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Consumer Trust in the U.S. Food System: An Examination of the Recreancy Theorem*

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ABSTRACT Because consumer opinions to an increasing extent affect the structure and management of the U.S. food system, it is important for social scientists to accurately model consumer trust in this system so they can better understand and anticipate public responses to existing or proposed food-related regulatory policies and facilitate effective partnership building between food-system representatives and the public. The recreancy theorem posits that individuals' trust in and support for societal institutions reflects their perceptions of the competence and fiduciary responsibility of institutional actors. This theorem might prove effective at identifying the key determinants of consumers' trust in and support for institutional actors within the U.S. food system, whether these actors be representatives of large-scale, internationally operated firms or small-scale, locally operated businesses. We used data from two nationwide samples of adults to test the recreancy theorem for seven to nine pertinent institutional actors each within five areas of the U.S. food system: food safety, nutrition, treatment of workers, environmental protection, and treatment of livestock. The resulting 55 tests of the theorem entailed the estimation of 55 structural equation models to evaluate model fit and the efficacy of perceived competence and fiduciary responsibility in explaining trust and support. The results of

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analyzing the structural equation models separately and overall indicate support for the recreancy theorem. Based upon our results, we offer suggestions for enhancing public-private partnership formation within the U.S. food system.

Introduction

We note at the early part of the twenty-first century that Americans are both geographically and conceptually far removed from the food system. That is, few live on farms (Dimitri, Effland, and Conklin 2005) and most know little about how food is produced, processed, transported, or prepared for sale (Godwin et al. 2005). Given their displacement from the food system, and as more food is produced and processed using advanced technologies or imported from many countries worldwide (Jerado 2003), U.S. consumers voice concerns about the safety and nutritional value of the food supply (e.g., White 2007; Wood and Vedlitz 2007). Also, to an increasing extent, U.S. consumers express concerns about the externalities of the food system, such as the extent of environmental degradation associated with food production and processing (e.g., Brouwer and Ervin 2002; Horrigan, Lawrence, and Walker 2002; Pew Commission 2008), the fair treatment of employees within the food system (e.g., Brouwer and Ervin 2002; Pew Commission 2008), and the humane treatment of animals grown for food (Brouwer and Ervin 2002; Pew Commission 2008; Rollin 2004). In short, now that Americans no longer live on the farm, they wonder what's going on down on it. And they worry that the news is not good. At the same time, consumer opinions significantly affect the structure and management of the U.S. food system, resulting in what some (e.g., Veneman 2001) have depicted as a *consumer-driven* agriculture. Social scientists therefore have put forth much effort into learning how best to inform consumers about the strengths and limitations of the U.S. food system. They conduct such investigations as a necessary component of engendering well-reasoned public discourse regarding current and proposed food-system policies and regulations. Informing the public about the technologies and policies arising from the operations of complex social systems is not nearly as easy as it might seem, as has been discovered through a series of trials and errors that have taken place over the past three decades (Fischhoff 1995). We have learned, for example, that ''just tell them the facts'' is a flawed approach both in its presumptions and application (see e.g., Bradbury 1989; Cohen 1985; Fischhoff 1995). Facilitating effective dialogue and decision making regarding complex social systems and potential alternatives to them,

therefore, requires sound basic science regarding the nature of individual opinion formation regarding these systems. Given its importance to understanding the public's risk perceptions and their responses to risk-communication messages, the trust concept has received much interest among scholars working within the life, physical, and social sciences (e.g., Barber 1983; Earle and Cvetkovich 1995; Slovic 2000). The goal of investigations within this area has been to explain a large amount of the variance in trust using parsimonious models that contain elements subject to influence by intervention efforts (Reynolds 1971).

We examined the extent to which the recreancy theorem might be suited to accomplishing this goal. This theorem states that the public's trust is explained by their perceptions of the competence of institutional actors and their belief that these actors will behave with fiduciary responsibility (Freudenburg 1993). Although the theorem was proposed 16 years ago, little empirical research exists to critically examine the viability of relying upon the recreancy theorem. Two key questions are: (1) Can the recreancy theorem adequately explain public trust? and (2) What are the relative effects of perceived competence and fiduciary responsibility in influencing public trust? This study examines these questions with respect to five related topics: food safety, human nutrition, environmental protection, employee care, and the treatment of livestock.

Understanding Consumer Trust

Theoretical Approaches to Understanding Trust

Trust has been conceptualized and investigated (Dasgupta 1988; Gambetta 1988; Kelton, Flelschman, and Wallace 2008; Luhmann 1979) as a personality trait, as an emergent property of human interaction (i.e., relational trust), as a feature of collectivities, and as a social bond existing between actors (i.e., interpersonal trust). As a *personality trait*, trust refers to the individual's expectations toward others (e.g., Rotter 1971), wherein trust is presumed to reflect the person's experiences in dealing with others (i.e., ''she is a trusting soul''). As a *relational property*, trust is viewed not as an attitude directed from one actor to another, but as a constructed feature of the relationship itself (i.e., ''I trust my grocer''). Trust as a *feature of collectivities* provides the needed bond by which complex social systems can fulfill the needs of their members (e.g., Luhmann 1979). This form of trust reflects the collectivity's conformance to normative expectations (i.e., ''we all recognize that grocers are trustworthy''), which

represents an essential element of organic social solidarity and hence the effective functioning of complex societies (e.g., Fukuyama, 1995; Giddens 1990, 1992; Putnam, Leonardi, and Nanetti 1993). To some (e.g., Beck 1992), this form of trust might become vulnerable as a result of rapid advances in technology, while others (e.g., Giddens 1990, 1992) assert that citizens and institutional actors have the capacity to develop a dialogue of democracy that builds trust through open, reflexive communication about system vulnerabilities.

We investigate the fourth type of trust—interpersonal trust—the perceived bond between a specific agent and the trustee (i.e., ''I trust grocers''). Later, in keeping with our focus upon the U.S. food system, we shall refer to this form of trust as *consumer trust*. As noted by Kelton et al. (2008), the conceptual foundations of interpersonal trust are posited as motivational relevance and expectations of competent and reliable performance (Barber 1983; Deutsch 1958; Rasmussen 1983). Typically, this form of trust is operationalized as the attitude that an actor holds toward the object, such as an expectation of competence (e.g., Barber 1983; Blomqvist 1997; Hart and Saunders 1997), goodwill (Blomqvist 1997; Hardin 2001), ethical behavior (Barber 1983), or commitment to a future action (Anderson and Weitz 1989; Gambetta 1988; McAllister 1995; Zaheer, McEvily, and Perrone 1998). Interpersonal trust likely is associated with trust as a feature of collectivities to the extent that it serves as a foundation for organic social solidarity (e.g., Cook 2005). Given its important theoretical and empirical connections to organic social solidarity, social scientists have exhibited an enduring interest in understanding the public's interpersonal trust in societal institutions. This interest has been manifested in studies focusing upon broad areas of societal efficacy, such as economic performance (e.g., Fukuyama 1995), civic participation (e.g., Putnam et al. 1993), social cohesion (e.g., Barber 1983), social order (e.g., Luhmann 1979), and to some extent the U.S. food system (Sapp and Korsching 2004).

Causal Models of Interpersonal Trust

Approaches to modeling interpersonal trust for the most part have been dominated by disciplines such as engineering, applied mathematics, and psychology (see reviews by Alario and Freudenburg 2003; Bradbury 1989; Knight and Warland 2005). Technical approaches advanced in engineering and mathematics (i.e., ''quantitative risk assessment''; see Renn 1992) have in common a focus upon what might be called the cognitive elements of trust in societal institutions. That is,

they emphasize getting the facts right and convincing the public of the competence—the skills and expertise—of those involved in technology development and management (e.g., Starr 1969). Because these approaches are guided by the seemingly intuitive logic of positivist scientific inquiry, they assume that quantitative risk assessments are correct, unbiased, and unaffected by political and economic contingencies. These assumptions, of course, are unrealistic (e.g., Adams 1995; Freudenburg 1988) and fail to recognize that interpersonal opinions reflect a broader range of determinants than just cognitive ones (e.g., Krimsky and Golding 1992).

Social-science theories posit that emotional elements can be at least as if not more important than cognitive ones in affecting interpersonal trust. The psychometric approach (e.g., Covello, Sandman, and Slovic 1988; Frewer et al. 1998; Slovic 2000), for example, focuses upon the effects of emotional as well as cognitive elements of interpersonal trust. Similarly, the cultural approach (Douglas and Wildavsky 1982) posits that the extent to which people will attribute risks to the actions of societal institutions reflects particular forms of social organization, culturally bound customs, and prevailing worldviews. A related line of inquiry evaluates perceived source credibility as a key determinant of interpersonal trust (e.g., Frewer et al. 1996; Jungermann, Pfister, and Fischer 1996; Peters, Covello, and McCallum et al. 1997; Trumbo and McComas 2003).

The Recreancy Theorem

The recreancy theorem derives from the sociological tradition of recognizing that citizens of technologically advanced societies are more dependent upon rather than in control of their technologies (Alario and Freudenburg 2003; Barber 1983; Freudenburg 1993). The theorem posits that trust reflects assessments of the competence (i.e., skill and expertise) of institutional actors and the belief that they will express fiduciary responsibility (i.e., a felt obligation to act on the behalf of the trusting party). It recognizes that risk is socially constructed, wherein contemporary citizens ''are dependent not just on the technologies, but also on the social relations that bring them into being, involving whole armies of specialists, most of whom have areas of expertise that we may not be competent to judge, and many of whom we will never even meet, let alone have the ability to control'' (Alario and Freudenburg 2003:200). Institutional actors must therefore be perceived as both competent and reasonably responsive to citizens (Freudenburg 1993).

In this manner, like other social-science approaches to understanding consumer risk perceptions, and in contrast with technical approaches, the recreancy theorem recognizes that people evaluate risk based upon their assessments of institutional responsibility as well as upon quantitative assessments issued by technical experts. As with other social-science approaches, the recreancy theorem posits that risk perceptions cannot be explained solely by differential levels of knowledge about potential hazards or by personal characteristics of the risk perceivers (see Brown and Mikkelsen 1990; Jasper 1988; Krauss 1989; Kroll-Smith and Couch 1990; Levine 1982; Rosa and Freudenburg 1984). In contrast with or perhaps as a complement to other social-science approaches, the recreancy theorem focuses upon citizens' evaluations of societal institutions rather than upon their evaluations of the technological sources of potential harm.

The term *recreancy* was selected (Freudenburg 1993) to imply a failure to behave according to normative expectations. Thus, it is intended to avoid moralistic evaluations of institutional actors as evildoers or as engaging in malpractice or misfeasance and focus instead upon ''failures'' resulting from insufficient skills and abilities or actions taken that contradict the values held by the evaluator of the institution's actions. Within the arena of food safety, for example, a food company might be considered as ''recreant'' if its products contain more contaminants than the public deems appropriate, either because the food company lacks the expertise to effectively remove the contaminants (i.e., a lack of competence) or because the food company incorrectly assumes, from the perspective of the public, that cost control is more important than devoting additional resources to reduce contaminants to a lower level (i.e., a lack of fiduciary responsibility).

Central to the recreancy theorem, therefore, are the propositions that trust in societal institutions results from public evaluations of the competence and fiduciary responsibility of institutional actors. Unfortunately, few studies have tested this theorem with empirical observations. Freudenburg (1993) found that the recreancy theorem explained about three times as much variance in individuals' concern about handling of nuclear wastes as did sociodemographic (i.e., age, sex, employment sector) and ideological (i.e., political party affiliation, political ideology) variables.

A Causal Model of Consumer Trust in the U.S. Food System

This investigation focused upon interpersonal trust expressed by consumers in the U.S. food system (i.e., *consumer trust*). In relying

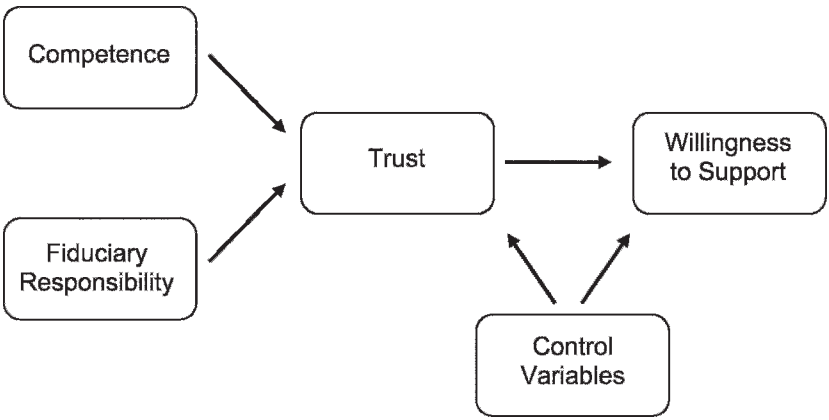

Figure 1. Causal Model Depicting the Recreancy Theorem

upon the recreancy theorem, we posit that the two key determinants of consumer trust in the U.S. food system are the perceived competence of institutional actors and the belief that these actors will behave with fiduciary responsibility (Figure 1). Thus, the recreancy theorem specifies that trust for the beholder rests upon the actions of the agents held responsible for risk rather than upon statements issued by quantitative risk assessors about risk.

This proposition regarding the causal mechanisms of trust requires for the purpose of theoretical closure a specification of an external validation of trust. That is, an assertion of trust by a beholder might not be a valid one within an applied setting without it being accompanied by an expression of commitment toward a behavior (e.g., Keh and Xie forthcoming). We therefore posit that an expressed willingness to support the recommendations made by institutional actors results from trust in these actors. This specification is one of many that might be used in examining the predictive validity of the recreancy theorem.

We specify this model to evaluate the extent to which the recreancy theorem can explain variance in trust, but do so within the context of recognizing other potential explanations of trust, such as the sociodemographic characteristics of the respondents (e.g., Davidson and Freudenburg 1996; Freudenburg and Davidson 2007) and their general concerns about the food system (e.g., Earle and Cvetkovich 1995). To this end, we include as control variables the age, formal educational attainment, household income, and sex of the beholders, and their expressed concerns regarding the topic under consideration. Also included as a control variable is the extent to which the

respondent believes the actor under consideration is responsible for behaviors related to the areas of the food system being evaluated. That is, because interpersonal trust depends in part upon the extent of perceived responsibility of the actor (e.g., Blomqvist 1997; Luhmann 1979), we thought it important to assess the model variables within the context of an assessment of this perceived responsibility.

Methodology

The Samples

Data were collected in two Internet-delivered surveys of the general public conducted in fall 2007 (''Study 1'') and summer 2008 (''Study 2''). The samples were drawn from Survey Sampling International's (SSI) consumer Internet panel, wherein participants were recruited through web-related contacts. Given that nearly 70 percent of homes in the United States have Internet access at home, a thorough compilation of potential panel members should cover most of the U.S. population, with less representation expected among lower-income households (Reuters 2007). After contacting potential respondents from the SSI sample frame, we selected study participants in Study 1 if they were primarily responsible for purchasing food prepared at home and were between the ages of 21 and 65. We selected participants in Study 2 if they were between the ages of 21 and 65. Each study had a survey response rate of approximately 25 percent.

Given the biased sample frame and low response rates, the samples, albeit national in scope, should be used with caution if attempting to generalize consumer opinions to the U.S. population. Our primary purpose was testing the recreancy theorem, which without empirical evidence to the contrary presumably applies to all members of a population. Therefore, we have no reason to expect that a biased sample should affect our theory testing. Nevertheless, we used sociodemographic characteristics of the respondents as statistical controls within our models to investigate potential limitations of the theorem in its application to the U.S. population.

Measurement and Data Analysis

The efficacy of a theory is enhanced by successful tests of it across a broad range of applications (Reynolds 1971). Also, research results can be more effectively conveyed through efforts at public sociology when these results apply to a broad range of potential constituents (Burawoy 2005). We therefore sought to test the recreancy theorem across a broad range of activities that represent the U.S. food system. We

collected information from respondents regarding their opinions of food safety, the nutritional quality of food, the fair treatment of food-related workers, the humane treatment of animals grown for food, and the protection of the environment as part of the production, processing, and retailing of food. Within each of these five areas, we selected seven to nine pertinent institutional actors whose activities are associated with the area (see Table 3 for the complete listing of actors within each area).

The data come from two samples, as described below. In Study 1, we asked respondents (N = 2,008) to rate each institutional actor on competence, fiduciary responsibility, trust, and support. For example, within the area of food safety, we asked the respondent to rate farmers/producers on all the model variables, then we asked the respondent to rate food companies/processors on all the model variables, and so forth to obtain ratings from the respondents on all the model variables for all the selected institutional actors within all five selected areas of the food system. In Study 2, some respondents (n = 1,321) provided ratings for all the model variables related to food safety and others (n = 685) provided ratings related to the humane treatment of livestock.

We gave these instructions to respondents to assess their ratings of competence for each area: ''Please tell us how competent these groups are at [the area]. Do they have the knowledge and skills to do a good job? Give a rating of 0 if you think they have no competence [in the area] and a rating of 10 if you think they are completely competent [in the area]. You can use any number between 0 and 10 to express your opinion.'' We gave similar instructions for the remaining model variables; we described fiduciary responsibility by asking, ''Do they have the same values as you do so you know they will do the right thing?'' described trust by requesting, ''Please tell us how much trust you have in the following groups [regarding the area],'' and described support by requesting, ''Please tell us how much you are willing to support the recommendations made by the following groups [regarding the area].'' Statistical controls on trust and support included age, sex, years of formal education, concern about the area, and an assessment of the extent to which the institutional actor was responsible for the area. To measure concern we requested, ''Please tell us how concerned you are about the following [area of] the food system.'' To measure opinions about responsibility we requested, ''Please allocate 100 points across the following [institutional actors] to tell us how much responsibility you believe each [one] has for ensuring the safety of the food we eat in the United States. Give more points to those [actors] you believe are more responsible for food safety and fewer

points to those [actors] you believe are less responsible for food safety. You can give any number of points from 0 to 100 to any [actor].''

Because our purpose was to assess the recreancy theorem across a broad range of actors, to manage respondent burden we avoided asking multiple questions for each model variable, for each actor, for each area. Therefore, we tested the 55 models of the U.S. food system using single, observed indicators of each model variable. To provide some sense of the reliability of the measures, we conducted principal-components factor analysis of the ratings provided by actors for each of the five areas of the food system.

We used the LISREL 8 (Jöreskog and Sörbom 1995) statistical package to estimate the 55 structural equation models. These models took the form:

$$\Sigma(\Theta)_j = \begin{matrix} \lceil (I-B)^{-1}(\Gamma\Phi\Gamma'+\Psi)(I-B)^{-1'} & (I-B)^{-1}\Gamma\Phi \rceil \\ \lfloor \Phi\Gamma'(I-B)^{-1'} & \Phi \rfloor_j \end{matrix}$$

where $\Sigma(\Theta)$ refers to the population covariance matrix for each of the $j = 55$ models, I refers to the identity matrix, B refers to the parameter estimate for the effect of trust on support, Γ refers to the matrix of parameter estimates for the effects of competence and fiduciary responsibility on trust and the effects of the statistical controls on trust and support, Φ refers to the variances and covariances among the exogenous variables, and Ψ refers to the unique variances for the estimations of trust and support.

Results

In Study 1, most respondents were female, ranging in age from 21 to 65 years (Table 1). Approximately 33 percent had a high school education, about 22 percent had vocational or technical training, and about 45 percent had at least a college education. The ages and educational attainments of respondents in Study 2 were similar to those in Study 1. The respondents in Study 2 were about evenly represented by males and females. Respondents in Study 2 were asked to state their total household income before taxes within five categories. Their responses indicate a slightly more affluent sample than is representative of the U.S. population (U.S. Bureau of the Census 2007).

We computed the average scores across the seven to nine institutional actors for the model and control variables within each of the topic areas (Table 2). The respondents in Study 1 seemed very concerned about the U.S. food system, with an average response of about 8 out of 10 regarding their concerns about food safety, nutrition,

Table 1. Descriptive Statistics for the Samples in Study 1 and Study 2

	Study 1[a]	Study 2	
	All Areas (Percentage)	Food Safety[b] (Percentage)	Livestock[c] (Percentage)
Age			
21 to 25	4.63	17.60	18.39
26 to 34	12.60	14.88	14.01
35 to 44	21.81	22.66	28.76
45 to 54	33.02	21.74	17.96
55 to 65	27.94	21.52	20.88
Sex			
Males	1.54	58.44	50.51
Females	98.46	41.56	49.49
Education			
Less than high school	0.80	1.16	0.73
High school	31.87	26.00	26.72
Vocational/technical	22.41	21.80	21.46
College degree	34.11	39.54	39.85
Masters degree	9.41	9.49	9.78
PhD/doctoral degree	1.39	2.03	1.46
Income			
Less than $25,000	—	18.05	15.09
$25,000 to $49,999	—	30.39	33.18
$50,000 to $74,999	—	24.53	22.64
$75,000 to $99,000	—	12.34	15.57
$100,000 or more	—	14.69	13.52

[a] The sample size for Study 1 is 2,008.
[b] The sample size for persons responding to the food safety questions in Study 2 is 1,381.
[c] The sample size for persons responding to the treatment of livestock questions in Study 2 is 685.

environmental protection, and treatment of farm animals, and a score over 7 regarding the treatment of workers, wherein a score of 10 indicated ''very concerned'' about the topic (Table 2). Respondents in Study 2 seemed to be less concerned about food safety, with an average response of about 7 out of 10 on this topic. At the same time, most of the average scores on competence, fiduciary responsibility, trust, and support were in the 6 out of 10 range, indicating that respondents expressed moderate agreement that institutional actors within the U.S. food system were capable, responsive, and trustworthy and would receive some support for their recommendations to the public. These results might indicate a high level of concern among U.S. consumers about their food system and moderate levels of trust and support for institutional actors within this system, but the results should be viewed with caution given the biased sample.

Table 2. Descriptive Statistics for the Model Variables for Studies 1 and 2

Variable	Study 1[a]		Study 2[b]	
	Mean	Standard Deviation	Mean	Standard Deviation
Competence				
Food safety	6.835	1.525	6.271	1.713
Nutrition	6.515	1.713	—	—
Worker care	6.227	1.932	—	—
Environmental protection	6.171	2.007	—	—
Treatment of livestock	6.294	1.918	5.461	1.885
Fiduciary responsibility				
Food safety	6.638	1.620	6.078	1.794
Nutrition	6.377	1.738	—	—
Worker care	5.938	1.989	—	—
Environmental protection	5.919	2.015	—	—
Treatment of livestock	6.134	1.956	5.273	2.005
Trust				
Food safety	6.370	1.657	5.938	1.799
Nutrition	6.247	1.786	—	—
Worker care	5.864	2.026	—	—
Environmental protection	5.870	2.035	—	—
Treatment of livestock	6.049	1.988	5.245	1.976
Support				
Food safety	7.183	1.795	6.579	1.983
Nutrition	6.777	1.928	—	—
Worker care	6.641	2.047	—	—
Environmental protection	6.687	2.044	—	—
Treatment of livestock	6.747	2.058	5.653	1.999
Concern				
Food safety	8.457	2.053	6.950	2.732
Nutrition	8.318	1.806	—	—
Worker care	7.435	2.383	—	—
Environmental protection	8.033	2.108	—	—
Treatment of livestock	7.966	2.308	7.457	2.807

[a] The sample size for Study 1 is 2,008.
[b] In Study 2, the sample size for persons responding to the food safety questions is 1,381 and for persons responding to the treatment of livestock questions is 685.

The results of the principal-components factor analysis and the reliability analysis showed that, at least across areas, respondents provided consistent interpretations of the concepts (results available upon request). That is, factor analysis indicated a single factor for each concept across areas and the Cronbach (1951) alphas for the 35 assessments of reliability ranged from .80 to .94. These results confirm the consistency of responses for concepts across areas, but not necessarily the construct validity of the concepts themselves.

All of the parameter estimates for the model variables for all 55 models were statistically significant at $p < .01$ (Table 3). The explained variance for trust ranged from .590 to .837, and the average *R*-square equaled .745 in Study 1 and .677 in Study 2. The model explained from .299 to .713 of the variance in support, with an average *R*-square value of .496 in Study 1 and .512 in Study 2. The averages for the adjusted goodness-of-fit indexes, squared-root mean residuals, and critical N's for the 55 models were .953, .040, and 536.668, respectively. The average standardized estimates for the effects of competence on trust, fiduciary responsibility on trust, and trust on support equaled .214, .671, and .676 in Study 1 and .171, .672, and .701 in Study 2. The standardized estimates for the effect of fiduciary responsibility on trust, therefore, ranged between two to five times larger and on average were three times larger than the estimates for the effect of competence on trust.

The standardized effects on trust show the importance of the model variables in explaining trust in comparison with the control variables (concern and responsibility) and the sociodemographic variables. That is, the model variables (competence and fiduciary responsibility) on average accounted for 98.62 percent and 97.65 percent of the explained variance in trust in Study 1 and Study 2, respectively (results available upon request). The percentage of the explained variance in trust accounted for by the sociodemographic variables in Study 1 and Study 2 equaled 0.58 and 1.14, respectively. And the percentage of the explained variance in trust accounted for by the control variables in Study 1 and Study 2 equaled 0.80 and 1.21, respectively.

We used the sociodemographic variables as statistical controls for expressions of trust. Thus, the analysis yielded 123 estimates for the sociodemographic variables used in the 41 models estimated in Study 1 and 56 estimates for the sociodemographic variables used in the 14 models estimated in Study 2 (results available upon request). Of these, 27 (15.1 percent) were statistically significant at $p < .05$. The most important of the sociodemographic variables seemed to be level of formal education in Study 1 and age in Study 2. Sex was not a statistically significant indicator of trust in any of the 14 models estimated in Study 2.

Opinions expressed about the model variables likely were correlated across institutional actors and areas of the U.S. food system. Hence, it might be anticipated that the variances of the parameter estimates were unequal across areas and actors. We therefore preferred to conduct hierarchical linear analysis to obtain more accurate calculations of the average parameter estimates. Unfortunately, the responses were paired comparisons conducted by the same respondents rather than opinions

Table 3. Standardized Estimates and R-square Values for the 55 Causal Models

Model	Causal Path			Explained Variance	
	Competence → Trust	Fid. Resp. → Trust	Trust → Support	*R*-Square Trust	*R*-Square Support
	Study 1[a]				
Food safety					
Farmers and producers	.177	.699	.587	.658	.371
Food companies/ processors	.154	.677	.571	.648	.335
Grocery stores	.233	.608	.552	.645	.324
Restaurants	.232	.619	.550	.657	.331
Food prepared at home	.223	.579	.520	.590	.299
Regulatory agencies	.169	.697	.654	.720	.439
Advocacy groups	.176	.646	.687	.671	.523
Nutrition					
Farmers and producers	.250	.654	.708	.754	.537
Food companies/ processors	.218	.676	.699	.758	.511
Grocery stores	.253	.628	.682	.724	.498
Restaurants	.252	.637	.677	.739	.500
Food prepared at home	.274	.560	.535	.643	.331
Regulatory agencies	.213	.701	.724	.795	.548
Advocacy groups	.226	.664	.771	.779	.648
K–12 schools	.287	.631	.751	.813	.624
Doctors/dieticians	.210	.645	.755	.720	.601
Worker care					
Farmers and producers	.214	.690	.684	.760	.504
Food companies/ processors	.200	.699	.649	.762	.453
Grocery stores	.202	.681	.653	.729	.457
Restaurants	.241	.648	.637	.733	.440
Employees	.197	.623	.584	.624	.367
Regulatory agencies	.209	.688	.712	.768	.525
Labor unions	.252	.629	.740	.758	.612
Advocacy groups	.239	.660	.782	.785	.662
Environment					
Farmers and producers	.192	.732	.715	.826	.541
Food companies/ processors	.165	.752	.688	.801	.393
Grocery stores	.208	.697	.673	.776	.479
Restaurants	.210	.700	.680	.788	.495
People like yourself	.216	.619	.596	.658	.419
Federal regulatory agencies	.198	.716	.678	.801	.495
State regulatory agencies	.181	.731	.686	.798	.519
Advocacy groups	.258	.642	.756	.789	.646
Treatment of livestock					
Farmers and producers	.154	.768	.675	.814	.468

Table 3, Continued

Model	Causal Path			Explained Variance	
	Competence → Trust	Fid. Resp. → Trust	Trust → Support	*R*-Square Trust	*R*-Square Support
Food companies/ processors	.165	.752	.688	.794	.487
Grocery stores	.208	.697	.673	.799	.479
Restaurants	.161	.754	.691	.797	.502
People like yourself	.215	.649	.642	.708	.450
Regulatory agencies	.232	.676	.704	.779	.518
The U.S. Humane Society	.246	.634	.746	.750	.650
PETA[b]	.248	.653	.762	.814	.713
Other advocacy groups	.311	.609	.792	.837	.618
		Study 2[c]			
Food Safety					
Farmers and producers	0.136	0.718	0.716	0.692	0.520
Food companies/ processors	0.140	0.699	0.647	0.649	0.424
Grocery stores	0.175	0.669	0.686	0.660	0.470
Restaurants	0.173	0.676	0.659	0.664	0.442
Food prepared at home	0.184	0.649	0.699	0.651	0.493
Federal regulatory agencies	0.209	0.662	0.715	0.734	0.526
State regulatory agencies	0.168	0.702	0.694	0.735	0.510
Advocacy groups	0.174	0.677	0.748	0.700	0.587
Treatment of livestock					
Farmers and producers	0.128	0.699	0.672	0.665	0.474
Food companies/ processors	0.230	0.650	0.703	0.691	0.502
Grocery stores	0.122	0.711	0.692	0.667	0.505
Restaurants	0.189	0.658	0.694	0.663	0.506
Federal regulatory agencies	0.161	0.654	0.724	0.663	0.554
Advocacy groups	0.205	0.580	0.769	0.642	0.652
Average effect (Study 1)	0.214	0.671	0.676	0.745	0.496
Average effect (Study 2)	0.171	0.672	0.701	0.677	0.512

All of these parameter estimates are statistically significant at $p < .01$.

[a] The sample size for Study 1 is 2,008.

[b] People for the Ethical Treatment of Animals.

[c] In Study 2, the sample size for persons responding to the food safety questions is 1,381 and for persons responding to the treatment of livestock questions is 685.

expressed by independent samples of respondents. Also, hierarchical linear analysis conducted either by area or institutional actor might provide biased results because the number of areas equaled just five and the maximum number of actors within an area equaled just nine

(Raudenbush and Bryk 2002). We therefore omitted hierarchical linear analysis of the parameter estimates. The average estimates presented in Table 3, therefore, likely are biased ones. Observing the relative sizes of these averaged effects, however, substantively yields the conclusion that the model variables far outweighed the effects of the control and sociodemographic variables in explaining trust and that perceived fiduciary responsibility far outweighed perceived competence in explaining consumer trust in the U.S. food system.

Discussion

As an essential element of providing a safe food supply and maintaining high standards for food wholesomeness, the humane treatment of animals, environmental protection, and the fair treatment of employees, the U.S. food system undergoes continuing evaluation by many agencies and organizations. To some extent these evaluations are affected by the opinions of a largely ignorant and therefore an understandably skeptical public. As part of an effort to facilitate well-reasoned public discourse about existing or proposed food-related policies and regulations, we assessed the extent to which the recreancy theorem explained consumers' opinions of the U.S. food system and their willingness to support the recommendations and policies offered by institutional actors associated with this system. Public trust in and support of societal institutions, within the food system or other areas of society, represent to some extent the willingness of citizens to recognize and accept the interdependencies of a complex social system (e.g., Cook 2005). In this respect, this study examined a theoretical approach to understanding the extent to which citizens express trust in and support for their societal institutions, wherein trust in and support of societal institutions serve as two key indicators of organic social solidarity (Durkheim 1947).

We examined the efficacy of the recreancy theorem to explain consumer trust in and support for actors within five areas of the U.S. food system: safety, nutritional quality, treatment of workers, environmental protection, and treatment of livestock. This examination involved interpreting the overall results of 55 applications of the recreancy theorem in the form of structural equation models. We conclude that the results show support for the recreancy theorem in explaining consumer trust in and support for institutional actors within the U.S. food system. That is, the model statistics indicate good fit of the data to the theorem and the average explained variances in trust and support across the 55 models tested equaled .728 and .500, respectively.

Also, the two primary indicators of trust—competence and belief in fiduciary responsibility—accounted for most of the explained variance in trust (98.62 percent in Study 1 and 96.65 percent in Study 2), and trust accounted for most of the explained variance in willingness to support the recommendations of institutional actors (96.44 percent and 98.51 percent in Studies 1 and 2, respectively). Also, we found low standardized total effects for the statistical controls of concern, responsibility, age, sex, income, and years of formal education on trust and willingness to support recommendations.

Further research is required to evaluate the model on a more representative sample of the U.S. population. Research is necessary also on a wider range of topics than trust in the U.S. food system. It might be instructive also to examine the efficacy of the model using longitudinal rather than cross-sectional data. Similarly, both qualitative and quantitative research and analysis should further explore the construct validity of the model concepts (see Freudenburg 1993 for suggested research designs). That is, to reduce respondent burden, we used single indicators of competence, fiduciary responsibility, trust, and support; thus, we have no means by which to empirically validate our measures of these variables. We note also that it might have been difficult for respondents to rate the model variables for –seven to nine institutional actors within five areas of the U.S. food system. Also, in some cases competence and fiduciary responsibility might have little effect on the *behavior* of societal institutions because these institutions have few options for policies and action (e.g., Barber 1983).

We found in estimating the recreancy theorem to explain trust in and support for institutional actors within the U.S. food system that the effects of fiduciary responsibility on trust outweighed those for competence by about three to one. Given this finding, one might wonder if trust and fiduciary responsibility simply are conceptually synonymous. This proposition is worthy of further empirical investigation, but we note that one also can make a valid argument that competence and trust are synonymous. In fact, theoretical approaches to understanding public risk perceptions arising from the disciplines of engineering, economics, and to some extent psychology have advanced this proposition; that is, that trust is most related to perceptions of the skills and expertise of technology developers (Freudenburg 1993; Knight and Warland 2005; Slovic 2000). The recreancy theorem's purpose is to evaluate the relative effects of competence and fiduciary responsibility on trust, and there seems to be no a priori rationale for stating that one of these determinants is necessarily more conceptually related to trust than the other.

The finding that fiduciary responsibility outweighs competence in understanding public trust might have a significant implication for improving approaches to risk communication. That is, the results imply that making consumers aware of the skills and expertise of food-industry actors might be a key element in gaining their trust. In accordance with technical approaches to risk communication, therefore, these findings support efforts to inform consumers about the competence of actors in the food system. Given the relatively much stronger effect of fiduciary responsibility on trust found consistently across the 55 models, however, it might be that consumers' trust is influenced to a stronger extent by their beliefs that institutional actors will behave with fiduciary responsibility. This finding implies communication approaches that convey a sense of responsibility to the public in addition to educating them about skills and expertise. Because fiduciary responsibility can perhaps endure the inevitable failings of technology development and management, fostering it might serve as the best mechanism for building and maintaining partnerships between science, industry, and the public. This proposed approach to partnership building might be effective, or not. A relevant point is that advising institutional actors to make significant investments in implementing such an approach assumes that the recreancy theorem accounts for a significant proportion of the variance in public trust. Our findings support this assertion.

The results imply that the type of partnership building between citizens and societal institutions envisioned by Fischhoff (1995) might best be created, ironically, by a form of noncommunication. That is, because the effect of fiduciary responsibility outweighed the effect of competence on trust across the 55 models, true partnerships might form and endure through citizens' impressions that institutional actors will behave with fiduciary responsibility. And it is unlikely that institutional actors can gain this sense of fiduciary responsibility simply by telling the public ''we know what we are doing and we are good people.'' We suspect that actions rather than words are needed to promote public confidence in fiduciary responsibility.

Actions indicating corporate social responsibility and responsiveness to technology-related problems, therefore, might be the keys to building successful partnerships between the public and institutional actors. Some evidence suggests that U.S. corporations appreciate the potential value of social corporate responsibility (''Just Good Business'' 2008) and that it can improve public perceptions of these actors as well as company financial performance (Margolis and Walsh 2003). Or there might be approaches other than corporate social responsibility

that can improve public confidence in institutional fiduciary responsibility. More research is needed to test approaches to building confidence in institutional fiduciary responsibility and the links between the extent of this confidence and the degree of organic social solidarity. Still, the results suggest that researchers and practitioners pursue a more sociological approach to facilitating partnership building between the public and institutional actors. That is, exploring approaches to engendering institutional fiduciary responsibility might be more productive than sharpening institutional actors' techniques of risk communication about their skills and expertise.

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