# Attitudes of the Food Industry towards Safety Regulations: Descriptive Statistics and Some Major Predictors[1]

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## Abstract

*A mail survey of managers of businesses that produce and sell food found that most respondents think that food safety regulations are neither too lenient nor too strict. By far the largest predictor of attitude towards regulation is the respondent's own belief about the safety of food — those who are more convinced that food is safe are more opposed to regulation. Other smaller effects are, 1) the more the firm's workers are perceived to be trained in safety; and 2) the more the respondent perceives customers to be concerned about safety, the less opposed they are to regulations. Moreover, 3) Producers and processors were more opposed to regulation than were those who sell the final product; 4) Those who responded after September 11, 2001 were less opposed to regulation than those who responded beforehand.*

*Keywords: food regulations, food safety, food industry opinions*

## Introduction

Food safety regulation in its current form has been part of the US landscape for nearly a century. In 1906, the Pure Food and Drug Law was passed (Young 1989), and in 1909 Chicago became the first city to pass compulsory milk pasteurization laws (Larsen and White 1913). Both of these events were triggered by concerns with unsafe food products; concerns which have persisted throughout the years as the food industry and consumers are faced with food scares on a regular basis. The use of Alar in apples was banned over concerns it might be carcinogenic (Ten Eyck 2000), and governmental moratoriums have been placed on the irradiation of food as it may have unintended consequences for the food supply (Diehl 1995). Outbreaks of *E. coli* O157:H7, salmonella, listeria, camplyobacter, and many other food borne pathogenic bacteria and viruses continue to plague the food system. Moreover, many states are undergoing changes in their food laws, and some industries (such as seafood and juice processors) are expected to implement a new inspection system known as Hazard Analysis and Critical Control Points (HACCP) (McSwane et al. 2000).

These regulations are often precipitated by public concerns about food safety. In recent years, events such as the outbreak of hoof and mouth disease in Europe, the increased use of biotechnology to alter food crops, and the increased concern about possible bio-terrorism following the attacks of September 11, 2001 have led to greater consumer concern with the food supply. These events, as well as others, have been the foundation for a number of studies of public attitudes and concerns regarding food safety (e.g., Bruhn and Schultz 1999; Gaskell and Bauer 2001; Unkelsday et al. 1998). Some studies have examined the role that trust plays in such attitudes (see e.g., Frewer et al. 1996; Frewer et al. 2003b) and the distinction between attitudes of the public and of experts (Frewer et al. 2003a). In short, most of these studies find that consumers are concerned with the safety of the food supply, though they are not always willing or able to act on those fears.

Concerns about food safety are consequences of social processes that affect many kinds of risk. According to Giddens (1990), the increasing globalization of modern societies makes it necessary for people to interact with others whom they have never met and whose identities are often unknown. This is especially relevant to our topic in that not only those who eat the food, but even those who sell it often have little to no contact with those who have produced it. Moreover, modern technology has created new risks that can be easily

spread across national borders. In a similar vein, Beck (1992) discusses the importance of risk in contemporary societies and underscores the role of trust in dealing with such risks. The fact that sellers and producers are so often distant from each other requires other mechanisms to substitute for the trust that is possible when people are interacting on a personal level.

## Regulations and Compliance

Thus, in contemporary societies, it is necessary to establish formal policies to manage these risks. One common strategy is direct regulation, which is usually designed to reduce risk to an acceptable level by either performance or process criteria (see Dietz et al. 2002a, 335).

While understanding public attitudes provides some help in understanding the prospects for regulation, one must remember that regulations disproportionately affect businesses in the industry being regulated. The institutions responsible for safety, however, must be seen as legitimate by those they are regulating — (see Habermas 1973). This is because many businesses have sufficient resources to mount effective opposition to policies that they find threatening. In addition, regulatory agencies often do not have enough resources to be constantly monitoring compliance (e.g., Dickinson 2000; *Food Processing* 2002). This suggests that, much of the time, businesses comply with safety regulations to the extent that they see them as legitimate. Hence, to understand the prospects for compliance, it is important to understand the attitudes of people who run businesses that prepare food for public consumption.

The dominant attitude of American business has historically been quite negative toward government regulation (see e.g., Vogel 1978). Regulation typically imposes costs on businesses, such as changing production procedures to meet new regulatory demands. There is also the cost of more paperwork, record keeping and inspections, in order to certify that businesses have been following the prescribed procedure. This often includes more inspections by health officials. These are additional burdens on industry as they take time and add stress to production, processing, and retailing.

Others (see e.g., Domhoff 1983; Dye 1995), however, have argued that the attitude of business towards regulation is more divided and more complex than one might think from examining the position of groups such as the Chamber of Commerce. For one thing, at times, some moderate business leaders have seen government regulation as useful for creating social stability. Second, McConnell (1966) argues that business interests often "capture" the agencies that are supposed to regulate them, thereby guaranteeing that regulations do not impose burdens that they consider excessive.

In addition, there are several advantages that some businesses may see in regulation. To the extent that consumers are concerned about the safety of a product, they may be reluctant to buy it. To the extent that regulations assuage such concerns, they can be good for business. Moreover, those businesses that incur extra costs to insure that their products are safe, have an additional interest in regulations. Regulations prevent any competitors who might ignore safety from obtaining lower costs through cutting corners and offering a less safe product. Finally, if a business has a safety problem, having followed the regulations may provide protection from both legal liability and a bad public image (e.g., Robeck 1996).

While research has examined some aspects of the attitudes of business towards regulation, we are aware of no prior research on the attitudes of the food industry towards regulation. Given the amount of resources invested in the safety of the food supply at the industry and retail level, it is important to understand the perceptions of those people who make management decisions in this industry. As indicated above, even when regulations do exist, those who are opposed to them can often find ways around the rules.

Currently, all businesses that produce or sell food and food products are supposedly inspected at least once a year (some however, are inspected on a daily basis), so these individuals should be familiar with the development, implementation, and enforcement of regulations. It is an open and important question as to whether or not they see these regulations as necessary.

## Objectives

In this article, we have three objectives: 1) to learn the distribution of attitudes toward safety regulation among businesses in the food industry; 2) to learn what characteristics of the business and of the individual respondent influence these attitudes; and 3) to learn the effects of the September 11th terrorist attacks on these attitudes.

Attitudes vary greatly in how strong they are (see e.g., Converse 1970). Strong attitudes are especially important to understand as they have greater resistance to change and greater impact on behavior (see e.g., Krosnik and Petty 1995). However, when something substantially affects people, their attitudes toward it are likely to be strong (see e.g., Crano 1995). As mentioned, managers of these businesses must comply with regulations and deal with inspections. Therefore we assume that their attitudes towards them are likely to be strong.

# Hypotheses

We now propose to test a number of hypotheses about determinants of the attitudes of managers towards regulation. These hypotheses reflect four kinds of variables a) other relevant attitudes and beliefs of the managers; b) structural characteristics of the business; c) socio-demographic characteristics of the managers; and d) effects of the attacks of September 11, 2001. While all of them have some plausible justifications, none have been tested.

There are at least three attitudes and beliefs of business people that might be relevant to their attitudes toward safety regulations. One is their belief about whether public health and safety requires such regulation. We predict that:

H1   Those who see the food industry as *more* safe are *less* likely to think that regulation is necessary to protect public health and therefore more likely to oppose it.

A second belief stems from market considerations. Businesses have an interest in satisfying whatever safety concerns their customers may have. The more they perceive such concern on the part of customers, the more they should be concerned about making their own food both safe and perceived to be so. Since regulation can help convince the public that their food is safe, this suggests a second hypothesis:

H2   The more managers in the food industry perceive concern about safety on the part of customers, the more we expect them to favor safety regulations.

It is often said that risk perceptions can be quite inaccurate. This is true not only of perceptions by the public but also of those by people in business, government, and scientific experts (see Clark and Short 1993, 383-384). Our hypotheses make no assumption that these risk perceptions are accurate.

Third, the political climate of different parts of the country varies. Some states (especially in the Northeast) elect politicians who are more supportive of the Democratic Party and of regulating business. In other states (especially in the South and some mountain states) voters tend to elect politicians who strongly oppose regulation (see reports of the League of Conservation Voters).

There is evidence suggesting that business people in states that are more supportive of regulation are themselves more accepting of regulation. According to Dye (1995), members of the elite from the Northeast and Midwest are more tolerant of government action regulating business and than are those from the Sunbelt. Therefore,

H3   Businesses from the more anti-regulation states will be most opposed to regulation. Businesses from the more pro-regulation states will be most supportive.

We now consider the role of structural characteristics of the food industry. One characteristic that may be relevant is size. At least part of the cost of complying with regulations is a fixed cost of creating policies and procedures. Such costs are relatively independent of the number of employees in the firm and the amount of its revenues. Hence, larger businesses may be better able to absorb the costs of regulation than smaller business. Therefore,

H4   Larger businesses should be less opposed to regulation than smaller ones.

A second such characteristic is the business's function in the industry. The major food safety problems are those resulting from producing and processing food (as compared to grocery stores that simply stock food produced and processed by others.) Therefore, regulations and their costs fall most heavily on those who produce and process. This leads us to our fifth hypothesis:

H5   Businesses that produce or process food should be more opposed to regulation than other businesses.

A third such characteristic is whether the business is a retail business, selling directly to the general public, or whether its customers are other food businesses. When a business is selling food to other businesses, its customers have more knowledge of food safety and more of a financial stake in it than do the customers of a retail establishment. Thus, non-retail businesses may feel that their customers are more concerned with safety than are the customers of retail businesses. Hence,

H6   Non-retail businesses should be more favorable to regulation than others, especially when they perceive this to be a concern of their customers.

A fourth characteristic of the business is how much time and money it invests in food safety. We predict that:

H7a)   A larger food safety budget should lead to more support for safety regulations.

H7b)   A workforce that is more committed to safety should lead to more support for safety regulations.

We have two reasons for the above hypotheses. First, those businesses that invest larger amounts in food safety are likely to care more about this topic, which should lead to greater support for regulation. Second, those that spend more

on safety programs may believe that regulation will deprive their less safety-conscious competitors of the cost advantage that would come from spending less on safety.

Next we consider the effects of the terrorist attacks of September 11, 2001. These attacks raised concern about all kinds of terrorism, including bio-terrorism aimed at America's food supply. Hence we predict that:

H8    After September 11, 2001, there should be greater concern about the safety of the food supply and therefore more support for regulation.

We also consider the education and sex of the respondent. Better educated people are more likely to engage in health enhancing behaviors (see e.g., Ross and Wu 1995), suggesting that they have a greater understanding of the relationship between controllable behaviors and health. Moreover, those with better education (see e.g., Jones and Dunlap 1992) and women (see e.g., Bord and O'Connor 1997) are more likely to worry about the environment and its associated risks to health than are others. This suggests that such people might be more likely to favor food safety regulations (but see Jussaume and Higgins 1998, for evidence that attitudes towards food safety are distinct from many environmental concerns). However, there is also evidence that women are more worried than men about food safety (see Burger 1998; Herrmann et al. 1998).

## Causal Model

We propose a causal model that incorporates our hypotheses. These hypotheses clearly indicate that the last variable in the causal ordering is attitude towards regulation. We must now decide on the ordering of the others. We regard all of the following as exogenous (not caused by any variables within the model):

1) both of the socio-demographics (gender and education),
2) the timing of the survey,
3) the state in which the business was located, and
4) these structural characteristics of the business:
    (a) the size of the workforce,
    (b) whether or not the business is a producer or processor of food, and
    (c) whether or not the business is a retail establishment.

As shown in Figure 1, we see the intervening variables as having the following causal order: First, is the degree to which the respondent sees customers as wanting assurance of safety. Next, are two variables that measure the business's
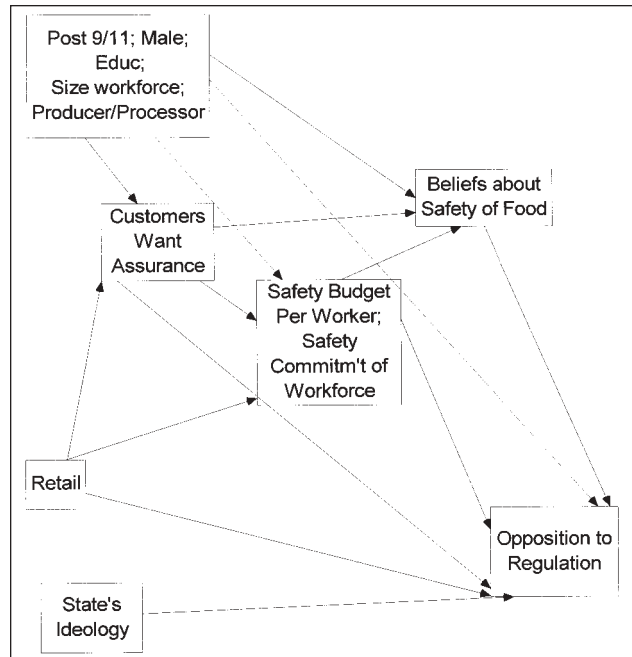


**Figure 1.** Causal model relating the theoretical variables to each other. (The relationships between the latent theoretical variables and their observed indicators are shown in Table 2.) To reduce clutter, the picture has been simplified as follows. 1) Those variables that have the same causes and same effects are in the same rectangle. 2) Each of these variables is assumed to have a causal arrow to each of the variables that causally come after it (except for State's ideology and Retail which have their own boxes). 3) The correlations among the exogenous variables have been omitted. 4) The endogenous variables in the same rectangle are assumed to have correlated errors of prediction and these are also omitted.

commitment to safety: a) the safety budget per worker; and the responses about: b) the safety knowledge/ commitment of the workforce. Next, we assume that all of the prior variables affect the respondent's perception of how safe the food is. Finally, is attitude toward regulation.

We also assume correlated errors of prediction among those variables at the same point in the causal sequence. This is because we believe that these variables have a causal influence on each other.

We chose to err on the side of a causal model in which we include all paths of interest, rather than the most parsimonious model possible. Therefore, we assumed a causal path from each theoretical variable to each variable subsequent in the causal path, with the *following exceptions*, in which the path seemed especially implausible.

a) From ideology we only include a path to one other variable — attitude towards regulation.
b) From Retail, we omit paths to beliefs about the safety of the food supply.

# Methods

## Sampling, Response Rate, and Characteristics of the Sample

The data collection was done in three phases. The population for the first two phases consisted of *managers* of firms in Michigan who provide any food related products (i.e., anything that people eat or drink). Using licensing data obtained from the Michigan Department of Agriculture, we obtained two lists:

1) a list of 18,329 restaurants,
2) a list of 37,516 other food businesses (this list includes producers, processors, wholesalers and retailers).

We randomly selected 1,000 firms from each list, for a total of 2,000 firms.

The manager of each firm selected was sent a mail survey during the Fall of 2000. The survey was accompanied by a cover letter, which explained the study and offered respondents the chance to win $100 if they returned a completed survey. A total of 144 surveys were returned from both samples, providing us with a response rate of 7.2%.

To increase the response rate, a second mailing was done in January/February of 2001. This new mailing sent out surveys to two kinds of firms:

a) to those who had not previously responded, and
b) to some new firms who replaced those whose surveys had come back as either undeliverable or not applicable (business was not providing any food related products).

An additional 158 surveys were completed and returned, increasing the total number of completed surveys to 302. Thus, our return rate was 15.1%. In our data analysis, we combined the first two waves and compared them with the third, (post-September 11th) wave.

The third wave involved sending the same survey and cover letter (explaining the study and offering a $100 lottery) to food establishments in the District of Columbia and the other 49 states (excluding Michigan) in the fall of 2001, after the terrorist attacks on September 11th.

We created a sample of 50 food establishments in each of these 50 areas. For each area, this consisted of a sample of 25 restaurants and 25 other food businesses. The restaurants were randomly chosen from each state based on Internet Yellow Page search engines. Our random sample of non-restaurant food establishments from each area was taken from the Thomas Food and Beverage Register[4]. This source catalogs over 49,000 food-related industries, including non-food businesses such as linen cleaning for restaurants and tent rentals for caterers. Since we wanted to survey only businesses that dealt directly with food (manufacturing, processing, distributing, and/or retailing), any business that was chosen that did not meet this criterion was considered non-applicable and replaced with a business that dealt directly with food/ingredients.

In this third wave, 216 completed surveys were returned, for a response rate of 8.6% (216/2500). If we exclude the 256 surveys returned as undeliverable or non-applicable, the return rate was 9.6% (216/2244). A second mailing was not undertaken due to time and financial constraints.

As compared to the population within this industry, our sample over-represents manufacturers and other non-retail establishments[5], though the final survey results contain data from 325 retail establishments and 189 non-retail establishments (we were unable to categorize four respondents). Because the sample may not be representative of the population, we regard the quantitative results presented below as a useful pioneering effort — rather than as precise estimates of population parameters.

## Measurement of Variables and their Univariate Distribution

*Attitude towards Regulation* was measured by two items. One was: "Some people think that the government's food safety regulations are not necessary for safety and place an excess burden on those who produce and sell food. Others think that the government is not doing enough to insure that all food is safe. What is your view?" Over 71% of respondents felt that regulations were about right, {coded 2} while 15% felt they were excessive {coded 3}, and 14% felt they were too loose {coded 1}. For the other question and its responses, see Table 1. Thus, we can see that most respondents thought that the regulations were appropriate.

*Beliefs about the safety* of the food supply were measured by responses to the following Likert scaled variables, each of which have a four-point response scale: (See Table 1 for the exact wording of questions and univariate descriptive statistics.) As can be seen, over 80% of respondents thought the food supply to be safe while over 50% admitted some worries about safety from terrorism or other problems. In Table 1, we also see that over 60% of respondents perceive their *customers to want assurances* about safety.

*Education of the Respondent* was measured on a six-point scale, ranging from not having graduated high school to having a post-baccalaureate (graduate) degree. We found that 50.4% did not graduate college, while 11.1% had a graduate degree. Moreover, 68.2% of respondents were male.

*Type of Business*: 63.2% were retail businesses, which were mostly restaurants, and the rest were grocery stores. The other 36.8% were divided among processors (14.8%),

*Table 1.* Univariate descriptive statistics.

| | % Agree + % Strongly Agree | Mean Response | Standard Dev |
|---|---|---|---|
| **Workforce commitment to safety** | | | |
| The workforce at this place of business is adequately educated in terms of food safety. | 87.9 | 3.09 | 0.58 |
| The workforce at this place of business is motivated to learn about food safety. | 81.2 | 2.95 | 0.61 |
| Most employees at this place of business are concerned with food safety. | 91.3 | 3.14 | 0.58 |
| **My customers want very thorough assurances about food safety before they buy my food.** | 62.0 | 2.71 | 0.72 |
| **Beliefs about Safety of Food** | | | |
| Overall, I think the food sold in the U.S. is very safe. | 86.4 | 3.06 | 0.62 |
| The U.S. food industry does an adequate job in trying to safeguard our food supply. | 82.8 | 2.96 | 0.64 |
| I feel that some food suppliers I know of should be more careful. | 56.1 | 2.57 | 0.71 |
| U.S. food companies are easy targets for terrorist attacks, such as poisonings and contaminations. | 54.4 | 2.60 | 0.84 |
| **Attitudes toward Regulation** | | | |
| "This Place of Business wishes government would do more to assure safe food." | 34.0 | 2.29 | 0.76 |
| | **Too Loose** 14% | **About Right** 71% | **Excessive** 15% |
| Regulations are: | | | |

Note: All Likert scale item questions were coded so that Strongly Agree = 4 and Strongly Disagree = 1.

producers (4.7%), wholesalers (9.9%), and others (7.4%). For testing H5, processors and producers were combined.

*Size of the business* was measured by the number of full time equivalent employees (the number of full time employees, plus half the number of part time employees). This variable had a median of 13.5 workers, a mean of 80, and a maximum of 7200. Only 1.3% of the businesses had more than 1000 workers.

*Safety budget* was measured by adding the responses to the following two questions: Approximately, how much do you budget each year for

    a) investigating or testing the safety of food products or processing techniques? and
    b) other food safety concerns?

This variable was zero for 39.7 % of respondents, the median was $500, the 95th percentile was $100,000 and the maximum was $20 million.

*Commitment of the Workforce to Safety* was measured by the responses to three items — each measured on a four-point Likert scale. As shown by Table 1, over 80% of respondents saw their employees as committed to safety on all three questions.

We have no direct measurement of the *ideology* of the business manager but use as a proxy the political culture of the state in which the business is located. This we measure by the results of the 2000 Presidential Election. For each state, the sum of the percentages received by Bush, Buchanan (Reform Party), and Browne (Libertarian) is the indicator of

the state's sentiment against regulating business during the years of the survey (1999 -2001).

The entire survey was six pages long (using 11 point type). Almost all variables of interest had missing data in less than 4% of cases. The only exceptions were the questions about size of the workforce (12% missing) and about safety budgets (45% missing).

# Results

## Causal Modeling

We tested and estimated some predictive causal models, via Structural Equation Modeling (SEM) using AMOS 5. SEM is well suited for a multiple-equation model in which some of the (latent) variables have multiple indicators (see e.g., Bollen 1989). Among the advantages are its ability to remove spurious correlation (through correlated errors of prediction) and its ability to correct for attenuation due to unreliability (see DeShon 1997).

SEM assumes multivariate normality, which is grossly violated when variables are highly skewed. Two of the raw variables (a) Safety Budget per Worker; and (b) Number of Workers had extremely high skews, exceeding 11. Therefore, we logarithmically transformed these variables. After transformation, the higher of the two skews was 1.03.

## Confirmatory Factor Analysis

We first tested our measurement model with a confirmatory factor analysis on all latent variables that have two or

more observed indicators.[6] We found, however, that the initial measurement model was not satisfactory. While the questions indicating satisfaction with safety loaded highly on the same latent variable, "Concerns about Terrorism" and "Some food suppliers I know of should be more careful" did not load well on the same latent variable.

We also found that these latter two variables had a correlation of only .189 with each other and therefore were not indicators of a common latent variable. We further found that adding both of these variables did not improve the explained variance beyond that which was gained by adding one of them. Since adding *some suppliers should be more careful* increased the explained variance in Attitude towards Regulation by .076 while the Terrorism variable increased it by only .034, *some suppliers should be more careful* was included in the causal model.

In addition, the safety budget per worker did not load well with the latent variable that was based on the questions indicating the workforce commitment to safety. Consequently it was a separate latent variable with one observed indicator.

After making these changes, the fit of the measurement model was quite satisfactory. We then estimated the full model, described in the theory section and in Figure 1, and report the associated factor loadings in Table 2.

This model also fits very well[7] $\{\chi^2(58) = 95.0\}$. The CFI, a fit index that does not take parsimony into account, was .979. The RMSEA, which takes parsimony into account,

*Table 2*. Standardized Loadings of Observed Variables on Latent Variables and Cronbach's α in Structural Equation Model.

| | Standardized factor loading |
|---|---|
| **Workforce commitment to safety** (α = **.765**) | |
| The workforce at this place of business is adequately educated in terms of food safety. | .673 |
| The workforce at this place of business is motivated to learn about food safety. | .765 |
| Most employees at this place of business are concerned with food safety. | .715 |
| **Believe Food is Safe** (α = **.813**) | |
| Overall, I think the food sold in the U.S. is very safe. | .835 |
| The U.S. food industry does an adequate job in trying to safeguard our food supply. | .820 |
| **Opposition to Regulation** (α = **.634**) | |
| This place of business wishes the government would do more to assure safe food. | -.861 |
| Are regulations excessively burdensome, about right, or too loose to guarantee safety? | .521 |

*Table 3*. Standardized Direct Effects: Structural Coefficients Predicting Safety Budget and Beliefs About Safety.

Dependent Variables

| **Predictors** | Workers Committed to Safety | Safety Budget (per worker) | Believe Most Food Quite Safe | Some Food Suppliers Should Be More Careful. |
|---|---|---|---|---|
| Post 9/11 | -.032 | .176** | .092+ | -.017 |
| Educat of Resp | .024 | .086 | -.064 | .046 |
| Male Resp | -.074 | -.019 | .140+ | -.051 |
| ideol of state | .000[a] | .000[a] | .000[a] | .000[a] |
| number of employees | -.092 | .030 | .192*** | .053 |
| producer or processor | .047 | .337*** | .025 | -.051 |
| retail business | .109+ | -.050 | .000[a] | .000[a] |
| Customers Want Assurance About Safety | .349*** | .104 | -.062 | .106* |
| Workers Committed to Safety | | | .193*** | -.074 |
| Safety Budget (per worker) | | | .080 | .141* |
| R- squared | .132 | .272 | .121 | .037 |

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ two tailed probabilities

*Note:* The four *dependent* variables above are all of the endogenous variables other than "Customers Want Assurance About Safety" (whose proportion of variance explained is only .028) and Opposition to Regulation, which is dealt with in Table 4.

[a] These coefficients were set to zero by the causal model, but an alternative model, in which they were estimated, failed to show significant improvement in fit.

was .035 (with a 90% confidence interval from .022 to .048). Adding the omitted paths from State Ideology and Retail resulted in an improvement in fit that was not statistically significant. Moreover, those measures that take into account the loss of parsimony show the model with these paths as fitting less well, thus justifying our decision to omit them.

Table 3 demonstrates the results of the prediction equations for the variables that intervene between our exogenous variables and opposition to regulation. The only significant (at $p < .05$) predictor of perceiving that the *workforce is committed to safety* is the belief that customers want to be assured of safety. The *size of the safety budget* is predicted primarily by whether the business was a producer or processor (they had higher budgets in proportion to size), and secondarily, when the survey was completed (safety budgets increased noticeably after September 11, 2001). The correlation of the errors of prediction of these two endogenous variables is modest (.143), but significantly different from zero ($p < .05$).

The belief that food is safe is predicted primarily by a)

*Table 4*. Standardized Direct and Total Effects of Other Variables Predicting *Opposition* to *Regulation*.

| Predictors | Standardized Direct Effect | Standardized Total Effect |
|---|---|---|
| Post 9/11 | -.200*** | -.133 |
| Male Respondent | -.005 | .099 |
| Education of Respondent | .125* | .075 |
| Anti-regulation ideology of state | -.001 | .001 |
| number of employees | -.073 | -.001 |
| retail business | .128* | .129 |
| producer or processor | .203** | .275 |
| Customers concerned about Safety | -.077 | -.175 |
| Safety Budget (per worker) | .118 + | .110 |
| Workers Trained in Safety | -.260*** | -.131 |
| Believe Most Food Quite Safe | .480*** | .480 |
| Some Suppliers Should Be More Careful. | -.322*** | -.322 |
| R- squared | .478 | |

$+ p < .10$, $* p < .05$, $** p < .01$, $*** p < .001$.  All are two tailed probabilities, except for the effect of Post 9/11 which is one-tailed.  Note that AMOS does not provide significance levels for total effects.

believing that one's own workforce is safety conscious; b) by having a larger workforce. The belief that some suppliers should be more careful is predicted primarily by a) perceiving that customers care about safety, and b) having a larger safety budget.  Only .037 of the variance in believing that suppliers should be more careful, however, is explained by other variables.

The correlation between the errors of prediction of believing food is safe and believing some suppliers should be more careful is -.217  ($p < .001$).  This reflects the mutual influence of these beliefs on each other.

Table 4 demonstrates that our R squared for attitude toward regulation is rather high (.479).  We examined the direct effects of these various factors on opposition to regulation and tested our hypotheses.  We saw that the two predictors with the greatest effect on this dependent variable were the beliefs about the safety of the food supply.  Thus H1 is dramatically confirmed.

Furthermore, we found that two other significant predictors relate to the commitment of the business to food safety. Interestingly, they have opposite effects.  Perceiving one's workforce as committed to safety has a negative effect on such opposition (thus confirming H7b).  Contrary to H7a, however, a larger food safety budget per employee is positively related to opposition to regulation, (though this result is not significant at $p < .05$).

Contrary to H2, Customer Concerns about Safety did not have a significant effect on attitudes toward regulation.

Contrary to H3, the ideology of the state in which the business is located had a miniscule coefficient that was not significantly different from zero.

Contrary to H4, the effect of the number of employees was also not significant.

Producers and processors are substantially more opposed to regulation than are other businesses, thus supporting H5.

Retail businesses are somewhat more opposed to regulation, therefore H6 is supported.

We also note that consistent with H8, responding after September 11, 2001 has a significant association with *reduced* opposition to regulation (see Table 4).  Contrary to H8, however, responding after 9/11 was associated with a belief that the food was more safe (see Table 3).  This was not, however, significant at $p < .05$.

Somewhat surprisingly, better educated respondents were significantly more opposed to regulation but gender had no significant effect.

For the most part, the standardized *total* effects in Table 4 tell a similar story to the *direct* effects.  There are a few variables, however, for which the difference between their direct and total effects is large enough to merit comment.  First, the total effect of Customer Concerns about Safety is more than twice as great as the direct effect and in the predicted direction.  Thus when we consider total effects, our results support H2.

Second, the total effect of being a producer or processor is even greater than the direct effect, thus supporting H5 even more strongly.

Third, there are several variables that have a significant direct effect but whose total effect is substantially smaller. They are a) post-9/11; b) education of respondent and c) belief that workers are trained in safety.

### Michigan vs. Other States

Since the first two waves were entirely from Michigan while the third wave was from other states, one may wonder about the confounding of the variables of time and geographic location.  One way to assess its effects is to see if the coefficients for Michigan differ from those for the rest of the US.  To accomplish this, we divide the sample into two groups (Michigan vs. non-Michigan) and test two alternative models.  (We also removed those variables determined by state and wave as they had zero variance for at least one of the groups.)  One is an unconstrained model, which allows for separate coefficients to be estimated for the two groups. This has $\chi^2$ (90) = 135.148; $\chi^2/df$ = 1.502.  The other model constrains all coefficients of the theoretical model to be equal for the two groups.  This has $\chi^2$ (131) = 195.093;  $\chi^2/df$ = 1.489.  The RMSEA, another measure of fit, per degree of

freedom is .031 for both models.

While the difference of $\chi^2$ test, ($\chi^2$ (41) = 59.95), has $p$ < .05 (thereby indicating that the coefficient differences between groups are beyond those expected by chance), other evidence suggests that these differences are not large. First, the measures of fit that take into account parsimony show both models fitting equally well. Second, a comparison of the standardized coefficients that were estimated separately for the two groups leaves the major conclusions unaltered. All of the largest coefficients for one group are also the largest for the other group and all of them have the same sign for both groups.

## Summary and Discussion

Most food industry managers we surveyed think the amount of regulation is "about right." Given the widespread campaign by businesses over the past 30 years to weaken regulation, it is not surprising that few of our respondents want regulations to be stronger. It is, however, noteworthy that the majority does not favor weakening them. Perhaps this reflects the fears that they would lose business if their customers thought there was less oversight into the producing, processing, and retailing of food.

The greatest predictor of manager's attitudes towards regulation is how safe they perceive the food supply to be. The belief that their customers are concerned about safety also indirectly affects this attitude, but less than their own beliefs. This is surprising, as we ordinarily think of business people as having their policies driven primarily by the demands of the market rather than by their personal preferences and beliefs.

### Explaining Some Other Small or Surprising Effects

While beliefs about safety had a major effect on attitudes toward regulation, other indicators of personal belief had much less effect. The effects of gender and of education were also quite small. Perhaps any effect of these variables was reduced by the more powerful effect of one's position as a manager of a business selling food.

The effect of state ideology was also minimal. There are two plausible reasons for this:

a) Measuring the ideological climate of the state in which the business is located may be an inadequate proxy for the respondent's own ideology;

b) Those states in which people are more supportive of regulation may already have stricter regulations.

Thus, a respondent living in a state with tight regulations may have accommodated them and think they are "about right," as might a respondent living with less tight regulations.

The fact that uniform federal regulations exist for food establishments does not invalidate this second argument. Enforcement of these regulations is often carried out by local inspectors, whose practice tends to reflect the state's dominant ideology toward regulation (Ten Eyck et al. 2005). In addition, states and local-level governments have the right to develop their own rules and regulations as long as they do not contradict federal regulations.

As predicted, producers and processors were more opposed to regulation than were other businesses. Our two other structural variables (whether the business was retail and the size of its workforce) had less effect. In fact, the latter variable had no effect in our models.

Our finding that the size of the business (size of workforce) had no effect was a surprise. Perhaps those businesses that can best absorb the costs of regulation are even larger than almost all of those in our sample. Perhaps the number of employees is a poor proxy for the amount of money the business earns. After all, some businesses are very capital intensive while others are very labor intensive. But it may also be that the ability to afford regulations depends less on the size of the business than on the total cost of compliance. These costs may depend primarily on the distinction between producers/processors and others.

Seeing the workers as committed to safety is associated with reduced opposition to regulation. This is no surprise, as it indicates greater management commitment to safety. In addition, resources that are currently directed toward worker training may need to be moved to cover the costs of meeting new regulations.

Surprisingly, however, businesses with greater safety budgets were more *opposed* to regulations. Since this finding is not quite significant at $p$ < .05, we have the option to dismiss it as sampling error. A related possibility is that the 45% of the cases for whom we lack data on safety budget, have a very different relationship between safety budget and attitude toward regulation, than do the cases for which we have data.

We shall now consider the possibility that our findings actually represent the population being studied. Perhaps, those businesses that already spend money on their own safety systems feel that the extra costs of proving that their food is safe serves no useful purpose. In addition, those businesses may be the ones that already experience above-average regulatory burdens, which could, in turn, cause opposition to regulation. While initially plausible, this explanation is not satisfactory. We have measured one major determinant of regulatory burden (processor or producer) and found that even when this is controlled for, the size of the safety budget still has an effect.

As predicted, the attack of September 11, 2001 modestly reduced opposition to regulation. Not surprisingly, it also

caused a modest increase in safety budgets. But surprisingly, it had minimal effect on the intervening variables of beliefs about the safety of the food.

## Limitations

Our total response rate of less than 20% makes generalization to the larger population tenuous, as one never knows how the attitudes of respondents compares with those who did not respond. We found no indications, however, that only certain types of respondents (e.g., size, type of business, type of food being processed, etc.) were completing the survey. While it is possible that people on one side of this issue had a greater probability of responding than those on the other side, the more likely bias is that those who did respond may have held stronger views on the issue (see e.g., Dillman 2000, 195). The major effect of this bias would be to increase the variance of our observed attitude variables. The direction in which this would bias our results, however, is not at all obvious.

Another possible limitation is the confounding of wave (pre vs. post 9/11) with population sampled (Michigan vs. the rest of the US). We believe, however, that this does not create serious problems. Our analysis permits us to estimate the effect of each variable, while controlling for the effects of all other variables in the model. Hence, even if businesses in Michigan differ from businesses elsewhere on some of the characteristics in our model, our analysis is able to distinguish the effects of such variables from the effects of pre vs. post 9/11. The only variables that could cause confounding are those that we have not included in our model.

We regard even this confounding as unlikely to be a major problem for three reasons. First, politically, Michigan is fairly close to the middle among all states. It had 47% support for rightwing candidates as compared to the 48.6 % figure for our entire sample and the 50% nationwide figure. Second, Michigan is not far from the median in affluence, as its median income ranked 17th of 50 states (US Census Bureau 2002). Third, we have found that the coefficient estimates for Michigan do not differ greatly from those estimated for the other states.

A third possible limitation is that since half of the sample is from Michigan, it is not representative of the entire US. For all of these reasons, our precise quantitative results should not be the last word on these questions.

## Importance of the Study

Despite these limitations, this study is important in that it is the first to seriously study the attitudes of the managers of the food industry. In addition, some of our findings are so strong that they are very unlikely to be contradicted by a more representative sample. Most managers see the amount of regulations as appropriate and the primary determinant of their attitudes towards regulations is their own views of the safety of the food supply. This suggests that most managers comply much of the time and that they do so to the extent that they see the regulations as necessary for safety.

This study fills an important gap in the literature. As indicated in the literature review, there are many studies about the views of the public (and of experts) on risk, including food safety. In addition, there is a body of literature that states that institutions are important in controlling perceptions of what is and what is not risky (Beck 1999; Beck et al. 1994; Giddens 1991). This is the first study, however, that has presented any data on the attitudes of managers who control these food-related businesses. As such it helps us better understand the behavior of these institutions.

This is a very important population as they have a great deal of control over what safety practices will be followed. While food safety is subject to government regulations, the businesses regulated are often able to influence the degree of enforcement. Moreover, enforcement is sometimes sufficiently lax that compliance is, to a great degree, voluntary and therefore depends on the attitudes of those managing the industry.

The public clearly sees the food industry as playing an extremely important role in food safety. When asked "how much *responsibility* does {this entity} have for the safety of the US food supply?" respondents in a national web-enabled survey said that food manufacturers and restaurants have the greatest responsibility and rated the US government third. When asked "how much *control* does {this entity} have for the safety of the US food supply?" respondents saw food manufacturers as having the greatest control and rated restaurants and US government as tied for second place (Ten Eyck 2003).

## Future Directions

We are left with three puzzles to ponder.

1) Why is the effect of one's belief about the safety of food an even more important predictor of attitude toward regulation than is one's perception of the desires of customers?

2) Why are those with greater safety budgets more negative towards regulations?

3) Why did the terrorist attacks of September 11, 2001, affect some variables of interest but not others?

One possible answer to the first question is that we have misjudged the direction of causation between a) beliefs about the safety of the food supply and b) attitude toward regulation. One's beliefs about the safety of the food might be a *consequence* of one's attitude toward regulation. But regardless of which is the true causal direction, it is clear that these attitudes are highly correlated. In fact, the CFA shows opposition to regulation to have a correlation of .471 with believ-

ing the food supply to be safe and -.392 with believing that some suppliers should be safer.

To answer the second question, we could collect more data and provide a larger incentive for full and accurate answers to all important questions. At the very least, this would tell us if our results stemmed from sampling error or missing data.

In the end, if we are concerned about the safety of our food supply, it is important that we continue to try to understand the attitudes of the industry and to try to overcome the obstacles to doing so. While public forums and public opinion are important, they are likely to have less effect on the industry than the perceptions and practices of those producing, processing, transporting, and retailing our food. Hence, we hope that others will extend this line of research.

## Endnotes

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4. For more information on the Thomas Food and Beverage Register, see their website at http://www.tfir.com/thomasfood/index.asp.

5. According to the US Census Bureau (www.census.gov), in 1997, 1,118,447 food retail establishments were in operation as compared to 26,302 food manufacturers. *The Thomas Registry*, as noted, lists over 49,000 food-related establishments, though not all of these deal directly with food. In either case, the percent of food manufacturers is somewhere between two and five percent of all food establishments. Just over 36% of the surveys in this study were categorized as coming from food manufacturers.

6. In using SEM, we are not measuring latent variables by combining observed variables into indices. Rather we infer the relationship of each latent variable to observed variables from the CFA results in Table 2 and estimated the relationship among latent variables without creating indices.

7. All coefficient estimates and *p* levels assume multivariate normality. According to Byrne (2001) this requirement is usually ignored by researchers reporting SEM results. In these data, despite some transforming, we still do not meet these requirements. According to Byrne, there are several possible errors that could result from this. The one that is most serious for this article is that the standard errors of coefficients may be underestimates, thereby causing the reported *p* levels for parameter estimates to be somewhat lower than the true *p* levels. We can still expect, however, that those with reported as $p < .01$ are significant at $p = .05$.

## References

Beck, U. 1992. [1985] *Risk Society: Towards a New Modernity*. Translated by Mark Ritter. London: Sage.

Beck, U. 1999. *World Risk Society*. Malden, MA: Blackwell.

Beck, U., A. Giddens, and S. Lash. 1994. *Reflexive Modernization*. Cambridge, UK: Polity Press.

Bollen, K. 1989. *Structural Equations with Latent Variables*. New York: Wiley.

Bord, R.J. and R.E. O'Connor. 1997. The gender gap in environmental attitudes: The case of perceived vulnerability to risk. *Social Science Quarterly* 78, 830-840.

Bruhn, C.M. and H.G. Schutz. 1999. Consumer food safety knowledge and practices. *Journal of Food Safety* 19, 73-87.

Burger, J. 1998. Gender differences in attitudes about fish safety in a coastal population. *Journal of Toxicology and Environmental Health Part A* 54, 181-192.

Byrne, B. 2001. *Structural Equation Modeling with AMOS: Basic Concepts, Applications and Programming*. Mahwah, NJ: Lawrence Erlbaum.

Clark, L. and J.F. Short, Jr. 1993. Social organization and risk: Some current controversies. *Annual Review of Sociology* 1, 375-399.

Converse, P.E. 1970. Attitudes and non-attitudes. In E.R. Tufte (ed.), *The Quantitative Analysis of Social Problems*, 168-189. Reading MA: Addison-Wesley.

Crano, W.D. 1995. Attitude strength and vested interest. In R.E. Petty and J.A. Krosnik (eds.), *Attitude Strength: Antecedents and Consequences*, 131-158. Mahwah, NJ: Erlbaum.

DeShon, R.P. 1997. Do structural equation models correct for measurement error? *1997 Research Methods Forum* 2, Summer.

Dickinson, J.G. 2000. FDA field inspections fall as much as 68 percent. *Medical Marketing and Media* 35, 36.

Diehl, J.F. 1995. *Safety of Irradiated Foods*. New York: Marcel Dekker.

Dietz, T., R.S. Frey and E.A. Rosa. 2002. Risk, technology and society. In R. Dunlap and W. Michelson (eds), *Handbook of Environmental Sociology*, 329- 369. Westport, CT: Greenwood Press.

Dillman, D.A. 2000. *Mail and Internet Surveys: The Tailored Design Method*, 2nd edition. New York: Wiley.

Domhoff, G.W. 1983. *Who Rules America Now? A View for the 80s*. Englewood Cliffs, NJ: Prentice Hall.

Dye, T. 1995. *Who's Running America? The Clinton Years*, 6th edition. Englewood Cliffs, NJ: Prentice Hall.

*Food Processing*. 2002. FSIS inspectors need more training, GAO finds: New study suggests ways to improve HACCP inspections, 63, 10, 14.

Frewer, L.J., C. Howard, D. Hederly and R. Shepherd. 1996. What determines trust in information about food-related risks? Underlying psychological concepts. *Risk Analysis* 16, 473-485.

Frewer, L.J, S. Hunt, M. Brennan, S. Kuznesof, M. Ness and C. Ritson. 2003. The views of scientific experts on how the public conceptualize uncertainty. *Journal of Risk Research* 6, 75-85.

Frewer, L.J., J. Scholderer, and L. Bredahl. 2003. Communicating about the risks and benefits of genetically modified foods: The mediating role of trust. *Risk Analysis* 23, 1117-1133.

Gaskell, G. and M.A. Bauer (eds.). 2001. *Biotechnology, 1996-2000*. London, UK: Science Museum.

Giddens, A. 1990. *The Consequences of Modernity*. Stanford CA: Stanford University Press.

Giddens, A. 1991. *Modernity and Self-Identity*. Stanford, CA: Stanford University Press.

Habermas, J. 1973. *Legitimation Crisis*, translated by Thomas McCarthy. Boston, MA: Beacon.

Herrmann, R.O., R.H. Warland and A. Sterngold. 1998. Who reacts to food safety scares?: Examining the Alar crisis. *Agribusiness* 13, 511-520.

Jussaume, R.A., Jr. and L. Higgins. 1998. Attitudes towards food safety and the environment: A comparison of consumers in Japan and the U.S. *Rural Sociology* 63, 394-411.

Jones, R.E. and R.E. Dunlap. 1992. The social bases of environmental concern: Have they changed over time? *Rural Sociology* 57, 28-47.

Krosnik, J.A. and R.E. Petty. 1995. Attitude strength: An overview. In R.E. Petty and J.A. Krosnik (eds.), *Attitude Strength: Antecedents and Consequences*, 1-24. Mahwah, NJ: Erlbaum.

Larsen, C. and W. White. 1913. *Dairy Technology*. New York: Wiley.

McConnell, G. 1966. *Private Power and American Democracy*. New York: Knopf.

McSwane, D., N. Rue, and R. Linton. 2000. *The Essentials of Food Safety and Sanitation*, 2nd edition. Upper Saddle River, NJ: Prentice Hall.

Robeck, M.R. 1996. Product liability issues related to food irradiation. *Food Technology* 50, 78-81.

Ross, C. and C. Wu. 1995. The links between educational attainment and health. *American Sociological Review* 60, 719-45.

Ten Eyck, T.A. 2000. The marginalization of food safety issues: An interpretative approach to popular mass media coverage. *Journal of Applied Communication* 84, 29-47.

Ten Eyck, T.A. 2003. Food safety and media trajectories: Interpreting public interpretations. Institute of Food Technologist's International Food Safety and Quality Conference and Exposition, Orlando, FL, November.

Ten Eyck, T.A., D. Thede, G. Bode, and L. Bourquin. Forthcoming. Is HACCP nothing? A disjoint constitution between inspectors, processors, and consumers in the cider industry in Michigan. *Agriculture and Human Values*.

Unklesday, N., J. Sneed, and R. Toma. 1998. College students' attitudes, practices, and knowledge of food safety. *Journal of Food Protection* 61, 1175-1180.

US Census Bureau. 2002. Three-year-average median household income by state: 2000-2002. /www.census.gov/hhes/income/income02/statemhi.html.

Vogel, D.. 1978. Why businessmen distrust their state: The political consciousness of American corporate executives. *British Journal of Political Science* 8, 45-78.

Young, James H. 1989. *Pure Food*. Princeton, NJ: Princeton University Press.