

Segmentation of consumer preference for food safety label on vegetables

Consumer profiles in central and south central Chile

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Abstract

Purpose – The purpose of this paper is to explore the differences in consumers' preferences to food safety label (FSL) on vegetables in central and south central Chile in terms of sociodemographic characteristics, consumers' food safety knowledge and frequency of vegetables consumption.

Design/methodology/approach – A survey was applied to 1,201 consumers in charge of buying vegetables for their households. The questionnaire measured consumer preference for FSL using tomatoes as a case study.

Findings – The most important attributes for consumers were price (57.3 percent), FSL (19.7 percent), point of sale (11.86 percent) and production system (11.07 percent). Cluster analysis was used to differentiate three types of consumers. The majority (50.5 percent) are consumers oriented to price of tomatoes more than other attributes. A second group (30.1 percent) considers it important to purchase tomatoes at the lowest price with the existence of a FSL. A minority (19.4 percent) was oriented to purchasing tomatoes with a FSL. The groups differ according to sociodemographic characteristics, food safety knowledge and frequency of vegetables consumption.

Research limitations/implications – The study was conducted in country in South America. The results revealed that the majority of consumers choose price over FSL. Nevertheless, a potential market niche was identified that was motivated by FSL as a potential risk-reduction strategy when making choices about fresh vegetables purchase.

Practical implications – FSL is a marketing tool to help the consumers about food decisions.

Social implications – To avoid problems associated to unsafe vegetables, FSL is used as a potential risk-reduction strategy when making choices about fresh vegetables purchase.

Originality/value – The research provides information about a market niche of consumers interested in the existence of an explicit FSL, due to their awareness of the risks associated with the consumption of vegetables. This topic has received little research in Latin American developing countries.

Keywords Vegetables, Food safety, Cluster analysis, Consumer preference

Paper type Research paper



Introduction

Pros and cons of consumption of vegetables

The consumption of fresh fruit and vegetables is beneficial for health. Scientific evidence proves that the consumption of this type of food has cancer and cardiovascular disease preventing effects (Dauchet *et al.*, 2006; Hung *et al.*, 2004; Van't Veer *et al.*, 2000). The World Health Organization (WHO, 2003) recommends consuming at least 400 grams of fruit and vegetables per day. Beneficial effects notwithstanding, there also exist health hazards associated with fruit and vegetables such as foodborne diseases (FBD) (Pires *et al.*, 2012). Given that certain vegetables are consumed uncooked, consumers run risks such as infection via microbiological contamination (mainly *Salmonella* spp., *E. Coli* and norovirus), exposure to toxic residues (pesticides and fertilizers) and exposure to technological hazards such as genetically modified organisms and nanomaterials (Berger *et al.*, 2010; Van Boxtael *et al.*, 2013; Yeung and Morris, 2001).

General overview of unsafe vegetables

In 2010 and 2011, 8.7 and 5.3 percent of verified foodborne disease outbreaks in the EU were linked to the consumption of vegetables, juice and products thereof (EFSA/ECDC, 2012, 2013). Pires *et al.* (2012) reported 6,313 foodborne illness events in Latin America and the Caribbean for the 1993-2010 period. However, these figures are not accurate due to the lack of precise monitoring and vigilance systems for FBD in developing countries in Latin America and the Caribbean, Asia and Africa (Akhtar *et al.*, 2014; Pires *et al.*, 2012). Hence, these outbreaks have significant economic and public health consequences (Arispe and Tapia, 2007; Böcker, 2002; Figueroa, 2010).

In developed countries, consumers are consistently concerned about food safety and nutritional risks. These issues are much less patent in developing countries, where this sort of concern will increase in line with economic growth (Havelaar *et al.*, 2010). Chile is a developing country and as such does not escape from food safety problems. Alerte *et al.* (2012), for instance, note that 20 children younger than one year of age die from gastroenteritis caused by FBD in this country every year. The same author reports 12,196 cases of people affected by FBD between 2005 and 2010. Vegetables are one of the causes for these diseases (5.1 percent of foodborne verified outbreaks), and it should be noted here that the fresh vegetables market is classified into two categories in Chile. There is a traditional market which accounts for 70 percent of the sales of vegetables and a modern market which covers the remaining 30 percent. The traditional markets (mainly municipal food markets and small greengrocers) do not demand the good agricultural practice certification protocols (promoted by Government since the 1990s) from the vegetable producers and/or wholesalers. In contrast, the modern market (supermarkets) meets most international quality standards (Faiguenbaum *et al.*, 2002; Mora, 2008). Tomatoes, for their part, are among the most consumed vegetables in the world. According to the Food and Agricultural Organization of the United Nations (FAO, 2014), world consumption of tomatoes reached 161.7 million metric tons in 2012. Their beneficial effects aside, they can also carry biological, chemical and technological agents such as *Salmonella* spp.; pesticides and genetic modifications with harmful effects on human health (dos Santos *et al.*, 2015; Gambacorta *et al.*, 2005; Lopez-Velasco *et al.*, 2013; Melo *et al.*, 2012).

Certification labels as credibility tools

Under normal circumstances, most consumers do not concern themselves with food safety. However, this concern changes whenever food safety is affected, and

consumers' preoccupation and anxiety is triggered (Verbeke *et al.*, 2007). Therefore, the perception of risk on the part of consumers and its impact on purchase behavior is an essential component in food safety management (Yeung *et al.*, 2010). At the same time, control and certification systems need to be improved in order to ensure the safety of fresh vegetables in Latin American developing countries. However, it is also imperative that the population itself demands safe products and defends the consumer's right to know (Milne, 2012).

Ways to lessen the consumer's perception of risk caused by lack of food safety include highlighting product brands, information labels, government and private certification, and using traceability programs and quality assurance processes as extrinsic attributes to promote the purchase of products in periods when consumers show concern (Grunert, 2005; Barrera *et al.*, 2003; Yeung *et al.*, 2010; Ortega *et al.*, 2011). Thus, improving food safety standards will in turn improve consumers' attitudes and perceptions (Yeung and Morris, 2006; Unnevehr, 2007; Van Fleet and Van Fleet, 2009; Van Wezemael *et al.*, 2011; Rezai *et al.*, 2014). These latter standards need to be improved in Latin America so that the population is able to purchase safe vegetables (Vera *et al.*, 2015).

From the standpoint of classical information economics theory, certification labels are used to correct asymmetries of information and to transform credence attributes into search attributes (Jahn *et al.*, 2005). In that sense, certification labels are one of the elements which ensure the safety of fresh vegetables; they are product differentiation tools which provide consumers with information so that they can decide whether or not to purchase any given item of food. Certification labels have also been used as a strategy to lessen consumers' perception of risk when it comes to food with a history of causing health problems. The adequacy of this tool has been demonstrated in a series of scientific papers (Moussa and Touzani, 2008; Verbeke *et al.*, 2008; Wu *et al.*, 2011). However, scientific evidence on safety certification as a quality attribute for fresh vegetables is scant. A list of relevant studies is found in the Table AI.

Price as a decision attribute affects food safety

Price is one of the main factors affecting the choice of food products (Steenhuis *et al.*, 2011). Perhaps the effect of price is more remarkable in developing countries, because per capita income in these countries is lower than in developed countries. Therefore, we could expect that the price barrier exerts high pressure on consumer choice in developing countries, even when considering the purchase of basic goods such as food products (Behrens *et al.*, 2010; Cassady *et al.*, 2007; Lacaze, 2014). In contrast, in industrialized nations, empirical evidence has revealed that the influence of price on consumer choice has decreased as other attributes such as health concerns and social and ethical aspects (e.g. fair trade, animal welfare, organic farming) have captured the attention of some consumer segments (Napolitano *et al.*, 2008; Padilla Bravo *et al.*, 2013; Zander and Hamm, 2010). In this context, labels have arisen as a policy instrument to ensure marketing claims for unobservable quality such as food safety (Jahn *et al.*, 2005). Therefore, the main hypothesis of this research is that price acts as a barrier to purchase vegetables certified by a food safety label (FSL).

Against the background set out above and given that Chile has one of the highest FBD records in Latin America (Pires *et al.*, 2012), this study aims at assessing consumer preference for tomatoes carrying safety labels. Furthermore, we describe differences across consumer segments using data collected in the central and south central areas of Chile as a case study for Latin American countries.

Method

Sample and procedure

This study was designed to be descriptive and was conducted in the Metropolitan (33°26'S, 70°39'W), Maule (35°25' S, 71°40'W) and Araucania (38°45'S, 73°03'W) regions of Chile. The study used a convenience sample of vegetable purchasers. A total of 1,201 (400 from Metropolitan, 401 from Maule and 400 from Araucania) selected consumers over 18 years old (legal age) were interviewed using the mall intercept technique. The survey data were collected by interviews conducted in public places close to banks, stores and supermarkets. Interviews were conducted in September-November 2012. Prior to data collection, the questionnaire had been previously validated through a preliminary test with 10 percent of the sample, using the same method of addressing the participants as in the final survey. The problems detected were corrected to apply the final version of the questionnaire and interview procedure. The surveyors explained the objectives of the study to interviewees and assured them that their answers would be confidential.

Questionnaire

A questionnaire with closed-ended questions was used to collect general information regarding fresh vegetables such as food safety knowledge, consumption frequency and point of purchase. Also, the questionnaire included classification questions to establish background information about gender, age, education, family income, occupation and household size.

In order to evaluate the preference for FSL, price, point of sale and production system a conjoint analysis (CA) was performed (Hair *et al.*, 1999). Table I shows the attributes and levels defined by literature for tomatoes (Loureiro and Umberger, 2007; Tobin *et al.*, 2012; Verbeke *et al.*, 2008). The levels defined for FSL were three: private FSL, government FSL and no FSL (Moussa and Touzani, 2008; Verbeke *et al.*, 2008; Wu *et al.*, 2011). The price levels were obtained from ODEPA (2012) and correspond to the average price variability of tomatoes for the 2011/2012 season (1 dollar = 654.07 Chilean pesos, the average for 2015). Three price levels were defined (US\$0.77, US\$1.54 and US\$2.31). The levels defined for point of sale were two: municipal food markets (traditional markets) and supermarkets (modern market) (Faiguenbaum *et al.*, 2002; Mora, 2008). Conventional and organic were the two levels defined for production system as a fourth attribute given that organic agriculture is perceived by consumers

Profile	Food safety label	Price (US\$/kg)	Point of sale	Production system
1	No food safety label	US\$0.77	Supermarket	Organic
2	No food safety label	US\$2.31	Municipal market	Conventional
3	Government food safety label	US\$0.77	Municipal market	Conventional
4	No food safety label	US\$1.54	Municipal market	Organic
5	Government food safety label	US\$2.31	Supermarket	Organic
6	Government food safety label	US\$1.54	Municipal market	Organic
7	Private food safety label	US\$1.54	Supermarket	Conventional
8	Private food safety label	US\$0.77	Municipal market	Organic
9	Private food safety label	US\$2.31	Municipal market	Organic
10	Private food safety label	US\$0.77	Supermarket	Organic
11	Private food safety label	US\$1.54	Supermarket	Organic

Table I.
Full factorial design
presented to
consumers

as being environmentally friendly, pesticide-free and without gene modification (Adasme-Berrios *et al.*, 2011; Hughner *et al.*, 2007; Losasso *et al.*, 2012).

The full factorial design based on the attributes and levels described above contains $3 \times 3 \times 2 \times 2 = 36$ combinations of attribute levels. Consequently, and in order to reduce the number of product profiles to be evaluated by interviewees, a fractional factorial design was generated by the orthoplan procedure in SPSS version 18. The orthoplan procedure generated 11 fully orthogonal factor-level combinations, corresponding to 11 different types of tomato products (stimuli). The verbal descriptions of these 11 types of tomato products are presented in Table I. All combinations were realistic and corresponding to different types of tomato products. Therefore, any multicollineality problems among attribute levels were eliminated (Green and Srinivasan, 1978). The stimuli were presented to the interviewees, in which each consumer had to score each profile on a 1-7 scale. 1 corresponds to the least preferred product and 7 to the most preferred one.

Statistical analysis

The CA was used to determine the relative importance that consumers gave to the levels of attributes defined for the study and the partial utilities score given by the formula:

$$P_{ik} = \beta_i + \sum_{j=1}^m \sum_{l=1}^{L_j} x_{klj} p_{ijl} \quad (1)$$

where P_{ik} represents the preference of respondent i for profile k , β_i are respondent specific intercept terms to be estimated, m is the number of attributes (four here), L_j is the number of levels of attribute j , x_{klj} is profile k 's value of a dummy variable for level l of attribute j ($x_{klj} = 1$ if profile k has level l of attribute j , and $x_{klj} = 0$ otherwise) p_{ijl} is the contribution of level l of attribute j to the preferences of respondent i . Responses were analyzed with the SAS 9.3 TRANSREG procedure (SAS Institute Inc., Cary, NC, USA).

Once partial utilities were determined with CA, they were segmented using a cluster analysis. The technique was applied in the following way: a hierarchical agglomerative cluster analysis was first carried out using Ward's method followed by a k -media for the stability of the cluster and a one-way ANOVA. The number of clusters was achieved on the basis of the R^2 obtained and from a strong increase produced in the cubic criterion of clustering and pseudo F values. The significant variables were separated using a Dunnett's T3 multiple comparison procedure to determine the validity of the cluster given that the variances were not homogeneous (Clatworthy *et al.*, 2005). Finally, contingency tables were built with the food safety knowledge, frequency of vegetables consumption and sociodemographic variables in order to describe the segments. Clustering was analyzed using SPSS version 18.0 (SPSS Inc., Chicago, IL, USA).

Results

The preference for attributes was determined through CA. The most important attribute for consumers was price (57.33 percent), followed by FSL (19.74 percent), point of sale (11.86 percent) and production system (11.07 percent). Consumers showed preference (positive utilities) for the lowest price (US\$0.77/kg) of the product shown, less preference for the intermediate price (US\$1.54/kg) and rejection (negative utility) of the highest price (US\$2.31/kg). The results reveal a broad preference for FSLs issued by

the government and a lower level of preference for safety labels issued by the private sector; consumers rejected products with no safety labels. Furthermore, consumers showed preference for vegetables sold at municipal markets and organic food production.

The cluster analysis allowed us to differentiate three consumer segments with statistically significant differences ($p \leq 0.001$) regarding the importance and utilities of FSLs, price, point of sale and production system (Table II). The consumer segments presented significant differences according to gender, age, education, socioeconomic group, occupation, family size, food safety knowledge, frequency of vegetable consumption and point of vegetable sale ($p \leq 0.001$). The composition of each segment is shown in Table III.

Group 1 represented 30.1 percent of the sample; for this segment, price was the most important attribute. However, the utility attributed to the lowest price by consumers was lower than in group 3. The second most valued attribute was FSLs, which was significantly higher than in group 3, but lower than in group 2 ($p \leq 0.00$). It is worth noting that this group valued point of sale more than the two other groups ($p \leq 0.00$). In this regard, supermarkets are the preferred choice to purchase vegetables; this choice scored significantly higher than in the other two groups ($p \leq 0.00$). In percentage terms, this group collected the highest proportion of men in relation to the two other groups ($p \leq 0.03$) and of people aged 35-54 years ($p \leq 0.00$). It also collected the highest proportion of consumers with completed high school studies and completed university or higher education studies ($p \leq 0.00$). In terms of household income, group 1 collected the highest proportion of monthly incomes lower than US\$500 ($p \leq 0.00$). The majority of consumers in group 1 were employees and it collected the highest proportion of housewives and pensioners in relation to the other two groups ($p \leq 0.00$). In terms of household size this group had fewer participants coming from households of five or more members than the other two groups ($p \leq 0.00$). This group collected the highest

Table II.
Distribution and relative importance for the total sample and the three clusters based on preferences for attributes: food safety label, price, point of sale and production systems in the Metropolitan, Maule and Araucania regions of Chile

	Total sample	Group 1 <i>n</i> = 361	Group 2 <i>n</i> = 234	Group 3 <i>n</i> = 606	<i>F</i>	<i>p</i>			
<i>Relative importance of the attributes (%)</i>									
Food safety label	19.74	26.65	b	44.30	a	10.35	c	482.1	0.000
Price	57.33	47.19	b	27.49	c	81.28	a	881.3	0.000
Point of sale	11.86	14.38	a	13.36	a	4.41	b	103.0	0.000
Production system	11.07	11.78	b	14.84	a	3.96	c	126.8	0.000
<i>Utility levels of attributes</i>									
Private food safety label	0.11	0.022	b	0.396	a	0.061	b	36.0	0.000
Government food safety label	0.21	0.031	b	0.785	a	0.102	b	162.3	0.000
No food safety label	-0.33	-0.054	a	-1.182	c	-0.163	b	397.9	0.000
Price: US\$0.77/kg	1.50	0.652	b	0.330	c	2.458	a	1252.7	0.000
Price: US\$1.54/kg	0.12	0.056	b	0.300	a	0.079	b	8.4	0.000
Price: US\$2.31/kg	-1.62	-0.708	a	-0.629	a	-2.537	b	1083.0	0.000
Point of sale: Municipal market	0.05	-0.163	c	0.387	a	0.045	b	66.6	0.000
Point of sale: supermarket	-0.05	0.163	a	-0.387	c	-0.045	b	66.6	0.000
Production: organic	0.15	0.158	b	0.475	a	0.024	c	82.8	0.000
Production: conventional	-0.15	-0.158	b	-0.475	c	-0.024	a	82.8	0.000

Note: Different letters on the line indicate significant differences according to Dunnett's T3 multiple comparison test ($p < 0.001$)

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Characteristics	Group 1 <i>n</i> = 361	Group 2 <i>n</i> = 234	Group 3 <i>n</i> = 606
<i>Gender</i>		<i>p</i> = 0.03	
Male	37.1	26.9	31.4
Female	62.9	73.1	68.6
<i>Age</i>		<i>p</i> = 0.00	
< 35 years old	38.5	60.3	50.0
35-54 years old	47.1	32.9	33.3
≥ 55 years old	14.4	6.8	16.7
<i>Education</i>		<i>p</i> = 0.00	
Elementary incomplete	1.1	5.6	4.3
Elementary complete	1.4	3.0	2.5
High school incomplete	4.2	2.6	4.5
High school complete	33.8	23.5	27.4
Technical college incomplete	1.1	3.0	3.1
Technical college complete or university incomplete	17.2	26.5	18.3
University complete or higher	41.3	35.9	39.9
<i>Socioeconomic group</i>		<i>p</i> = 0.00	
> US\$3.700	17.5	20.9	11.7
US\$1.401 to US\$3.700	42.4	48.7	44.1
US\$1.121-US\$1.400	26.3	20.9	27.6
US\$500-US\$1.120	10.0	6.8	13.9
< US\$500	3.9	2.6	2.8
<i>Occupation</i>		<i>p</i> = 0.00	
Homemaker	17.5	11.5	14.5
Entrepreneur or self-employed	21.6	16.7	42.9
Employee	44.3	44.4	26.6
Pensioner	3.6	2.6	3.3
Student	13.0	24.8	12.7
<i>Family size</i>		<i>p</i> = 0.00	
Family of 1-2 members	22.7	13.7	29.2
Family of 3-4 members	60.7	61.1	51.7
Family of 5 or more members	16.6	25.2	19.1
<i>Food safety knowledge</i>		<i>p</i> = 0.02	
Low	34.6	24.8	36.1
Medium	52.1	56.0	49.3
High	13.3	19.2	14.5
<i>Frequency of vegetables consumption</i>		<i>p</i> = 0.00	
Occasionally	4.2	2.6	7.8
Once a week	7.5	6.8	11.7
Three times a week	36.0	29.5	39.4
Daily	52.4	61.1	41.1
<i>Where do you purchase fresh vegetables?</i>		<i>p</i> = 0.00	
Supermarkets	38.0	29.5	29.7
Municipal markets	34.9	27.8	30.2
Greengrocers'	24.1	35.0	32.6
Food distribution centers	25.4	16.4	7.5

Table III. Characteristics with significant differences between the groups identified in cluster analysis in the Metropolitan, Maule and Araucanía regions of Chile

proportion of participants stating their knowledge of food safety was intermediate to low ($p \leq 0.02$). It is worth noting that the frequency of consumption of vegetables ranged from three to seven times a week ($p \leq 0.00$). In view of the characteristics set out above, this group was named “moderate” consumers.

In group 2 (19.4 percent of the total sample) safety labels ranked first and significantly higher than in the other two groups ($p \leq 0.00$). This group assigned significantly higher positive utility to safety labels issued by the government ($p \leq 0.00$). It proportionally collected the highest number of female consumers ($p \leq 0.03$) and the highest proportion of people under 35 years of age. Furthermore, it collected the highest proportion of people with unfinished technical and university studies ($p \leq 0.00$) and the highest proportion of incomes higher than US\$3,700 ($p \leq 0.00$). The majority of interviewees in this group were university students and waged employees ($p \leq 0.00$) and it collected the highest proportion of households with three-four and more than five members in relation to the other two groups ($p \leq 0.00$). It proportionally collected interviewees with medium to high knowledge of food safety ($p \leq 0.00$). Furthermore, it proportionally collected people who consume vegetables on a daily basis ($p \leq 0.00$). This group was named “food safety oriented” consumers.

Group 3 collected the largest number of consumers (50.5 percent of the sample), and in this group price was ranked first and scored significantly higher than in the other groups ($p \leq 0.001$). This group showed the highest level of preference for the lowest price. It collected the highest proportion of people over 55 years of age ($p \leq 0.00$), 60.1 percent had completed primary and secondary education ($p \leq 0.00$) and it is the group which collected the highest proportion of interviewees with incomes between US\$1,121 and US\$1,400 ($p \leq 0.00$). It featured the highest proportion of entrepreneurs or self-employed people in relation to the total sample ($p \leq 0.00$). In terms of household size, a higher proportion of participants were part of families of one-two members in relation to the total sample ($p \leq 0.00$). This was the group with the highest proportion of consumers with low food safety knowledge ($p \leq 0.02$) and who eat vegetables one-three times a week ($p \leq 0.00$). In view of the characteristics set out above, this group was named “price oriented consumers.”

Discussion

The CA showed that the attributes “price” and “safety label” were more important than “point of sale” and “production system” in the purchase choice of fresh tomatoes for the study. Three segments were identified based on the importance assigned to the attributes studied and on the consumers’ preference for safety labels on tomatoes. The findings of this research revealed that approximately 19.4 percent of the sample (food safety-oriented segment) expresses a preference for safety labels for fresh vegetables issued by the Chilean Government. The existence of this group is of particular interest considering that Latin America is one of the markets with the lowest levels of control of FBD outbreaks in the world and consequently with the lowest recorded number of this type of disease (Pires *et al.*, 2012). This means that food safety issues has been positioning in developing countries even though the lack of information about food safety incidents provided by official authorities and poor media coverage compared with other food markets (e.g. European Union, USA), some consumers seem to be aware of the potential health implications when buying and consuming uncertified fresh vegetables, which is in line with the finding of Lagerkvist *et al.* (2015) who state that from a consumer point of view the necessity exists to tackle the hygiene problems of traditional markets. Therefore, this consumer segment might use an

officially certified label as a food risk-reduction strategy (Yeung and Yee, 2012). This is consistent with classical economic theory, as brands and labels reduce the consumers' perception of risk in the purchase process (Erdem and Swait, 2004; Grunert, 2005). Despite the fact that the amount of consumers influenced by a safety label in their choice behavior represents a market niche, marketers in the wholesale and retail sector could take advantage of using a safety label on fresh vegetables if for example these consumers are willing to pay more for such labeled products (Wongprawmas *et al.*, 2014). Whether consumers are willing to pay more for labeled fresh vegetables in the Chilean market, however, remains unclear in this study and should be matter of further research. In any case, the implementation of a safety label for fresh vegetables should be accompanied by the participation of the public sector since, as we have seen in this specific study, consumers apparently trust public certification more than private. This statement is supported by the fact that in Chile people trust state institutions twice as much as private companies (Universidad Diego Portales, 2013, 2014). Furthermore, the implementation of a public safety label for fresh vegetables would necessarily have to be supported by food safety training programs for horticultural producers. These actions could have a positive impact on the domestic markets, such as the modernization of the traditional fresh vegetables market and improvement in the quality assurance systems (chemical residues controls, cold chain, conservation and food storage among others).

A FSL could be a potential tool to differentiate unsafe vegetables and, as shown in this research, it can influence the purchase decision of at least some Chilean consumers. However, it is necessary to educate the population about the potential risk associated with unsafe vegetables and their storage (Terpstra *et al.*, 2005; Redmond and Griffith, 2005). Additionally, as developing countries achieve higher levels of development, the safety-oriented segment should grow following the trend observed in developed countries (Havelaar *et al.*, 2010). Consequently, if the public and private sectors respond to the concerns of safety-oriented consumers by ensuring safety and quality of fresh vegetables, we will probably observe changes such as the homogenization, transparency and modernization of the domestic vegetables market, as well as compliance with existing rules and control of the commercialized products.

Furthermore, the results support the hypothesis that price is a barrier to the purchase of vegetables carrying food safety certification labels; the "price oriented" segment (50.5 percent of the sample) would rather purchase less costly products as a way of making savings, which confirms that price is an important factor when it comes to selecting food items (Jomori *et al.*, 2008). Although GDP per capita in Chile has considerably increased to around US\$21,500 in 2012 (OECD, 2014a), official statistics indicate that Chile has the worst income distribution indicator among OECD members (OECD, 2014b). Therefore, it is not unusual to find a large consumer segment in Chile still motivated by price when making choice for basic goods such as fresh vegetables. Moreover, the "price oriented" segment is the group with the least knowledge and concern for the concept of food safety and the group with the lowest level of vegetables consumption, which further suggests a low involvement when purchasing fresh vegetables. This result is in line with the previous study by Baker (1999), who found a segment of price-oriented consumers he called "price pickers," given that they show concern for factors which immediately affect them, such as price, rather than factors that will affect them in time, such as chemical agents found in food products. If a safety label were implemented, markets and public authorities would need to design communication

strategies (focussed on the family and household decision makers) to inform consumers about the potential hazards of buying unlabeled fresh vegetables. In this way, consumer awareness about food safety in the fresh vegetables market and consumer acceptance for safety labeled products would increase. Another aspect to consider is that certification costs can increase product price and lead consumers to pick unsafe food (Andreyeva *et al.*, 2010; Behrens *et al.*, 2010). Thus, considering a scenario where a safety label is released into the market, producers would need to set up agronomic management plans with a minimum possible impact on the final price of vegetables in order to lower the price barrier to safe food (Horgen and Brownell, 2002; Padilla Bravo *et al.*, 2013).

The results also reveal the existence of a “moderate” consumer segment (30.1 percent of the sample), who show moderate concern for the price, safety label, sale point and production system attributes in vegetables. Baker (1999) found a similar group who moderately valued price, food safety and high quality. Furthermore, the higher education level and average age of this group is not accompanied by higher food safety knowledge. This is not in line with the results of previous studies which found that people with high educational level and/or of an advanced age are more aware of food hazard (De Boer *et al.*, 2005; Van Fleet and Van Fleet, 2009). Thus, to capture the attention of this consumer segment and motivate their purchasing decisions more effectively, it would be necessary to provide labeled products at a convenient price, offered in a convenient place and considering certain production methods such as organic farming.

In terms of the limitations of the study, it is worth noting that the sample is not representative of the population distribution of Chile. However, the sample is composed of consumers who are in charge of buying vegetables for the household, as acknowledged by a higher proportion of female interviewees, a situation similar to that in developed countries (van Vliet *et al.*, 2015; Schnettler *et al.*, 2011, 2015). In addition, CA has received some criticisms, e.g. not allowing the respondent to not choose any of the shown products, and the use of a small number of attributes (Louviere *et al.*, 2010). Despite these criticisms, CA is a mature method that permits a global and individual vision of the relative importance and consumer preferences for different attributes and levels of products (Claret *et al.*, 2012; Gustafsson *et al.*, 2007). On the other hand, the knowledge is made up of two dimensions: objective and subjective. The research assessed the subjective knowledge about food safety, which could negatively affect the preference toward FSL, especially in the price-oriented segment. Therefore future studies should consider knowledge as a construct (House *et al.*, 2004).

Finally, future research should take into account horticulture producers and assess their adoption of agronomic management plans for the production of vegetables that meet national and international safety standards. In addition, to validate the results presented in this study, we recommend implementing further research in similar developing countries. Only in this way the potential effect of fresh vegetables labeling on consumer choice decisions can be revealed.

Conclusions

The findings reveal that fresh vegetables are purchased mainly on traditional markets and that consumers in charge of buying vegetables for their households would choose price over FSL. However, there is a potential market niche that is motivated by a FSL when purchasing fresh vegetables. This scenario leads us to conclude that the successful labeling of fresh vegetables would require educating the population on the

health hazards associated with buying and consuming fresh vegetables lacking safety controls. Furthermore, a strong communicational campaign could aid in highlighting the value-added in fresh FSLs. This would allow consumers to change their preference to the price and moderate consumer segments.

All in all, the success of a potential safety label for fresh products will not only depend on achieving consumer recognition in the market place but also on increasing consumer awareness of the risks associated with purchasing and consuming unsafe food products. In this way, consumer attention toward the labeling mechanism would be captured more effectively and thus demand would increase. FSL have a high potential to provide information about the quality of fresh vegetables and can influence consumer decision-making processes in the purchase of such food products. This finding acquires special relevance if we consider that the growing level of development in Chile will put pressure on the public sector to invest in a quality control system, especially for the traditional fresh vegetable market.

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Further reading

Milton, A and Mullan, B (2010), "Consumer food safety education for the domestic environment: a systematic review", *British Food Journal*, Vol. 112 No. 9, pp. 1003-1022.

Appendix

Author	Date	Food products
Yeung and Morris	2001	Chicken
Roe <i>et al.</i>	2001	No specific food
Sánchez <i>et al.</i>	2001	Beef and lamb
Riordan <i>et al.</i>	2002	Beef
Bernués <i>et al.</i>	2003	Beef and lamb
FSANZ	2003	No specific food
Barrena <i>et al.</i>	2003	Beef
TNS	2004	No specific food
Enneking	2004	Beef
OPTEM	2005	No specific food
Redmond and Griffith	2005	No specific food
Terpstra <i>et al.</i>	2005	8 perishable products
Verbeke and Ward	2006	Beef
Avendaño <i>et al.</i>	2006	Vegetables
Barrena & Sánchez	2006	Beef and lamb
Pieniak <i>et al.</i>	2007	Fish
Angulo and Gil	2007	Beef
Loureiro and Umberger	2007	Beef
FSANZ	2008	No specific food
Gonzalez-Roa and Calatrava-Requena	2008	No specific food
Sans <i>et al.</i>	2008	Beef
Verbeke <i>et al.</i>	2008	Tomatoes
Mackey and Metz	2009	29 labels from different products
Ababio <i>et al.</i>	2012	No specific food
Lim <i>et al.</i>	2012	Beef
Tobin <i>et al.</i>	2012	No specific food
Xu <i>et al.</i>	2012	Seafood
Hall and Osses	2013	No specific food
Wang <i>et al.</i>	2013	Seafood

Table A1.
Food safety studies
about different kinds
of food

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