Risk Perception and Trust Interaction in Response to Food Safety Events across Products and the Implications for Agribusiness Firms[1]

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Abstract

Food safety events can create devastating economics losses for agribusiness firms. The objective of this study is to identify the factors that influence potential purchasing decisions for fresh produce and meat products. The SPARTA model, based on the Theory of Planned Behavior, is used to determine the impact of probable factors that influence consumers' purchasing decisions. The data for this research was obtained from two surveys: fresh produce and meat products. The results suggest a food safety event in fresh produce markets affect purchasing decisions more than the same event in meat markets. Results also suggest information consumers receive about food safety events from casual conversations with family members, friends, and colleagues can influence purchasing decisions. Agribusiness firms can use these results to form strategic responses to food safety events.

Keywords: consumer behavior, theory of planned behavior, food safety, risk and trust

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Introduction

Substantial media attention given to recent food safety events has increased consumers' awareness and further complicated the marketing aspects of agricultural products. Recently, *E. coli* outbreaks in ground beef and fresh spinach, *Salmonella*-tainted fresh tomatoes and jalapeno peppers, and *Listeria* contaminated cantaloupe have captured news headlines nationwide (CDC 2015). Prior to these concerns, Avian Influenza and Bovine Spongiform Encephalopathy (BSE) dominated media coverage. Food safety events such as these have detrimental economic impacts on agribusiness firms in these markets. Brand images can be destroyed and entire industries can be affected. As an example, Kroger Co. announced in 2012 that they would no longer sell bean sprouts nor handle products processed on the same equipment because of food safety concerns (Kroger 2012). Economic losses associated with food safety events are not limited to domestic and local markets. Rather, the effects can be long-reaching and create barriers to trade with international partners. Theoretically, food safety events can open competitive opportunities for individual firms within an affected industry. Firms can differentiate their products' attributes and market safer production methods in an attempt to capture a larger market share (Bruhn and Schutz 1999). It is unclear how long the food safety event cycle takes or what signals are most effective to persuade consumers to return to their pre-scare behavior. Recent research suggests that consumers may attribute a food safety event concerning a particular product (*i.e.* spinach) to other items within the same category (*i.e.* leafy green fresh produce) (Arnade, Kuchler, and Calvin 2011). However, it is not known if consumer response is the same across product categories and geographical regions. Strategic response plans that work in one market or product area may not be as effective in others.

This study relies on contributions from the field of psychology to determine how underlying perceptions, beliefs such as trust and risk, subjective norms, and perceived behavioral control influence potential purchasing decisions following a hypothetical food safety event. The objective of this study is to identify the factors that influence potential purchasing decisions for fresh produce and meat products. It is beneficial for agribusinesses to understand how multiple determinants influence a consumer's purchasing decisions both before and after a food safety event occurs. Understanding consumers' actions in the wake of food safety events is of paramount importance, as better understanding is the cornerstone of effective strategic responses that minimize economic losses. To the best of our knowledge, no studies in the United States (US) have used the psychology-based Theory of Planned Behavior (TPB) in determining consumer response to food safety events (Ajzen 1991).

Literature Review

Extensive literature evaluating risk and how it affects human behavior exists. Some research has been dedicated to evaluating the best approach to measuring the effects of risk attitude and risk perceptions, how these differ between measurement approaches, and how they translate to actual behavior (Pennings and Smidts 2000; Pennings, Wansink, and Muelenberg 2002). Others have applied the same concepts to understanding how risk perceptions and risk attitudes affect consumer acceptance of genetically-modified foods (Lusk and Coble 2005). Further research has focused on how much trust consumers have in food-safety information sources (Ekanem, et al. 2008); how risk is conveyed to the public and its impact on potential responses (Melkonyan

2011); and evaluating food safety risk perceptions on consumption. This study adds to this body of literature that uses a cross-disciplinary approach to understand consumer behavior. The method used here accounts not only for the individual components of risk and trust as studied by others, but concerns itself with the interaction of these components while including other psychological factors.

In this study we use the *SPARTA* model, which is constructed under the TPB framework in order to determine how these psychological factors influence consumers' potential purchasing decisions. Furthermore, the results from this study are compared to results from a similar study completed by Lobb, Mazzocchi, and Traill, in the European Union conducted in France, Germany, Italy, Netherlands, and the United Kingdom (2007). As agribusinesses are becoming ever more global, it is of interest to determine how consumers in the U.S. compare to those of the other countries. Agribusinesses need to tailor strategies to the consumers' perception for different products in each region as opposed to having a blanket response to food safety events.

The reliability of hypothetical studies has been examined and a growing body of literature is emerging that analyzes how accurate hypothetical scenarios are to actual consumer behavior. There is some reassuring research that indicates that hypothetical results, while imperfect, can be a good measure of actual consumer behavior (Grebitus, Colson, and Menapace 2012). Further, meta-analysis has shown that the TPB approach is effective in predicting behavior (Armitage and Conner 2001). In a recent study concerning consumers' intention concerning a food safety recall message, the TPB showed to accurately predict behavior except for one component of the model, perceived behavioral control (Freberg 2012).

Data and Methodology

The data used to conduct this research was obtained via mail survey through the United States Postal Service. The survey instruments used were comprehensive and constructed in a manner that allows consumer behavior to be traced before and after a hypothetical food safety event occurs (Lobb, Mazzocchi, and Traill 2007). This is achieved by eliciting the respondent's intended purchasing behavior concerning the target product before, and one week following, a hypothetical food safety event. This allows us to determine what factors influence consumers' decisions to purchase items in both scenarios (before and after a food safety event). *E. coli* and *Salmonella* were the hypothetical food safety events used. The decision to use these food risks was based on recent media coverage of such events and the assumption that most consumers were aware of these food borne pathogens. Most of the questions on the survey were measured with a seven-point Likert scale. For ease of explanation, most results reported have been condensed into fewer categories.

Two surveys were mailed targeting two separate products. The first survey, referred to from this point forward as the fresh produce survey targeted *"fresh produce"* in general. The second survey, referred to as the meat survey henceforth, targeted *"chicken and/or beef."* The fresh produce was mailed to 800 individuals in Kentucky in 2006 with a response rate of 5.9% (47 respondents). The target areas were the five largest cities in Kentucky based on population. The share sent to each area was weighted by the county's population that contained each of the five cities (2003 US Census Book). These cities were, in descending order of population size, as

follows: Louisville, Lexington, Covington, Owensboro, and Bowling Green. The sample size was increased to 2,000 for the meat survey with equal shares (400 each) being sent to individuals in the five largest cities in Kentucky in 2007. In an attempt to increase the response rate for the meat survey, a $2 incentive check was offered to respondents who returned a completed survey. For each survey, a reminder card was mailed 21–28 days after the initial mailing. Since the survey was an established and previously used survey in the EU, a focus group was not developed to test it before mailing it. However, changes were made to the survey to fit the population and products targeted.

An 11.2% response rate (224 respondents) was realized. Both surveys used random mailing samples obtained from the University of Kentucky Survey Research Center. In both surveys, female response rate was about 60%, indicating that in many households, female members are still the primary food purchasers. Respondents were asked to indicate their level of education from no formal education through graduate level degree. The majority of respondents, over 50%, in each survey indicated having some college education. Income levels of respondents in both surveys showed over 50% of respondents reporting income between $15,000 and $60,000. Selected demographic variables are presented in Table 1.

Table 1. Selected Demographic Variables

	FP		Meat	
	Mean	**Std Dev**	**Mean**	**Std Dev**
Number of People in Household	2.47	1.21	2.38	1.29
Age of Respondents (years)	52.8	14.1	54.24	14.36
Average Weekly Target Product Purchase (LBS)	4.5	3.27	5.32	6.53
Average Weekly Expenditure on Target Products ($)	16.8	17.3	15.45	16.75
Number of Respondents	47		224	

SPARTA Model and TPB

The survey instrument was constructed under the SPARTA model based on the TPB (Lobb, Mazzocchi, and Trail 2007; Ajzen 1991). TPB is an extension of the Theory of Reasoned Action and links attitude and beliefs to actions through intentions (Ajzen 1991). The TPB suggests that a person's intentions are determined by behavioral beliefs, normative beliefs and control beliefs. These beliefs affect intentions which is the antecedent to actual action (Ajzen 2002). This approach has been used in several studies, including the meat market in the UK (McEachern and Shroder 2004), as well as evaluating food choices of adolescents (Dennison and Shepherd 1995), predicting safe food handling by adolescents (Mullan, Wong, and Kothe 2012), evaluating how consumers' attitudes and preferences affect food-away-from-home decisions (Bhyuan 2011), as well as, evaluating farmer's acceptance to environmental measures in the EU (Schroeder 2012). Including risk and trust, which are formulated under the expectancy-value formulation consistent with the TPB, broadens the discovery of human behavior. The expectancy value model suggests that belief based measures should correlate with a direct measure of that belief based observation (Ajzen 1991). Therefore, measuring the beliefs about a certain action as well as the perceived control over acting out that behavior, gives an indication of the actual behavior that will result when the opportunity arises. This is important as this study is hypothetical and actual behavior

cannot be measured following a food safety event with prior knowledge on intended actions. Lobb, Mazzocchi, Traill added these two additional measures (risk and trust) to the traditional TPB framework, resulting in the SPARTA model. SPARTA represents subjective norms, perceived behavioral control, attitudes, risk, trust, and *alia* (all other variables) as shown in Figure 1 (Lobb, Mazzocchi, and Trail 2007).
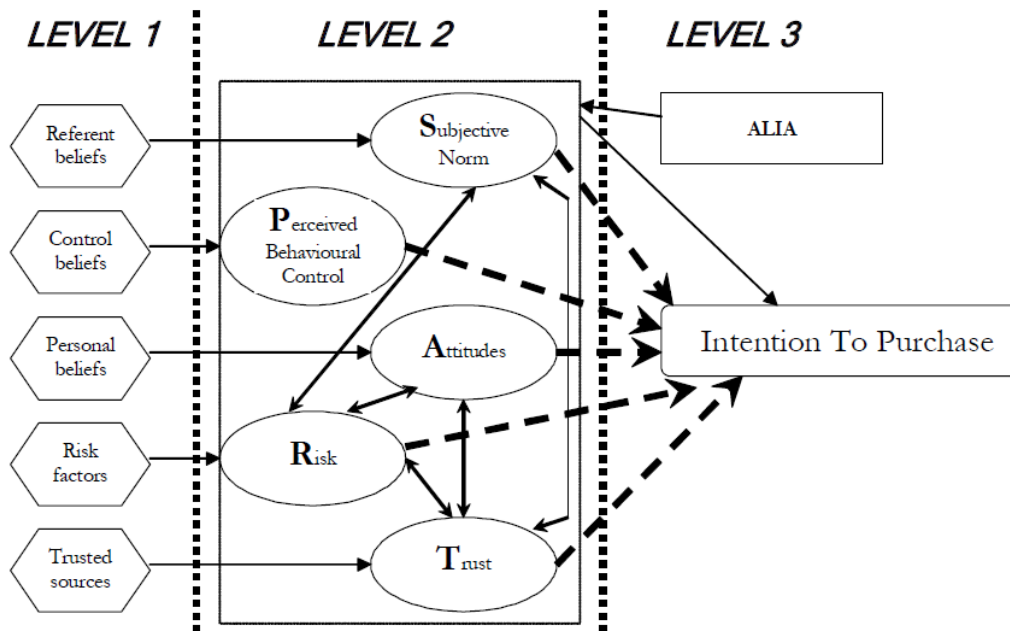
Figure 1. SPARTA Model
Source: Lobb, Mazzocchi, Traill, 2007.

Subjective norms are the peer pressures individuals feel to participate or not participate in a certain behavior. These actions are influenced by normative beliefs which are behavioral expectations a consumer may feel from referents they consider close to them such as family and friends (Ajzen 1991). These referent beliefs directly influence how individuals behave. For example, family and friends could impose opinions that purchasing organic produce will reduce food safety risks and is more ethical. Therefore, an individual may feel pressured by these referent beliefs to purchase such products for themselves. Referent beliefs differ depending on the situation (Ajzen 1991). In the workplace, referent beliefs could come from bosses or co-workers. For this study, family, friends, and colleagues are considered to be possible sources of referent beliefs. Subjective norms are hypothesized to have either a positive or negative impact on the likelihood of purchasing the target product. This is because increases in the normative belief component are consistent with consumers perceiving other opinions about the target product in their diet as being *good*. The opposite of this holds as well. Increases in motivations to comply are analogous to consumers taking others' opinions into account in their purchasing decisions to a large extent.

Perceived behavioral control is how a person sees their ability to perform a certain activity. Control beliefs are factors that make behaving in a certain manner easier or more difficult (Ajzen

1991). When considering food products there are a limited number of control beliefs to measure. For this study, two different control factors that addressed potential impediments to purchasing decisions were identified. These control factors were the consideration that a consumers' purchase decision may depend on how much of the target product the person has already consumed in the current time period or if they have a lot of the target product on hand (i.e. in the refrigerator or freezer) (Lobb, Mazzocchi, and Traill 2007). Perceived behavioral control should have a positive impact on the likelihood to purchase. An increase in this variable is consistent with consumers indicating they are "more likely" to purchase the target product if they already had some of that item on hand. Increases in the other control factor component of this variable indicate that consumers are "more likely" to purchase the target product even if the household had consumed a lot of that product during the week they completed the survey.

Attitudes are simply the perception that an individual has towards a certain activity such as it being *good* or *bad*. Attitudes are influenced by behavioral beliefs which are the expected outcomes of the behavior in question (Ajzen 1991). A person's attitude towards a certain behavior will likely be negative if the expected outcome of that behavior will have unfavorable consequences. Food safety risks may promote a negative attitude because consumers are considering the negative effects of consuming a food that is potentially risky. Attitudes are hypothesized to have a positive impact on the likelihood of purchasing the target product. If consumers have a positive attitude towards purchasing a product, their indicated purchasing decision should reflect this belief. Risk factors that are common to food safety concerns such as *Salmonella, E. coli*, etc., contribute to the risk component. Health attributes such as cholesterol and fat content are also considered risk factors because of long-term health consequences. Risk perception is hypothesized to have a negative impact on the likelihood of purchasing because increases in the risk associated with the product should deter consumption.

Trust is measured by identifying sources of information from whom consumers trust to receive food safety information. In order for agribusiness firms to effectively communicate information, it has to be conducted through trusted mediums. Increases in trust should positively affect the likelihood of purchasing the target products.

The *alia* component in this study measures demographic variables. These factors are important to analyze as they influence purchasing decisions. Poor consumers are usually concerned with maximizing caloric intake and minimizing food expenditures. When faced with a food safety event, they may not be able to substitute to other goods. Education is likely to influence a person's ability to more accurately interpret food safety information. Presence of young children may also make a household more risk averse to certain food safety concerns. All of these factors interact and influence consumers' intentions to purchase food. It is hypothesized that socio-demographic variables will have both positive and negative impacts on the likelihood of purchasing.

Model Development

The first three variables *S*, *P*, and *A* are formulated under Fishbein and Ajzens' (1976) expectancy value formulation. Following Lobb, Mazzocchi, and Traill (2007) the construction of the variables appear below:

(1) $S \propto \sum_{j=1}^{g} n_j m_j$

where S is subjective norms and is constructed by n_j and m_j which are normative beliefs and motivations to comply, respectively. This component accounts for the "peer pressure" individuals may feel when making food purchasing decisions. Normative beliefs were obtained by asking respondents about how they perceived others' perceptions on whether or not the target product is considered "*very bad*" or "*very good*" in the diet (on a seven-point Likert scale). Motivations to comply were measured via a question that asked the respondent to indicate whether or not they take others' opinions into consideration when making food purchasing decisions about the target products.

(2) $P \propto \sum_{k=1}^{q} c_k p_k$

P is perceived behavioral control and contains c_k, control beliefs and p_k, power of control beliefs. Perceived behavioral control measures the individuals' perceptions concerning the amount of control they have over their decision. This element was measured by asking respondents to indicate if already having the target product in the freezer would affect their decision to purchase the product the following week. Power of control beliefs were measured by asking the respondents to indicate the likelihood of purchasing the product next week if they had already consumed a lot of that product in the week they completed the survey.

(3) $P \propto \sum_{k=1}^{q} c_k p_k$

A is attitude and contains b_i, behavioral beliefs and e_i, outcome evaluations of the behavioral beliefs. This component simply accounts for attitudes respondents have about certain factors that may influence their purchasing decisions. Behavioral beliefs were measured by asking the respondent to indicate how important, in general, 10 stated beliefs were about the target products to their household. These stated beliefs focused, for example, on the target product's ease of preparation, its taste in general, and whether or not they thought the target product was safe, among others. The strength of these beliefs was measured by asking the respondent to rank the three most important of the 10 beliefs when making a purchasing decision. Outcome evaluations were determined by a question later in the survey asking the respondent to indicate the importance of the 10 beliefs used to determine behavioral beliefs, in general terms, as opposed to them being tied directly to the target product. For example, "*In general, how important are each of the following to your household*." This statement was followed by a list including, "*tasty food, ease of preparation, food safety, etc.*" The respondent then indicated the importance of these statements to their household on a seven-point Likert scale with (1) indicating "*extremely un-important*" and (7) indicating "*extremely important*." Attitude also had a direct measure where the respondents were asked to indicate, on a seven-point Likert scale as to whether or not purchasing the target product for their household was *good* or *bad* in general.

The risk component, R, and trust component, T, are formed similarly to the variables above (S,P,A) using the expectancy-value formulation (Lobb, Mazzocchi, and Traill 2007):

(4) $\quad R \propto \sum_{l=1}^{u} r_l k_l$

where r_l are specific risk factors and k_l are weights given by respondents stating their knowledge of each risk factor. This component accounts for how risk affects consumers purchasing decisions. Risk factors were obtained by asking the respondents to rate the risks of any one person in the household experiencing long-term health problems due to consuming the target product from a list of potential health problems, such as *E. Coli, Salmonella,* pesticides/antibiotics, cholesterol, etc. The weights were given by the respondents indicating their level of knowledge associated with each specific risk factor.

The trust component is as follows:

(5) $\quad T_z = \sum_{w=1}^{s} \alpha_{zs} t_s, z = 1,...,Z$

where t_s are the specific trust factors, α_{zs} are the loading factors, T is the principal component score, and Z is the total number of components measured across. This component of the model accounts for levels of trust consumers have towards potential information sources of hypothetical food safety events. The trust component in the meat survey was achieved by asking respondents the following question: "*Suppose that each of the following has provided information about potential risks associated with e-coli in food. Please indicate to what extent you would trust that information.*" This question was followed with a table of 20 entities that hypothetically provided information about food safety risks on a seven-point Likert scale. Principal component analysis with varimax rotation was used to reduce the number of variables in this measure by accounting for correlations that may exist between these categories (Lobb, Mazzocchi, and Traill 2007). These results can be seen in Table 2. Using this statistical technique, the number of variables in this component for the meat survey was reduced into four categories: Suppliers, Government/University, Organizations, and Media; T_1, T_2, T_3, and T_4, respectively.

The Suppliers category includes shopkeepers, supermarkets, organic shops, and processors. All of these categories cover the same concept of where a consumer may obtain a food product. The Government/University category contains doctor/health authority, university scientist, USDA, state and federal government. These sub-categories are all entities that consumers would most likely consider possessing an authoritative or policy influencing voice.

Organizations contain the sub-categories of political groups, environmental groups and animal welfare organizations as well as the category of "television documentary". On first glance, television documentary sub-category seems non-applicable. However, there is a common thread among the sub-categories in that they all have a primary focus or cause. For example, arguably, television documentaries focus on one subject or cause, allowing their inclusion into this category. Lastly, the Media category contains typical forms of communication, newspaper, internet, radio, magazines, and product labels.

Interpretation of these results is as follows. A consumer who trusts one of the sub-categories also trusts the other sub-categories within each respective group. For example, respondents who trust shopkeepers also trust supermarkets, organic shops and processors. The same is true for the case of distrust.

Principal component analysis was not conducted on the results from the fresh produce survey as the number of responses did not meet the minimal criteria for this data analysis tool. Instead a simple average of the 20 trust categories was used. Using a simple average of all trust dimensions measured puts serious limitations on this variable for the fresh produce results. The simple average does not allow for in-depth empirical analysis of how trust influences purchase decision which is one of the main focuses of this study.

(6) *Alia* = socio-demographics

Age, income, education, and gender were used as socio-demographic variables.

Following previous work by Lobb, Mazzocchi, and Traill (2007), four models were estimated for each target product; consumers' intention to purchase the target product next week in general (FP_1 and $MEAT_1$) and consumers' intention to purchase the target product next week following a hypothetical *E. coli/Salmonella* outbreak (FP_2 and $MEAT_2$). These models were also estimated using socio-demographic variables to determine if such variances have an effect on the probability of purchasing decisions (FP_{1SD}, FP_{2SD}, $MEAT_{1SD}$, and $MEAT_{2SD}$, respectively). An ordered probit regression was used to estimate these models because of the ordered structure of the data and appears below (Lobb, Mazzocchi and Traill, 2007):

$$(7)\quad I_b = \beta_0 + \beta_1 S + \beta_2 P + \beta_3 A + \beta_4 R + \sum \lambda_z T_z$$

The inclusion of socio-demographic variables is as follows:

$$(8)\quad I_b = \left(\beta_0 + \sum_{i=1}^{d}\gamma_{0i}D_i\right) + \left(\beta_1 + \sum_{i=1}^{d}\gamma_{1i}D_i\right)S + \left(\beta_2 + \sum_{i=1}^{d}\gamma_{2i}D_i\right)P + \left(\beta_3 + \sum_{i=1}^{d}\gamma_{3i}D_i\right)A +$$
$$\left(\beta_4 + \sum_{i=1}^{d}\gamma_{4i}D_i\right)R + \sum_{i=1}^{Z}\left(\lambda_Z + \sum_{i=1}^{d}\gamma_{gi}D_i\right)T_Z$$

Where D_i is the *i*th socio-demographic variable. Descriptive statistics for model parameters are shown in Tables 3 and 4 (see Appendix).

Table 2. Meat Survey: trust component factor loadings for respondents' trust of food safety information from 20 different potential informational sources

	Suppliers (T_1)	**Gov't/University** (T_2)	**Organizations** (T_3)	**Media** (T_4)
Shopkeepers	**0.76**	0.09	0.06	0.1
Supermarkets	**0.7**	0.23	0.1	0.06
Organic Shop	**0.74**	0.08	0.19	0.08
Farmers	**0.75**	0.11	0.16	0.09
Processors	**0.61**	0.07	0.27	0.24
Doctors/ health authority	0.18	**0.53**	-0.34	0.29
University scientists	0.22	**0.62**	0.14	0.24
USDA	0.08	**0.8**	0.18	0.05
State Government	0.17	**0.78**	0.27	0.1
Political groups	0.17	0.27	**0.63**	0.22
Environmental organizations	0.22	0.15	**0.72**	0.31
Animal welfare organizations	0.22	0.06	**0.8**	0.12
Federal Government	0.08	**0.65**	0.38	0.07
Television documentary	-0.03	0.27	**0.62**	0.21
Television news/current events[a]	0.05	-0.66	-0.05	0.21
Newspapers	0.13	0.38	0.06	**0.61**
Internet	0.12	0.19	0.2	**0.54**
Radio	0.23	0.22	0.22	**0.73**
Magazines	0.06	-0.13	0.06	**0.68**
Product label	0.04	0.12	0.2	**0.54**

Notes: [a] Television news/current events was dropped from the analysis because it loaded on more than one factor. Values in bold are greater than or equal to .40 through varimax Rotation. This statistical technique was not performed on the fresh produce survey results due to limited sample size.

Results

Regression estimates from the ordered probit model are shown in Table 5 (see Appendix). Marginal effects, shown in Table 6 (see Appendix), provide more interpretable information and are used in this section to discuss the model results.

Fresh Produce Results

The fresh produce model evaluating the likelihood of purchasing before the hypothetical food safety event with socio-demographic variables included (FP_{ISD}), resulted in the model being statistically significant at the 5% level. Marginal effects suggest that subjective norms had a negative impact on the likelihood of respondents purchasing fresh produce in general the week following the survey. This can be seen with the negative marginal effect (-0.1421) under *likely*. As subjective norms increase, the respondents' probability of purchasing the product in question shifts away from *likely* and more towards *neither* or somewhere between *neither* and *likely* (non-negative marginal effects associated with the other categories). A negative impact was also seen

with this variable when coupled with the socio-demographic variable income. Both of these results are as expected. When the level to which consumers value the opinions of others is increased, these social pressures will influence decisions made by the consumer. Higher levels of income allow consumers to be more selective in their purchasing decisions and also allow consumers to participate in purchasing trends. When the subjective norm variable was combined with socio-demographic variable, level of education, the result was positive. Intuitively, higher levels of education allow people to make more scientific decisions about food purchasing decisions and not rely on referent beliefs as much.

Perceived behavioral control coupled with socio-demographic variables, education and income had positive impacts on the likelihood to purchase. Increases in consumers' perceived behavioral control over purchasing a product should increase the likelihood of said purchase occurring. This is because this determinant is based on whether the respondent had consumed a lot of the product in the week prior to taking the survey or had a lot of the product on hand the when taking the survey. It is reasonably assumed that consumers that had recently (within seven days before taking the survey) consumed a lot of the fresh produce or had a lot on hand would not be as likely to hypothetically purchase fresh produce the following week.

Attitude with socio-demographic variable education had a negative impact. Education is likely to influence attitudes and attitudes are simply how consumers feel about consuming a product. If consuming a product is considered good, then a positive attitude will result. This result is counterintuitive as it seems rational to assume that higher education levels would positively affect attitudes. In other words, attitudes should be more scientifically influenced with increases in education. A positive increase in likelihood to purchase was realized with the attitude variable and socio-demographic variable, income. This result seems reasonable as positive increases in attitudes and income should increase the likelihood to purchase.

Average trust positively impacted the likelihood to purchase, while the inclusion of socio-demographic shifters education and income changed the impact to negative. Interestingly, education and income change the impact of trust of informational sources on potential purchasing decisions. Increases in income allow for a larger selection of substitutes and may negate the importance of trust. Further, relatively higher education levels allow for more self directed information discovery that may offset the importance of trust.

The fourth fresh produce model, FP_{2SD}, was statistically significant at the 1% level. Subjective norms with socio-demographic variable education had a negative impact. In other words, following a food safety event, consumers that are relatively more educated will likely follow further information discovery processes. More educated consumers may look further into the food safety event and determine the particulars of the event as opposed to generalizing it to all product types of the affected market. It is important to note that in the hypothetical food safety event questions, participants were asked if a food safety event would affect their purchasing decision for purchasing fresh produce the following week. The construct of the question limits the time period from which the consumer learns of the food safety event and their purchasing decision to period of seven days or less. These results show that following a food safety event, consumers with relatively higher levels of education will have a lower likelihood to purchase fresh produce.

Attitudes coupled with socio-demographic variable income, had a positive impact on the likelihood to purchase. This is consistent with what was seen in the fresh produce model that evaluated purchasing decisions in general. Risk on the other hand was positive in this model. This is of opposite effect of what was realized in FP_{1SD}. Intuitively, an increase in risk perception would result in a decreased likelihood to purchase. Risk and socio-demographic variable income in both fresh produce models had a negative impact. As risk and income increases, the likelihood to purchase decrease because higher incomes allow for more substitution. The fresh produce models of purchasing the product next week in general (FP_1) and purchasing the product following a food safety event (FP_2), were not statistically significant.

Meat Results

In the first model, $MEAT_1$, which models consumers' intentions to purchase chicken and/or beef the week following the completion of the survey, was statistically significant at the 10% level. The marginal effects indicate that subjective norms have a negative impact on the likelihood of purchasing.

In the model $MEAT_2$, which models the consumers' intentions to purchase chicken or beef the week following the completion of the survey following a hypothetical food safety event was significant at the 5% level. Trust in government/universities had a positive impact and trust in media had a negative impact. Generally, consumers trust university scientists and other authoritative entities. Trust in media is likely to be negative as media is often biased and heavily focused on sensationalized stories (Baker 1998).

The fourth model, $MEAT_{2SD}$, which includes socio-demographic variables and models consumers' intentions post a hypothetical food safety event was statistically significant at the 1% level. Subjective norms had a negative impact on the likelihood to purchase. However, when this variable was coupled with socio-demographic variables education or income or gender, the results became positive. It is likely that education, income and gender (female) over-ride the influences others have on purchasing decisions. Risk had a negative impact but coupling it with socio-demographic variables, age or income changed it to positive as well.

Trust category, suppliers, when coupled with socio-demographic variable age had a negative impact as did the trust category government/university when coupled with education. This seems counterintuitive; it seems reasonable to assume that as education increases, the trust in the educator would increase as well. Trust category media, when coupled with socio-demographic shifters age or education had a positive impact. It may be the case that relatively older consumers trust the media more than younger consumers. Further, increases in education may override the negative impacts of the media as those with higher education may be better able to decipher the bias and sensationalism. When media was coupled with the socio-demographic variable income, the impact became negative. This is most likely because higher incomes allow for more access to different media outlets and therefore can make more informed decisions. The model, $MEAT_{1SD}$, was not statistically significant.

Conclusion and Agribusiness Implications

Referent beliefs are a strong influence on consumers' purchasing decisions. Subjective norms showed a negative impact in all cases where the factor was statistically significant. The implication for agribusiness firms is that information needs to be disseminated in a timely manner. It needs to be available to the public at large. It seems as though talking over the "water cooler" is where consumers obtain information about food safety events. Since consumers are influenced by their peers, quick and uniform dissemination of information could be of benefit to affected firms/industries. In other words, it may be best for these entities to "get out ahead" with factual information and target consumers through multiple information sources. This may help solidify the message being shared amongst consumers. It could be argued that social media outlets have become the "digital water cooler," and as such, agribusinesses need to consider these information dissemination tools as well. Trust in food safety informational sources is paramount for effective restorative strategies. Further, socio-demographic variables are an influencing factor in consumer behavior as well. Higher incomes will most likely affect purchasing decisions in a negative manner as the relatively higher income allows for more substitution. Higher levels of education also seem to minimize the effects of food safety events.

Comparisons across products in the empirical sense are limited to both models that addressed intention to purchase following a food safety event with the inclusion of socio demographic factors ($Meat_{2SD}$ and FP_{1SD}). In both cases subjective norms and education were statistically significant factors but of opposite signs. Risk perception also had opposite signs when compared across products. Some of the common statistically significant factors across the two survey models offer opposite impacts on the likelihood to purchase. This may be because of the fundamental differences in the two products.

The fact that fresh produce is perishable and meat is not (can be frozen), plus the fact that meat is often cooked to high temperatures may play a role in customer perceptions/buying behavior as well. If the proper meat cooking temperatures are achieved in this process, the risk of becoming ill from a food borne pathogen is significantly reduced. Simply washing fresh produce prior to consumption does not offer the same level of risk reduction. Therefore, consumers are likely to be influenced differently by food safety events in these two different markets.

Comparison across regions is limited to the statistically significant variables and models in which both this study and the EU have in common. For the U.S., this was limited to the FP_{1SD} model. Subjective norms have a negative impact on the likelihood to purchase prior to a hypothetical food safety event in both in the EU and in the U.S. in the case of fresh produce. In both cases, as increases in subjective norms occur, the likelihood the average consumer in these studies would purchase the fresh produce decreases. Here increases in subjective norms would be the combination of how influential referents were to the average respondent and if they took this information into account before making a purchasing decision. Average trust levels from this research as well as those found by Lobb, Mazzocchi, and Traill can be seen in Table 7.

Attitude coupled with the income socio-demographic shifter was statistically significant in both the EU study and the fresh produce survey before a hypothetical food safety event. In both cases, this resulted in increased likelihood of the respondent purchasing the product the following week. This is intuitive. Increases in attitudes suggest the respondent would "feel" better about a

particular purchase. Increase in income is not as clear with its role in this variable having a positive effect on the likelihood to purchase said products.

Agribusiness firms can use these results to analyze their strategic food safety response plans. These results suggest that agribusiness firms that include strategies that relay the risk of a food safety event to consumers are likely to minimize the economic losses associated with such events. Typically, individual firms may attempt to address consumers to protect a brand image in the occurrence of a food safety event. However, it may be beneficial for entire industries to form strategic alliances amongst themselves to communicate perceived risks of food safety events to consumers to protect the entire industry that may often not be branded. Risk perception also indicates that unaffected firms could potentially tout their products as being safer in a food safety crisis in an attempt to capture more market share. Although interesting conclusions can be drawn from these results, more observations from different areas and products are needed before conclusive arguments can be made about generalizations across products and regions.

Table 7. Average trust of 20 entities that hypothetically provided information about food safety risks across products and regions

	Fresh Produce Survey	**Meat Survey**	**US Average**	**EU Average**[a]
Shopkeepers	4.57	4.41	4.49	4.69
Supermarkets	5.21	5.12	5.16	4.64
Organic Shop	4.83	4.14	4.49	5.01
Farmers	5.02	4.90	4.96	4.97
Processors	4.28	4.03	4.15	3.74
Doctors / health authority	5.96	6.08	6.02	5.99
University Scientists	5.62	5.45	5.53	5.77
USDA	5.57	5.48	5.53	5.79
State Governments	5.36	4.83	5.10	4.50
Political Groups	3.55	3.06	3.31	3.52
Environmental Organizations	4.51	3.94	4.23	4.86
Animal Welfare Organizations	3.96	3.40	3.68	4.70
Federal Government	4.96	4.48	4.72	5.21
Television documentary	5.06	4.59	4.83	4.98
Television News	5.55	5.11	5.33	5.19
Newspapers	5.66	4.99	5.32	4.94
Internet	5.15	4.44	4.80	4.54
Radio	5.30	4.54	4.92	4.97
Magazines	5.04	4.53	4.78	4.49
Product Label	5.11	4.60	4.85	5.03
Average	5.01	4.61	4.81	4.88
Elicitation	"Suppose that each of the following has provided information about potential risks associated with e-coli/salmonella in food. Please indicate to what extent you would trust that information for each category below"			
7-Point Likert Scale	Completely Distrust=1, Neither=4, Completely Trust=7			

Note. [a] Average Levels of Trust taken from taken from Lobb, Mazzocchi, and Traill 2005.

Average Trust Implications

While the sample size and limited geographical nature of the survey results may limit sweeping generalizations of the empirical results, some general observations can be made about average trust levels across products and regions. In general, consumers have clearly defined preferences for sources they trust in receiving food safety information. Based on average trust levels, university scientists and doctors/health authorities are two sources that agribusiness firms could align themselves with to provide food safety information to consumers during and after a food safety crisis. However, this is contradictory to results from the $MEAT_{SD}$ model results which showed a negative impact towards university/government sources when coupled with socio-demographic variables. Indicating that more research across a larger area in terms of geography and products is warranted to fully understand this relationship.

Typical media sources such as the internet, television and newspapers should continue to be used to provide consumers with information following a food safety event. Since consumers rely on these sources for information, it may be in the best interest of agribusiness firms to have public relations personnel who can give pertinent information to these agencies in a timely manner. Descriptive results from this study indicate that consumers expect to be informed of food safety events. Information concerning the end of food safety events or steps being taken by firms to handle the situation needs to be provided to consumers.

Subjective norms play a role in consumers' purchasing decisions. Consumers take friends and family members' opinion into consideration when making decisions. Further, consumers indicated that informing family and friends was important when hearing of a food safety event. These factors highlight the need for correct and timely information to be given to consumers. Every strategic response plan should emphasize timely dissemination of correct information to minimize the scope of events.

This research shows, in general, consumer response to food safety events is consistent. Agribusiness firms can use this information to create a base strategic response plan to food safety events. Caution should be exercised in sweeping generalization in all areas, as the results show that consumers react differently depending upon the product. Moreover, the results of this study are limited because of the small geographical area covered and the relatively low response rate. More research is needed across more products and geographical regions before adopting a blanket-type strategic response nationwide.

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Appendix

Table 3. Descriptive Statistics for Subjective Norms, Perceived Behavioral Control and Attitude

Variable	Elicitation and Scale (7-Point Likert Scale)	FP[a] Mean	FP[a] Std Dev	Meat[b] Mean	Meat[b] Std Dev
Risk (R)					
Risk Factors (r_i)	Please rate the risk of any one person in your household suffering from the following as a result of eating (product[c]) Negligible (1)………………….....................................Extremely High (7)	1.83	1.77	1.56	1.39
Motivations to Comply (m_j)	I take others' opinions into account when making decisions about whether or not to buy product Completely Disagree (1).………………….…………. Completely Agree (7)	2.05	1.52	2.81	1.87
Perceived Behavioral Control (P)					
Control Beliefs (c_k)	Assume that you have (product) in the refrigerator. Is it likely you would buy more next week? Extremely Unlikely (1)……………………………...….Extremely Likely (7)	1.79	1.46	2.89	1.8
Power of Control Beliefs (p_k)	Assume last week you ate a lot of (product). Is it likely you would not buy (product) at all next week? Extremely Unlikely (1)…………………………...…….Extremely Likely (7)	5.00	1.99	4.05	2.36
Attitude (A)					
Belief Strengths (b_i)	My decision whether or not to buy (product) next week is based on the fact that:				
(product) tastes good	Completely Agree (1)……………….Completely Disagree (7)	6.43	0.95	6.34	1.22
(product) is not easy to prepare		3.23	2.02	2.34	1.69
(product) is a safe food		5.26	1.82	5.08	1.91
Everyone in the family likes (product)		5.89	1.67	6.35	1.35
(product) works well with lots of ingredients		5.91	1.67	6.48	1.04
(product) is low in fat		6.30	1.55	4.92	1.70
(product) is low in cholesterol		5.66	2.25	4.03	2.07
(product) helps the local farmers and economy		4.64	2.34	4.65	2.40
I do not like the idea of (product) being killed for food/is grown		2.94	2.10	2.00	1.66
(product) is not produced taking into account animal/environmental welfare		2.64	2.06	5.81	2.28
Outcome Evaluations (e_i)					
Tasty food		6.13	1.42	6.34	1.13
Value for money		5.72	1.54	5.92	1.29
Ease of preparation		5.49	1.41	5.71	1.20
Food safety		6.11	1.43	6.40	1.18
Food everyone likes		5.91	1.32	6.10	1.25
Food variety		5.72	1.44	5.80	1.25
Fat content		5.51	1.57	5.63	1.37
Cholesterol content		5.36	1.61	5.48	1.40
Ethical food production methods		4.89	1.76	4.46	1.82
Local community livelihood		5.09	1.61	4.71	1.68
Animal welfare/environmental welfare		4.87	1.66	4.13	1.91

Notes: a/b "FP" and "Meat" refers to the *"fresh produce"* and *"meat"* surveys respectively. c product refers to *"fresh produce"* and *"chicken and or beef"* for the fresh produce and meat surveys, respectively.

Table 4. Descriptive Statistics for Risk and Trust

Variable	Elicitation and Scale	FP[a] Mean	FP[a] Std Dev	Meat[b] Mean	Meat[b] Std Dev
Risk (R)					
Risk Factors (r_l)	Please rate the risk of any one person in your household suffering from the following as a result of eating (product[h]):				
E-coli	Negligible (1)………………………….……Extremely High (7)	1.83	1.77	1.56	1.39
Salmonella		1.53	1.47	1.63	1.46
Listeria		1.17	1.27	1.14	1.23
Cholesterol		2.09	1.89	1.47	1.48
Health problems from pesticides		1.21	0.92	2.31	1.96
Health problems from antibiotics		1.53	1.4	1.45	1.5
Health problems from growth hormones		1.4	1.19	1.47	1.6
Weights (k_l)					
E-coli		4.23	1.66	1.56	1.39
Salmonella		4.21	1.64	1.63	1.46
Listeria		2.91	1.97	1.14	1.23
Cholesterol		4.74	1.89	2.31	1.96
Health problems from pesticides		3.65	1.9	2.94	2.06
Health problems from growth hormones		3.65	1.75	1.45	1.67
Trust(T)	Suppose that each of the following has provided information about potential risks associated with e-coli/salmonella in food. Please indicate to what extent you would trust that information				
Suppliers (T_1)		-[c]	-	22.6	7.51
Gov't./University (T_2)	Completely Distrust (1)…………………..………Completely Trust (7)	-	-	14.9	6.13
Organizations (T_3)		-	-	20.23	6.02
Media (T_4)		-	-	18.11	6.72
Intention to Purchase					
Meat$_1$/FP$_1$[j]	How likely or unlikely is it that you will buy fresh or frozen (product) for your household's in-home consumption at least once in the next week?	5.46	2.17	5.17	1.95
	Extremely Unlikely (1)…………………………Extremely Likely (7)				
Meat$_2$/FP$_2$	Assume that you have just read an article in the newspaper that high rates of *e-coli/salmonella* in (product) have been found in your area, resulting in several people being hospitalized. How likely or unlikely is it that you will buy fresh or frozen (product) for your household's in-home consumption at least once next week?	4.63	2.15	5.23	1.99

Notes: [a/b] "FP" and "Meat" refers to the "*fresh produce"* and *"meat"* surveys respectively. [c] product refers to"*fresh produce"* and *"chicken and or beef"* for the fresh produce and meat surveys, respectively. [c] Principal Component Analysis was not possible for the Trust category for the fresh produce survey. Instead, a simple average of trust was used for each category in the probit regression. For brevity, those results are not shown here.

Table 5. SPARTA Ordered Probit Regression Estimates

Meat Survey					**Fresh Produce Survey**				**EU**[a]			
Parameter	Demographic Shifter	MEAT$_1$	MEAT$_2$	MEAT$_{2SD}$	Parameter	Demographic Shifter	FP$_{1SD}$	FP$_{2SD}$	Parameter	Demographic Shifter	ITP1[b]	ITP2
S		-0.0085***		-0.0704**	S		-0.3584**		S		-0.17***	-0.23***
S	Education			0.0082***	S	Education	0.1012**	-0.0383***	S	Education		0.07***
S	Income			0.0061***	S	Income	-0.0566**		S	Income	0.08**	
S	Gender			0.0454*	P	Education	0.4963**		A	Income	0.19**	
P		0.1388**			P	Income	1.0705*					
R				-0.0207**	A	Education	-0.0102*					
R	Age			0.0003***	A	Income		0.0053***				
R	Income			0.0017***	R			0.3893*				
Supplier	Age			-0.0019**	R	Income		-0.0506*				
Gov't/Univ			0.0384**		Avg Trust		6.124**					
Gov't/Univ	Education			-0.0247**	Avg Trust	Education	-0.5189***					
Media			-0.0254**		Avg Trust	Income	-1.3874*					
Media	Age			0.002***								
Media	Education			0.0238**								
Media	Income			-0.0249**								
Chi Squared		15.37***	17.06**	66.51*			48.45**	55.65*				
Log Likelihood		-385.11	-372.65	-347.92			-68.17	-87.25				
Number of Observations		224	224	224			47	47				
Degrees of Freedom		40	40	40			25	25				

Notes: Level of significance: ***** 1% ,** 5%,*** 10%. Only models that were at least 10% significant and only variables in those models that were at least 10% significant are reported in table above. [a] Parameter estimates taken from Lobb, Mazzocchi, and Traill 2007. [b] ITP1 = the intention to purchase in general. ITP2= the intention to purchase following a food safety event. In both cases, these models included socio-demographic shifters.

Table 6. SPARTA Intention to Purchase Marginal Effects

	Unlikely			**Neither**			**Likely**[a]
Meat₁							
S	0.0022	0.0006	0.0001	0.0002	0.0002	-0.0004	-0.003
P	-0.0139	-0.001	-0.0002	-0.004	-0.004	0.0007	0.0049
Meat₂							
Gov't/Univ	-0.004	-0.0046	-0.003	-0.0019	-0.0015	0.0001	0.0148
Media	0.0026	0.003	0.002	0.0013	0.001	-0.0001	-0.0098
Meat₂sᴅ[b]							
S	0.0049	0.0079	0.0062	0.0044	0.0037	-0.0001	-0.0271
S * Education	-0.0006	-0.0009	-0.0007	-0.0005	-0.0004	0	0.0032
S * Income	-0.0004	-0.0007	-0.0005	-0.0004	-0.0003	0	0.0024
S * Gender	-0.0032	-0.0051	-0.004	-0.0028	-0.0024	0	0.0175
R	0.0014	0.0023	0.0018	0.0013	0.0011	0	-0.008
R * Age	0	0	0	0	0	0	0.001
R * Income	-0.0001	-0.0002	-0.0002	-0.0001	-0.0001	0	0.0007
Suppliers * Age	0.0001	0.0002	0.0002	0.0001	0.0001	0	-0.0007
Gov't/Univ * Education	0.0017	0.0028	0.0022	0.0015	0.0013	0	-0.0095
Media * Age	-0.0001	-0.0002	-0.0002	-0.0001	-0.0001	0	0.0008
Media * Education	-0.0017	-0.0027	-0.0021	-0.0015	-0.0013	0	0.0091
Media * Income	0.0017	0.0028	0.0022	0.0015	0.0013	0	-0.0096
FP₁sᴅ							
S	0.0076	0.0129	0.0085	0.0101	0.0743	0.0287	-0.1421
S * Education	-0.0021	-0.0036	-0.0024	-0.0029	-0.021	-0.0081	0.0401
S * Income	0.0012	0.002	0.0013	0.0016	0.0117	0.0045	-0.0224
P * Education	-0.0105	-0.0179	-0.0118	-0.014	-0.1028	-0.0398	0.1968
P * Income	-0.0226	-0.0386	-0.0253	-0.0302	-0.2218	-0.0858	0.4244
A * Education	0.0002	0.0004	0.0002	0.0003	0.0021	0.0008	-0.004
A * Income	-0.0001	-0.0002	-0.0001	-0.0001	-0.0011	-0.0004	0.0021
R	0.0016	0.0028	0.0018	0.0022	0.0161	0.0062	-0.0308
R * Income	0.0001	0.0002	0.0002	0.0002	0.0013	0.0005	-0.0026
AT	-0.1295	-0.2206	-0.145	-0.1727	-1.269	-0.4911	2.428
AT * Education	0.011	0.0187	0.0123	0.0146	0.1075	0.0416	-0.2057
AT * Income	0.0293	0.05	0.0328	0.0391	0.2875	0.1113	-0.5501
FP₂sᴅ							
S * Education	0.0001	0.0006	0.001	0.0035	0.0058	0.0034	-0.0145
A * Income	0	-0.0001	-0.0001	-0.0005	-0.0008	-0.0005	0.002
R	-0.001	-0.0065	-0.0105	-0.0354	-0.0595	-0.0347	0.1475
R * Income	0.0001	0.0008	0.0014	0.0046	0.0077	0.0045	-0.0192

Notes: [a] A 7-point Likert scale was used to measure intention to purchase anchored with *unlikely* and *likely* at values of 1 and 7, respectively. [b] SD indicates inclusion of socio-demographic variables.