G., Neal, J. A. &Sirsat, S. A. (2017). Food safety and food quality perceptions of farmers'market consumers in the United States. *Food Control, 79,* 266-271. DOI: 10.1016/j.foodcont.2017.04.010. https://pubag.nal.usda.gov/catalog/5672384.