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A note on modeling consumer reactions to a crisis: The case of the mad cow disease

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Abstract

What drives the behavior of consumers when faced with a product-related crisis, such as that involving food contamination or life-threatening design flaws? For both consumers and companies, these crises have become of increasing importance because of the globalization of markets and an increased coverage by the media. Marketers need to understand why and how consumers react to a crisis. We show that by decoupling risk response behavior of consumers into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumers' reactions is possible. Such a framework helps provide answers on how marketers can deal with such types of crises. The merits of this conceptualization are illustrated in two field studies that examine the reactions of German, Dutch, and American consumers to the BSE (mad cow disease) crisis. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

What drives the behavior of consumers when faced with a product-related crisis, such as that involving food contamination or life-threatening design flaws? While some crises have influenced the recall, redesign, and communication efforts of individual companies (such as Tylenol, Perrier, Ford, Goodyear, and Shell), others—such as the threat of BSE in beef—can compromise an entire industry. Yet the behavior of

consumers in a crisis situation is not always consistent with the true level of risk they face. This note examines how seemingly inconsistent behaviors of consumers in three countries can be explained by a combination of risk perceptions and risk attitudes. Knowing the drivers of behavior provides insights on whether the solution to the crisis lies in more effective communication efforts or in more drastic measures with respect to product supply (such as recalls or product elimination).

We argue that by decoupling the risk response behavior of consumers into the separate components of risk perception and risk attitude, we can develop a more robust segment-level conceptualization and prediction of consumers' reactions. This, in turn, provides answers as to how marketers can deal with different segments of consumers in a crisis situation.

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Food safety crises have the potential to dramatically illustrate the need marketers have to understand why and how consumers react to a crisis. Since such crises can be seen as wide spread, catastrophic, and of irrevocable consequence, we examine the crisis of mad cow disease because of its economic consequence to an entire industry and an entire continent. To examine how different countries are influenced, we conduct two field studies with consumers in Germany, the Netherlands, and the United States who have responded differently to the crisis. We show that the relative influence of risk perception and risk attitude on consumers' reactions depends on the accuracy of knowing the probability of being exposed to the risk. These results suggest while clear, forthright, and consistent communication is effective in some countries, other countries require more extreme measures with respect to product supply.

We begin with a brief overview of the role of risk attitude and risk perception in consumer behavior. The independent impact both concepts have on behavior is then reviewed. A general conceptual framework of risk behavior is presented. Two field studies examine this framework across the three countries. The results strongly suggest that decoupling risk attitudes from risk perceptions can be valuable in determining what drives the behaviors of various consumer segments in crisis situations. Knowing these drivers suggests what solutions will be most effective in controlling such crises.

2. Consumer risk behavior: some key notions

Risk is a key component of consumer behavior.¹ In their seminal article, Hauser and Urban (1979)

¹ The decision-making literature sometimes makes a distinction between risk and uncertainty (Knight, 1933). In that literature, the term risk refers to the situation where the decision-maker knows the probabilities associated with the possible consequences, while the term uncertainty refers to the situations in which these probabilities are not known. Consistent with marketing literature, we use the term risk to mean uncertainty. When probabilities are known, we explicitly use the term "known probabilities". Kahn and Sarin (1988) used the term ambiguity when referring to risky decisions for which the probabilities of the uncertain event were not known. Hirshleifer and Riley (1992) disregard Knight's distinction between risk and uncertainty, but make a distinction between hard and soft probability.

stimulated a wide range of studies that focused on how risk influenced decisions.² Consumer decision-making and behavior is often analyzed and reported in terms of *perceived risk* (Bauer, 1960, 1967; Bettman, 1973; Pras & Summers, 1978; Rao & Farley, 1987; Srinivasan & Ratchford, 1991). The concept of perceived risk imbeds two dimensions: perception of the uncertainty and the seriousness of adverse consequences. This concept is primarily used in research focusing on potential negative outcomes (e.g., Dowling & Staelin, 1994; Engel, Blackwell, & Miniard, 1986; Zaltman & Wallendorf, 1979). However, focusing only on the adverse consequences of risk presents a specific framing of the risk that is different from the approach taken in other disciplines such as *economics* and *statistical decision theory* (e.g., Bazerman, 2001). In these disciplines, the concept of *risk perception* consists only of the first dimension of the perceived risk concept—the uncertainty component (see Fishburn, 1983, 1988; Schoemaker, 1982). The economics and statistical decision theory approach is particularly useful in domains, such as financial and health-related domains, where there can be wide differences in both risk attitudes and risk perceptions (Keller, 1985; MacCrimmon & Wehrung, 1990; March & Shapira, 1987; Shapira 1995).³

In this paper, we use the concept of risk perception instead of perceived risk, since it allows us to truly decouple risk response into the components risk perception and risk attitude (the concept of perceived risk assumes risk aversion and hence embeds already a risk preference).⁴ In the next section, a conceptual framework is developed in which risk perceptions and risk attitudes play a key role in understanding consumers' risk behavior.

² Risk is modeled in this paradigm by reflecting the decision-maker's response to uncertain outcomes defined in terms of specific probabilities of risk.

³ It is interesting to note that, depending on the individual and the situation, subjects can engage in both risk-taking as well as risk-avoiding behavior (Brockhaus, 1980; Smidts, 1997).

⁴ The concept of risk perception is closely related to the Pratt and Arrow framework of risk management, in which risk perception is reflected in the variance of outcomes.

3. Conceptual framework

We propose that consumers' reactions to a crisis can be effectively modeled as a combination of risk perceptions, risk attitudes, and the interaction between them. *Risk perceptions* reflect the consumers' interpretation of the chance to be exposed to the content of the risk and may be defined as a consumer's assessment of the uncertainty of the risk content inherent in a particular situation. *Risk attitude* reflects a consumer's general predisposition to risk in a consistent way. Risk attitude and risk perception are two different concepts. Whereas risk attitude deals with the decision-maker's interpretation of content of the risk and how much (s)he dislikes the risk, risk perception instead deals with the decision-maker's interpretation of the chance to be exposed to the content of the risk.

The notable work of Arrow (1971) and Pratt (1964) provides further insights into the relationships between risk perceptions and risk attitudes, and risk behavior. In Pratt and Arrow's work, risk management, reflected in the risk premium π , is a function of risk attitude (risk aversion r), the situation (base wealth W) and risk perception (with a mean of $\bar{\varepsilon}$ and σ^2 variance of source of additional wealth ε). Risk management is determined such that the risk premium leaves the decision-maker indifferent between holding the perceived risky asset or holding its mean value minus the risk premium: $EU(W + \varepsilon) = U(W + \bar{\varepsilon} - \pi)$, where EU is the expected utility. In the expected utility model this translates into:

$$\begin{aligned} EU(W + \varepsilon) &= \int U(W + \varepsilon)f(\varepsilon)d\varepsilon \\ &= U(W + \int \varepsilon f(\varepsilon)d\varepsilon - \pi), \end{aligned}$$

where $U(\cdot)$ is the von Neumann–Morgenstern utility and $f(\cdot)$ the probability density function of additional wealth ε . It can be shown that the risk premium π is equal to

$$\pi = \frac{1}{2} \int \varepsilon^2 f(\varepsilon)d\varepsilon \frac{-U''(W)}{U'(W)},$$

which can be written as: $\pi = \frac{1}{2}\sigma^2 r(W)$, where $r(W) = -U''(W)/U'(W)$, the Pratt–Arrow coefficient of absolute risk aversion.⁵

This demonstrates that risk management behavior depends on risk attitude $r(W)$, risk perception σ^2 , and the product between them. Consequently, the Arrow and Pratt framework implies that not only risk perception or risk attitude, but also their interaction, drive risk behavior. This interaction reflects that risk averse decision-makers will engage in behavior that reduces risk, and that this becomes more prominent as the decision-maker perceives more risk (e.g., Pennings & Smidts, 2000).

By decoupling risk response behavior into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumer reactions is possible. The insights that result from decoupling risk perceptions and risk attitudes can yield important managerial implications. Consider the two following outcomes.

Outcome #1. Suppose that risk perception is the main driver of consumers' reactions. This would suggest that effectively communicating research information is a powerful tool in changing behavior. That is, providing and communicating the "true" probabilities of being exposed to the risk (when possible) will be a useful way to respond to consumers' concerns.

Outcome #2. Suppose, on the other hand, that risk attitude is the true driver behind consumers' responses. In such a case, even if the probabilities of being exposed to the risk are small, effectively communicating these probabilities will have little influence on consumer behavior. Instead, marketers will have to focus on ways to eliminate the risk. This may involve a total recall or an elimination of the risk.

In the next section, we apply our framework for consumer behavior with respect to risk and food safety. While some risks (such as parachuting or motorcycling) can be avoided, food safety-related risks are unique because they can only be avoided

⁵ The formal derivation supporting this claim can be obtained from the authors.

to a limited extent. Even when a person switches from one product to another, contaminated food still remains harder to avoid than parachuting, especially in the incipient phase where the risk is not yet known to the public, and when consumers do not have full control over these risks (e.g., Slovic, 1987).

4. The health of nations: method and findings

The Bovine Spongiform Encephalopathy (BSE) crisis, often referred to as the mad cow disease, fanned out across Europe causing consumer panic and disrupting meat markets. For example, Fig. 1 shows a dramatic decrease in beef consumption when the first BSE case was detected in Germany on November 26, 2000. Despite the fact that during this time of the year (holiday season; Christmas time) the German beef consumption is the highest of the year, consumption decreased dramatically (compare the period October–January in 1999 with the same period in 2000). Even outside of Europe, the ramifications of the European BSE crisis put intense pressure on foreign government agencies, industries, and marketers (Wadman, 2001).

One of the biggest concerns with BSE is that contaminated beef can cause Creutzfeldt–Jacob Disease (CJD) in humans (Abbott, 2001). Yet, since the chance of receiving CJD by eating beef is extremely small (the World Health Organization reports only 87 cases of CJD during the period October 1996–December 2000), it is puzzling that consumers react the way they do (Aldhous, 2000).

What explains the different consumer reactions to such a crisis, and what solution is most effective? Our

framework is useful in determining whether and to what extent risk perception and risk attitude contribute to the consumers' reactions. Predicting how consumers will react to a market crisis has important managerial implications. If beef consumption is primarily driven by risk perceptions (the likelihood of contracting CJD), the solution of the BSE crisis lies in effectively educating consumers about the level of risk involved. If, however, the consumers' response to the BSE crisis is primarily driven by risk attitude (risk aversion), the beef industry has fewer and costlier options, namely to test each cow for BSE and to slaughter those which test positive. In a third case, it may be that consumers' responses are driven by the interaction between risk attitude and risk perception. In this case, some combination of both solutions will be needed to deal with the crisis. To better understand the impact of BSE on consumer behavior, two key questions need to be answered. (1) Why do consumer reactions to BSE vary across countries? (2) How do changes in levels of risk affect beef consumption?

Our objective was to examine these questions in a natural experiment that would generate behavioral insights that might illustrate the importance of different policy measures. To accomplish this, German, Dutch, and American consumers were selected because they represented a wide range of responses to the BSE crisis.⁶ In all, 298 German, 223 Dutch, and 228 American consumers were intercepted while shopping in their home countries and were interviewed in the last week of January and the first week of February 2001.^{7,8}

The focus of the first part of the study was on BSE risk perceptions, risk attitudes, and beef consumption.

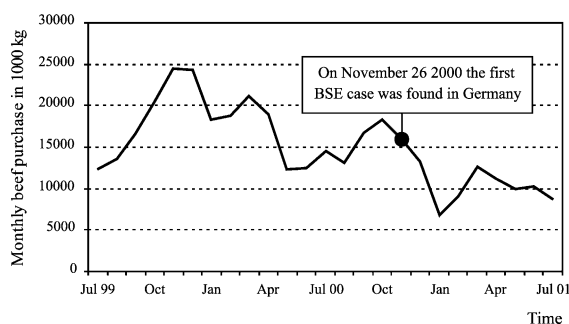


Fig. 1. German monthly domestic beef purchase for the period July 1999–July 2001 (Source: GfK).

⁶ In the Netherlands and Germany, several cases of mad cow disease have been reported. Since 1991, the United States has taken measures to protect itself by banning imports from BSE contaminated countries and animal feeds.

⁷ Since the same content of the questionnaire was being used across countries, the precise wording was modified through backward-translation procedures.

⁸ The average age of the consumers ranged from 42 years in the Netherlands to 45 years in Germany and the percentage of women in the three samples ranged from 51% in Germany to 60% in the United States.

We used a scaling procedure to measure risk attitude and risk perception, thereby recognizing that our empirical study did not exactly follow the Pratt and Arrow framework outlined in the conceptual framework.⁹ Based on the work of Childers (1986), MacCrimmon and Wehrung (1986, 1990), Pennings and Garcia (2001), and Pennings and Smidts (2000), we developed scales that were consistent with our definition of risk perception and risk attitude and that were as closely as possible related to the Pratt and Arrow framework. In two pre-studies, we tested several different scales on convergent validity and nomological validity.

The final scales consisted of nine-point semantic differential scales. The risk attitude measures consistently reflected consumers' predisposition to respond to risk in eating beef, and the risk perception measures reflected consumers' interpretation of their chance of being exposed to contaminated beef (Churchill, 1979; MacCrimmon & Wehrung, 1986; Pennings & Smidts, 2000; Shapira, 1995). The measures of risk attitude consisted of the following 9-point items: (1) For me, eating beef is worth the risk ("strongly disagree" to "strongly agree"), (2) I am . . . "not willing to accept" to "willing to accept" the risk of eating beef, and (3) I do not accept the risks of eating beef ("strongly disagree" to "strongly agree"), and for risk perception (1) When eating beef, I am exposed to "much risk" to "not much risk", (2) I think eating beef is risky ("strongly disagree" to "strongly agree"), and (3) For me, eating beef is . . . "risky" to "not risky". Both measures had reliable construct validity exceeding $\alpha = 0.8$ (Churchill, 1979).

One's reduction in beef consumption since the BSE crisis was measured (yes–no), and consumer knowl-

edge of CJD was measured through a multiple choice question. The second part of the study presented consumers with four scenarios and assessed their consumption intentions under four different levels of risk. The order in which these scenarios were presented to consumers was randomized.

4.1. Consumers' risk attitudes and risk perceptions with respect to beef consumption

Using the average sum-score on the risk attitude scale, it appears that German consumers are significantly more risk-averse (risk attitude score of 4.40), than American (5.02) or Dutch (5.04) consumers. This is consistent with the findings in Table 1 that shows that Germans have reacted most strongly to the BSE crisis. These results are also in line with the findings of Hofstede (1980, 1983) who found, using his uncertainty avoidance dimension, that the Dutch and Americans are in the same segment whereas the Germans were in another—one which scored higher on Hofstede's uncertainty avoidance index. Similar results are found when investigating the average sum-score on the risk perception scale: German consumers perceive significantly more risk (risk perception score of 5.15) than US and Dutch consumers (scores of 3.72 and 3.46, respectively).

We analyzed the relationship between demographic variables (age and gender) and the risk measures in each of these three countries, and it was found that they did not significantly differ. This finding further substantiates our conclusion that the differences between countries are not demographically driven. This is in line with Hofstede's conclusion that behavior and attitudes toward risk are (partly) culturally dependent, and that the differences in responses across countries are not simply demographic.

Stimulated by the work of Laurent and Kapferer (1985) and Kapferer and Laurent (1993), we tested whether involvement was related to our risk measures of beef consumption. In the survey, consumers responded to the following question "How many times during the week did you eat beef (before hearing of the mad cow disease)?" which can be viewed as a proxy for one's involvement in beef consumption (Sudman & Wansink, 2002). It appears that involvement is significantly negatively related to consumer risk aversion and consumer risk perception for all three countries

⁹ Some researchers have measured the Pratt and Arrow coefficient of absolute risk aversion using the certainty equivalence technique (e.g., the lottery technique) and measured risk perception by assessing the probability function of respondents using the interval technique (see, for an application, Smidts, 1997, and for a detailed description of these techniques Farquhar, 1984; Hershey & Schoemaker, 1985; Keeney & Raiffa, 1976). A drawback of these measurements is that it takes a lot of effort and time from the respondents, since they can only be obtained by time-intensive experiments. Furthermore, these elicitation techniques are extremely costly to conduct on a large scale.

Table 1
Cross-country differences in knowledge about CJD and beef consumption

	United States	Germany	Netherlands
What do you think contracting Creutzfeldt–Jacob Disease (CJD) from eating beef will do to you? ^a			
● I would die; there is no treatment	24.1%	58.7%	58.1%
● I might die, but there is treatment and a chance of surviving	31.5%	19.5%	17.8%
● I would get very ill, and the illness would be chronic	19.4%	9.7%	15.3%
● I would get ill, and will recover after some time	19.4%	4.0%	4.5%
● I would feel ill, but would recover fast	5.6%	8.1%	4.3%
What do you think is your chance of getting CJD from eating beef? (1 = small; 9 = large) ^b	2.92	3.42	2.77
Are you concerned about eating beef? (1 = not concerned; 9 = very concerned) ^b	3.74	6.27	3.80
Do you trust the information that your government provides? (1 = do not trust; 9 = fully trust) ^b	5.93	3.42	5.00
Have you reduced your beef consumption because of the BSE crisis? ^a	17.8%	58.1%	22.9%
By what proportion have you reduced your beef consumption? ^a	54.6%	77.7%	56.4%
Have you switched to other meat products and fish products? ^a	17.8%	49.0%	19.7%

^a All cross-country differences were significant. Chi-square tests on the independence between countries resulted in *p*-values less than 0.02.

^b The hypothesis that the means of these variables of the three countries is equal was rejected at the 5% level using ANOVA.

($p < 0.01$); this indicates that the higher the involvement, the lower the risk aversion and risk perception regarding eating beef. This result is in line with the findings of Laurent and Kapferer (1985) and Kapferer and Laurent (1993) who showed that risk importance (importance of negative consequences) and risk probability (subjective probability of mispurchase) are two facets of the involvement construct.

4.2. Why do consumer reactions to BSE vary across countries?

The dramatic differences in consumers' reactions to the BSE crisis are shown in Table 1. The differences between the United States and the European countries are not surprising since BSE has never been a problem in the United States. Most illustrative here, however, are the large differences between neighbors. Both Germany and the Netherlands have a similar experience with the severity of the disease. Yet, as shown in Table 1, most of the Dutch perceptions resemble American rather than German perceptions. In general, the Dutch and Americans are less concerned about eating beef than the Germans, and they estimate their chance of contracting CJD relatively lower.

One explanation for these different levels of concern may be because American and Dutch consumers are more trusting of the information from their governments than are the Germans. As noted in Table 1,

consumer confidence in government-issued information is significantly related to consumer concern in all three countries, and while the Germans have relatively

Table 2
Explaining consumer beef reduction with risk attitude, risk perception and their interaction

	Risk Attitude (RA)	Risk Perception (RP)	RA × RP
	γ_1	γ_2	γ_3
United States	-0.920*	0.189	0.220*
Nagelkerke's $R^2 = 0.517$	(0.020)	(0.402)	(0.002)
Correctly classified choices = 84.9%			
Germany	-0.549*	0.688*	0.440
Nagelkerke's $R^2 = 0.663$	(0.021)	(0.000)	(0.315)
Correctly classified choices = 86.6%			
The Netherlands	-0.137	0.726*	-0.033
Nagelkerke's $R^2 = 0.442$	(0.687)	(0.000)	(0.707)
Correctly classified choices = 85.4%			

An asterisk indicates that each parameter significantly improves the fit when compared to the null model, which includes only an intercept, at the 5% level. Nagelkerke's R^2 is similar to the R^2 in linear regression and measures the proportion of variance of the dependent variable (reduction of beef consumption) about its mean that is explained by the independent variables (risk attitude, risk perception and their interaction).

Table 3
How changes in the probability of contracting CJD will change beef consumption^a

Suppose that science had shown with absolute certainty that the chances of getting CJD by eating beef are...	Percentage of consumers that decide to reduce their beef consumption			Proportion by which consumers diminish their beef consumption		
	United States	Germany	Netherlands	United States	Germany	Netherlands
<i>Scenario 1</i>						
1 in 10 million per year	34.3%	40.9%	35.0%	41.3%	73.2%	66.9%
<i>Scenario 2</i>						
1 in 1 million per year	47.3%	49.8%	48.9%	48.8%	77.7%	73.4%
<i>Scenario 3</i>						
1 in 100,000 per year	68.5%	66.7%	75.8%	57.6%	80.6%	78.0%
<i>Scenario 4</i>						
1 in 10,000 per year	73.5%	75.2%	86.5%	69.7%	91.1%	89.1%

^a The hypothesis that the means of these variables of the three countries is equal was rejected at the 5% level using ANOVA.

low trust in government information (3.42), both the Dutch and the Americans are highly trustful of their food regulatory agencies (5.00 and 5.93). Indeed, in the US, 83% trust the FDA, making it the most trusted government organization after the Supreme Court (Wansink & Kim, 2001). Without trust in the information about BSE, fear and overestimates of risk may dramatically decrease beef consumption.

How do these combined variations in risk perceptions and risk attitudes influence consumer decisions about whether or not to reduce beef consumption? Logistic regressions indicated that there were significant variations across countries (see Table 2). While risk *perceptions* drive the Dutch decision to decrease beef consumption ($\gamma_1 = 0.726$; $p < 0.01$), risk *attitudes* drive the American decision ($\gamma_2 = -0.920$; $p < 0.02$). German behavior is determined both by risk attitudes ($\gamma_1 = 0.688$; $p < 0.00$) and risk perceptions ($\gamma_2 = -0.549$; $p < 0.02$).

4.3. How would accurate information change behavior in a crisis situation?

If consumers in these three countries had equally accurate (and trusted) information, and if they had an equal risk of contracting CJD, would these differences still exist? That is, are the differences we see between countries circumstantial, or do they represent different ways in which consumers use risk information to modify their behavior? To some extent, this might vary across the level of risk that's involved.

To answer this question, all 749 consumers were presented with the four following scenarios: "Imagine that science had shown with absolute certainty that the chances of getting CJD from eating beef are..." 1 in 10 million (Scenario 1), 1 in 1 million (Scenario 2), 1 in 100,000 (Scenario 3), 1 in 10,000 (Scenario 4). Following this, the consumers stated whether they would reduce their beef consumption in this scenario, and by how much they would reduce it.

Table 3 shows that the difference in the percentage of consumers reducing their beef consumption between consecutive scenarios is largest between Scenario 2 and Scenario 3, and the proportional decrease in beef consumption (per capita) is largest between Scenario 3 and Scenario 4. This result suggests that when a country faces a mild chance of BSE contamination (e.g., less than one chance in a million), national beef consumption will decrease because a larger number of consumers will reduce their beef consumption. However, when facing a serious chance of contamination, such as Scenario 4, a radical decrease per capita consumption is the main cause of the decrease of consumption.¹⁰

¹⁰ The notion that risk attitude is context specific (March & Shapira, 1992), i.e., the attitude toward risk (beyond a general propensity) depends upon the level of risk, is confirmed in this study. The risk attitude score decreased (i.e., consumers become more risk averse) monotonically when going from Scenario 1 to Scenario 4 for all consumers across all countries.

Table 4
How different risk levels influence beef consumption

	Risk Attitude (RA), β_1	Risk Perception (RP), β_2	RA \times RP, β_3
<i>United States</i>			
Scenario 1 ($R^2 = 0.47$, cc = 81.3%)	– 0.298 *	0.525 *	0.010
Scenario 2 ($R^2 = 0.49$, cc = 76.4%)	– 0.309 *	0.470 *	0.005
Scenario 3 ($R^2 = 0.52$, cc = 84.2%)	– 0.752 *	0.544 *	0.047
Scenario 4 ($R^2 = 0.51$, cc = 82.8%)	– 1.128 *	0.515 *	0.090 *
<i>Germany</i>			
Scenario 1 ($R^2 = 0.56$, cc = 82.8%)	– 0.403 *	0.218	0.045 *
Scenario 2 ($R^2 = 0.65$, cc = 84.5%)	– 0.473 *	0.282 *	0.071 *
Scenario 3 ($R^2 = 0.64$, cc = 88.1%)	– 0.543 *	0.212	0.066 *
Scenario 4 ($R^2 = 0.65$, cc = 90.5%)	– 0.332	0.456 *	0.002
<i>The Netherlands</i>			
Scenario 1 ($R^2 = 0.56$, cc = 83.0%)	0.203	0.577 *	0.040
Scenario 2 ($R^2 = 0.61$, cc = 83.6%)	0.285	0.744 *	0.052
Scenario 3 ($R^2 = 0.66$, cc = 91.4%)	– 0.477 *	0.032	0.081 *
Scenario 4 ($R^2 = 71.4$, cc = 94.6%)	– 0.647 *	0.590 *	0.034

Scenarios 1–4 go from least risky to most risky. An asterisk indicates that each parameter significantly improves the fit when compared to the null model, which includes only an intercept, at the 5% level. The reported cc is the correctly classified choices (e.g., the predictive validity).

Earlier we examined how beef consumption was influenced in the present situation where consumers have *inaccurate* information about the probabilities of contracting CJD. How is this changed when they have *accurate* information? The logistic regression results in Table 4 show risk perception influences all three countries for all scenarios either directly or indirectly through its interaction with risk attitude. Even when accurate information is available, risk attitude remains an important driver of beef consumption in the US and Germany, and becomes important in the Netherlands in high-risk scenarios.

In general, it can be observed from Table 4 that the influence of risk attitude on beef consumption increases with an increasing chance of contamination (from Scenarios 1 through 4), except for Germany. The latter deviating result may be caused by the extreme risk aversiveness of Germans, leading to homogeneity in the impact of risk attitudes on beef consumption. On the other hand, the impact of risk perception on beef consumption does not systematically increase with more risky situations (Scenario 1 through Scenario 4). In the US, there is little or no difference across scenarios. In the Netherlands, no systematic increase of the influence of risk perception can be observed from Scenario 1 through Scenario 4,

while for German consumers an increase can be found in Scenario 4.

4.4. What is the answer to the BSE crisis?

Our research demonstrates that the way marketers respond to the BSE crisis should take into account whether a country's beef consumption is influenced more by risk perceptions or by risk attitudes. The relative influence of risk perception and risk attitude on beef consumption depends, among others, on the accuracy of knowing the probability of contracting CJD from eating beef.

If the probability of contracting CJD is *not* accurately known, which is the current situation, this analysis suggests different policy implications for different types of countries. In countries such as the United States, tough measures are required to prevent a BSE crisis because risk attitudes drive consumption and little can be done to change consumers' risk attitudes. This means testing and slaughtering all suspected cows. In countries such as Germany, both risk perceptions and risk attitudes drive consumer behavior, suggesting not only the need for tough measures, but also for extensive and responsible dissemination of accurate information by government, industry and me-

dia. In contrast to the US and Germany, Dutch consumer behavior is driven mainly by risk perceptions. In this case, honest and consistent communication by both the government and the beef industry is more effective than a mass slaughtering of cows.

If the probability of contracting CJD is accurately known (or becomes more accurate), risk perception becomes a more important driver of beef consumption than risk attitude in low and mildly risky situations (such as Scenarios 1 and 2) in the US and Netherlands. In low risk situations, messages from the government, the beef industry, and the media will have a notable impact on helping consumers respond to the BSE crisis (e.g., Slovic, 1987; Tversky & Kahneman, 1981). In contrast, with high risk situations (such as Scenario 4) tough measures—recall or elimination—are also necessary. In the case of strongly risk-averse consumers, however, any level of risk is treated as a high-risk situation. As a result, tough measures and information are important, even in low and mildly risky situations. On the production side, an ounce of prevention is worth a pound of cure, but on the policy side, an ounce of information is worth even more.

5. Conclusions

While “perceived risk” has often been used as an explanatory variable, we argue that the behavior of consumers in a crisis can be better understood by decoupling risk response behavior into the separate components of risk perception and risk attitude. This conceptualization provides information about the tools that might be used to deal with a crisis. We find that behavior toward a risk-related crisis (such as food safety) is driven by different factors for different segments and that the relative influence of these variables depends on the accuracy of knowing the probability that the risky event occurs.

These findings have important managerial and public policy implications. If consumers’ behavior is driven primarily by risk perceptions, the solution lies in combining consistent and effective communication with ongoing efforts to reduce the risk. If consumers’ behavior is instead driven by risk attitudes, such as extreme risk aversion, in the end the only effective efforts will lie in eliminating the risk.

Our empirical application to the BSE crisis illustrates the strengths of the proposed framework. If consumers’ reactions are mainly driven by risk perception, effective communication efforts can increase the consumers’ knowledge about the probabilities of being exposed to the risk (e.g., getting CJD) may be sufficient. If, however, the consumer response to the crisis is mainly driven by risk attitude, the marketer has fewer options. In fact, ultimately, the only tool available is to eliminate the risk (e.g., slaughter all cows which might have BSE or check every single cow for BSE).

The three-country study showed significant differences in consumers’ risk attitudes and risk perceptions and consequently consumers’ reactions. Interestingly, our findings regarding risk attitudes are consistent with the landmark findings of Hofstede (1980) some 20 years ago. Understanding these cross-cultural differences is particularly critical for managers and public officials who need to predict how and why consumers in different countries will respond to a crisis.

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