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On the Bad Reputation of Processed foods in Economic Science: The Analysis after Ten Years at the Fukushima Nuclear Power plants Accident

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On the Bad Reputation of Processed foods in Economic Science: The Analysis after Ten Years at the Fukushima Nuclear Power plants Accident

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Abstruct

This paper discusses the "bad reputation effect" of processed food brought about by the Fukushima nuclear power plants accident in 2011. About ten years have passed since the disaster. Although various discussions have focused on the economic and other impacts of the disaster, unfortunately the bad reputation effect has not been adequately dealt with. This paper analyses the relationships between the distance from the nuclear power plant to the production place and the prices of the same processed foods produced in different places. The other objective of this research is to discuss the “Long-term bad reputation effect” based on the research data about nine years and a past instance of Bovine Spongiform Encephalopathy.

JEL Classification: H23, O13, Q43, Q51
Keywords: Fukushima Nuclear Accident, Economic Approach, Bad Reputation

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1. Introduction

In relation to the Great East Japan Earthquake which occurred on March 11, 2011 and the subsequent accident of the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plants, the “bad reputations” occurred. There reputations ware caused by the diffusion of radioactive substances such as cesium over.

The purpose of this paper is to perform empirical analysis of the “bad reputations” caused by the Fukushima Daiichi nuclear disaster about processed foods. According to [1], a so-called bad reputation effect is about 1 trillion 303.9 billion yen (p.7). And it is used as a transient thing. However, the damage is still remains.

This paper deals with processed foods. The reasons for processed foods are as follows: (1) There are no academic papers as far as I know. (2) Processed foods' taste and quality do not vary depending on the area of its production. (3) The processed foods' market has a large impact on the economy. These freshness dates are more than 4 months.

Many papers including Consumer Affairs Agency have to do with "bad reputation effect" of foods except for processed food (see below). The researches in individual foods are covered rice, fish and vegetable and so on. Due to author's reasons, examples are not described. Nevertheless, the market size for rice is over a trillion of yen, the one for the fish or vegetable dealt with in the papers is tens of billions of yen. In any case, in comparison with the market size for processed foods (about 30 trillion of yen), rice or the perishable food market is far small. As further explanation, rice and perishable food is the goods with different quality by the district. In contrast, in the case of processed foods, constant quality has been ensured by the manufacturer regardless of the producing areas. Consequently, the economic influence of the "bad reputation effect" of the processed foods is clarified is important.

2. Methods

This research is the subject for this investigation into processed foods. In this research, data on the bargain price items and data on the regular price items of the same product in the same store are acquired as a set of data. Bargain price items refer to items placed on shelves dedicated to spot prices for one day only. Regular price items are products that are always placed. The investigation target commodity group has a long best-by date. Specifically, the products have a best-by date of 4 months or more. More specifically, the investigation target are plastic bottles for beverage, foods filled up in retort pouch, bagged or boxed sweets, snacks and confections and others. Based on those data, it has been analyzed prices and distaces from the Fukushima Daiichi Nuclear Plants to the manifactory.

The study areas are Hikone City in Shiga Prefecture, Nagoya City and Kiyosu City in Aichi Prefecture. The survey period conducted from October 1, 2011 to November 30, 2020. 231 pair obtained from the more than 2000 datum.

One pair consists of two identical goods which have different prices and distances from the nuclear power plant. One pair of prices is obtained from a regular price and a bargain price. A pair of distances is obtained from the different manufacturing plant identification mark on goods. It is the location of the production facility and the name of the producer may be replaced by indicating the address and name of the producer and the marks unique to the production facility which the producer has notified to the Minister of Health, Labour and Welfare (limited to marks made in Arabic numerals, Roman letters, Hiragana, Katakana, or a combination thereof).

3. Characteristic of Processed Food

Processed foods' major characteristics are as follows.

1) There is almost no difference in ingredients from place to place except for water, air, egg, milk and so on. In other words, there are standard for controlling the quality each product. Therefore by collectively guaranteeing identities of the brand, there are not a broad distinction of factory places. On the other hand, there are causes of “bad reputation” according to a part of ingredients’ differences among factory places. However, Tajima (2015) argues that there is the reasonable basis to occur the “bad reputation”. The decisions of the individual by the grounds for something are divided. If one considers something different kinds, the group becomes economically rational judgments, but if one considers something same kinds, they are called "bad reputation".
2) This point is different from rice, vegetables and other perishable foods. The JAS System under the Law Concerning Standardization and Proper Labeling of Agricultural and Forestry Products (the name of the quality labeling system) makes it obligatory. On the basis of the law, in the case of fish and shellfish, the landing port is displayed. The information of the landing port may be different greatly depending on the fishing ground. In the case of vegetable and rice, the prefecture is displayed. However, about blended rice in a plurality of production area "domestically produced rice" is displayed. In that case, to obtain detailed information is difficult. In that case, there is an exception, however consumers can be obtained the information of the production area at a glance.

4. Survey results

The mean values of research results are shown in the following Table 1. The “except Japanese curry loux” field is each period data except for curry loux data. As a reason for that curry loux data is a largest disturbing factor. The grounds on disturbing factor are as below.

1. The manufacturer gives no attention to the distance. According to do research using telephone, the distance between the place of production and the place of consumption is not considered. Factory locations are the reason. It comes from mergers and absorption-type acquisitions. It is a result due to historic background, but is not a result of thinking about the

area of consumption.

2. The factors come from the products' characteristics. The major characteristics are small volume and light weight. And the products are having low possibility of containing ingredients around the factory. The raw ingredients of Japanese curry loux are imports. In other words, the Japanese curry louxs are not included in the raw ingredients near the factory. Thus, the factors of bad reputations are merely relatively small factors. And, it is thought that the price differences caused by another factor different from bad reputation. Therefore, Table 1 shows whole data and the data excluding curry loux in each period.

Much of the data on figure 1 is greater than 1, that is indicating "bad reputation effect" existed. Figure 2 shows 25-intervals moving average and a logarithmic curve approximation of the curve. "bad reputation effect" has been declining. Nevertheless, the degree of declining is diminishing. However, the problems involved in the research existing, that are much noise. Reasons of sell at low prices are various things, not always the same reason. For all that, there is an weak correlation between approximate curve and the data. Considering the results, that looks almost unchanged in recent years.

		Bargain price items		Regular prices items		price	distance
		price	distance	price	distance	proportio	proportio
1st period (2011.10–2013.9)	total	117.00	283.92	151.17	377.02	1.29	1.33
	except Japanese curry loux	116.25	267.99	147.32	386.41	1.27	1.44
2nd period (2013.10–2015.9)	total	91.72	338.11	122.08	354.41	1.33	1.05
	except Japanese curry loux	89.08	328.55	116.41	391.55	1.31	1.19
3rd period (2015.10–2017.9)	total	106.09	316.37	148.85	400.13	1.40	1.26
	except Japanese curry loux	107.61	331.84	147.03	387.85	1.37	1.17
4th period (2017.10–2020.11)	total	98.86	372.15	140.65	403.63	1.08	1.42
	except Japanese curry loux	98.95	364.10	140.50	410.60	1.42	1.13

Table 1. The average in each period

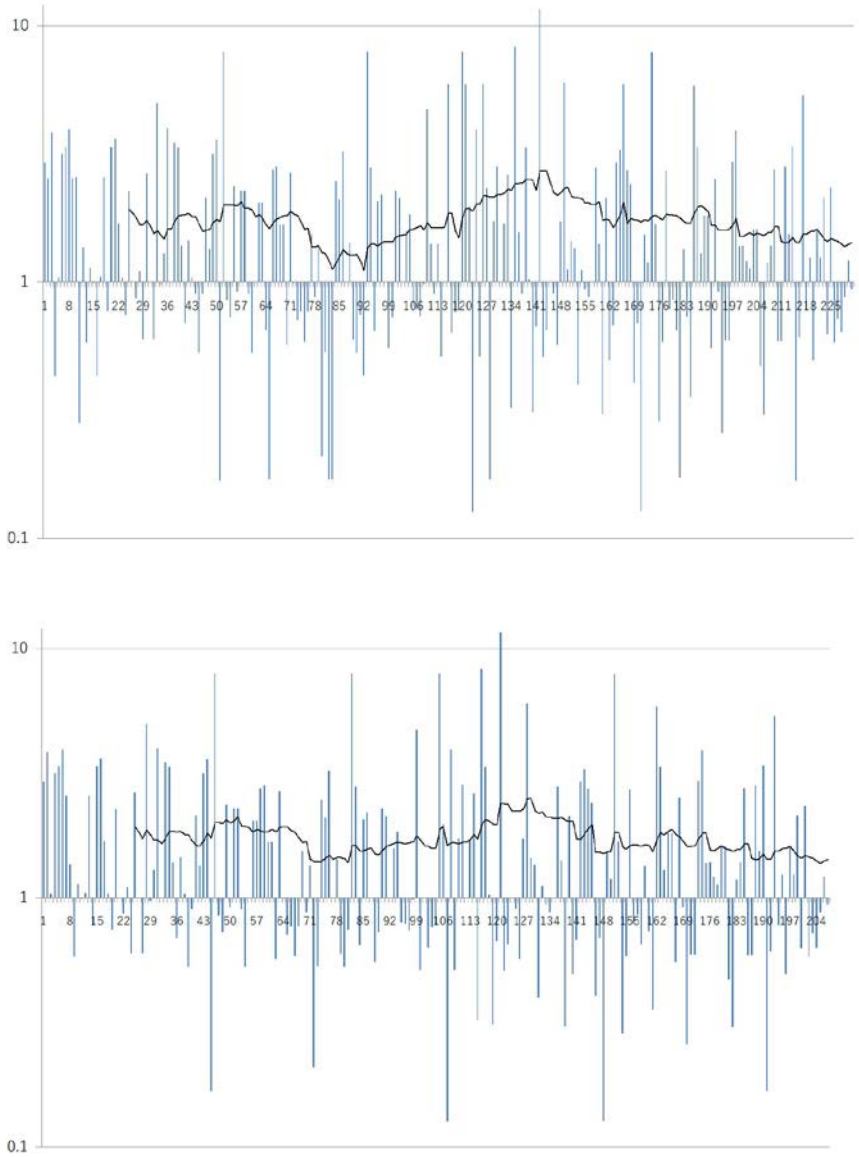

Figure 1. the logarithmic proportion of distance between regure item and bargain item to be arranged in the time series sequence thereby and 25-intervals moving average

Upper figure: whole data (the number of data: 231)

Bottom figure: whole data except curry loux (the number of data: 207)

Horizontal axis: Time-series, Vertical axis: logarithm scale

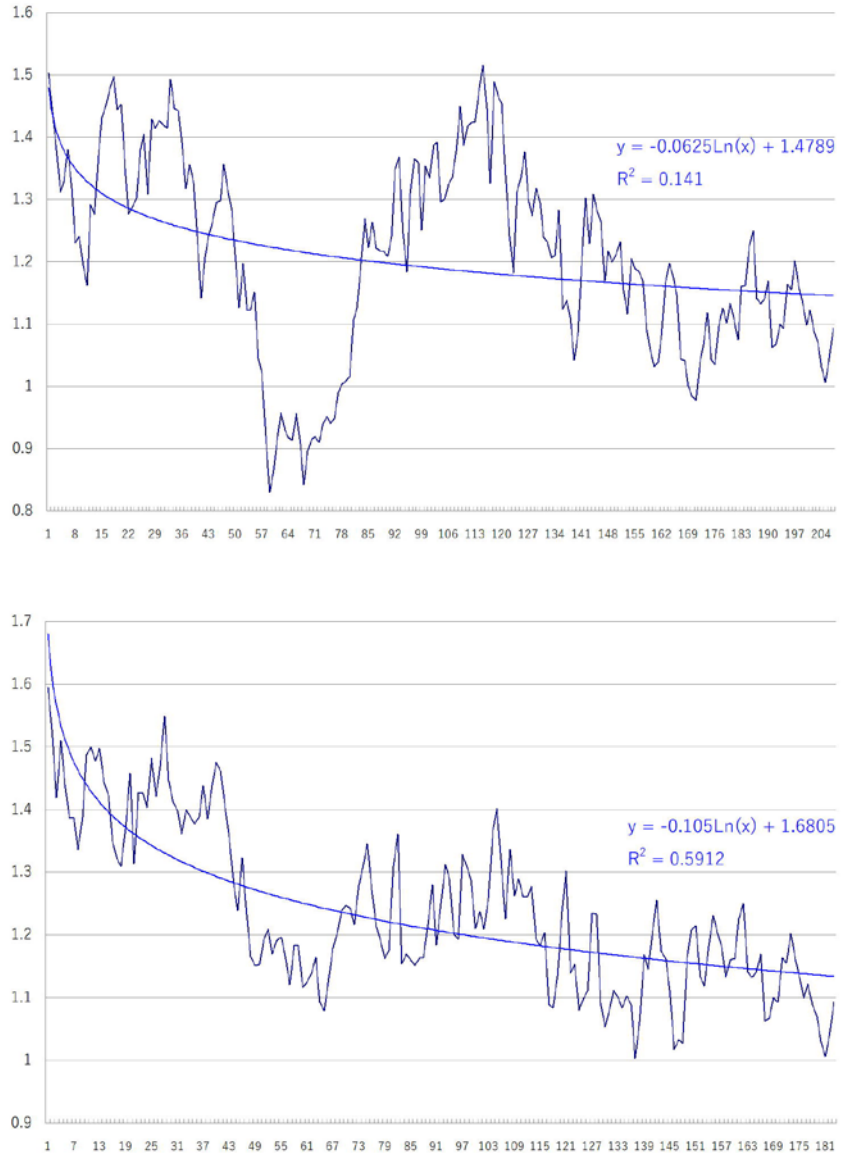

Figure 2. 25-intervals moving average and a logarithmic curve approximation of the curve
Upper figure: whole data
Bottom figure: whole data except curry loux
Horizontal axis: Time-series
Vertical axis: distance proportion (regular price items / bargain price items)

5. Characteristics of research results

As noted above, the processed foods from the factory near the Fukushima Diichi power plants tend to sell discount price. The other features is the bargain price items tend to newer than the regular one. Only 2 data of the whole data is that the bargain price items are older than regular one. The data suggests the bargain price items are not dead stock.

Judging from this fact, it can be said a result to consumers choice by the greatness of risk and uncertainty. Where unmanageable uncertainty exist, that can be thought the wisdom of crowds is superior to that of a single expert. When the consumer has no choice but to have deep concern for health, it is natural they have tendencies to avoid risk. Therefore, the price differences can regard as reasonable.

6. Comparison with the other data

The interpretation of the risks to radioactive materials		
How do you perceive the risk of low doses so small that the health effects of radiation cannot be identified? (Single answer)		
1. Even if it is within the standard value, the risk of carcinogenesis may increase even a little, so it is not accepted.	755	14.60%
	734	14.20%
2. If it is within the standard value, the risk is low compared to other carcinogenic factors (smoking, drinking 540 ml or more daily, being too thin, etc.), and foods distributed under the current inspection system are acceptable.	1797	34.70%
	1711	33.10%
3. Cancer can occur due to factors other than radioactive substances, so I don't worry about it.	957	18.50%
	902	17.40%
4. I can't think of risks because I don't have enough information	1645	31.80%
	1790	34.60%
5. Others.	22	0.40%
	39	0.80%
total amount (2020 year)	5176	100%
total amount (2021 year)	5176	100%

Table 2. The interpretation of the risks to radioactive materials
Source: Consumer Affairs Agency(2020,2021)p.8, Question 7

According to [2] and [3], 14-15% people are concerned about foods containing low-level radioactive substances. If the price elasticity of processed foods is about 1, there is consistency among the data of processed foods and the surveys of customers' awareness.

7. A comparison between Kasperson's "ripple effect" and "bad reputation"

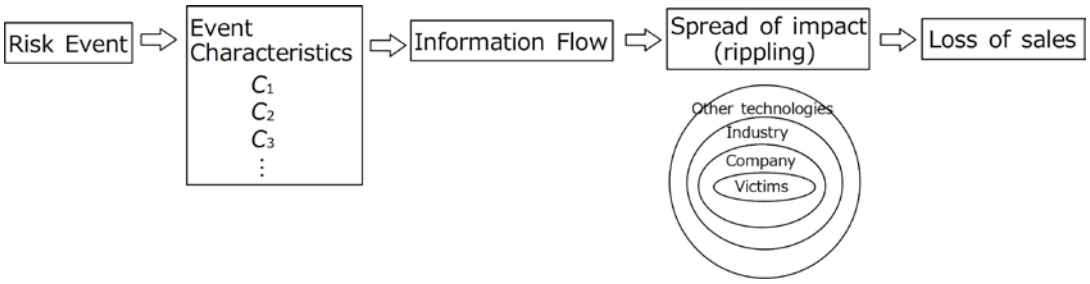

Figure 3. A simple flow chart of "ripple effect" according Kasperson (2003)
Source: [4] p.30

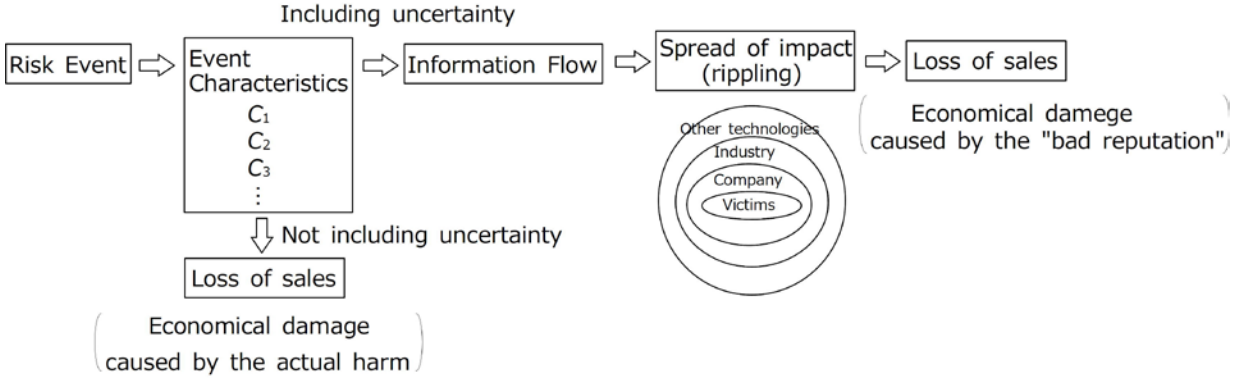

Figure 4. A flow chart of "bad reputation"

The difference between figure 3 and 4 is the loss of sales caused by the actual harms separated or not. The loss of sales caused by the actual harms is not including uncertainty. Economical damage caused by the actual harm is certain. Therefore, "ripple effect" is not happen. The remaining parts of the risk event cause "ripple effect", and the economical damage is called "bad reputation effect".

8. "Long-term bad reputation effect"

Typical example of the "Long-term bad reputation effect" is Bovine Spongiform Encephalopathy (hereinafter referred as BSE). As shown in Figure 5, it can be seen that meat consumption is expanding as the final consumption expenditure per capita increases. The correlation between beef consumption and final consumption expenditure per capita from 1983 to 2000 is 0.9748. It can be said that the correlation is very high. After that, in September 2001, the issue of BSE arose in Japan. And, after a

few cases of BSE were reported in Canada and the United States in 2003, Japan banned beef imports from the two countries. As the graph suggest, the beef consumption is declined due to two occurrence of BSE, afterwards the beef consumption remained weak.

It is unlikely that everyone who avoided beef around the year 2000 will remember the BSE problem for 20 years. And, it is unlikely they still recognize the same risks as at that time. Due to the above reasons, Some people think the "bad reputation effect" cames to an end. However, Judging from Figure 5, it should be considered this effect is continuing even now.

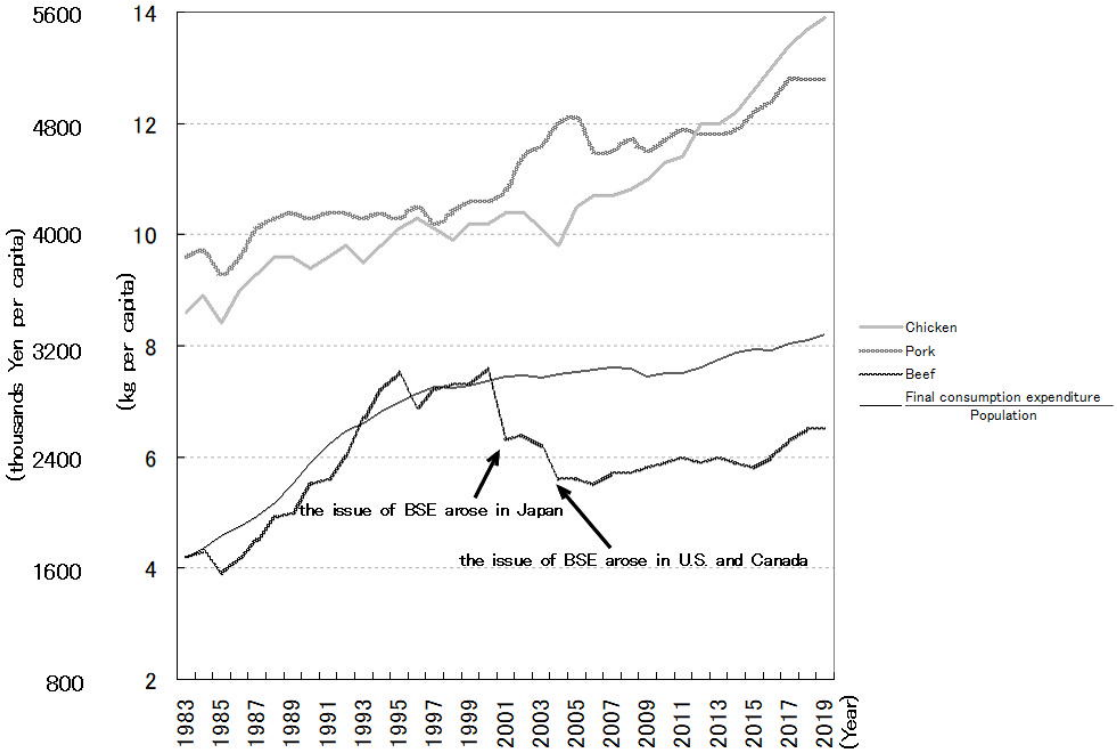

Figure 5. The relation among final consunmption expenditure and consumption of meat (in Japan)

Horizontal axis: Year

Vertical axis: kg per capita (Chicken, Pork and Beef), thousands Yen per capita (Final consumption expenditure per capita)

Source: [12]

Note: During this period, classical swine fever and bird flu occurred. Those economic damage is caused, and the damage can be confirmed from the graph. However, those damages were resolved in a short period of time.

The following possible reasons BSE problem is “Long-term bad reputation effect” are given. Prion is considered to cause BSE. Prusiner is as a proud achievement in prion. However, in this field of study, very notable achievements were not recorded after [7]. That hasn't become clear in detail. Therefore, there is not cause to change the consumer awareness.

The interest of a consumers from being reduced about 5 years passed since the occurrence of cause. There is no longer cause to change the consumer awareness.

9. Current state of Fukushima Daiichi Nuclear Power Plants

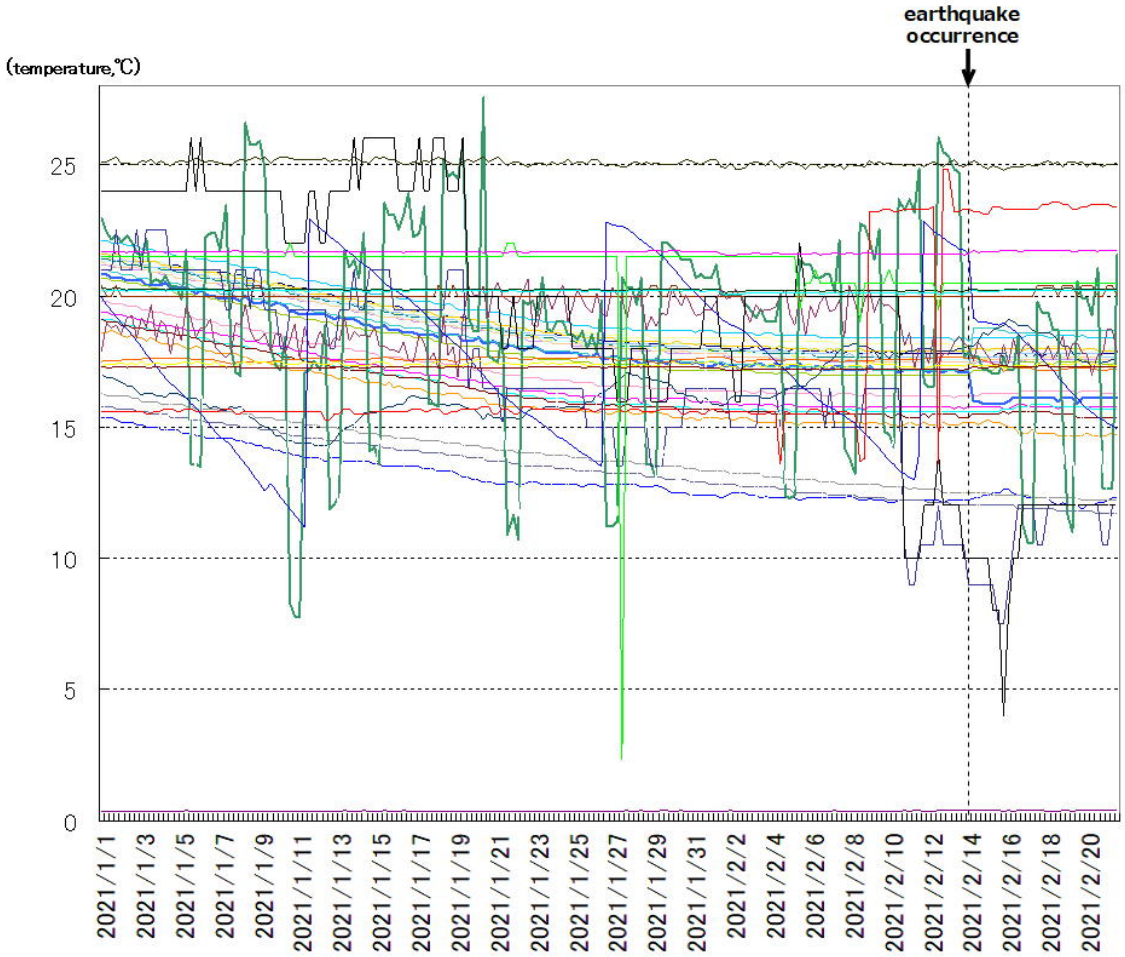

Figure 6. The numerical values, such as the temperature, pressure and so on at the Fukushima Daiichi Nuclear Power Plant (Unit 3,4) before and after an earthquake

Source: [10]

Note: The data are displayed in a form of graph so that 6-hour changes can be arranged in time series since 5 a.m. on January 1, 2021.

The earthquake of magnitude 7.3 occurred on February 13, 2021. According to [5], “Tokyo Electric Power Co. spokesman Keisuke Matsuo said the drop in water levels in the Unit 1 and 3 reactors indicates that the existing damage to their primary containment chambers was worsened by Saturday's magnitude 7.3 quake, allowing more water to leak”. In regards to this, Figure 6 shows that there have been some changes in the numeric values after the earthquake occurred. And according [11], Cs-134 and Cs-137 are contained in the sub drain water. Naturaly, the water include a large quantity of Tritium. Currently, these data can't be judged sweepingly whether a failure with resulting in a serious situation has occurred or not. And it is unexpected the effects of radioactive materials in foods on health. Every time a disaster occurs, decrease of uncertainty is stopped. Accordingly, "bad reputation effect" will be continued for some time now.

10. Conclusions

Economic effect of the "bad reputation" is due to differences after satisfying the evaluation as to safety. About 10 years has already passed since the accident. during this time, the environmental pollution have decreased to a certain degree. However, the rate of decline has decreased. Currently, purchasing the bargain items means purchasing the factory products that is close to 15% closer to the nuclear power plant than purchasing the regular items. According to the concept of "The wisdom of crowds" by [8], economic evaluation.

On the other hand, the information on fine movements at Figure 2 hasn't been investigated in detail. That is the research task from now on.

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