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# Attitudes of Retailers and Consumers toward the EU Traceability and Labeling System for Beef

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The spread of bovine spongiform encephalopathy (BSE) in Europe has induced EU policy makers to implement a mandatory traceability and labeling system in the beef supply chain. This paper analyzes consumer and retailer attitudes toward this system. Data used in the study were collected through two surveys of consumers and retailers in the province of Aragón, Spain, in 2002. Consumer and retailer attitudes toward beef traceability are examined to identify main underlying factors. Using these factors, consumers and retailers are segmented into homogenous groups according to their attitudes toward traceability for beef. Results indicate that both consumers and retailers highly value the positive aspects related to the traceability and labeling system for beef, and they value the possible disadvantages to a lesser extent.

The bovine spongiform encephalopathy (BSE) crisis, reinforced by other events such as the outbreak of foot and mouth disease, caused a loss of confidence in the safety of meat products, especially beef, by many EU consumers. Consequently, the consumption of beef has declined. To regain consumer confidence in beef safety necessary for the stability of the beef market, the EU has developed a system for identification and registration of cattle and a compulsory traceability and labeling system that allows the flow of product information throughout the supply chain, from farmer to consumer.

The new regulation requires EU members to create a national computerized database to record the identity of the animal, all holdings in its territory, and animal movement. In addition, animal owners shall maintain an individual register. A compulsory beef labeling system is also introduced. The system requires, as of September 2000, that the label reports information about the beef and the point of slaughter of the animal. The approval number of the slaughtering house is also reported. Since January 1, 2002, the label also contains information on the animal's origin, in particular where the animal was born, fattened, and slaughtered.

The identification system will permit trace-back of the beef sold in the market in case a food-safety problem emerges. Trace-back will allow the identification and isolation of the source of contamination and will protect firms that practice due diligence from free riders who fail to invest in good pro-

duction practices or preventive measures (Hobbs 2003). Moreover, this registration system provides consumer confidence in the agri-food chain by allowing the quick withdrawal of contaminated beef once a safety problem appears. From the consumer's point of view, the mandatory labeling of traceability is very valuable because it assures that information on credence attributes—food safety, in this case—flows across the agri-food marketing chain. Traceability alone does not contribute to higher levels of safety or other quality attributes; it only transfers information along the supply chain (Souza-Monteiro and Caswell 2004). Different actors in the supply chain share the benefits of this measure—it was implemented in order to respond to consumer information demand for food safety, but it also protects producers and other actors in the food chain when a safety crisis emerge.

Although traceability is one aspect of the whole food-safety debate, it has not been examined as often as have other food-safety issues. Few empirical studies have been addressed (Burh 2003), and only a few studies have analyzed consumer response to the new beef-labeling system (Verbeke and Ward 2003). Hooker, Nayga, and Siebert (1999) analyze the food-safety activities in the beef industry mainly with regard to the ability to implement food-safety practices. Burh (2003) provides case illustrations of the implementation of information systems to support traceability in Europe. Most studies on traceability have focused on consumer willingness-to-pay (WTP) for traceability. Dickinson and Bailey (2002) study the WTP for traceability and transparency in meat products by U.S. consumers. Similarly, Hobbs (2003) assesses Canadian consumers' WTP for traceability, food safety, and on-farm

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production information for beef and ham products. Dickinson et al. (2003) compare U.S. and Canadian consumers' WTP for red-meat traceability.

In Europe, few studies have analyzed this topic. The first, by Latouche, Rainelli, and Vemresch (1998), assesses French consumers' WTP for beef that would not transmit Creutzfeldt-Jakob Disease (CJD). This study was conducted in 1997, before the implementation of the mandatory EU traceability and labeling system for beef and after the first BSE crisis in Europe. Once the traceability system was mandatory in Europe, traceability became an issue of access to markets, the analysis of consumers' WTP for traceability took a secondary role, and empirical studies are needed to analyze whether and to what extent consumers recognize and pay attention to the benefits of information transmitted by the traceability and labeling system and if they understand and process the information. In this way, Verbeke, Ward, and Avermaete (2002) assess the attention paid and the importance given by consumers to different mandatory indications of the new compulsory EU traceability system for beef (traceability reference number, cutting unit license number, slaughterhouse license number, etc.). Results indicate that consumers paid less attention and gave less importance to the traceability indications than to other indications in the label. Verbeke and Ward (2003) study the importance of EU label requirements to attract consumer's interest; they analyze the indications of the mandatory European beef-labeling regulation and measure the probability of giving higher or lower scores to each of the indications.

The present work builds on earlier studies. It also analyzes the attitudes of consumers and of retailers toward the mandatory European traceability and labeling system for beef. Consumers have been chosen because they are the final link in the flow of information provided by the traceability and labeling system; retailers—specialized meat stores in particular—have been selected because they are directly in contact with the consumer, and, in Spain, still play an important role in consumers' purchase decision.

Consumer and retailer attitudes toward the mandatory European traceability and labeling system for beef are investigated, and three main questions in particular are examined:

- How much do consumers and retailers value

different aspects related to the mandatory European traceability and labeling system for beef?

- Can consumers and retailers be segmented into different homogenous groups according to their perceptions of various aspects related to the mandatory European traceability and labeling system for beef?
- What are the main profiles of these segments?

Data for the analysis come from two surveys conducted of consumers and retailers in the region of Aragón, Spain, in 2002. The next section contains the description of the data and the methods, and is followed by a section discussing results on attitudes toward traceability and labeling for beef along with segmentation for consumers. The fourth section discusses the segmentation of retailers. The paper ends with some practical recommendations.

## Data and Methods

Data for the study were obtained from two different surveys conducted with consumers and retailers in the Spanish region of Aragón during spring and fall, respectively, of 2002. The main town in Aragón, Zaragoza, was chosen because it contains more than half of the population of the whole region. In addition, Zaragoza is a town widely used by food marketers in Spain because its socio-demographics are representative of the Spanish population.

The final sample included 260 consumers, with a confidence level of 95.5% ( $k=2$ ), assuming  $p=0.8$ , defined as the proportion of consumers who usually purchase beef for consumption at home,<sup>1</sup> given an error of around 5%. The sample was selected using a stratified random sample of consumers by quotas on the basis of age and town districts. Respondents were the primary food buyers in the households.

A list of meat stores and their location was obtained from the Zaragoza Industry and Trade Board (Camara de Comercio e Industria de Zaragoza). The total number of meat stores in Zaragoza is approximately 500 (excluding stores that sell only poultry meat). A total of 220 meat store managers were personally interviewed (confidence level of 95.5%,

<sup>1</sup> A similar survey was conducted in 2001 in Zaragoza, and 80% of respondents stated that they usually purchased beef for consumption at home that year.

$k=2$ ) in order not to incur an error higher than 5% ( $p=q=0.5$ ). The sample was selected using a stratified random sample of meat retailers by quotas from five town districts.

The consumer questionnaire was designed to determine attitudes toward the mandatory EU traceability and labeling system for beef. Respondents were asked to indicate their attitudes toward different aspects related to the traceability and labeling system. Respondents indicated their degree of agreement on a Likert scale, where 1 meant a low level of agreement and 5 was the maximum level of agreement (see Appendix 1 for statements shown to consumers). Prior to answering questions, respondents were introduced to the topic by a paragraph explaining the main characteristics of the traceability and labeling system for beef and the new mandatory application. The first question in the survey instrument was whether the respondent usually ate meat at home. If the answer was negative, she was not interviewed. Only non-vegetarian consumers were considered. This decision does not induce any bias on the results because the incidence of vegetarian consumers is almost zero in Spain. The survey also contained questions about the level of beef consumption, the frequency of consumption of different meat products (beef, chicken, pork and lamb) in four categories (i.e., never, less than once a week, once a week and more than once a week), degree of expertise in beef shopping, the level of confidence in beef safety, socio-demographic characteristics (i.e., sex, family size and composition, age, education level, income, etc.), and lifestyles (Table 1A).

Retailers were also asked to indicate their attitudes toward different aspects related to the traceability and labeling system for beef using a Likert scale, where 1 meant a low level of agreement and 5 the maximum level of agreement (see Appendix 1 for statements shown to managers). The survey also included questions about store and manager characteristics (e.g., age of the owner, business size, number of workers and years operating), beef sales as a percentage of total meat sales, and management styles of running the business (Table 2A). Both consumer and retailer questionnaires were validated through pilot surveys of a representative group of consumers by age and district, and of stores selected by district.

The data were analyzed by means of factor and cluster analysis and by cross-tabulation tests. Fac-

tor analysis was used to investigate the underlying attitudes toward the mandatory EU traceability and labeling regulation for beef. The number of factors was chosen according to the eigenvalue criterion and the factors were extracted using a varimax rotation. The K-mean cluster analysis was then applied to differentiate consumers according to their attitudes toward the mandatory EU traceability and labeling regulation for beef. The individual factor scores obtained in the factor analysis were used as division variables. The number of clusters was selected according to statistic and economic criteria; the number of clusters selected was that which maximized the between-groups variance, minimized the within-group variance, and provided the more reliable clusters profiles according to the characterizing variables. Cross-tabulation chi-squared and analysis-of-variance tests were performed to profile each consumer group according to the significant differences in the segmentation variables.

### Consumer Segments

#### *Consumers' Attitudes toward the Mandatory European Traceability and Labeling System*

Table 1 shows the average scores given by consumers to the different statements about traceability and labeling listed in the questionnaire. The highest scores correspond to the statement that traceability will increase consumer-safety perceptions and the confidence in beef, followed by the opinion that this requirement will induce higher prices and production costs. However, the lowest scores correspond to the beliefs that traceability is only a legal requirement and is not really needed. Consumers believe that they will be more confident in beef because the beef traceability and labeling requirement will improve safety perception, although it will bring a higher cost of production and therefore a higher price.

The scores were reduced using a factor analysis to detect the underlying consumer attitudes toward the mandatory European traceability and labeling system for beef. The factor loading for each of the underlying consumer attitudes toward the traceability and labeling system for beef is presented in Table 1.

The Cronbach's alpha value of 0.63 indicates the reliability of the Likert scale (Hair et al. 1998) employed in the questionnaire. Attitudes toward

**Table 1. Factor Loadings Associated with Statements Describing Consumer Attitudes toward the Mandatory European Traceability and Labeling System for Beef in 2002.**

Consumer attitudes toward the traceability and labeling system for beef	Average rating	Factor 1 Enforce and costly requirement	Factor 2 Beneficial requirement	Factor 3 Unnecessary requirement
It is only a new requirement but we do not perceive that beef is safer	2.73	<b>0.6902</b>	-0.0852	0.2583
It will increase the price	3.35	<b>0.6912</b>	0.1648	0.1582
It represents only a legal obligation	2.64	<b>0.7058</b>	-0.0399	0.3221
It increase the cost of production	3.41	<b>0.5774</b>	0.1220	0.0597
It increases consumers' beef-safety perceptions	3.8	0.0431	<b>0.8771</b>	0.1162
It provides higher consumer confidence in beef safety	3.54	0.1017	<b>0.8740</b>	-0.0385
It does not imply higher quality	2.54	0.1891	-0.1081	<b>0.7511</b>
It is an unnecessary requirement because I have enough confidence in beef safety	2.33	0.0451	0.2079	<b>0.7972</b>
Percent of total variance		28.29	19.44	13.38
Eigenvalue		2.26	1.55	1.07
Cronbach's alpha	0.63			
Kaiser-Meyer-Olkin measure of sampling adequacy	0.61			

the mandatory European traceability and labeling system for beef were grouped into three factors that accounted for 61% of the total variance. The first factor is positively associated with consumer beliefs that traceability is an obligation and legal requirement that will only induce higher production costs and therefore higher beef prices. This factor explains the 28% of variance and it can be named "Enforced but costly requirement." The second factor, "Beneficial requirement," explains 19% of the total variance and is positively associated with consumer opinions that traceability will provide benefits because it will induce higher safety perceptions and confidence in beef safety. The third factor contributes to 13% of the total variance. It can be called "Unnecessary requirement" because it is linked to consumer beliefs that traceability does not imply higher meat quality and does not provide higher confidence in beef safety because previous confidence was high enough.

### *Consumer Segmentation and Profiles*

The K-mean cluster analysis technique (Malhotra 1993) was used to identify consumer segments according to their attitudes toward the mandatory EU traceability and labeling system for beef. Using the consumer's individual scores obtained in the factor analysis mentioned above as division variables, three segments were identified among Aragon consumers. Each segment was characterized by taking into account main consumer socio-economic variables (i.e., gender, family size and composition, age, education, and income level), lifestyles,<sup>2</sup> the level and frequency of beef consumption, the level of consumer expertise in beef shopping, and

<sup>2</sup> A factor analysis was carried out with the lifestyles statement scores in order to detect main consumers lifestyles (see table 1A in Appendix II).



the confidence in beef safety.<sup>3</sup> Results are shown in Table 2.

The first segment accounts for 21 percent of the sample. It includes those consumers who believe that the mandatory traceability and labeling system for beef offers benefits but might be unnecessary because it does not imply higher quality and confidence, since consumers in this segment had sufficient confidence in beef safety. However, they view the requirement as difficult and costly. Moreover, these consumers are more concerned about food and healthy diets and follow an active lifestyle. They show the highest beef-consumption level and also eat beef more frequently than do consumers from other segments. Because they highly value the traceability benefits and have relatively more confidence in beef safety this segment can be named "Positive attitudes toward traceability and higher confidence on beef safety." The high confidence in the safety of beef implies that they also believe that traceability, although beneficial, is unnecessary in terms of providing additional confidence in beef safety. Consumers in this group are of middle age, have a high education level, and are from households with a lower proportion of children.

The second segment represents 25 percent of consumers. Members of this segment are the least likely to be interested the traceability and labeling requirement and show the lowest confidence in beef safety. The segment can be named "no involvement in traceability and less confidence in beef safety." Consumers in this segment are less concerned about food and healthy diets than are other segments, but they follow an active lifestyle. They are from the smallest households, with the highest percentage of young people and a larger number of consumers with high income. Most believe they have the lowest expertise in beef shopping.

The third segment represents more than one-half of consumers. They perceive that the traceability system provides some benefits but also that it will induce higher costs and therefore higher prices. However, they believe to a lesser extent than do other segments that the traceability is an unnecessary requirement. They are aware of food and healthy diets but do not report active lifestyles. The segment

can be named "medium involvement in traceability and medium confidence in beef safety."

## Retailer Segments

### *Retailer Attitudes toward the Mandatory European Traceability and Labeling System*

Table 3 shows the average scores given by retailers to the different statements about traceability included in the questionnaire. The highest scores correspond to the statements that traceability and labeling provide a higher quality and safety assurance to consumers and that traceability benefits retailers. On the other hand, the lowest scores correspond to retailer beliefs that traceability requirement is not needed and should not be mandatory.

The scores were reduced using a factor analysis to detect the underlying retailer attitudes toward the mandatory European traceability and labeling system for beef. The factor loadings for each of the underlying retailer attitudes toward the mandatory European traceability and labeling system for beef are shown in Table 3.

The Cronbach's alpha value of 0.6 indicates the reliability of the Likert scale (Hair et al. 1998) employed in the questionnaire. Attitudes toward the mandatory European traceability and labeling system for beef were grouped into three factors and accounted for 60 percent of the total variance. The first factor, positively associated with those aspects that describe benefits of the traceability and labeling system, accounts for 32 percent of the total variance and can be named "Beneficial requirement." The second factor is related to retailer beliefs that traceability will not induce a higher consumer safety perception because it is not a needed requirement, and therefore should not be mandatory because it will only induce higher prices. This segment therefore is defined as "Not beneficial requirement" and accounts for 17 percent of the total variance. The third factor, called the "Unnecessary requirement," explains 10 percent of the total variance and is related to the retailer attitudes that beef sold in the market prior to the new regulations was of good quality and was sufficiently safe.

### *Retailer Segmentation and Profiles*

A segmentation similar to that of consumers was carried out with retailers. The underlying traceabil-

<sup>3</sup> Consumers were asked to indicate their level of confidence in beef safety ranging from 1 to 5, where 5 indicates the highest level of confidence.

**Table 2. Consumers' Profiles According to Their Attitudes toward the Mandatory European Traceability and Labeling System for Beef.**

	Segment 1 21%	Segment 2 25%	Segment 3 54%
Consumer characteristics	Positive attitudes toward traceability and more confidence in beef safety	Not involved in traceability and less confidence in beef safety	Medium involvement in traceability and medium confidence in beef safety
<b>Traceability attitudes factors*</b>			
Enforced and costly requirement	-0.7	-0.43	0.47
Beneficial requirement	0.56	-1.19	0.34
Unnecessary requirement	1.12	-0.19	-0.34
<b>Sex</b>			
Male	46.3%	48.5%	42.1%
<b>Family Size and Composition*</b>			
Children less than 6 years old	1.85%	12.12%	8.57%
Children between 6 and 16 years old	20.4%	13.6%	20%
Adults more than 65 years old	24.0%	22.7%	33.6%
<b>Age* (average)</b>			
Less than 35	35.2%	43.9%	25.0%
Between 35 and 50	22.2%	19.7%	32.8%
Between 51 and 65	31.5%	16.6%	17.1%
Older than 65	11.1%	19.8%	25.1%
<b>Education level*</b>			
Basic	12.96%	19.7%	35.7%
High school or less	55.61%	53.03%	37.1%
University	31.48%	27.27%	27.2%
<b>Monthly income</b>			
< €1,500	16.7%	12.2%	17.8%
€1,500–2,100	46.3%	43.9%	54.3%
> €2,100	37.0%	43.9%	27.9%
<b>Beef consumption level (weekly average, kg) *</b>			
Less than 1 per week	14.8%	33.3%	15%
1 per week	53.7%	53.0%	57.8%
More than 1 per week	31.5%	13.64%	27.1%
<b>Consumer expertise in beef shopping*</b>			
Low	37%	51.5%	27.1%
Medium	59.2%	43.9%	72.9%
High	3.8%	4.6%	0%
<b>Confidence in beef safety (average)*</b>			
	4.11	3.65	3.85
<b>Lifestyle*</b>			
Food concern	0.01	-0.036	0.26
Health diet	0.04	-0.21	0.08
Hedonist	-0.2	-0.22	0.18
Active	0.13	0.01	-0.05

\* indicates significant difference between segments at 5% significance level.

**Table 3. Factor Loadings of Retailers’ Attitudes toward the Mandatory European Traceability and Labeling System for Beef.**

Retailer attitudes toward traceability and labeling system for beef	Average rating	Factor 1 Beneficial requirement	Factor 2 Non-beneficial requirement	Factor 3 Unnecessary requirement
It mainly benefits retailers	3.89	<b>0.8455</b>	0.0225	-0.0810
It assures consumers of the quality and safety of beef	3.98	<b>0.7909</b>	-0.1614	0.2919
It provides higher confidence to consumers	4.07	<b>0.7588</b>	-.02794	0.1835
It benefits the whole beef-supply chain	3.46	<b>0.6249</b>	-0.3026	-0.2820
The mandatory enforcement of traceability is exaggerated	2.48	-0.0544	<b>0.7884</b>	-.0968
It provides higher consumer beef-safety perceptions	2.7	-0.1159	<b>0.5362</b>	0.0450
It has only made beef more expensive	3.03	-0.1763	<b>0.6231</b>	0.1558
It is an unnecessary requirement	2.45	-0.2037	<b>0.7496</b>	0.0349
Beef sold in the market already had good quality	3.56	0.0759	-0.0471	<b>0.8704</b>
Beef safety before the traceability was good enough	2.68	0.0224	0.4619	<b>0.5260</b>
Percent of total variance		32.11	16.88	10.51
Eigenvalue		3.21	1.68	1.05
Cronbach’s alpha	0.6			
Kaiser-Meyer-Olkin measure of sampling adequacy	0.77			

ity factors defined in Table 3 were used as segmentation variables. Two retailer segments emerge—the mean scores for the attitudes toward the traceability and labeling system for beef are statistically different and of opposite signs (the null hypothesis of no difference in the analysis of variance test was rejected at the 5-percent level). To characterize the segments, the following variables were used: store owner age, business size, beef sales as a percentage of total meat sales, number of years the store was operating, and the business management strategies.<sup>4</sup> Table 4 shows the results. The classified variables showed no statistical differences between clusters, except for the percentage of beef sales in total meat

sales.

The first cluster represents 34.7 percent of retailers. They perceive that traceability does not provide benefits or is an unnecessary requirement. These respondents are innovative and keep themselves informed, but are not satisfied with the loyalty of their customers or with the current situation of their business. The segment is labeled “Pessimists about traceability” because they have negative attitudes toward beef traceability. Businesses included in this

<sup>4</sup> A factorial analysis was carried out with the scores of management styles in order to detect retailer’s prevailing management styles (see table 2A in Appendix II).



**Table 4. Retailer Profiles According to Their Attitudes toward the Mandatory European Traceability and Labeling System for Beef.**

Retailer characteristics	Segment 1 Pessimists about traceability (34.7%)	Segment 2 Optimists about traceability (65.3%)
Traceability attitudes factors*		
Beneficial requirement	-0.71	0.38
Non-beneficial requirement	0.69	-0.37
Unnecessary requirement	0.37	-0.19
<b>Age of owner</b> (average)	45.6	44.8
<b>Business size</b>		
Small	52%	49.65%
Medium	45.33%	43.26%
Large	2.67%	7.09%
<b>Number of full-time workers</b>		
One	57.33%	63.12%
Two	21.33%	22.70%
Three or more	21.33%	14.18%
<b>Beef sales as percentage of total meat sales*</b>		
0–20	12.16%	20%
20–25	17.57%	16.43%
25–30	17.57%	25.71%
30–50	43.24%	37.86%
50–100	9.46%	0%
<b>Years operating (average)</b>		
0–10	25.76%	18.10%
10–20	25.76%	24.14%
20–30	13.64%	24.14%
>30	34.85%	33.62%
<b>Management strategies</b>		
Innovative	0.07	-0.03
Informed	0.008	-0.004
Satisfied	-0.029	0.016

\* Indicates significant differences between segments at 5% significance level.

segment are small but include mainly beef retailers; for more than a half of retailers in this group, beef represents more than 30 percent of total sales.

The second segment accounts for 65 percent of retailers and can be called “Optimistic about traceability” because they perceive that traceability is

beneficial for the beef sector. They own larger businesses and are satisfied with them, although they believe that they are not innovative and they do not care much about information about the sector. The segments differ in terms of their attitudes toward the mandatory traceability and labeling system but do

not show many differences in terms of characteristics, so no distinct profiles can be identified.

### Summary and Conclusion

The European beef market suffered an important crisis because many consumers lost their confidence in beef safety as a consequence of the BSE outbreak. The European Union, in order to restore consumer confidence in beef safety and market stability, developed a system of identification and registration of cattle and introduced a compulsory system of beef traceability and labeling. The mandatory nature of the EU traceability and labeling system for beef informs consumers about one important attribute—safety—that cannot be judged at the time of purchase. In other words, beef safety is a credence attribute that cannot be perceived by consumers unless some additional information is provided, mainly through a label. Consumers are the intended primary beneficiaries of the new traceability and labeling system because the identification and registration system permits trace-back of beef when a food-safety problem emerges. It also protects producers with good production practices and other actors in the beef chain (processors and retailers) when a safety crisis emerges.

The new system was implemented in January 2002 in all EU member states. Once the system was in force, it became important to evaluate whether the beef supply-chain agents recognized benefits from its implementation. This has been the main objective of this study. In particular, we focused on consumer and retailer attitudes toward the mandatory EU traceability and labeling system for beef.

Results indicate three main underlying consumer attitudes toward the mandatory EU traceability and labeling system for beef. The first reflects consumer beliefs that the public authorities have imposed mandatory traceability and it has led to higher beef prices. The second is related to the benefits perceived by consumers from the new traceability and labeling system, such as consumer beliefs that traceability increases consumer-safety perceptions and confidence in beef safety. Third, consumers believe that the traceability and labeling system is an unnecessary requirement because the quality and safety of beef was adequate before the implementation of the system.

Retailers also displayed three underlying attitudes toward the mandatory EU traceability and

labeling system for beef. The first accounts for benefits that the labeling system provides to consumers, retailers, and the rest of actors in the beef supply chain. The second is associated with retailer beliefs that traceability and labeling have been legally enforced and this mandatory enforcement is overstated and leads to higher beef prices than before the system's implementation. Finally, they believe that this new measure is unnecessary because beef was safe before the system was developed. Underlying consumer and retailer attitudes toward mandatory EU traceability and labeling system are similar, although their degree of importance differs. Moreover, consumers and retailers think that the new system leads to higher prices, the mandatory implementation could be overstated, and the new measure benefit is higher consumer confidence in beef safety than without the system. Moreover, they believe that the system also benefits other actors in the beef supply chain. Based on this last result, it might be stated that the implementation of the EU mandatory traceability and labeling system has been successful because it has fulfilled the EU authorities' aims to restore consumer confidence in beef safety and assure beef supply-chain links of market stability should a safety crisis emerge.

Consumers and retailers were segmented. Consumers were classified into three groups, and retailers into two. The smallest consumer group (21 percent of respondents) consists of consumers with positive attitudes toward traceability and increased confidence in beef safety. They are concerned about food and healthy diets and lead an active lifestyle. They have the highest beef consumption level and eat beef more frequently than do other segments. The largest consumer group (64 percent) shows a mixed opinion about traceability. They think the system provides benefits for them (i.e., increases consumer confidence in beef safety) but also presents some disadvantages (i.e., increases production costs and prices). They are less confident about beef safety. They are concerned about food and healthy diets, but they do not lead an active lifestyle. Finally, consumers in the third segment represent one-fourth of respondents. They are the least involved with traceability and show the lowest confidence in beef safety. The segmentation indicates that two-third of consumers believe that traceability offers benefits to them, although some think that it leads to higher prices. However, one-third of consumers who are not involved with the new traceability measure

should be targeted for promotion and information campaigns about the benefits of traceability.

According to the retailer segmentation, the largest group (65 percent) consists of retailers who are convinced that traceability is a beneficial requirement, while the remaining retailers do not believe that traceability provides benefits or they believe that it is an unnecessary measure. However, a clear profile of both groups could not be determined because neither shows important differences in store and manager characteristics or management style.

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## Appendix I

Statements rated by consumers on a five-point scale, where 1 = totally disagree and 5 = totally agree:

1. Traceability is only a new requirement but we do not perceive that after its implementation beef is safer.
2. Traceability increases the price of beef.
3. Traceability represents only a legal obligation.
4. Traceability increases the cost of production.
5. Traceability increases consumers' beef-safety perceptions.
6. Traceability provides consumers' higher confidence in beef safety.
7. Traceability does not imply higher quality of beef.
8. Traceability is a non-needed requirement because I have enough confidence in the safety of beef.

Statements rated by retailers on a five-point scale, where 1 = totally disagree and 5 = totally agree:

1. Traceability mainly benefits retailers.
2. Traceability assures consumers of the quality and safety of beef.
3. Traceability provides higher confidence to consumers.
4. Traceability benefits the whole beef supply chain.
5. The mandatory implementation of traceability is exaggerated.
6. Traceability provides higher consumers' beef-safety perceptions.
7. Traceability has only made beef more expensive.
8. Traceability is a non-needed requirement.
9. Beef sold in the market already had good quality.
10. Beef safety was good enough before the traceability system was implemented.

## Appendix II

**Table 1A. Factor Loadings of Consumers' Lifestyles.**

Consumer lifestyles	Factor 1 Food concern	Factor 2 Healthy diet	Factor 3 Hedonism	Factor 4 Active
I frequently eat fruit and vegetables	<b>0.5825</b>	0.4174	-0.1667	-0.1358
I am concerned about the impact of diet on my health	<b>0.7260</b>	0.3286	0.0903	-0.1534
I keep myself informed about food intake	<b>0.6216</b>	-0.0238	0.3587	0.1281
I am concerned about the effects of genetically modified food on human health	<b>0.6829</b>	0.0164	0.1113	0.0143
I periodically control my health condition	0.1670	<b>0.7809</b>	0.1168	-0.0870
I follow a healthy diet	0.4304	<b>0.6337</b>	0.1283	-0.1865
I practice sports every week	-0.1792	<b>0.6188</b>	-0.0403	0.4577
I enjoy good food and cuisine	0.2960	-0.0718	<b>0.5358</b>	0.1738
I like cooking	0.1236	0.3414	<b>0.6357</b>	-0.2661
I like trying new recipes	-0.0222	0.0415	<b>0.8742</b>	-0.0155
I like traveling	0.2572	-0.0595	-0.0670	<b>0.7604</b>
I usually eat out of home	-0.2644	-0.0469	0.0671	<b>0.6948</b>
Percent of total variance	26.24	12.18	11.46	9.76
Eigenvalue	3.46	1.47	1.38	1.19
Cronbach's alpha	0.68			
Kaiser-Meyer-Olkin measure of sampling adequacy	0.73			

**Table 2A. Factor Loadings of Retailer Management Styles.**

Retailer Management Styles	Factor 1 Innovative	Factor 2 Informed	Factor 3 Satisfied
I periodically enlarge the product range	<b>0.8127</b>	-0.0255	0.0926
I redecorate the store once every five years	<b>0.5733</b>	0.4505	0.0101
I periodically offer new products to attract new customers	<b>0.8546</b>	0.1165	0.0447
I try to satisfy only my usual customers	-0.0604	<b>0.7896</b>	-0.0485
I keep informed about the sector in other regions	0.2326	<b>0.6376</b>	0.1697
I think my customers are loyal to my shop	-0.1386	0.2436	<b>0.8175</b>
I am satisfied with the present situation of my business	0.3624	-0.1637	<b>0.7008</b>
Percent of total variance	31.47	16.85	15.43
Eigenvalue	2.2	1.18	1.08
Cronbach's alpha	0.61		
Kaiser-Meyer-Olkin measure of sampling adequacy	0.65		