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**Who are more sensitive to food-borne risks in Japan, consumers or
politicians? : A political economy perspective**

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Introduction

The shutting-out of U.S. beef from the Japanese market due to the BSE scare caused serious economic damages to the U.S. beef industry. Although it was unclear what kinds of political mechanisms may or may not have affected such an outcome, it should generally be noted, aside from any external link to the U.S. situation, that in Japan there have been several incidents of food-borne risks related to various sources other than BSE, and these sources, such as dioxin and *E. coli* O-157, have for the last decade been at the center of a growing concern about the relationship between objective scientific data on food safety and political decision-making.

As an illustration of this relationship, Japanese consumers have a tendency to pay attention to a specific source of food-borne risk at one time, but later, when another source becomes recognized as a more critical threat, the earlier potential risk quickly fades into oblivion. While consumer feeling is likely to fluctuate in this way, politicians cannot avert such emotional and transient scares.

Although the fluctuation of consumer feeling related to the fear of food-borne risks can be observed in countries other than Japan, the degree of this tendency seems to be extra-ordinary in Japan. Political science literatures often points out that politicians in Japan have limited staff, and so they lack the capacity, compared with their counterparts in the U.S., to fully understand scientific information related to food safety. In addition, consumer interest groups also do not have adequate staff or advisers, compared with similar groups in the U.S., able to understand the scientific data on food-borne risks. As a result, both politicians and consumers may drift aimlessly through periodic food safety scares that are not anchored in science.

The purpose of this paper is to examine what kind of mechanism exists

behind recent government decisions concerning food-borne risks in Japan. To fulfill this purpose, the next section surveys the features and present situation of political decision-making around food safety issues. The third section employs a conceptual analysis and then a model is built in order to compare how the change of parameters affects outcomes. Then, taking those results into consideration, the basic ideas of this model are applied to the contemporary Japanese political situation in order to explain what kinds of political mechanisms cause extremely strict regulation relating to BSE. In a previous study, Kramer (1990) suggests that there is a possibility that consumers cannot accurately perceive real risks and therefore inappropriately make demands of politicians who ultimately adopt policies misled by such inappropriate requests. This paper intends to test this proposition in a far more concrete form than the previous study.

Pre-study Analysis

Policy change relating to food safety in Japan

Before building a model, three major events or political changes must be pointed out as crucial factors that affect the political decision-making around food safety issues in Japan. The first is food-borne diseases other than the BSE scare of U.S. beef with which people had a growing concern. The second is the administrative reform of the government organizations relating to food safety policies, following the recommendation by CODEX. The third is general political movements under the Prime Minister Jun-ichi-rou Koizumi's reform.

The first factor stems from the last half of the 1990's, from which time there has arisen several food-borne risks that caused a growing concern among consumers. The first one was *E. coli* O-157, and the second was dioxin. The third, and the one that most profoundly affected the U.S. beef BSE scare, was the BSE

issue related to domestically produced beef. In September 2001, a cow suspected of carrying BSE was detected in a dairy farm in Japan and subsequently several other cows were also found to be infected.

The fundamental cause of these incidents is said to be negligence in the strict regulation of the ban on importing bone meal as feed from BSE-infected countries, even though CODEX strongly recommended several years ago that these measures be taken in order to prevent BSE from widely spreading. Even so, the government did not directly admit this policy fault. Moreover, they appeared to attempt to shirk the responsibilities, and this attitude of the government made the matter worse, ending up in public distrust of government policies relating to food safety.

Consequently, beef consumption plunged to a low level, not only for domestic beef but also for imported beef. For Japanese consumers, beef had been becoming a popular source of high quality protein, due to recent price reductions resulting from large increase in importation from the U.S. and Australia. However, in Japan beef was not a daily necessity. Instead of beef, people easily altered their food choices to other protein sources such as pork and chicken, even to fish.¹ Furthermore, in response to high consumer pressure demanding strict regulation to protect food safety, the government was forced to promise to test for BSE on all cows, rather than employing a sampling method.

The second factor is the re-formation of government organizations following the recommendations by CODEX. Through this reformation, the so-called risk analysis system was introduced and the government organization in charge of food safety was separated into three parts: a part responsible for risk assessment, one for risk communication and one for risk management. These changes should

¹ The opposite phenomenon happened when high PCB levels were detected in fishes.

have been completed earlier, however, they were stalled because of bureaucratic red tape. Then, the domestic beef BSE scare took place. Eventually, such incidents triggered the government to adopt drastic movement toward the CODEX recommendation. In addition, in order to support the newly introduce system, the Basic Law of Food Safety and other related laws were enacted in 2003.

As a result of these governmental reformations, the separation of risk assessment from risk management seems to put importance on scientific knowledge. On the other hand, risk communication becomes independent, and the government has to communicate with consumers and respond respectfully to their opinions. Ironically, such a change made it more difficult for the government to neglect consumer feeling with its inclination toward emotional fluctuation.

Third factor concerns general political movements under the Prime Minister Jun-ichi-rou Koizumi's reform², in which the decision-making in food safety policies as well as that of other policy areas was drastically changed in the last decade from traditional Japanese bureaucrat-led decision-making to politician-led decision-making. In Japan, ministries including their related research institutions have traditionally possessed adequate information concerning decision-making, while parties and politicians do not have necessary information due to their lack of access to think-tanks, expert staff or advisers. Food safety issues are no exception. In the past, bureaucrats who controlled public access to information, including scientific data concerning food safety, had wielded a power to persuade or dissuade consumers and interest groups and to force them in certain directions irrespective of consumers' emotional and sometimes groundless opinions. However, today, such an old-fashioned decision-making process is gone forever.

² Strictly speaking, these political movements are not confined to Koizumi's reform. Predecessors also attempted to reform the fundamental decision-making structure for the past decade. Nevertheless, others' reform was neither so drastic nor determined as that of Koizumi.

Decision-making is more and more democratic and the pivotal players are shifting from bureaucrats to politicians and consumers. Ironically, as a result, decisions are more likely to fluctuate rapidly, to be emotional and even to be arrived at less scientifically.

What kinds of features are observed in decision-making around food safety?

In addition to the changes mentioned above, two distinctive features of the food safety decision-making, as compared with decision-making on other issues, in Japan should be taken into consideration. One is with respect to the ratio of unanimity in the decision-making in the parliamentary committee and the other is with respect to the degree of pork barrel attitude among key political figures who play a substantially central role in decision-making.

Table 1 shows the ratio of bills that were unanimously approved by committee members as compared with total approved bills from 1975 to 2004. These figures are based upon the statistical data collected from the minutes of the relevant parliamentary committees. The ratio of unanimity was significantly higher in the case of bills concerning food safety (0.733) than in the case of those not concerning food safety (0.498).

This fact suggests that politicians may, like consumers, lean toward making ad hoc voting decisions on food safety issues. This means that in a stage when excessive emotional fear relating to food safety is prevailing among consumers, politicians tend to unanimously approve policies that simply strengthen the regulation or enlarge the budget related to rising food-borne dangers. In usual cases, food and farm policies are controversial. The conflict between interest groups, i.e. farmers groups and industrial groups or consumers groups are so severe that among politicians, even among those in the ruling party, opinions are

widely disparate. The extra-ordinarily high ratio of unanimity surrounding food safety decisions suggests that politicians behave differently in voting on this issue, as compared with other, more constant issues.

Table 2 shows the list of the members of the unofficial group within the ruling party associated with promoting food safety policies³. The members of these groups, though the membership is voluntary and unofficial, have played a pivotal role in promoting food safety policies. Especially after the outbreak of BSE in domestic beef, those members were central in making the Basic Food Safety Law and other related laws for the purpose of promoting related preventive measures. Although sophisticated analysis of the relationship between those members and their constituency's beef production and other interest group activities has not been done yet, it can be easily observed in this table that there is only a weak connection between those members and the beef production constituency.

Consequently, one of the two distinctive features of the political decision-making regarding food safety is that politicians behave according to the sentiment of the day when the bills become a growing concern. In other words, their behaviors are ad hoc and might be described as riding on the bandwagon. Another feature is that when faced with food safety threats, there seems little evidence of pork barrel politics or protectionism with regard to constituent agricultural production.

³ Although it is unofficial and not widely known, the existence of such a group and the names of the members are known among politicians and interest groups concerning this matter.

Model

Theoretical Framework

Prior to building a model, previous studies were surveyed, and two general propositions were presented as follows:

According to consumer behavior responding to food-borne risks, it is observed that consumers perceive any increase of those risks with a sharply sensitive manner while an amelioration of those risks is only appreciated mildly. We often hear food companies' sales managers complain that they can acquire only a little premium by efforts to prevent food-borne risks even though consumers, on the surface, appreciate the direction of such efforts. On the other hand, consumers sometimes excessively refuse the foods produced by companies that fail to maintain minimum sanitary standards, even ousting those companies from the market.⁴ Considering these two drastically different responses, it is reasonable to suppose that consumer behavior relating to the increase or the decrease of food-borne risks is asymmetric.

Moreover, it is also observed that marginal response to an increase or amelioration of risk seems to occur in a diminishing manner. In the case of the amelioration, the fact that a food-borne risk is ameliorated is in itself important and people do not so much care about the degree of amelioration. As a result, a response curve towards the amelioration is likely to be concave to the horizontal axis. In the case of the risk increase, similar to the case of amelioration, the fact that a food-borne risk gets worse, itself, is of great concern to consumers, and they are not so conscious about the degree of it. Consequently, a response curve toward the risk increase is likely to be concave to the horizontal axis.

⁴ In 2002, Japan's largest dairy products company became bankrupt and ousted from the market because of consumers' strong refusal to buy its products because of a series of food-borne incidents due to poor sanitary standards.

Combining the asymmetric response and the diminishing response towards the amelioration and the increase of food-borne risks, we can obtain a curve similar to the curve of the so-called ‘Prospect Theory’ presented by Kahneman and Tversky (1979).⁵ Figure 1 depicts the pattern of the subjectively perceived risk following the Prospect Theory. If a consumer could realize the objective risk,⁶ the curve should become a 45-degree angled line. However, consumers are likely to behave following a subjective and unscientific pattern of perception.

Consequently, an empirically observed but also theoretically based proposition is presented as follows:

Proposition 1: Consumers subjectively perceive food-borne risks according to the pattern of the so-called Prospect Theory. In the case that a risk is perceived as being ameliorated by a policy, consumers’ appreciation for this policy is marked at first, but its marginal rate of increase is gradually diminished, while in the case that a risk is perceived to increase due to a policy’s ineffectiveness, consumers’ condemnation of this ineffectiveness is very high.

With regard to politicians’ behaviors, there is a conceptual theory that a politician or a party tends to adopt policies that satisfy the requirements of a median voter, not an average voter, aiming at acquiring maximum voter support. This theory, the Median Voter Theorem, is often criticized because such a principle can easily be broken under ideological disputes or so-called logrolling behaviors. Certainly, there may be logrolling behaviors between the bills related to food safety issues and other bills. However, it is reasonable to suppose that the degree of distortion caused by logrolling behaviors in cases of food safety issues

⁵ This idea was originally suggested by Nakajima (1999).

⁶ This means that the subjectively perceived risk is equal to the objective risk.

is not more than that in other issues. Since ideological disputes are relatively weak over food safety bills, it is more likely that politicians behave following the pattern of the Median Voter Theorem regarding food safety, as compared with other policy areas.

Considering these situations totally, a theoretical proposition is presented as follows:

Proposition 2: Politicians aim to maximize the possibility of being re-elected. As a result, they tend more often to behave following the pattern of the Median Voter Theorem on food safety issues.

Model

Under this theoretical framework, two conditions are assumed as follows:

Assumption 1: Consumers do not understand the scientific information regarding food-borne risks and behave according to their subjectively perceived risks.

Assumption 2: Politicians do not understand the scientific information regarding food-borne risks and behave in an attempt to maximize voter support.⁷ This means that they adopt policies aiming to satisfy the median voter's preference⁸.

⁷ Although some politicians may behave so as to averse a risk, others may behave so as to take a risk, here we suppose that politician behave with risk-neutral manner.

⁸ As mentioned previously, the Median Voter Theorem is problematic. However, here, the criticism is not justifiable, since in this case the preference of the majority of consumers is the same as that of the median voter. The typical case of this theorem is that only a number of half plus one of consumers are satisfied by the adopted policy. Hence, this case is entirely different from the typical case.

The model is as follows:

Suppose that consumers evaluate a politician as vote-worthy according to the Prospect Theory in the case when a food-borne risk is realized or of great concern. In this situation, consumers tend not to care about how much preventive measures cost. Therefore, how effective a policy is in preventing or mitigating such a risk equals the vote-worthiness of the politician presenting the policy.

On the other hand, suppose that consumers evaluate a politician as vote-worthy, according to budgetary issues when a food-borne risk is neither realized nor of great concern: i.e. when the public considers increased for food safety to be a waste of tax payers' money. In this situation, consumers almost forget future risks and tend not to care about how effective such measures might be in preventing possible risk in the future. As a result, consumers simply regard a policy with the attitude that cheaper is better. Politicians who present lower budgets for food safety are thus appreciated as more vote-worthy.

When a food-borne risk is realized or of great concern, the risk is subjectively perceived by consumers in the manner following the Prospect Theory. A risk perception function (RPF) is represented as follows:

$$\begin{aligned} \text{RPF} &= \alpha \log(q - \gamma + 1) \text{ if } q > \gamma \\ &= -\beta \log(\gamma - q + 1) \text{ if } q < \gamma \end{aligned}$$

q: A level of risk estimated by scientific data

γ : The perceived risk of present situation⁹

⁹ γ , the perceived risk of present situation, is equivalent to the so-called 'reference point' in the Prospect Theory's terminology. While the reference point is the origin in a Prospect Theory diagram, here, in this modified diagram, it is located in a certain point other than the origin. The location of γ on the horizontal axis shows the present situation of a risk as a scientifically measured and objectively observed value. It also represents the present level of preventive measures taken under the present food safety policies. The location of γ on the vertical axis shows the level of subjectively perceived risk, which is equivalent to the level of

α, β : Parameters¹⁰

According to the supposition mentioned above, this risk perception function of consumers is equivalent to the politician evaluation function (PEF) of voters.

Consequently, it is re-modeled as follows:

$$\begin{aligned} \text{PEF} &= \alpha \log(q - \gamma + 1) \text{ if } q > \gamma \\ &= -\beta \log(\gamma - q + 1) \text{ if } q < \gamma \end{aligned}$$

When a food-borne risk is not realized, consumers simply regard a policy with the attitude that cheaper is better. Preventive measures for reducing a risk necessarily accrue accompanying costs. Suppose that an initial cost is needed, but the marginal cost is required in a linear manner as represented below.¹¹

$$C = \lambda + \mu * q$$

C: Cost function of preventive measures for reducing a food-borne risk

λ : Fixed cost of preventive measures

μ : Marginal cost of preventive measures per unit of scientific risk reduction

The politician evaluation function is equal to the degree to which the budget is wasted, that is, the initial level of reputation minus the cost of seemingly wasteful budgets for food safety. As a result, the function simply becomes a down-sloped linear style one as follows:

evaluation of the policy from consumers (voters) to politicians who adopt such a policy.

¹⁰ Suppose $\alpha < \beta$, following the proposition presented by the Prospect Theory. Just as a company in the food industry would dramatically reduce its reputation by neglecting appropriate food safety measures, so a politician would disproportionately lose his political support from voters. On the other hand, he could only obtain a disproportionately smaller increase in his support by promoting appropriate policies.

¹¹ The cost of preventive measures may increase exponentially rather than linearly. However, whether it increases linearly or exponentially does not crucially affect the conclusion of this problem. Therefore, in order to simplify the model, we adopt a linearly increasing cost function.

$$\begin{aligned} \text{PEF} &= I - C \\ &= I - \lambda - \mu * q \end{aligned}$$

I: Initial evaluation of politician vote-worthiness

It is supposed that the possibility of a politician's re-election is determined by voters' evaluation of his political actions. This evaluation consists of, on the one hand, his foresightedness in adopting effective preventive measures when an incidence of food-borne diseases might happen and, on the other hand, his apparent waste of funds due to excessive precautionary measures when such an incident might not occur.

In order to integrate the politician evaluation function in two cases, i.e. in the case when a food-borne risk is realized and in the case when it is not, the probability of occurrence for each case should be considered. It should be noted that it is doubtful whether consumers could correctly perceive a real, scientifically predicted probability of being exposed to food-borne threats. It is reasonable to suppose that consumer prediction of the probability of threats would differ from scientific prediction. Consequently, we present two kinds of probabilities, one subjectively predicted by consumers, the other objectively predicted on scientific grounds.

ρ : probability subjectively predicted by consumers

σ : probability objectively predicted on scientific grounds

We use the former probability for modeling a total politician evaluation function because it is determined by voters or consumers. As a result, the total politician evaluation function is modeled as follows:

$$\begin{aligned} \text{TPEF} &= \rho * \alpha \log(q - \gamma + 1) + (1 - \rho) * (I - \lambda - \mu * q) \text{ if } q > \gamma \\ &= -\rho * \beta \log(\gamma - q + 1) + (1 - \rho) * (I - \lambda - \mu * q) \text{ if } q < \gamma \end{aligned}$$

Politicians behave in response to such voter evaluation so as to maximize the

possibility of re-election. In other words, politicians adopt the optimum policy or the optimum level of preventive measure that maximizes TPEF, subject to constraints. The constraints of this function depend on a range of consumers' acceptance of the policy change. Consumers may insist on maintaining the present level of preventive measures.

When a food-borne risk is of great concern or is in fact realized, an optimum level of q would be located to the right hand side of γ . Since TPEF is concave to the horizontal axis in this area, the first order condition of TPEF gives an optimal level of q , i.e. the optimum level of preventive measure and the optimum policy for politicians. The political equilibrium is obtained by solving the equation below.

$$\partial(\text{TPEF}) / \partial q = \partial / \partial q (\rho * \alpha \log(q - \gamma + 1) + (1 - \rho) * (I - \lambda - \mu * q)) = 0$$

The solution is as follows:

$$Q^{op} = (\rho / (1 - \rho) * \alpha / \mu) + \gamma - 1$$

When a food-borne risk is not realized and is of little concern, an optimum level of q would be located equal to the point of γ , or less than γ , depending upon the constraints or the relationship among various parameters.¹²

In order to examine the features of this political equilibrium deeply, let us consider the meaning of ρ further. Since ρ is the probability subjectively predicted by consumers, it depends upon each individual's emotions. It distributes from a higher probability predicted by highly food safety-conscious consumers to a lower

¹² Even the zero level of preventive measure would be adopted if there are no constraints on consumers' acceptance levels compared with the present situation and consumers' subjectively perceived risks, ρ , are extremely small. However, in usual cases, consumers may not accept the preventive measure at levels extremely lower than the present level. Besides, even if there are no constraints, since β is usually overwhelmingly higher than α , λ may be relatively a stable point when a range of change of subjectively perceived probability from the point $(\rho / (1 - \rho) = \alpha)$ is not so large.

probability predicted by consumers with a low consciousness of food safety. It may not be normally distributed. Rather, when a food-borne risk is just becoming of great concern, the distribution of consumers' prediction of probability would be skewed toward higher probability.¹³ On the other hand, when a food-borne risk is not of critical concern or even when such concern is downplayed by the appearance of another new threat of food safety, the distribution would be skewed toward lower probability.¹⁴

As a result, a politicians' evaluation by an average consumer must not be equal to that by a median consumer. Politicians aim to maximize the possibility of being re-elected and thus adopt policies aiming to satisfy the median voter's preference. This means that politicians do not tend to adopt the policy that appropriately reflects average consumers' concerns.

Still, there may exist politicians who are capable of understanding a real situation due to their own scientific knowledge or due to the advice of staff with scientific expertise. Such politicians may persuade people that a real probability of food-borne risk is not ρ but σ . Nevertheless, in order to fulfill such a role, a politician is required to have access to not only his own or his staffs or advisers' scientific expertise but also some degree of courage in order to defy the prevailing opinion and attempt to change it. If a politician or his staffs or advisers could have scientific expertise, the probability used in his presenting policy would become not ρ widely apart from σ , but ρ relatively closer to σ .¹⁵

¹³ Majority of consumers would be becoming fanatic and highly conscious during phase like this, while a limited number of consumers would be calmly and scientifically judging a real situation.

¹⁴ Majority of consumers would be excessively optimistic for food-borne risks and ignorant of precaution of them based upon scientific data, while only a limited number of consumers would notice about such risks during phase like this.

¹⁵ In order to adopt policy that is not submissively following the prevailing opinion, a politician is required to have both adequate scientific expertise and courage. Such a politician may be quite rare. The ratio of courageous politicians does not vary from country to country but politicians' or their staff's and advisers'

Another possibility that ρ relatively closer to σ is adopted may also exist if consumers have scientific expertise and are provided relevant information. In usual cases, since consumers are not provided adequate information on food-borne risks, they would predict the probability ρ very far from σ . However, if they would be led by opinion leaders who understand scientific information, they would predict the probability ρ relatively closer to σ .

Results

The problem is that the political equilibrium of q would be determined at a different level from the socially optimum level of q . In this paper, if the probability used to determine the political equilibrium is just equal to the scientifically based probability, i.e. $\rho = \sigma$, we call its equilibrium q the socially optimum level.¹⁶ It is possible that the political equilibrium of q would be determined relatively closer to the socially optimum level if the subjectively predicted probability ρ is relatively closer to σ . Nevertheless, usually a larger gap remains.

In the case when the fear of a certain type of food-borne disease arises, the probability subjectively expected by the average consumer or voter (ρ_{ac}) tends to become higher than that objectively predicted by scientific knowledge (σ). A distribution of voters' opinion tends to be biased toward excessive fears of

scientific expertise does vary from country to country.

¹⁶ Precisely speaking, the scientifically optimum level of q is determined only by scientific data. However, it should be considered that consumers' misperception of risk is, to some extent, unavoidable. In this paper, we presume that such misperception is human's intrinsic characteristic and inevitable. Under this presumption, we call it a socially optimum level if the predicted probability would be one based upon scientifically correct ground, i.e. σ , instead of ρ , even though consumers' subjectively perceived risks remain on the curve depicted by the pattern following the Prospect Theory.

food-borne risks, because the majority of consumers who do not have adequate scientific knowledge excessively fear food-borne risks, while a limited number of consumers calmly keep their heads. Under such a distribution, the probability subjectively expected by the median voter (ρ_{mv}) is supposed to be higher than ρ_{ac} .

According to the Median Voter Theorem, politicians tend to adopt the policy that can satisfy the preference of the median voter. The probability strategically adopted by politicians tends to be larger than not only σ but also even ρ_{ac} unless such politicians' unreliable judgments would be rectified by their staff's advice based upon scientific expertise. The political equilibrium is given as below.

$$Q_p^{op} = Q_{mv}^{op} = \rho_{mv} / (1 - \rho_{mv}) * \alpha / \mu + \gamma - 1$$

As a comparison, the socially optimum equilibrium and the optimum level at which an average consumer is satisfied are presented below:

$$Q_{so}^{op} = \sigma / (1 - \sigma) * \alpha / \mu + \gamma - 1$$

$$Q_{ac}^{op} = \rho_{ac} / (1 - \rho_{ac}) * \alpha / \mu + \gamma - 1$$

In the case that the fear of a certain type of food-borne disease rises, since the levels of the probability of these three categories are $\sigma < \rho_{ac} < \rho_{mv}$ in order, the optimum level of preventive measure of these three categories is $Q_{so}^{op} < Q_{ac}^{op} < Q_{mv}^{op}$. Thus, it is supposed that a politically determined level of preventive measures (Q_p^{op} (= Q_{mv}^{op})) is greater than not only the socially optimum level (Q_{so}^{op}), but also the optimum level for the average consumer (Q_{ac}^{op}).

By contrast, in the case when the fear of an outbreak of a certain type of food-borne risk would excessively decrease due to another sort of risk, the opposite situation would be brought about. ρ_{mv} is smaller than ρ_{ac} as well as σ ($\sigma > \rho_{ac} > \rho_{mv}$), so that a politically determined level of preventive measures (Q_p^{op} (= Q_{mv}^{op})) tends to be smaller than not only Q_{so}^{op} but also Q_{ac}^{op} .

Thus, the change in the objective risks may be magnified by consumers'

subjectively perceived risk feelings and the strategic behaviors of politicians. The change in the objective risks is often brought about by newly invented food materials such as GMOs or by newly discovered scientific facts such as BSE and dioxin. Newly discovered risks often should be made priorities over the existing risks. Under such circumstances, even the probability of a risk based upon scientific ground may often fluctuate. Therefore, the fluctuation of the objective risks itself is not a problem. The point is that the fluctuation may be magnified.

Discussion

Factors that affect the degree of magnification

The degree of magnification is affected by two parts in the formula.

$\rho / (1 - \rho)$: Here, we call it ‘the subjective probability perception bias.’

α / μ : Here, we call it ‘the subjective benefit-cost perception bias.’

The latter, the subjective benefit-cost perception bias, is determined by intrinsic cultural norms. The cost of preventive measures is determined physically with no room for differences among people and cultural norms. However, the worth of preventive measures, that is, the benefit, is perceived so subjectively that it varies among individuals and from culture to culture. This is exemplified by the case of the difference of the subjectively perceived worth of preventive measures against GMO foods between European consumers and American consumers. α of European consumers is considered to be relatively greater than that of Americans. This difference is deeply rooted in cultural norms.

The former, the subjective probability perception bias, is affected by socio-political structures and is relatively changeable, compared with the subjective benefit-cost perception bias. Several factors may affect the degree of this bias. Major factors are as follows:

(1) Politicians' (including their staff's or advisers') capability of understanding scientific information

(2) Ethical behavior principles of politicians (not strategically behaving so as to maximize the possibility of re-election, but sincerely behaving to maximize the eventual positive contribution to the society)

(3) Consumers' (including their opinion leaders' or interest group leaders') capability of understanding scientific information and dissuading consumers' emotional responses when incompatible with scientifically correct judgments

(4) Bureaucrats' guidance of consumers and relevant business interest groups towards following their administrative decisions because they possess adequate scientific information

(5) Pressure from interest groups or pork barrel politicians who attempt to protect the domestic production of foods that cause food-borne risks

In order to reduce the bias caused by politicians, the conditions of (1) and (2) should both be met. Without high-principled ethics and strong will to fulfill the purpose of maximizing the contribution to the society, politicians will not act on scientifically correct grounds even if they are capable of understanding scientific information. With regard to (3), consumers themselves inevitably have an inclination to respond subjectively to food-borne risks, however, there is the possibility that such emotional responses can be rectified toward calmer and more intelligent ones by consumer opinion leaders or related interest group leaders with scientifically knowledgeable staff.

(4) and (5), which are newly presented here, may also affect the degree of the subjective probability perception bias. With regard to (4), bureaucrats possess scientific information in their own databases and in their affiliate institutions. They have therefore a greater potential to persuade or dissuade consumers and

interest groups irrespective of consumers' emotional and sometimes groundless feelings¹⁷. Even if they cannot wield a power to force consumers to obey, as they did in the past, they may rectify consumers' incorrect subjective perceptions by providing necessary information and by communicating with consumers.

With regard to (5), farmers' interest groups may attempt to mitigate consumers' subjectively perceived fears and politically magnified fears in order to protect their domestic production if the source of food-borne risks is derived from that production. In the case that food-borne risks relate to imported foods, there is the possibility that farmers welcome consumer tendencies to fear imported foods' risks. Nevertheless, there is also a possibility that an adverse effect may take place. If such tendencies go beyond a normal level to an extreme, even domestically produced foods in the same category as well as the imported foods may be rejected by consumers and discarded from the marketplace.

What has happened in Japan?

Some commentators in Japan say that the Japanese perception concerning food safety is completely different from that of western people. This might explain

¹⁷ Here, we suppose that bureaucrats behave as agents of voters or politicians who represent voters. We can also differently assume their principle of behavior as a strategic one. There are several hypotheses that convincingly explain a principle of bureaucrats' behavior. Niskanen(1971) presented the budget maximizing hypothesis, while Downs(1967) and Chant and Acheson (1972) pointed out the characteristics of behaviors as prestige-maximizing and Breton and Wintrobe(1982) as promotion chance-maximizing. If they behave following these hypotheses, bureaucrats as well as politicians may magnify consumers' excessive response to food-borne risks, because to concentrate their effort on such issues in which public opinion is heating up gives bureaucrats a chance to acquire larger budgets, the satisfaction of contributing to the resolution of people's worries (thus gaining prestige) and opportunities to be promoted as a result of high appreciation. However, since these arguments are controversial and debatable in their application to Japanese bureaucrats' situation, we do not explore this further in this paper.

some part of the reason for the recently observed excessive response to the BSE scares. In this paper's context, this explanation refers to the subjective benefit-cost perception bias, i.e. α / μ .

Nevertheless, it is very difficult to verify the validity of this explanation via empirical data. Whether such an intrinsic difference of perception exists between Japanese and western people or not is not a question for economic analysis. Therefore, here we do not discuss the subjective benefit-cost perception bias further. Instead, it is more fruitful to focus on the probability perception bias and to discuss it more deeply.

The necessary factors in enabling politicians to reduce consumers' emotional response to food-borne risks are their (including their staff's or advisers') capability of understanding scientific information and the ethical behavior principles of politicians aiming at maximizing the eventual positive contribution to the society. The latter factor does not seem to vary from country to country: some politicians may behave so as to maximize the eventual contribution to the society, while others may not. The former factor, though, does vary from country to country. Thus, it is now discussed further.

As mentioned previously, according to commonly available findings in political science, politicians in Japan have a limited number of political staff or advisers and thus lack the capacity, as compared with their counterparts in the U.S., to understand scientific information related to food safety. This fact convincingly explains why Japanese politicians, compared with U.S. politicians, cannot adequately mitigate consumers' fluctuating emotional feeling toward food-borne risks.

In the past Japanese politicians did not play an important role in such matters. Instead, bureaucrats were in charge of them. Bureaucrats were able to guide consumers toward the correct direction concerning food safety concerns even

without providing scientific information. This is because consumers believed that bureaucrats possessed adequate information and thus gave much credence to bureaucrats' judgments. However, recently, bureaucratic mistakes undermined consumer perception of their reliability. Moreover, in the last decade political changes have taken place. These changes have replaced traditional bureaucrat-led decision-makings with politician-led decision-making. During such a transitional stage, the lack of politicians' capabilities relating to scientific expertise is becoming the cause of serious dysfunction in political decision-making.

That is, in the context of the model in this paper, the modification mechanism of consumers' subjective probability perception from ρ_{ac} or ρ_{mv} to σ does not function enough. On the contrary, politicians may even magnify the bias from Q_{ac}^{op} to Q_{mv}^{op} ($=Q_p^{op}$). It should be called the political dysfunction of modification mechanism.

The lack of consumers opinion leaders' (or their interest group leaders') capability of understanding scientific information is also revealed under the present socio-political situation. Under the risk analysis system following the recommendation by CODEX, more emphasis is put on risk communication and consumer opinion has become sovereign. In the reformed administrative system, every stage of governmental decision-making requires convincing consumers before the process can proceed. Consequently, it becomes more and more difficult for decision-makers, both bureaucrats and politicians, to neglect consumer feeling that in turn tends toward emotional fluctuation. Nevertheless, consumer interest groups do not have adequate staff or advisers, compared with similar groups in the U.S., able to understand the scientific data on food-borne risks.

That is, in the context of the model in this paper, the modification mechanism of consumers' subjective probability perception from ρ_{ac} or ρ_{mv} to σ by consumers themselves does not function enough. It should be called the dysfunction of

consumers' self-modification mechanism.

It should be noted that politicians who attempted to protect the production of agricultural products that cause food-borne risks had lost their political power at the time when the BSE scare in imported beef was occurred. This was because the incident of BSE in domestic beef took place before the imported beef scare. As a side effect of the domestic incident, consumers had changed to strongly refuse political interventions in decision-making related to food safety prior to the BSE outbreak linked to imported beef from the U.S.

By contrast, as conceptual analysis in the previous sections suggests, some sources of food-borne risks are conversely downplayed by consumers. Furthermore, politicians may also tend to pay less attention to those sources that have nearly faded into oblivion. A typical case of this type is *E. coli* O-157.

Thus, the Japanese government's seemingly excessive preventive measures and ad hoc political decision-making on food-borne risks can be convincingly explained.

Policy Implication

Political implications from this economic analysis are very clear.

To the Japanese government and its political system, it is recommended that the politicians' capability of understanding scientific data and of guiding emotional consumers appropriately towards correct directions should be immediately strengthened. This capability also must be required in consumer interest group leaders. More experts with scientific knowledge should be employed as staff or be invited as advisers by politicians or parties and consumer interest groups. The political change now taking place in Japan from a bureaucrat-led country to a politician-led country may be the right direction

overall. However, in the process of transition, political actors including politicians, bureaucrats and interest groups must not withdraw from or shirk the responsibility to make informed judgments and guide emotionally drifting consumer feeling to the appropriate direction.

To the U.S. government, it is advisable to provide information directly to Japanese consumers and thus persuade them, since consumers substantially lead contemporary Japanese decision-making. In this case, the persuasion based upon only scientific data is not enough. To convince Japanese consumers not only objectively but also emotionally is a necessary condition for Japanese acceptance of imported beef from the U.S.¹⁸

Conclusion

Three major findings of this study are as follows:

First, theoretically, excessively sensitive response to food-borne risks can be explained by the behavioral pattern presented by the Prospect Theory. Such response can be returned to and maintained at a more moderate level by politicians or consumer interest group leaders' (including their staff's or advisers) capability of understanding scientific information and persuading consumers. Bureaucrats and politicians with scientific expertise may also play a similar role. Nevertheless, it is theoretically valid to claim that there is a high possibility that politicians may magnify such consumer response if they act primarily to maximize their probability of being re-elected.

¹⁸ As Segerson (1999) pointed out, there might be the argument that the regulation should be voluntary instead of mandated for food safety. In this case, for example, no import restriction combined with the regulation of labeling to clarify the inspection process would be one of the alternative measures. Nonetheless, this option is unrealistic under current circumstances in which consumers' emotional refusal worsens.

Secondly and as a result, when a food-borne risk is of great concern or fully realized, it is possible that the politically optimum level of adopted preventive measures regarding food safety would be not only higher than the socially optimal level but also higher than the optimal level for the average consumer. On the other hand, when such concerns fall out of public eye or nearly fade into oblivion, the outcome is the opposite, i.e. the politically optimum level would be lower than the socially optimum level and the optimal level for the average consumer. The range from the politically optimum level to the social optimum level is determined by the subjective benefit-cost perception bias and the subjective probability perception bias.

Finally, in Japan, the lack of staff with scientific expertise in consumer groups may cause excessive scares among consumers. Furthermore, the lack of such expertise among politicians' staff or advisers cannot restrain consumers from excessive responses. In addition to these intrinsic socio-political structural weaknesses, two political changes may make the matters worse. One is the administrative reform complying with the recommendation of CODEX, and the other is the general political shift of Japanese political structure from a bureaucrat-led system to a politician-led system. These changes are making the bureaucrats' position in deciding food safety policy weaker, and that of consumers stronger. Consequently, it is highly possible that the subjective probability perception bias in Japan is becoming greater than other countries.

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Table 1. Comparison of the ratio of unanimity

The name of committee	The number of approved bills	The number of unanimously approved bills	The ratio of unanimity	Statistical significance
Welfare and Labor (General)	245	137	0.559	
Welfare and Labor (Food safety)	5	4	0.800	Significant at 15% level (compared with general ones)
Agriculture (General)	217	93	0.429	
Agriculture (Food safety)	10	7	0.700	Significant at 5% level (compared with general ones)
W&L and A (General)	462	230	0.498	
W&L and A (Food safety)	15	11	0.733	Significant at 5% level (compared with general ones)
Environment (As a reference)	62	29	0.468	

Table 2. The name list of the unofficial group promoting food safety policy in LDP

The name of member	Constituency	beef production (Value)
Fumio Kishida	Hiroshima	53 (28/47)
Tarou Kouno	Kanagawa	11 (39/47)
Ichirou Aizawa	Okayama	69 (21/47)
Shigehiko Okuyama	Kyoto	15 (37/47)
Yoshihide Sakagami	Hyogo	112 (14/47)
Yoshihisa Shiozaki	Ehime	32 (34/47)
Shunichi Suzuki	Iwate	196 (6/47)
Yoshisuke Sunada	Hyogo	112 (14/47)
Yasufumi Tanahashi	Gifu	99 (15/47)
Takumi Nemoto	Fukushima	148 (10/47)
Hiroshi Hase	Ishikawa	6 (44/47)
Kouzou Yamamoto	Fukuoka	53 (28/47)
Hironari Sekou	Wakayama	9 (42/47)

Note: 1) The unit of beef production value is million yen.

2) The number in a parenthesis show the order from the top within 47 prefectures

Figure 1. Prospect Theory

Kahneman and Tversky (1979)

