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Trade treaties have introduced the principle that similar risks should be treated similarly, and that countries must achieve internal consistency in the levels of protection they afford against certain hazards within their territories. The problem is that there is no agreement on when risks are "similar" or when levels of protection are "consistent." The danger is that in resolving these issues, international trade institutions will infringe on the political sovereignty of their Members. This Article proposes a science-based solution. A substantial body of scientific research establishes that a person's judgments about the risk posed by a hazard are influenced by a number of factors, including certain characteristics of the hazard itself, scientific uncertainty in the evidence about the risk, and certain characteristics of the person evaluating the risk. This Article argues that such factors should also be relevant to deciding whether a country is being consistent in setting its levels of protection. International trade institutions that ignore such factors imperil their own success and legitimacy, and do so unnecessarily. General and specific empirical studies can provide a neutral means of deciding whether different levels of protection are risk-based or are merely disguised restrictions on international trade.

The World Trade Organization (WTO) Agreement on Sanitary and Phytosanitary Measures

The central requirement of many trade treaties is a prohibition against discrimination. The General Agreement on Tariffs and Trade prohibits certain acts of discrimination among trading partners, and discrimination against imported products as compared to domestic products.[1] Equal treatment is the norm, and departures from equal treatment must be justified. It is therefore understandable that contracting parties would turn to the principle of equal treatment when formulating other aspects of trade treaties. The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) is one of the Uruguay Round trade agreements administered under the WTO.[2] A "sanitary or phytosanitary measure" covered by the SPS Agreement is any law, regulation or other requirement established to protect against certain risks, including risks posed by additives, toxins, or contaminants in foods, beverages, or feedstuffs.[3] If a WTO Member ascertains a risk by a sufficiently specific risk assessment,[4] then it is entitled to select any "level of protection" against that risk for its territory, or adopt any level of risk as "acceptable," provided certain requirements are met.[5] A principal requirement is that a Member must be "consistent" in the levels of protection that it adopts.[6] If two or more adopted measures reflect different levels of protection in similar circumstances and result in discrimination or a disguised restriction on international trade, then such differences must not be "arbitrary or unjustifiable."[7]

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1. *See, e.g.*, General Agreement on Tariffs and Trade, Apr. 15, 1994, arts. I, III, Annex 1A to Agreement Establishing the World Trade Organization, 33 I.L.M. 1154, 108 Stat. 4809 (1994) (entered into force Jan. 1, 1995); John O. McGinnis & Mark L. Movsesian, *Commentary: The World Trade Constitution*, 114 HARV. L. REV. 511, 544-52, 590-92 (2000).

2. Agreement on the Application of Sanitary and Phytosanitary Measures, Apr. 15, 1994, Annex 1A-4 to Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, in H.R. Doc. No. 103-316, vol. I, at 1381-95 [hereinafter SPS Agreement].

3. *See id.*, Annex A.1, definitions.

4. *See id.*, arts. 2.2, 5.1; Report of the Appellate Body, EC Measures Concerning Meat and Meat Products (Hormones), Jan. 16, 1998, adopted Feb. 13, 1998, WT/DS26/AB/R & WT/DS48/AB/R, ¶¶ 186, 193, 200.

5. *See* SPS Agreement, *supra* note 2, pmbl., art. 2.1, Annex A.5 (stating that many Members refer to the "appropriate level of protection" as the "acceptable level of risk"); Vern R. Walker, *Keeping the WTO From Becoming the "World Trans-Science Organization": Scientific Uncertainty, Science Policy, and Factfinding in the Growth Hormones Dispute*, 31 CORNELL INT'L L.J. 251, 267-71 (1998).

6. Article 5.5 of the SPS Agreement, *supra* note 2, provides:

> With the objective of achieving consistency in the application of the concept of appropriate level of sanitary or phytosanitary protection against risks to human life or health, or to animal and plant life or health, each Member shall avoid arbitrary or unjustifiable distinctions in the levels it considers to be appropriate in different situations, if such distinctions result in discrimination or a disguised restriction on international trade.

Id.

7. *Id.* The Appellate Body case law has developed three factual elements to be proved under SPS Article 5.5:

> (1) That the defendant Member has established different levels of protection in different situations that may nevertheless be compared, such as situations involving potential for the same or similar adverse health effects;
>
> (2) That the difference between levels of protection is arbitrary or unjustifiable; and
>
> (3) That the arbitrary or unjustifiable difference results in discrimination or a disguised restriction on international trade.

Appellate Body Report (Hormones), *supra* note 4, ¶¶ 210-246; Report of the Appellate Body, Australia—Measures Affecting Importation of Salmon, Oct. 20, 1998, adopted Nov. 6, 1998, WT/DS18/AB/R, Section V.C; Committee on Sanitary and Phytosanitary Measures, World Trade Organization, Guidelines to Further the Practical Implementation of Article 5.5, G/SPS/15 (July 18, 2000), Sections A.2, A.4 [hereinafter Committee Guidelines].

The SPS Agreement is an attempt to apply the equal treatment principle to risks. Similar risks must be treated similarly. For example, if two different products pose the same risks, then the levels of protection against those risks should also be the same.[8] Unless a consistency requirement is imposed on levels of protection, a Member could subvert the nondiscrimination goals of the SPS Agreement simply by adopting different levels of protection for the different products. It is not enough for regulatory measures to be risk-based and administered evenhandedly. Discrimination would still be possible if different levels of protection could be applied to different products that pose similar risks. Indeed, the existence of a difference in levels of protection for similar risks, in the absence of justification, may be a "warning signal" that a measure is either discriminatory or a disguised restriction on international trade.[9]

The goal of the SPS Agreement is to balance the communal interest in efficient trade against the sovereign interest of each Member country in protecting health, safety, and the environment within its territory.[10] On the one hand, disguised economic protectionism is possible unless differences between levels of protection are justifiable. Similar risks could be treated differently in order to promote domestic economic interests. On the other hand, the SPS Agreement does not dictate how to justify adopting any particular level of protection, because such decisions are political acts of sovereignty rightly reserved to the Members. In selecting a level of protection, a Member decides which risks to take and not to take. The people in a territory are entitled to use their government to decide which risks are acceptable, as well as which risks can be lawfully imposed by some private parties on others within the territory.

But while the threat of such disguised restrictions on trade may be real and the goal of equal treatment is talismanic, these are uncharted and dangerous waters. Serious problems arise in determining whether two risks are the same or similar, and what is to count as an adequate justification for a difference between two levels of protection. The question is whether the requirement of equal treatment of similar risks can be made operational without usurping the risk-taking decisions of WTO Members.[11] Ultimately, determining that a difference between levels of protection is justifiable may require a balancing of the relevant factors. But at a minimum, deciding that a difference is justifiable requires determining which factors are *relevant* to justifying such differences. Indeed, the SPS Agreement directs that guidelines to implement this provision must take into account "all relevant factors, including the exceptional character of human health risks to which people voluntarily expose themselves."[12] But which factors are relevant to justifying different levels of protection, and why are they relevant? What kind of evidence should be admissible under the SPS Agreement to demonstrate that different levels of protection are justifiable?

This Article suggests one approach to resolving this problem. The proposal is to turn to science as a neutral arbiter. There is good research about how people evaluate, rank, or compare risks, and about the factors that influence those judgments. The core argument is that the factors that actually influence people in evaluating the risks of everyday life should also be relevant in determining whether differences between levels of protection are justifiable. If the people of a WTO Member, through their governmental processes, establish levels of protection that are in fact focused on risk, as opposed to trade protectionism, then that should be the end of the matter for purposes of the SPS Agreement. The scientific studies discussed in this Article establish a list of factors that have been found to be relevant to risk perception and acceptance. In any particular trade dispute, if differences in levels of protection are rationally supported by empirical evidence that such risk perception factors explain those differences, then the WTO should regard those differences as justifiable and those levels of protection as consistent.

In making good on this argument, the first step is to establish that there are scientific methods for measuring what scientists call "risk perception," and to discuss the general nature of what those methods are measuring. The second step is to summarize the scientific findings about which factors influence a person's perception of risk. Some relevant factors involve characteristics of the hazard itself, while others are related to uncertainties in the evidence or to the demographics of the people evaluating the risk. The third step is to argue why these scientific findings about risk perception should be used to resolve trade disputes under SPS Article 5.5. I will argue that scientific evidence of differences in risk perceptions for different products should be relevant in justifying the adoption of different levels of protection. Recognizing the probative value of such scientific evidence would strengthen the effectiveness and legitimacy of WTO fact-finding about consistency, without compromising the sovereignty of the WTO Member imposing the sanitary or phytosanitary measures.

8. For purposes of triggering a consistency determination, different products can be compared if they pose the same or similar risk. See Appellate Body Report (Salmon), *supra* note 7, Section V.C.1; Committee Guidelines, *supra* note 7, at Section A.2.

9. Appellate Body Report (Salmon), *supra* note 7, Section V.C.3, ¶¶ 3-4.

10. As the SPS Agreement, *supra* note 2, reaffirms in the preamble:

> [N]o Member should be prevented from adopting or enforcing measures necessary to protect human, animal or plant life or health, subject to the requirement that these measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between Members where the same conditions prevail or a disguised restriction on international trade.

11. Some commentators have argued that the WTO's determinations of consistency do or should employ "procedure-oriented" tests. *See* McGinnis & Movsesian, *supra* note 1, at 572-83, 596-601. Although these commentators acknowledge that the consistency requirement "would intrude somewhat" on the policymaking role of nation states, *see id.* at 576, I think it is misleading to characterize such determinations as "procedure-oriented." Deciding whether a difference between two levels of protection is justifiable requires deciding which factors are relevant to selecting levels of protection in the first place—a decision that lies at the core of political decisionmaking. Deciding whether the "acceptable levels of risk" assigned to two different products are "consistent" and "justifiable" must be a substantive inquiry, not merely a "procedure-oriented" one.

12. Article 12 of the SPS Agreement, *supra* note 2, establishes a Committee on Sanitary and Phytosanitary Measures, and Article 5.5 directs the committee "to develop guidelines to further the practical implementation of this provision [on consistency among levels of protection]. In developing the guidelines, the Committee shall take into account all relevant factors, including the exceptional character of human health risks to which people voluntarily expose themselves."

The Scientific Study of Risk Perception

Since the mid-1970s, scientists have evolved methodologies for measuring judgments about the risks posed by products, activities, and technologies. Such judgments about risk are commonly called "risk perceptions." Researchers have studied the effects of different measurement designs on risk perception data,[13] as well as the merits of using different rating categories and different verbal cues.[14] They have also studied the effect of analyzing aggregated group data, as compared to analyzing data at the individual level.[15] The result is a substantial and growing body of research on the methodologies that are available for measuring perceptions of risk.

One general conclusion is that there are reliable techniques for measuring the risks perceived by individuals.[16] The many studies conducted to date have produced fairly consistent results. Some studies have asked participants to evaluate heterogeneous sets of hazards—sets including a diversity of hazards ranging from pesticides to caffeine and downhill skiing.[17] Other studies have measured perceived risk for more homogeneous sets of hazards within narrower areas, such as nuclear waste,[18] automobile safety defects,[19] pharmaceutical products and medical procedures,[20] and food products.[21] Based on this evidence, risk perception techniques appear to measure a real phenomenon in human beings.

The more difficult problem is interpreting what is being measured. There is now substantial evidence that "risk" means something more to ordinary people than it does to many experts. From even the earliest studies, researchers had evidence that the risk ratings of experts tended to correlate highly with estimates of annual fatalities,[22] while the risk ratings of nonexperts reflected additional factors.[23] It is not simply that nonexperts inaccurately estimate expected fatalities; when nonexperts are asked to estimate annual fatalities, their estimates are moderately accurate, with the exception that hazards that cause the most fatalities may be underestimated and hazards that cause rare fatalities may be overestimated.[24] Nevertheless, the risk judgments of nonexperts are only moderately correlated with even their own estimates of the annual fatalities due to the hazard.[25] For nonexperts, the concept of risk seems to involve much more than estimated annual fatalities.[26]

13. *See, e.g.*, Paul Slovic et al., *Response Mode, Framing, and Information-Processing Effects in Risk Assessment*, *in* THE PERCEPTION OF RISK ch. 9 (Earthscan 2000) (originally published in NEW DIRECTIONS FOR METHODOLOGY OF SOCIAL AND BEHAVIORAL SCIENCE: QUESTION FRAMING AND RESPONSE CONSISTENCY (R. Hogarth ed., 1982)); M. Granger Morgan et al., *Categorizing Risks for Risk Ranking*, 20 RISK ANALYSIS 49 (2000).

14. In early studies, researchers used quantitative scales to try to rate perceived risks. *See* Baruch Fischhoff et al., *How Safe Is Safe Enough? A Psychometric Study of Attitudes Towards Technological Risks and Benefits*, 9 POL'Y SCI. 127 (1978). Participants were asked to "consider the risk of dying as a consequence of this activity or technology." They were asked (1) to rank the order the activities from least risk to most risk, and (2) to rate the degree of riskiness of each activity after assigning a value of 10 to the least risky item. Thus, a rating of 12 would indicate that the activity is 1.2 times riskier than the least risky item, and a rating of 200 would indicate 20 times riskier. *See id.* at 131. *Compare* Christoph Hohenemser et al., *The Nature of Technological Hazard*, 220 SCIENCE 378 (1983) (using a scale of 1 to 100).

    It is common today to measure the risk perception of hazards using scales with a smaller number of categories. *See, e.g.*, Paul Slovic et al., *Evaluating Chemical Risks: Results of a Survey of the British Toxicology Society*, 16 HUM. & EXPERIMENTAL TOXICOLOGY 289, 290 & fig. 1 (1997) (using the categories "almost no health risk," "slight health risk," "moderate health risk," "high health risk," and "don't know"); Michael Siegrist & George Cvetkovich, *Perception of Hazards: The Role of Social Trust and Knowledge*, 20 RISK ANALYSIS 713, 715 (2000) (using a 7-point scale with endpoints labeled "not at all risky" [1] and "very risky" [7]). *See generally* Michael A. Diefenbach et al., *Scales for Assessing Perceptions of Health Hazard Susceptibility*, 8 HEALTH EDUC. RES. 181, 188-89 (1993) (finding that in measuring susceptibility or likelihood of harm, a 7-point verbal category scale performs at least as well as a 100-point numerical scale).

15. *See* Claire Marris et al., *Exploring the "Psychometric Paradigm": Comparisons Between Aggregate and Individual Analyses*, 17 RISK ANALYSIS 303 (1997); Lennart Sjöberg, *Factors in Risk Perception*, 20 RISK ANALYSIS 1, 4 (2000).

16. *See* Paul Slovic, *Perception of Risk*, 236 SCIENCE 280, 282-83 (1987).

17. *See, e.g.*, Fischhoff et al., *supra* note 14 (30 activities and technologies); Hohenemser et al., *supra* note 14 (81 hazards); Paul Slovic et al., *Facts and Fears: Understanding Perceived Risk*, *in* SOCIETAL RISK ASSESSMENT: HOW SAFE IS SAFE ENOUGH? 181 (Richard C. Schwing & Walter A. Albers Jr. eds., 1980) (90 hazards).

18. *See* Paul Slovic et al., *Perceived Risk, Trust, and the Politics of Nuclear Waste*, 254 SCIENCE 1603 (1991).

19. *See* Paul Slovic et al., *Perception of Risk From Automobile Safety Defects*, 19 ACCIDENT ANALYSIS & PREVENTION 359 (1987).

20. Paul Slovic, *The Perception and Management of Therapeutic Risk*, *in* THE PERCEPTION OF RISK, *supra* note 13, at ch. 15.

21. *See, e.g.*, Lynn J. Frewer et al., *The Interrelationship Between Perceived Knowledge, Control, and Risk Associated With a Range of Food-Related Hazards Targeted at the Individual, Other People, and Society*, 14 J. FOOD SAFETY 19 (1994); Monique M. Raats & Richard Shepherd, *Developing a Subject-Derived Terminology to Describe Perceptions of Chemicals in Food*, 16 RISK ANALYSIS 133 (1996); Donna M. Dosman et al., *Socioeconomic Determinants of Health- and Food Safety-Related Risk Perceptions*, 21 RISK ANALYSIS 307 (2001).

22. If loss of life is the worst-case outcome, then "expected fatality" might be a proxy measure of expected loss. "Expected loss" is usually defined as the gravity of the adverse effect multiplied by the probability of its occurrence. In decision theory, interpreting risk as expected loss (or as a species of "expected utility") plays a central role in developing decision strategies. *See, e.g.*, R. DUNCAN LUCE & HOWARD RAIFFA, GAMES AND DECISIONS: INTRODUCTION AND CRITICAL SURVEY, ch. 13 (John Wiley & Sons 1957); HERMAN CHERNOFF & LINCOLN E. MOSES, ELEMENTARY DECISION THEORY, chs. 1, 4 & 5 (John Wiley & Sons 1959). This interpretation of risk is particularly useful in finance and economics. *See, e.g.*, KENNETH S. ABRAHAM, DISTRIBUTING RISK: INSURANCE, LEGAL THEORY, AND PUBLIC POLICY 1-2, at ch. 4 (Yale Univ. Press 1986); JOSEPH E. STIGLITZ, ECONOMICS, 130-36, 231-36 (2d ed. 1997). It can also be useful whenever statistical data form part of the basis for decisionmaking. *See, e.g.*, WILLIAM L. HAYS, STATISTICS, 273-79 (5th ed. 1994); THOMAS H. WONNACOTT & RONALD J. WONNACOTT, INTRODUCTORY STATISTICS ch. 20 (5th ed. 1990). Theorists have argued for care, however, in applying the expected-utility model to risks concerning health, safety, or the environment. *See, e.g.*, K.S. SHRADER-FRECHETTE, RISK AND RATIONALITY: PHILOSOPHICAL FOUNDATIONS FOR POPULIST REFORMS ch. 8 (University of California Press 1991).

23. *See, e.g.*, Paul Slovic et al., *Rating the Risks*, 21 ENVIRONMENT 14, 19 (1979); Slovic, *supra* note 16, at 282-83. As Slovic stated: "In contrast [to the findings for nonexperts], experts' perceptions of risk are not closely related to any of the various risk characteristics or factors derived from these characteristics." *Id.* at 283.

24. *See* Slovic et al., *supra* note 23, at 15-16, 19-20; Sjöberg, *supra* note 15, at 1-2.

25. *See* Slovic et al., *supra* note 23, at 19-20; Hohenemser et al., *supra* note 14, at 382. As Slovic stated, the "risk perceptions [of nonexperts] were no more closely related to their own fatality estimates than they were to the technical estimates." Slovic et al., *supra* note 23, at 20.

26. *See* Slovic et al., *supra* note 23, at 19-20; Paul Slovic, *Informing and Educating the Public About Risk*, *in* THE PERCEPTION OF RISK, *supra* note 13, ch. 11, at 189-90; Slovic, *supra* note 16, at 282-83. A later regression analysis of the data confirmed the relevance of expected mortality, but also its limited explanatory power. Robin

More recent studies have confirmed the early finding that there is a difference between the risk perceptions of experts and nonexperts. For example, a series of studies in two different countries used similar measurement instruments to compare the risk perceptions of toxicologists and the general public.[27] Expert samples were drawn from members of professional societies of toxicology in Britain and Canada, and a large public sample was drawn from Canada. Compared to the percentages of British experts (rating 24 hazards) and the Canadian experts (rating 38 hazards), higher percentages of the Canadian public rated risks to be either moderate or high for virtually all of the hazards.[28] The differences in percentage between the public and the experts were often quite large. The general public tends to perceive far more risk than do the experts, especially with regard to such technological risks as nuclear waste disposal.[29]

There are two additional indications that the risk perceptions of most people reflect more than expected fatality. First, some studies have measured how much the current risk of a hazard would have to be reduced in order to be "acceptable," and found that perceived risk itself was highly correlated with the desire to have risk reduced or regulated.[30] This suggests that risk perception and the desire for risk reduction are closely related concepts, and that the higher the perceived risk for a hazard, the more people want to see its current risks reduced.[31] Risk perception ratings may therefore reflect the degree to which the person doing the rating considers the current level of risk to be unacceptable.

Second, some studies have reported an inverse relationship between perceived benefits and perceived risks.[32] As perceived benefits increase, perceived risks decrease, and vice versa. This inverse correlation is especially notable when risk is perceived as high.[33] This inverse relationship between perceived risk and perceived benefit is additional evidence that risk perception data are capturing a richer concept of risk than mere expected fatality.

But if ordinary people have a complex notion of risk, what is included in that concept? The additional hazard characteristics that account for the gap between the public's perceptions of risk and those of experts are sometimes called "outrage factors."[34] Whatever the appellation, there is strong evidence for an evaluative dimension of perceived risk that experts tend to discount but ordinary people do not.

Explaining Variability in Risk Perceptions

Scientists have demonstrated that the actual risk perceptions of individuals can be determined empirically, and that there is wide variability among those risk perceptions. Researchers have provided a means of measuring variability in risk perceptions, as well as a broad picture of the variability actually present, but this leads to questions about the statistical and causal relationships behind that variability.[35] Some of that variability is systematic and predictable, such as the risk perception differences between experts and nonexperts. Such systematic variability provides good evidence that some causal factors are at work producing the systematic results. But what factors influence a person's risk perception? What explains the variability among risk perceptions, especially the systematic differences? Researchers have had modest success in predicting and explaining risk perception by drawing upon factors in three major areas:

(1) characteristics of the hazard posing the risk;
(2) scientific uncertainty about the risk; and
(3) characteristics of the people who are evaluating the risk.

The next three subsections of this Article summarize some of the salient findings in each of these areas.

Characteristics of the Hazard

Researchers have reported statistically significant correlations between perceived risk and various characteristics of the hazards posing the risks. Statistically significant correlations are statistical relationships in a sample that are unlikely to be due merely to the chance effects of the sampling process. Not surprisingly, perceived risk and the likelihood

Gregory & Robert Mendelsohn, *Perceived Risk, Dread, and Benefits*, 13 RISK ANALYSIS 259 (1993). The authors state: "The regression results show that each of the two dependent variables, dread and perceived risk, reflect widely held public concerns about risks that are not captured by expected mortality or morbidity." *Id.* at 263.

27. *See* Paul Slovic et al., *Intuitive Toxicology II: Expert and Lay Judgments of Chemical Risks in Canada*, 15 RISK ANALYSIS 661 (1995); Daniel Krewski et al., *Health Risk Perception in Canada II: Worldviews, Attitudes, and Opinions*, 1 HUM. & ECOLOGICAL RISK ASSESSMENT 231 (1995); Slovic et al., *supra* note 14; C.K. Mertz et al., *Judgments of Chemical Risks: Comparisons Among Senior Managers, Toxicologists, and the Public*, 18 RISK ANALYSIS 391 (1998).

28. *See* Slovic et al., *supra* note 27, at 664-66 & figs. 1, 2; Mertz et al., *supra* note 27, at 399-402 & fig. 2.

29. *See* Lennart Sjöberg, *Risk Perception: Experts and the Public*, 3 EUR. PSYCHOLOGIST 1, 6-9 (1998). *But see* Gene Rowe & George Wright, *Differences in Expert and Lay Judgments of Risk: Myth or Reality?*, 21 RISK ANALYSIS 341, 348, 354 (2001) (providing a methodological criticism of a number of expert-public studies, and arguing that the studies did not prove a difference between experts and the public because the studies did not adequately control for possible confounding factors).

30. *See* Fischhoff et al., *supra* note 14, at 132, 137 (reporting that participants "felt that the higher the risk, the more it should be reduced"); Slovic et al., *supra* note 17, at 202 (finding that "[t]he greater the perceived risk, the larger the adjustment judged necessary to bring the risk to an acceptable level"); Paul Slovic et al., *Characterizing Perceived Risk*, *in* PERILOUS PROGRESS: MANAGING THE HAZARDS OF TECHNOLOGY ch. 5, at 105 (Robert W. Kates et al. eds. 1985) (stating that "mean risk adjustment and perceived risk were highly correlated . . . , indicating that people wanted stricter regulation of the hazards they viewed as most risky. This is also implied by the correlation between perceived risk and desired regulation . . . .").

31. *See* Slovic, *supra* note 16, at 283 (concluding that the higher a hazard's score on the factor he called "dread risk," "the higher its perceived risk, the more people want to see its current risks reduced, and the more they want to see strict regulation employed to achieve the desired reduction in risk"). *Cf.* Sjöberg, *supra* note 15, at 8-9 (stating as a general principle "that people tend to see mostly good properties of those concepts or objects that they like and mostly bad properties in those that they dislike: beliefs and values are often strongly correlated and psychologically interdependent").

32. *See* Ali Siddiq Alhakami & Paul Slovic, *A Psychological Study of the Inverse Relationship Between Perceived Risk and Perceived Benefit*, 14 RISK ANALYSIS 1085 (1994); Gregory & Mendelsohn, *supra* note 26, at 262-63; Melissa L. Finucane et al., *The Affect Heuristic in Judgments of Risks and Benefits*, *in* THE PERCEPTION OF RISK, *supra* note 13, at 413, 415-17.

33. *See* Alhakami & Slovic, *supra* note 32, at 1091.

34. *See* Peter M. Sandman, *Risk Communication: Facing Public Outrage*, 13 EPA J. 21 (1987).

35. *See* Slovic, *supra* note 13, at xxviii-xxix.

of fatal consequences are correlated.[36] Other things being equal, a hazard with possibly fatal consequences is perceived as posing a higher risk than one without fatal consequences. But in addition, studies have found that a good predictor of perceived risk is whether a hazard is the kind that is "dreaded" by people. Higher dread correlates with higher perceived risk.[37]

Additional hazard characteristics have been found to be highly correlated with dread and with each other. Such factors include having little control over the occurrence or the severity of the accidents, having a potential for causing large numbers of fatalities in a single accident (possibly with a global potential), posing a threat to future generations, and inequitably distributing risks compared to benefits.[38] Another study of 13 hazards found dread significantly correlated with 6 other hazard characteristics, as well as with 4 out of 5 measures of perceived risk.[39] Various hazard characteristics can therefore be combined to form composite indices of "dread risk," which has emerged as a major predictor of perceived risk.[40]

Hazards that elicit dread in people tend to receive higher risk perception ratings, to an extent not explained by expected fatalities. But is "dread" simply another word for "perceived risk"? In the early 1990s, Robin Gregory and Robert Mendelsohn used multiple regression techniques to determine the extent to which such hazard characteristics could explain either dread or perceived risk.[41] They found, for example, that greater risk to future generations and more immediacy in the risk of death (as opposed to a delayed effect) were positive predictors for both dread and perceived risk, even after controlling for expected annual mortality and perceived benefits.[42] However, expected annual mortality had little effect on the dread ratings, but strongly affected the perceived risk ratings.[43] Dread and perceived risk are therefore not equivalent concepts, even though dread helps to explain perceived risk.[44]

Such findings about dread are consistent with evidence that negative attitudes toward a hazard help predict higher perceived risk.[45] Recent studies have used the mediating influence of a person's affective reactions to explain why perceived risks are inversely correlated with perceived benefits.[46] When negative affects were studied with a "worry index," worry and perceived risk were distinct phenomena that were positively correlated to each other.[47]

This evidence suggests that measurements of dread or worry reflect characteristics of the hazard that are difficult to identify except through a negative emotive reaction. Some of those hazard characteristics have been identified. The question for continuing research is which characteristics of a hazard generate reactions of dread or worry, and therefore higher perceptions of risk.

Scientific Uncertainty About the Risk

Even the early studies found correlations between perceived risk ratings and uncertainty about the nature, severity, or likelihood of the risk. Those authors sometimes referred to this factor as the degree to which the risk was "unfamiliar" or "unknown."[48] More recent work has found similar correlations.[49] For example, in a recent Swedish study, "beliefs in unknown effects emerged as the most important determinant of perceived risk of the nuclear technologies studied."[50] It is certainly reasonable that a person's uncertainty or lack of knowledge about a risk would increase the perceived risk of the relevant hazard. Stepping into the unknown is generally regarded as a risky undertaking. Consistent with this hypothesis is the finding in one study that the risk perceptions of nuclear waste experts about non-nuclear hazards tended to agree with the perceptions of the public, while the experts' risk ratings about nuclear waste hazards were predictably lower than the perceptions of the public.[51]

36. *See* Fischhoff et al., *supra* note 14, at 132-33, 140 (finding that severity correlated significantly with perceived risk, where "severity of consequences" measured the participants' views of how likely it is that the consequences would be fatal, provided the adverse effect happened at all); Slovic et al., *supra* note 17, at 195, 202-05; Slovic et al., *supra* note 30, tbls. 5 & 9; Slovic, *supra* note 20, at 257.

37. *See, e.g.*, Fischhoff et al., *supra* note 14, at 140-41; Slovic et al., *supra* note 17, at 202-05; Slovic et al., *supra* note 30, at 110-14; Slovic et al., *supra* note 19, at 363.

38. For lists of the risk characteristics studied, *see, e.g.*, Slovic et al., *supra* note 30, tbls. 5, 8, and 11.

39. Marris et al., *supra* note 15, at 307-10. The six hazard characteristics were: delayed effects, risk to future generations, catastrophic potential, involuntariness, unfairness, and severity. The four measures of perceived risk were: riskiness, annual fatalities, environmental harm, and unacceptability of current risk. The study confirmed "that expert definitions of risk, which are usually based on the expected number of fatalities and injuries, fail to take into account other dimensions of risk which are of importance to the public." *Id.* at 308.

40. *See, e.g.*, Fischhoff et al., *supra* note 14, at 144-47; Slovic et al., *supra* note 17, 202-05; Slovic et al., *supra* note 30, at 112-14; Slovic, *supra* note 16, at 283.

41. *See* Gregory & Mendelsohn, *supra* note 26. The authors used six risk attributes, expected annual mortality, and two benefit measures as independent variables. This study, like the earlier studies, did not analyze the data on an individual level, but rather analyzed mean scores for each question and characteristic. *See id.* at 260.

42. *See id.* at 261-62.

43. *See id.* at 262-63 & tbl. 2. Also, the regression patterns for dread and perceived risk were not identical. *See id.* at 261, 263.

44. The authors state that "the frequent assumption of equivalence between perceived risk and dread is not correct." *Id.* at 263.

45. *See, e.g.*, Alhakami & Slovic, *supra* note 32, at 1093, 1095.

46. *See* Finucane et al., *supra* note 32. The study showed that evaluative judgments on one attribute (either perceived risk or perceived benefit) can be modified experimentally by providing information on only the opposite attribute. The authors concluded that "the study demonstrated a causal relationship by means of a direct experimental manipulation of risk and benefit. When the manipulation worked (i.e., when information increased perceived risk or benefit) the expected affectively congruent but inverse effect was found on the non-manipulated attribute (i.e., perceived benefit or risk decreased)." *Id.* at 426.

47. *See* Lennart Sjöberg, *Worry and Risk Perception*, 18 RISK ANALYSIS 85, 90-91 (1998).

48. *See, e.g.*, Slovic, *supra* note 16 (finding a predictive factor he called "unknown risk," reflecting the ratings of the hazard as being unobservable, unknown, new, and delayed in manifesting harm); Slovic et al., *supra* note 19, at 363-67 (in a study of perception of risk from automobile defects, finding a predictive factor they called "foreseeable injury," determined primarily by the anticipatory knowledge of the defect on the part of the manufacturer).

49. *See, e.g.*, Alhakami & Slovic, *supra* note 32, at 1093 (finding a "familiarity" factor somewhat predictive for 25 bipolar hazard-rating scales). However, studies have not always found correlations involving lack of knowledge. *See, e.g.*, Marris et al., *supra* note 15, at 309-10.

50. Lennart Sjöberg, *Limits of Knowledge and the Limited Importance of Trust*, 21 RISK ANALYSIS 189, 194 (2001).

51. *See* Sjöberg, *supra* note 29, at 6-9.

Subjective or personal lack of knowledge, however, is not the same as scientific uncertainty about a risk. The role of scientific uncertainty was explored in a series of studies about the confidence of experts and the public in the probative value of scientific evidence. Several findings are striking. First, both the toxicologists studied and the public participants were evenly divided on the value of animal studies in predicting toxicity in humans. In response to the proposition that "[t]he way that an animal reacts to a chemical is a reliable predictor of how a human would react," 43.7% of the Oregon public sample agreed and 45.7% disagreed, while 55.4% of U.S. toxicologists who were sampled agreed and 40.8% disagreed.[52] In a similar Canadian study, 60.3% of the Canadian public sample agreed,[53] while 66% of the Canadian toxicologists agreed.[54] Among British toxicologists who were studied, only 48.1% agreed with the proposition.[55] This suggests that neither the public nor toxicologists have achieved a consensus on the probative value of animal evidence.[56]

A second finding was that if animal tests show positive results for carcinogenicity, public confidence in the probative value of the evidence increases, with an even wider difference developing between the public and the experts. When asked whether a chemical that causes cancer in animals will cause cancer in humans, 69.4% of the Oregon public sample agreed and 82.3% of the Canadian public sample agreed.[57] Among the toxicologists surveyed, however, only 34.9% agreed in Britain, 51.3% in Canada, and 40.6% in the U.S. study.[58] The public considers evidence of increased risk of cancer to be more probative than either evidence of no risk or no evidence of risk.[59] People seem to place more confidence in animal tests if they show adverse effects on health.[60]

Third, there is a lack of confidence in the general ability of scientists to predict risks accurately. When asked whether "experts are able to make accurate estimates of health risks from chemicals in the environment," over 36% of the Canadian public sample disagreed with this statement.[61] Moreover, the Canadian toxicologists surveyed were more pessimistic than the Canadian public, with 53.3% disagreeing.[62] Among British toxicologists studied, 28.2% disagreed with the statement that experts can make "reasonably accurate quantitative estimates" of such risks.[63] Substantial percentages of both the public and the experts, therefore, have doubts about the capacity of scientists to predict environmental risks accurately.

A recent study of both nuclear waste experts and the public in Sweden measured beliefs about the likelihood that there are effects of nuclear technology that are unknown today.[64] Among the public surveyed, 54% thought that there are likely to be unknown effects of Swedish nuclear power, including 22.9% who thought this to be "very likely."[65] Only 8.6% of the experts thought this to be likely, and none thought it "very likely." When asked about unknown effects of a nuclear waste repository, 46.5% of the public sample thought unknown effects to be likely, including 21.6% who thought them "very likely." Only 5.4% of experts thought such effects to be likely, with none thinking them "very likely." Among the participants in the public sample, beliefs in unknown effects were very common,[66] and there were fairly strong correlations between risk perceptions and the beliefs in unknown effects.[67]

When people associate significant scientific uncertainty with a risk, their trust or distrust of those who manage those risks in society may influence their perceptions of the risk. Lack of trust is a critical factor in the management of risk and it underlies many of the divisive controversies about which risks are acceptable in society.[68] A reasonable hypothesis is that trust becomes important in judging a risk to the extent that a person lacks personal knowledge about that risk.[69] In a sample of students at the University of Zurich, judgments of social trust were inversely correlated with perceived risk for three hazard areas: pesticides, nuclear power, and artificial sweeteners.[70] In a study conducted in Switzerland in 1997, researchers measuring perceptions and acceptance of risk for gene technology found evidence that trust has an influence on perceived risk, and indirectly on acceptance of biotechnology.[71] A recent Swedish study confirmed that trust in authorities (especially trust measured specifically for particular hazards) may be a moderately important factor in risk perception, although beliefs in unknown effects remain more important than trust.[72]

In sum, a person's uncertainties about a risk can heighten the perception of that risk. Moreover, there may be substantial scientific uncertainty about certain risks, which can in-

52. Nancy Kraus et al., *Intuitive Toxicology: Expert and Lay Judgments of Chemical Risks*, *in* THE PERCEPTION OF RISK, *supra* note 13, ch. 18, at 292, tbl. 18.2.

53. *See* Krewski et al., *supra* note 27, at 237.

54. *See* Slovic et al., *supra* note 27, at 668, tbl. 2.

55. *See* Slovic et al., *supra* note 14, at 296, tbl. 3.

56. *See* Kraus et al., *supra* note 52, at 312; Slovic et al., *supra* note 27, at 674; Slovic et al., *supra* note 14, at 303.

57. *See* Kraus et al., *supra* note 52, at 292, tbl. 18.2; Slovic et al., *supra* note 27, at 665.

58. *See* Kraus et al., *supra* note 52, at 292, tbl. 18.2; Slovic et al., *supra* note 27, at 665; Mertz et al., *supra* note 27, at 395, tbl. 2a.

59. *See* Paul Slovic, *Perceived Risk, Trust, and Democracy*, 13 RISK ANALYSIS 675, 678-79 (1993); Michael Siegrist & George Cvetkovich, *Better Negative Than Positive? Evidence of a Bias for Negative Information About Possible Health Dangers*, 21 RISK ANALYSIS 199 (2001). Reports of studies confirming a danger increased perceptions of risk more than reports of studies indicating low risk decreased perceptions of risk. *See id.* at 199, 202. Moreover, the more severe the reported risks, the more confident participants were in the study results. *See id.* at 203.

60. *See* Siegrist & Cvetkovich, *supra* note 59, at 205.

61. Krewski et al., *supra* note 27, at 244, tbl. 9.

62. *See* Slovic et al., *supra* note 27, at 671, tbl. 6.

63. Slovic et al., *supra* note 14, at 299, tbl. 9.

64. *See* Sjöberg, *supra* note 50.

65. *See id.* at 193, tbl. 2.

66. *See id.* at 193-97. Public participants usually believed that unknown effects (if they were to happen) would be bad effects, not good ones. *See id.*

67. *See id.* at 194-95.

68. *See, e.g.*, Slovic, *supra* note 59, at 676-77.

69. *See, e.g.*, Siegrist & Cvetkovich, *supra* note 14, at 717-18. In the study's small sample of college students in the United States, admittedly not representative of the U.S. population, the results supported the hypothesis.

70. *See* Michael Siegrist et al., *Salient Value Similarity, Social Trust, and Risk/Benefit Perception*, 20 RISK ANALYSIS 353, 358-59 & figs. 2-4 (2000).

71. *See* Michael Siegrist, *The Influence of Trust and Perceptions of Risks and Benefits on the Acceptance of Gene Technology*, 20 RISK ANALYSIS 195, 201 (2000).

72. *See* Sjöberg, *supra* note 50, at 193-94.

crease the perception of risk. Finally, distrust of scientists and risk managers can undermine efforts to inform the public about risk—especially if scientists themselves are divided on the adequacy of the scientific evidence.

Demographic Factors: Characteristics of the Risk Perceiving Subject

A 1996 literature survey covering 75 studies and reports found abundant support for the proposition that women tend to express higher levels of concern than men do about potential technological and environmental risks.[73] The evidence was especially strong and consistent for nuclear power and nuclear waste, but it was also clear for other risks, e.g., groundwater contamination or releases of genetically engineered organisms.[74] Other studies not covered in that survey also report a gender difference in risk perception.[75] For example, in a study with a representative sample of the Canadian public, a higher percentage of women than men gave a rating of "high risk" on all but 1 of 38 hazards—with the one exception being heart pacemakers.[76] As Paul Slovic reported in 1999, "[s]everal dozen studies have documented the finding that men tend to judge risks as smaller and less problematic than do women."[77]

Several studies have also found a similar gender difference among experts. One study found that women scientists judge risks from the nuclear waste cycle to be substantially higher than do male scientists.[78] Moreover, the women scientists in the study were less confident of the ability of current technology to reduce risks.[79] In a study of members of the Canadian Society of Toxicology, for 26 out of 38 hazard items, a higher percentage of women than men rated the hazard as moderate or high in risk.[80] In a survey of members of the British Toxicology Society, for 27 out of 29 hazards, women were more likely than men to label the hazard as posing moderate or high risk.[81] Given the gap in risk perceptions between experts and the general public, we can expect that the perceptions of women experts will tend to be closer to those of the general public than will the perceptions of male experts.

The explanation for such consistent correlations between risk perception and gender remains controversial. One hypothesis with supporting evidence is that health and safety concerns are more salient for women than for men, due to the common role of women as care providers within both the family and the community.[82] Another supported hypothesis is that women tend to be more distrustful than men about institutions, particularly those involved with science, technology, and government.[83] A third theory is that demographic differences in risk perception are explained less by biology or economics than by fundamental attitudes or "worldviews" about life.[84] Various researchers have begun measuring worldviews and have found them "strongly linked" to public perceptions of risk.[85] For example, studies have found that moral evaluations, including judgments about unnaturalness, may account for some of the additional component in perceived risk.[86] One study comparing the risk perceptions of men and women scientists about nuclear waste found that the women participants were far less likely than the men to believe that the risks "can be justifiably imposed on individuals without their consent," despite the benefits to society, the giving of individual compensation, or the (low) magnitude of the risk.[87]

There is some evidence that race may play a role in risk perception, although race may be a proxy measure for culture or worldview. One study found a "white male" effect on risk perception.[88] The researchers asked 1,489 Americans to rate the riskiness of 25 hazard items, and higher percentages of women (compared to men) gave "high-risk" ratings on every item.[89] When the variable of race (white/non-white) was taken into account, white males produced mean risk perception ratings that were much lower than the means of white females, non-white males, and non-white females.[90] There was evidence that sex, race, and being "white male" are each highly significant predictors of risk perception

73. *See* Debra J. Davidson & William R. Freudenburg, *Gender and Environmental Risk Concerns: A Review and Analysis of Available Research*, 28 ENV'T & BEHAV. 302 (1996).

74. *See id.* at 310-16 & tbl. 1.

75. *E.g.*, Michael R. Greenberg & Dona F. Schneider, *Gender Differences in Risk Perception: Effects Differ in Stressed vs. Non-Stressed Environments*, 15 RISK ANALYSIS 503, 509 (1995) (finding that women were more concerned than men about environmental risks, although there was no consistent difference in concern by gender in "stressed neighborhoods" with multiple hazards); Dosman et al., *supra* note 21, at 316 (finding that, while variables such as household income, number of children, age, and voting preferences were strong predictors of an individual's risk perceptions, gender was not only a strong predictor, but also a robust one).

76. *See* Daniel Krewski et al., *Health Risk Perception in Canada I: Rating Hazards, Sources of Information, and Responsibility for Health Protection*, 1 HUM. & ECOLOGICAL RISK ASSESSMENT 117, 122-23 & fig. 3 (1995).

77. Paul Slovic, *Trust, Emotion, Sex, Politics, and Science: Surveying the Risk-Assessment Battlefield*, 19 RISK ANALYSIS 689, 692 (1999). *See also* Greenberg & Schneider, *supra* note 75, at 503-04 (stating that "[m]any reports have shown that women are more concerned about environmental risks" than men are); Per E. Gustafson, *Gender Differences in Risk Perception: Theoretical and Methodological Perspectives*, 18 RISK ANALYSIS 805, 806 (1998) (concluding from a review of studies that "men express less concern for practically all the risks studied").

78. *See* Richard P. Barke et al., *Risk Perceptions of Men and Women Scientists*, 78 SOC. SCI. Q. 167, 169-74 (1997) (comparing male with female physical scientists, and male with female life scientists).

79. *See id.* at 175.

80. *See* Slovic et al., *supra* note 27, at 664 & fig. 3.

81. *See* Slovic et al., *supra* note 14, at 292, 303 & fig. 2. Men were more likely to agree that animal tests are good predictors of human reactions to chemicals, while women were more likely to agree that evidence of carcinogenicity in animals means that the chemical is likely to cause cancer in humans. *See id.* at 300. The study also found that men exhibited more trust that experts can make accurate estimates of health risks from chemicals in the environment. *See id.*

82. *See* Davidson & Freudenburg, *supra* note 73, at 323.

83. *See id.* at 319-22.

84. *See* James Flynn et al., *Gender, Race, and Perception of Environmental Health Risks*, 14 RISK ANALYSIS 1101, 1107 (1994); Slovic, *supra* note 77, at 693-94. Worldviews are general attitudes that influence how people make judgments about complex issues. *See id.* at 693. Examples of such fundamental attitudes on which we are beginning to have data include: fatalism (e.g., "I feel that I have very little control over risks to my health"); hierarchy (e.g., "decisions about health risks should be left to the experts"); and technological enthusiasm ("a high-technology society is important for improving our health and social well-being"). Krewski et al., *supra* note 27, at 241-46 & tbl. 10.

85. *See* Slovic, *supra* note 77, at 694.

86. *See, e.g.*, Sjöberg, *supra* note 15, at 4, 8.

87. *See* Barke et al., *supra* note 78, at 175.

88. *See* Flynn et al., *supra* note 84.

89. *See id.* at 1102 & fig. 2.

90. *See id.* at 1102 & fig. 1; Slovic, *supra* note 77, at 692.

even after controlling for such factors as education, income, age, political orientation, presence of children under age 18 in the household, and either sex or race.[91] Additional analysis suggested that the "white male effect" might be driven primarily by a subgroup of white males who perceived risks to be low and who "can be characterized by trust in institutions and authorities and a disinclination toward giving decision-making power to citizens in areas of risk management."[92] Ultimately, adequate explanations of risk perception in terms of characteristics of the perceiving subject are likely to be rather complicated and difficult to achieve.

Trade Disputes Involving Article 5.5 of the SPS Agreement

The SPS Agreement is based on the premise that good science can act as a neutral arbiter of disputes over restrictions on international trade. Measures taken to protect the health and safety of a population are justified by the threat of an ascertainable risk, provided similar risks are treated similarly. The argument in this Article is that good science about how people actually evaluate and compare risks should provide a legitimate basis for evaluating the consistency of levels of protection against ascertainable risks. In a dispute settlement proceeding, a WTO Member should be allowed to produce empirical evidence to justify different levels of protection for different products. There are several lines of reasoning that support this argument.

First, risk perception science can help the WTO to achieve its goal of eliminating those measures that are merely disguised restrictions on international trade. The scientific research demonstrates how perceptions of risk can be measured and documented. Scientists can therefore provide evidence on whether the people of a country actually consider two products to pose similar or different risks. Empirical studies can help establish that a difference between levels of protection corresponds to a difference in risk perceptions, and therefore is not arbitrary or unjustifiable.[93] However, an unexplained lack of such empirical evidence might suggest that a difference in levels of protection is in fact arbitrary or unjustifiable. Sound science can help differentiate between good-faith differences in levels of protection and disguised restrictions on trade.

Second, the language and intent of the SPS Agreement show that factors relevant to risk perception and acceptability should be taken into account. The SPS Agreement explicitly recognizes that an indefinite number of factors, such as voluntariness in being exposed to a risk, are relevant in justifying different levels of governmental protection.[94] This example of a relevant factor is supportable by evidence that involuntary exposure to a risk correlates with the desire for governmental protection against the risk,[95] although other evidence suggests that such a correlation may be due to other hazard characteristics, such as catastrophic potential, dread, and inequity.[96] But there is also sound research demonstrating that other factors are relevant to risk perception. The language and intent of the SPS Agreement indicate that such factors should be considered when justifying different levels of protection.

Third, the research summarized in this Article establishes that certain kinds of factors are presumptively relevant to justifying different levels of protection. Such evidence documents the relevance of the dread-generating characteristics of a hazard, of the scientific uncertainty about a risk, and of demographic factors such as gender.

For example, a hazard's catastrophic potential or its potential to adversely affect future generations may increase the dread that people experience with regard to the hazard, and may lead them to place the hazard in a more serious risk category. Non-food examples are the hazards of nuclear power generation and nuclear waste management, but food products covered by the SPS Agreement can pose similar risks. If bovine spongiform encephalopathy poses a risk of widespread fatalities after a long latency period or a genetically modified organism poses an irreversible threat to an ecosystem or to human health, it should come as no surprise that many people desire heightened levels of protection against such hazards. There is good evidence for presuming that people consider the risks posed by such hazards as different in kind from the risks posed (for example) by automobile collisions.

The research also establishes that scientific uncertainty about the risk is presumptively relevant to risk perception, as is the population's level of trust in its regulatory institutions. And it is reasonable that scientific uncertainty and trust would be inversely related. Our willingness to allow experimentation with a product depends in part on our trust that risk assessors and managers know what the risks are. To the extent that a technology is new and there is little experience with it, we can presume that people will regard its risks as being higher than the risks posed by more familiar hazards.

The risk perception studies also demonstrate that different segments of a population tend to perceive risks differently. For example, we can expect that the levels of risk perceived by women, and especially by mothers of small children, will be higher than the levels of risk perceived by men. We can also expect that experts in a field will perceive the risks in that field to be lower than the general public perceives them to be. It should be left to the political processes of each WTO Member to decide how to take such group per-

91. *See* Flynn et al., *supra* note 84, at 1102, 1106-07 & tbl. 3. Other studies have found that risk perceptions differ among groups that are different in education, see Sjöberg, *supra* note 29, at 10, or that worry tends to be higher for those who have young children, see Sjöberg, *supra* note 47, at 86, 90. Women with children at home have the highest level of concern of any group, as found in several studies. *See* Davidson & Freudenburg, *supra* note 73, at 307, 325-26.

92. Flynn et al., *supra* note 84, at 1106.

93. The determination of the Appellate Body in the hormones case that consumer concerns are relevant to decisions under the SPS Agreement Article 5.5 is consistent with this argument, see Appellate Body Report (Hormones), *supra* note 4, ¶¶ 245-246. The Appellate Body's reasoning, however, was both unclear and problematic. *See* Walker, *supra* note 5, at 306-08 & n.264.

94. The SPS Agreement, *supra* note 2, Article 5.5 directs the Committee on Sanitary and Phytosanitary Measures to develop guidelines to implement the consistency requirement of Article 5.5, taking into account "all relevant factors, including the exceptional character of human health risks to which people voluntarily expose themselves."

95. *See* Fischhoff et al., *supra* note 14, at 133, 143-44, 148-49 (concluding that their respondents believed that "society should tolerate higher risk levels for voluntary, than for involuntary activities"); Gregory & Mendelsohn, *supra* note 26, at 261, tbl. 1 & n.8.

96. *See* Slovic et al., *supra* note 17, at 205-07. As Gregory & Mendelsohn, *supra* note 26, stated: "One interpretation of this result is that voluntariness is not important in and of itself but acts as a proxy for other variables, such as equity or personal benefits." *Id.* at 262.

ceptions into account when deciding which levels of risk are acceptable. Empirical evidence that documents such risk perception differences within a population should help justify a government's decision to establish different levels of protection.

A fourth and final argument is that it would be extremely imprudent for the WTO to rule, through either dispute settlement panels or the Appellate Body, that a population's documented risk perceptions are irrelevant in justifying different levels of protection. If sound risk perception research accurately describes how people in fact evaluate and compare two products, then ruling their risk perceptions to be irrelevant would undermine the credibility and success of the WTO itself. National governments will not ignore the actual risk perceptions of their own people—or will ignore them at the peril of the governments themselves. When health and safety are thought to hang in the balance, democratic governments are far more likely to abandon the WTO than to ignore the concerns of their people. WTO Member governments have a strong and reasonable interest in preserving the public trust that their regulatory institutions can and will provide adequate protection.[97]

Conclusion

The WTO faces considerable difficulty in judging two risks to be similar or two levels of protection to be consistent, without infringing on the political sovereignty of its Members. Sound science presents a solution to this difficulty. The language and intent of the SPS Agreement, as well as prudent self-interest, should lead the WTO to take risk perception research into account when determining whether a Member's different levels of protection are consistent and justifiable.

97. Trust is typically created very slowly, but it can be destroyed very quickly. *See* Slovic, *supra* note 59, at 677-79.