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Taiwanese voter surveys on restrictions of food imports from five prefectures near Fukushima, Japan: an empirical analysis

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ABSTRACT

After the Fukushima nuclear accident in 2011, Taiwan restricted food imports from the five prefectures around Fukushima, Japan. The purpose of this study is to assess the influence of Taiwanese politics on the 2018 import restriction referendum. In this study, we conducted a telephone survey two months after the referendum to examine the difference between the votes cast and the real opinions using cross analysis. After controlling for individual attribute variables such as age, education level, gender, region, and family composition, we found that party support has a significant effect on attitudes toward food imports from Fukushima. In addition, familiarity with Japanese food also influences attitudes. Thus, in this referendum vote, Kuomintang (KMT) supporters mirrored the party's support for the import ban while Democratic Progressive Party (DPP) supporters had lower voter intention, although their real opinions may have been in favor of open imports. We conclude that efforts to remove food import restrictions should not only emphasize food-safety policy responses but also domestic politics.

KEYWORDS

Fukushima nuclear accident; food import restrictions; referendum; Japan; Taiwan; food security

1 Introduction

In the years after the Fukushima nuclear accident in Japan, many countries and regions introduced import restrictions on Japanese food products. Since then, countries have been loosening or eliminating these restrictions. Among the 54 countries that established restrictions, 34 have since removed them. As of the end of 2020, countries continuing to impose restrictions from prefectures such as Fukushima include Hong Kong, China, Taiwan, South Korea, Macau, and the United States. With the exception of the United States, which has restricted imports on a prefecture-by-prefecture basis, all the countries and regions imposing restrictions have been in East Asia. East Asia is a major export destination for Japanese agricultural, fishery, and other food products, and the import restrictions have hindered export growth for Japanese agricultural and fishery products.

On March 26 2011, Taiwan halted imports of food products (except for liquor) from five Japanese prefectures: Fukushima, Ibaraki, Tochigi, Gunma, and Chiba. On May 15 2015, Taiwan expanded the restrictions requiring all exported foods from an additional 42 prefectures near Fukushima to be accompanied by a certificate of origin. Other exports

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such as fishery products, tea, and infant foods must be accompanied by a radioactive material inspection report. As of the end of 2020, this regulation is still in place. In November of 2018, Taiwan held a referendum to decide whether to maintain the import restrictions on agricultural products from the five prefectures including Fukushima; 77.7% of those surveyed voted to continue the import ban.

The purpose of this paper is to identify what factors have influenced Taiwanese people's opinions on the import restrictions, focusing on the November 2018 referendum. Due to the absence of exit polls for voters in Taiwan, it was not possible to analyze the relationship between voting and voter demographics directly. Therefore, we collected information on voting and voter demographics by conducting a telephone survey in late January 2019, stratifying voters by age and gender.

2 History of Japanese import restrictions in Taiwan

2.1 Overview

Table 1 summarizes the history of Japanese import restrictions in Taiwan and provides an overview of related food safety cases (Source: Ministry of Agriculture, Forestry and Fisheries of Japan).

In Taiwan, several incidents related to food safety have affected consumers' attitudes, amplifying concerns about food safety problems. Beginning October of 2013, major cooking oil companies in Taiwan were accused of selling inferior cooking oil (e.g., cottonseed oil) and fraudulently labeling ingredients. Subsequently, in September and October of 2014, these companies' production of illegal lard and cooking oil was exposed. In response to these incidents, Taiwanese consumers have become increasingly concerned about food safety, causing a drop in the approval ratings for the Kuomintang (KMT) President, Ma Ying-Jeou. The issue of fraudulent food in Taiwan has raised another important food safety issue with the potential to affect import regulations. In 2015, it was discovered that the origins of food imported from Japan were being disguised with the identification of 273 cases of false production locations. In these instances, the production locations of food products originating from the five prefectures neighboring Fukushima were listed as Tokyo or Osaka. In response to this incident, the Taiwanese government strengthened the standard for radioactive substances (Cs134+ Cs137) in Japanese food, lowering the threshold from 370 to 100 becquerels per kg (50 becquerels for dairy and baby food) as well as requiring foods to have certificates of origin. This regulation was described as a "short-term measure," but in fact, it still applies today.

Table 1. Changes in Taiwan's food import regulations after the Fukushima nuclear accident.

March 11 2011:	The 2011 Great East Japan Earthquake and the Fukushima Nuclear Power Plant Accident
March 25 2011:	Import of food products from five prefectures suspended
March 2015:	Origin misrepresentation on processed food from five Japanese prefectures uncovered
May 2015:	All exported food products must be accompanied by a certificate of origin; fishery products, tea, infant food, etc. must be accompanied by a radioactive material inspection report
January 16 2016:	Tsai Ing-Wen elected in presidential election
November 24 2018:	Referendum decides to continue import restrictions

Thus, food safety has been a sensitive issue in Taiwan, and the public is seeking zero risk when it comes to food safety.

In Taiwan, the political environment has further compounded the challenge of controlling imports of Japanese food products. Originally, the main parties in Taiwan were divided in their support of nuclear power plants, with the KMT often adopting a supportive position and the Democratic Progressive Party (DPP) taking an opposing one. Before 2016, when the KMT was the ruling party, the DPP also opposed easing the food import restrictions, partly because of its attitude toward nuclear power. However, after it won the January 2016 presidential election, the DPP (which has historically promoted green energy) demonstrated an openness to restarting food imports from the areas surrounding Fukushima. This position was based on scientific evidence, but another objective was to maintain favorable relations with Japan. Conversely, the KMT has supported the bans on Japanese food imports and has been opposed to lifting the restriction.

On November 7 2016, Taiwan's Executive Yuan submitted a report to the Legislative Yuan proposing partial relaxation of the import restrictions of Japanese food products. This lifting of restrictions was to be gradual and applied on a conditional basis to four of the five prefectures that had been subject to the embargo: Gunma, Tochigi, Ibaraki, and Chiba. The KMT advocated for a referendum to decide whether to continue the food import restrictions from these Japanese prefectures. The intention of the KMT may have been to highlight the contradiction in the DPP's attitude toward nuclear power.

2.2 Results of public referendum

On November 24 2018, a national public referendum was held for ten proposals along with the unified mayoral elections. The Public Vote Law maintained that if one fourth (4,939,267) of the voters approved the law, it would be enacted. Between 2004 and 2016, Taiwan held public referendums on six items, but none met the requirements for passage.

Proposal No. 9 of the national referendum was proposed by the KMT. The question in Proposal No. 9 was, "Do you agree or disagree that the government should continue restricting the import of agricultural and food products from the areas affected by the Fukushima nuclear accident in March 2011, including Fukushima and the four nearby prefectures (Ibaraki, Tochigi, Gunma, and Chiba)?"

The referendum was held at the same time as the general election, and all political parties strove to increase their turnout by emphasizing the popular issues at stake in the election. The DPP mainly promoted the issue of LGBT marriage to encourage young people, who were more likely to support DPP candidates, to vote. Although the DPP's policy plan was to lift the restrictions on food importation from Japan, few DPP candidates mentioned the referendum during the election period, recognizing some supporters' concerns about food safety. Therefore, the DPP did not issue a strong opinion on the 9th referendum.

The KMT proposed two public referendums in addition to the one related to import restrictions on food from Japan. These referenced lowering the generation and construction of coal-fired power plants and indirectly referenced nuclear power, since reducing coal-fired power would increase the country's reliance on nuclear power. Another purpose of the referendums was to recruit votes from KMT supporters and reduce support for the DPP in local elections.

Table 2. Results of referendum proposal 9 on continuing import restrictions, 2018.

Number of registered voters	Number of valid votes					Number of invalid votes	Number of voters	%turn-out rate	%valid agreement/ the number of voting rights
	Agreement		Disagreement		Total				
	C1 votes	%C1/ C	C2 votes	%C2/ C	C = C1 + C2				
B						D	E = C + D	F = E/B	G = C1/B
19,757,067	7,791,856	77.74	2,231,425	22.26	10,023,281	756,041	10,779,322	54.56	39.44

Source: Central Election Commission (2018), Taiwan

Table 2 shows the results of the 9th referendum. Voters overwhelmingly expressed their support for the restrictions: 7.79 million voted in favor of the regulation while 2.23 million voted against it. The director of the Ministry of Health and Welfare, Dr. Chen Shi-Chong, suggested that this result validated a growing trend in public opinion regarding the importance of food safety.

In the unified local elections that were held along with the national referendum, the KMT had the upper hand; the seats held by the DPP dropped from 13 to six in the mayoral election, while the KMT won 15 seats. This was the first major defeat for the DPP since 2016, when Tsai Ing-wen was elected president. The first reason behind this result was people's inability to adapt to the Tsai administration's rapid reforms. Support for the administration declined among the civil service class due to pension reforms and among the working class due to working hour reforms. Moreover, the Chinese Communist Party sought to attack the pro-American and pro-Japanese Tsai regime diplomatically, limiting the number of tourists, plundering the diplomatic state, and adroitly guiding Internet discussions. Another factor that helped the KMT's win was the "Han Kuo-Yu boom" in the 2018 election. Han Kuo-Yu, the KMT's mayoral candidate in Kaohsiung, had suddenly grown popular. Han was the general manager of a Taipei wholesale market who became popular through his response to public disappointment with the DPP's deployment of new managers in the wholesale market. Han's popularity was further boosted as a result of praise from the Taipei mayor, Ko Wen-je, who was recognized as nonpartisan and approved of Han's wholesale market response.

Thus, the results of Taiwan's referendum not only reflected consumer concerns about Japanese food products, they were also affected by various political factors. Statistical analyses could reveal the background behind voters' massive support for continuing the import restrictions.

3 Literature review

Previous studies have focused on the behavior of Japanese domestic consumers. Reiher argued that even though the disaster occurred a long time ago, consumers in Japan still lack trust in government institutions and in the food industry as a whole and that the Japanese government's communications about risks have been ineffective for rebuilding public trust¹. Other studies have estimated consumer behavior in Japan in relation to food produced near Fukushima². Considering that domestic confidence in Japan has not

¹Reiher, "Food safety and consumer trust."

²See Ito and Kuriyama, "Averting behaviors of very small radiation;" Aruga, "Consumer reaction and willingness;" Wakamatsu and Miyata, "Reputational damage and the Fukushima disaster;" Shimokawa et al., "No-tolerant consumers."

yet been restored, the problem is even more likely to be complicated abroad. However, few studies have focused on how the problem is perceived by foreign consumers, especially those in countries that are the main importers of Japanese products. Hosono compared perceptions of the risk levels of Japanese beef distributed in Japan, the United States, France, and China, including perceived risk levels of radioactive cesium. According to the results of the survey, respondents in China perceived that beef from Japan had a higher risk compared to respondents in Japan, the United States, and France³. This result shows that Chinese consumers are most skeptical of Japanese beef and suggests that countries' attitudes toward radioactive materials may differ. Furthermore, political and environmental factors, such as those related to nuclear power plants, are likely to vary between countries.

According to previous studies, the public has been incurring higher than necessary economic costs in exchange for "security", even in Japan. Understandably, an equal or greater effort would be needed to achieve the same level of security in other countries. In this section, we highlight literature that is directly relevant to Taiwanese consumers' concerns regarding nuclear power and food produced near Fukushima.

Jiang pointed out that the Fukushima nuclear power plant accident shifted public debate on nuclear power in Taiwan from the "justification of use and economic effect involving scientists" to the "prevention of danger"⁴. The discussion also evolved from the advantages and disadvantages of nuclear power generation to the establishment of hazardous areas and other related issues. According to Kim and Chung, nuclear policy shifted in Taiwan, Japan, and Korea, in that order⁵. The policy changes in East Asia in response to the Fukushima accident have been most significant in Taiwan, followed by Japan and Korea.

Within a week of the Fukushima nuclear power plant accident, Chen explored Taiwanese people's opinions on nuclear power in a telephone survey⁶. Those with less confidence in the KMT government perceived the nuclear risks to be higher. According to the results of the survey, the higher a person's level of confidence in the government, the more he or she supported nuclear power. In addition, those who watched more television news shows were more likely to perceive the risks of nuclear power as significant and hence, oppose it. In addition, those with higher levels of education were more supportive of nuclear power and more accepting of its risks, and males were more supportive of nuclear power than females. KMT supporters favored nuclear power more than the DPP supporters did. The study found that the influence of political party affiliation was strong, particularly the week after the accident when the perceived risk was greatest.

Chiu et al. reported that the Institute of Nuclear Energy Research in Taiwan had tested the radioactivity of approximately 20,000 food samples from Japan during the period March 24 2011 to March 31 2012, following the Fukushima nuclear power plant core meltdown⁷. It detected forty-six cases of radioactivity, all below the acceptable threshold. However, these results did not assuage the public's anxiety, as witnessed by the

³Hosono et al., "Consumer evaluation of foods."

⁴Jiang, "From Seeking legitimacy to protection from hazard."

⁵Kim and Chung, "Dynamics of nuclear power policy in the post-Fukushima era."

⁶Chen, "Risk perception and attitude toward nuclear energy during the Fukushima crisis."

⁷Chiu et al., "Radioactivity inspection of Taiwan for food products imported from Japan."

referendum. Handler found that two and a half years after the 2011 accident, safety concerns were still influencing the intentions and behaviors of Taiwanese travelers⁸, some of whom viewed Japan as safe and clean while others remained worried about restaurant safety and nuclear contamination. After the accident in Japan, Ho et al. surveyed residents of Taiwan living within 30 km of the country's new No. 4 nuclear power plant. Residents' thoughts about nuclear energy were clearly affected by the Fukushima accident and were centered on three main concerns: "nuclear accidents" (82.2%), "radioactive nuclear waste disposal" (76.9%), and "potential health impacts" (73.3%). Being female and having a lower education level were factors associated with increased concerns about adverse health effects⁹.

This study focuses on Taiwanese consumers and considers the external political environment, consumer characteristics, and the literature to understand effects on transoceanic information about food safety issues.

4 Methods

Data was collected via a computer-based random survey administered from January 23–25, 2019, from 18:30 to 22:00. The survey respondents were from a database of self-employed telephone users. The Shanshui Civil Intent Research Company, a leading research firm on Taiwan's election, commissioned the survey. Only those over the age of 20 were included in the survey. This is because individuals over 18 but under 20 had limited voting rights; they could vote for the referendums but not for the mayor.

A stratified random sampling method was used in the survey. In a telephone survey, the gender and age distributions of respondents would not match those of actual voters, as women and the elderly are the most likely to respond to calls via landlines. Thus, we conducted a stratified survey with a designated number of voters by age and gender, weighting the actual number of voters by age and gender to calculate the statistics. As Taiwan does not publish voter participation statistics by age and gender, we used the numbers of voters as the weights. Therefore, this survey should be viewed as a survey of "eligible voters" as opposed to "actual voters".

We collected 30 samples in each of six age strata for each gender, with a total sample size of 360. Then, for each stratum, we performed a stratified random sampling by county and city based on the Taiwanese area code to eliminate any regional bias. Considering the sensitivity of the issue, the response rate in this study was expected to be and indeed was quite small. With a sample size of 360 based on random sampling, the maximum confidence interval at a 95% level would be 5.2% ($= 1.967\sqrt{50 \cdot 50/360}$). Therefore, we expected that a proportion of answers would be interpreted with approximately a 5% confidence interval. Whether the sample size was valid for analyzing factors related to the referendum will be addressed in the section discussing the survey results. Another concern was that a telephone survey sample may not have been representative of the population, but this problem would not have been solved by increasing the sample size.

⁸Handler, "The impact of the Fukushima disaster on Japan's travel image."

⁹Ho et al., "Perceived environmental and health risks of nuclear energy in Taiwan."

Regional sample quotas were set according to the December 2018 population data published by the Home Office. A total of 1988 calls were answered out of 7761 calls. Among answered calls, 1121 declined to respond; 485 did not belong to the relevant age sample and did not complete the survey; and 22 calls with other issues were excluded. Thus, 360 responses were obtained.

The public referendum on the import restriction of Japanese food referred to two questions. The first question asked about actual voting actions, as follows: “Did you vote to continue the import restriction or to end it?” The next question inquired about respondents’ opinions rather than actions, as follows: “Do you agree or disagree that the government should maintain the import restrictions?” We included the latter question to include the opinions of those who did not vote, either in the election or on the referendum proposals. The reason for this is that during the 2018 election, people voted both on items pertaining to local elections and on the 10 referendum proposals. Therefore, people could vote on the items pertaining to local elections but abstain from the referendums. As shown below, a substantial portion of those who abstained from the referendums or did not go to the polls were against the Japanese food import restrictions.

5 Results and discussion

5.1 Voting action and opinions

Table 3 shows the responses regarding voting actions and opinions by gender. Hereafter, the ratio “agreement/(agreement + disagreement)” is referred to as the “agreement rate”. The ratio of turnout, excluding those who answered “forgot/no opinion” and those who refused to answer, is referred to as the “turnout rate”.

These results in Table 3 show the Taiwanese people’s general support for continuing the import restrictions. In this study, the rate of agreement with the import

Table 3. Voting action and opinions on Japanese imported foods by sex.

	Voting action			Opinion		
	Total	Male	Female	Total	Male	Female
Number of surveys	360	180	180	360	180	180
Number weighted by voters	360	176.9	183.1	360	176.9	183.1
Agree with import restrictions	60.9	56.0	65.6	71.6	64.7	78.3
(s.e.)	(2.6)	(3.8)	(3.5)	(2.4)	(3.6)	(3.0)
Disagree with import restrictions	9.7	14.8	4.9	19.5	27.9	11.4
(s.e.)	(1.6)	(2.7)	(1.6)	(2.1)	(3.4)	(2.4)
Abstentions/blank votes	11.3	12.4	10.3	-	-	-
(s.e.)	(1.6)	(2.4)	(2.2)			
No-vote	12.3	11.9	12.6	-	-	-
(s.e.)	(1.7)	(2.4)	(2.5)			
Forgot/no opinion	4.3	3.9	4.6	5.7	4.9	6.5
(s.e.)	(1.0)	(1.4)	(1.5)	(1.2)	(1.6)	(1.8)
Refusal to answer	1.5	1.0	2.0	3.1	2.5	3.8
(s.e.)	(0.6)	(0.7)	(1.0)	(0.9)	(1.1)	(1.3)
Rate of agreement	86.2	79.1	93.1	78.6	69.8	87.3
(s.e.)	(2.2)	(3.7)	(2.2)	(2.3)	(3.6)	(2.6)
Voter turnout rate	74.9	74.5	75.4	-	-	-
(s.e.)	(2.4)	(3.3)	(3.3)			

Note: Real population composition is weighted by number of voters in each sex/age cohort

restrictions (in terms of voting action) was 86.2%, which was higher than the actual agreement rate of 77.74%. The reason for this difference could be that the survey turnout rate, 74.9%, is higher than the actual voter turnout rate, 54.56%. This may be because people are more likely to respond to telephone surveys than to participate in elections. The 95% confidence intervals are $\pm 4.3\%$ for the agreement rate and $\pm 4.6\%$ for the turnout rate. The rate of agreement in terms of opinions is 78.6% with a 95% confidence interval of $\pm 4.5\%$. This agreement rate is lower than that for voting action, meaning that compared to those who voted, those who abstained from the referendums or did not vote at all in the election had more negative attitudes toward the referendums.

In addition, Table 3 shows a very high rate of agreement among females in terms of their voting actions. In fact, the agreement rate among women in terms of voting action was 13.9% higher than that for men. A large number of women also agreed with the import restriction in the opinion question. The agreement rate in terms of opinions is 17.5% higher for women than that for men, and the null hypothesis that the agreement rates among men and women are equal is statistically rejected at a 1% significance level. These results are consistent with those from Ho et al.'s study indicating that women were more concerned about the health effects of nuclear power plants¹⁰.

Table 4 shows the relationship between individuals' voting actions and opinions. It would be reasonable to assume that individuals' voting actions in terms of agreement or disagreement with the referendums would be similar to their "opinions". However, some respondents indicated "abstention/blank vote" or "no-vote" in the "voting action" question while also indicating disagreement with the import restriction in the "opinion" question. This suggests that to some extent, those abstaining at the polls included some individuals who passively disagreed with the import restriction.

5.2 Association with political parties

Since the referendum was politically motivated, as discussed in Section 2, we need to analyze voting actions and opinions of the supported parties. Specifically, we should analyze the responses of those without party affiliations to understand the effect of the KMT's political campaign on independents. In particular, we focused

Table 4. Relationship between "voting action" and "opinion" on the import restriction.

		Opinion				Total	Rate of agreement
		Agree	Disagree	No opinion	Refusal to answer		
Voting action	Agree	198.8	15.5	3.1	1.7	219.2	92.7
	Disagree	1.0	34.0	0.0	0.0	35.0	2.9
	Abstentions/ blank votes	18.7	7.9	10.3	3.9	40.8	70.2
	No-vote	31.0	6.8	3.2	3.3	44.2	82.0
	Forgot/no opinion	7.4	4.1	4.0	0.0	15.5	64.1
	Refusal to answer	0.9	1.9	0.0	2.5	5.3	33.3
	Total	257.9	70.3	20.6	11.3	360.0	78.6
	Rate of agreement	99.5	31.4	100.0	100.0	86.2	
Voter turnout rate		80.1	77.1	18.7	19.1	74.9	

¹⁰Ho et al., "Perceived environmental and health risks of nuclear energy in Taiwan."

on the rate differences between DPP supporters and independents, because the DPP supporters were less likely to be affected by the KMT political campaign.

Respondents were asked the following question: “Which political party has ideas and propositions that are most similar to yours?” They were given a list of parties as choices (DPP, KMT, Pro-Democracy Party, Taiwan Unionist Party, New Party, or the New Power Party) the order of which was randomly assigned. Only 16 people chose a party other than the DPP or KMT, and another 12 people had no idea or did not respond. Note that a respondent choosing a particular party would not necessarily have been an active supporter of that political party. The question asked about the ideas and propositions of the political parties.

Table 5 shows the survey results according to the political parties. The KMT had a high number of supporters (110.1/360 = 30.6%), as it originally had a higher number of official members. Conversely, DPP supporters were fewer, as DPP supporters may not necessarily have been official DPP members at the time of the election. Those without supported parties were the majority, or 45.3%, of respondents.

The survey clearly indicates that the agreement rate among KMT supporters was high, reaching 95.7%, which was 13.4% higher than the rate for those without supported parties. Conversely, the agreement rate for those without party affiliations was higher than that of DPP supporters by 6.1%, but this difference is not statistically significant. The voter turnout rate among KMT supporters was also very high, at 88.0%. Meanwhile, the turnout rates of DPP and KMT supporters were much lower at 65.8% and 68.4%, respectively. Perhaps, DPP supporters did not go to the polls because KMT candidates were dominant in the county mayoral elections. Furthermore, the DPP did not actively promote the referendum on this issue. The agreement rate, in terms of opinions, was highest among KMT supporters, and it was higher among independents than among DPP supporters. Therefore, the KMT political campaign clearly affected the KMT supporters, and its effect on independents was positive but limited.

Table 5. Voting action and opinions on Japanese imported foods by supporting parties.

	number	weighted	Voting action		Opinion
			rate of agreement	voter turnout rate	rate of agreement
DPP supporters	59	57.4	76.2	65.8	67.3
(s.e.)			(7.2)	(6.4)	(6.6)
KMT supporters	107	110.1	95.7	88.0	88.5
(s.e.)			(2.1)	(3.1)	(3.1)
Support no party	166	163.3	82.3	68.4	76.0
(s.e.)			(3.9)	(3.9)	(3.7)
(Difference)					
DPP – no party			-6.1	-2.7	-8.7
(s.e.)			(8.2)	(7.5)	(7.5)
KMT – no party			13.4	19.6	12.5
(s.e.)			(4.4)	(5.0)	(4.8)
DPP – KMT			-19.5	-22.3	-21.2
(s.e.)			(7.5)	(7.1)	(7.3)

Note: Weighted population composition is weighted by number of voters of each sex/age cohort.

5.3 Associations with voters' attributes

Table 6 shows the results of the survey by gender, age cohort, and other attributes. First, the agreement rate with the import restriction was higher among those in their 40s and older. The agreement rate was extremely high (97.9%) among those in their 50s. Second, there were differences in the agreement rates between men and women, but the difference appeared only in some age groups. For example, there was little difference between the responses of men and women among respondents in their 20s. Conversely, all women in their 40s and 50s reported agreement with the import restriction in both “voting action” and “opinion”. The agreement rate of men in their 50s was as high as that of women, but among men in their 40s, the agreement rate was much lower.

Regarding education level, four respondents refused to answer, but otherwise the agreement rate was slightly higher among those without a college degree compared to more educated groups. The agreement rate was lowest among those with graduate school education, which may be due to differences in education levels between generations. Honda et al. found that one's profession and thinking style play important roles in risk

Table 6. Survey results by attribute.

					Voting action		Opinion
			number	weighted	rate of agreement	voter turnout rate	rate of agreement
Total			360	360	86.2	74.9	78.6
Sex and age cohorts	20–29	male	30	30.8	73.7	67.9	67.9
		female	30	28.5	78.3	82.1	65.4
	30–39	male	30	34.4	66.7	85.7	62.1
		female	30	34.4	91.7	85.7	80.0
	40–49	male	30	34.2	79.2	82.8	69.0
		female	30	35.3	100.0	79.3	100.0
	50–59	male	30	33.6	96.0	83.3	82.1
		female	30	34.7	100.0	76.7	100.0
	60–69	male	30	26.2	81.2	55.2	69.2
		female	30	28.4	89.5	73.1	80.8
	70-	male	30	17.7	73.3	57.7	68.0
		female	30	21.9	100.0	42.3	95.2
Education	Primary school	54	41.8	85.8	34.9	76.7	
	Junior High School	37	34.7	88.6	68.0	88.6	
	Senior High School	84	88.4	93.1	80.6	82.1	
	Vocational school	60	63.6	89.2	81.4	83.9	
	University	94	98.4	83.9	79.4	73.9	
	Graduate School or Higher	27	29.6	67.9	92.6	64.8	
	Child	Children under the age of 18 living together	128	133.5	82.0	78.2	77.5
	None of above	232	226.5	89.0	72.9	79.2	
	Children under the age of 6 living together	61	63.2	79.5	80.4	79.9	
	None of above	299	296.8	87.9	73.7	78.3	
Japanese familiarity	Purchased or consumed food produced from Japan in the last six months	74	79.6	78.8	82.6	65.8	
	None of above	276	270.5	89.1	71.7	82.8	

Note: Weighted population composition is weighted by number of voters of each sex/age cohort.

judgments regarding food contamination from radioactive materials¹¹. Training on scientific thinking in graduate school, therefore, may have influenced respondents' views on the referendum.

We asked whether respondents had children under the age of 18 living in their homes, and more specifically children under six. The purpose of this question was to examine any differences in responses arising from concerns about infant food being among banned imported items. The households with children had a lower rate of agreement with the import restriction, as shown in their "voting action", even when respondents had children under six years old. The agreement rate in terms of "opinion" was higher among those with children, but this difference was very small. It is surprising that having children in the household had little impact in people's responses. Most research on Japanese consumers has found that consumers with children under 15 years old required a higher discount rate to accept agricultural products from regions nearer power plants¹².

This study's survey included a question to explore whether people had purchased any imported Japanese food products in the past six months from places other than the five prefectures in question. When compared to non-purchasers, purchasers of these products were 10.3% less likely to agree with the import restriction in "voting action" and 17.0% less likely to agree in "opinion". This may be because people familiar with Japanese food supported lifting the import restriction or that those supportive of lifting the restriction eat Japanese food. Since these foods were from prefectures other than the restricted ones, there would not have been concerns about residual radiation. Therefore, the effect from familiarity with Japanese food could be greater than the effect from food safety concerns.

The preference for daily consumption of Japanese food and confidence in Japanese food testing may be two sides of the same coin; hence, the result is not surprising. After the Fukushima nuclear disaster, Miyata and Wakamatsu (2018) found that 20% of general consumers avoided seafood from Fukushima. However, these consumers also reported not trusting the radioactive test results from any entity, and they did not buy seafood frequently, even from regions other than Fukushima. This is similar to the finding that infrequent consumers of Japanese food did not have confidence in the safety of food from the Fukushima area, suggesting that information about radioactivity tests and safety is circulated more often among people who regularly purchase Japanese food.

5.4 Regression analysis

The descriptive statistics in Table 5 indicate that a factor influencing an individual's referendum votes to uphold the import restriction was his or her supported party, especially the KMT. However, this result may have been affected by other attributes, as well. For example, the rate of support for the KMT was high among respondents in their 30s–50s, while respondents in their 20s, 60s, and 70s expressed low rates of KMT support. We will study how differences in agreement and turnout rates by supported parties change when we control for other factors. Next, we use regression analysis with OLS to examine the impact of party support when we control for potentially influential factors.

¹¹Honda et al., "Variation in risk judgment on radiation contamination of food."

¹²Aruga, "Consumer responses to food produced near the Fukushima nuclear plant."

As explanatory variables, we included dummy variables for all combinations of gender and age as well as for education level, meaning that the intersection of age and gender was taken as an independent variable. In addition to age and gender, we controlled for the presence of children, education, and residence. Further, the landline area code was entered as a dummy for the region to control for the area. The sample size became smaller, as some respondents declined to provide their level of education or political party preference.

Table 7 summarizes the results for supported parties when we control for sex, age, education, children, and region. The coefficients and significance were stable regardless of whether gender or age were controlled separately. The differences in agreement rates (opinions) between KMT supporters and those without supported parties decreased from 13.4% to 11.3% and 10.6%, respectively, but the differences were still statistically significant. Even when controlling for other factors, the differences in agreement rates (voting actions) between DPP supporters and those without supported parties were not statistically significant. When controlling for other factors, these differences were 6.1% and 5.4%. Therefore, support for the KMT had a statistically positive effect on the rate of agreement with import restrictions, even when controlling other attributes. Although KMT supporters were more supportive of a nuclear power plant, as mentioned above, they were more opposed to food imports from the prefectures near Fukushima¹³.

The differences in turnout rates between KMT supporters and independents became smaller when we controlled for other factors, but the differences remained statistically significant (14.9 and 15.0%). However, differences in turnout rates between the DPP and independents were not statistically significant (2.7 and 3.9%). This could be because of the limited sample size in this study. Another possibility is that the political campaign by the KMT regarding the referendum had a limited effect on the voter turnout rate.

Table 7. The effects of supporting parties on the probabilities of agreeing with the import restriction.

	Voting action		Opinion
	rate of agreement	voter turnout rate	rate of agreement
(No control)			
DPP – no party	–6.1	–3.2	–8.7
(s.e.)	(8.2)	(7.5)	(7.5)
KMT – no party	13.4 ***	19.1 ***	12.5 **
(s.e.)	(4.4)	(4.9)	(4.8)
(2 sex and 6 age categories, education and having children)			
DPP – no party	–6.1	–2.7	–10.3
(s.e.)	(8.9)	(7.7)	(7.6)
KMT – no party	11.3 **	14.9 ***	10.0 **
(s.e.)	(4.7)	(5.1)	(5.1)
(12 sex-age combinations, education and having children)			
DPP – no party	–5.4	–3.9	–10.5
(s.e.)	(8.9)	(7.8)	(7.7)
KMT – no party	10.6 **	15.0 ***	10.4 **
(s.e.)	(4.7)	(5.1)	(5.1)
Sample	225	308	297

Note: The results on control variables are omitted for space.

¹³Chen, “Risk perception and attitude toward nuclear energy during the Fukushima crisis”

Shifts in Taiwanese politics often result from the voting behaviors of neutral supporters of the two major parties. Regarding the referendum on the Japanese food import restriction, it was a combination KMT supporters actively voting to express agreement and DPP supporters and independents' passive attitudes and lack of voting that led to the enactment of the referendum.

Meanwhile, why was the KMT dummy significant? First, this was a public referendum originally proposed by the KMT, whose supporters would have been loyal to the party's claims. It is possible that an inverse cause-and-effect relationship existed such that those who agreed with the import restriction became supporters of the KMT. The more plausible argument, however, is that the KMT inflamed fears about "nuclear contaminated food", and that this fear was more easily absorbed by those likely to support the KMT. Second, the KMT party was at the peak of its power at the time of the survey, as exemplified by the "Han Kuo-Yu boom", making it easier for its claims to penetrate people's thoughts and opinions (however, the people subsequently recalled Han Kuo-Yu in June of 2020).

The fragmentation of the media in Taiwan may also have contributed to this phenomenon. In Taiwan, DPP and KMT affiliations have divided TV, newspapers, and other media. At the time of the referendum, the KMT-affiliated media emphasized the dangers of "nuclear food", encouraging KMT supporters to favor the import restrictions. In addition, the Taiwanese people have always been concerned about information regarding Japan (not only official information from the Japanese government but also both positive and negative information from other sources). This interest paved the way for suspicions, which may have been exploited for political purposes.

5.5 Implication: the U.S. pork issue in taiwan

Political manipulation is a problem that applies not only to food imports from parts of Japan but also to pork imports from the United States. Following the DPP's successful reelection in 2020, with its high approval rating for the successful handling of COVID-19, President Tsai Ing-Wen announced on August 28 2020 that the importation of U.S. pork containing ractopamine would be liberalized in 2021. In addition, restrictions on the importation of U.S. cattle over 30 months of age would also be relaxed. This incited considerable controversy. As early as July 5 2012, the Codex Alimentarius Commission (CODEX) had adopted maximum residue levels for ractopamine, a type of clenbuterol. In September 2012, Taiwan also announced the introduction of a new tolerance level for ractopamine in beef, which follows the CODEX standard of 10 ppb in cattle muscle. The KMT then opened up beef imports in 2012 while the DPP opposed it, because the Taiwanese consumed pork offal, and the amount of pork consumed was higher. In the end, under strong public pressure, the KMT government decided against the importation of cattle offal and pork. The government announced that instead of adopting international standards, it would conduct a risk assessment based on national eating habits. Until 2019 and after the DPP's administration, Taiwan's Food and Drug Administration completed a "Health Risk Assessment of Ractopamine Exposure from Meat Consumption" and confirmed that there were no food safety concerns for the general population under the CODEX standards for ractopamine-containing meat products. However, the KMT, which had become the opposition party, strongly criticized the DPP government and even threatened to launch a referendum on U.S. pork imports,

similar to that for the Fukushima food imports. In addition, the DPP government also proposed that all pork-containing products and pork vendors be subject to obligatory origin labeling.

6 Conclusion

Past studies have shown that the Japanese public has strong negative feelings toward agricultural products from Fukushima, and negative rumors have circulated about the region's agricultural products. Naturally, Taiwanese consumers would be even more anxious than the Japanese ones about Japanese food safety, especially because the food produced was overseas and information about it would be difficult to obtain. It is understandable, then, that in the Taiwanese referendum, regardless of their attributes, many voters opposed the relaxation of import restrictions. The scientific argument was valid for some but not all segments of the population. For example, among those with post-graduate education, there was a noticeable preference for relaxing import restrictions on the food imports from the vicinity of Fukushima. However, the opinion of one's political party, (especially the KMT) strongly influenced voting behavior. In other words, even with the scientific debate, partisan positions have the power to counteract rational decision-making. The controversy between the ruling and opposition parties over the issue about import of US pork containing ractopamine is similar to the situation analyzed in the analysis. This is partly due to Taiwan's unique political environment, in which party affiliations shape agendas to strongly influence consumer sentiment, such as food safety.

This study recommends that efforts to remove import restrictions on food be based on food safety policies but must also ensure that any food safety policies are in line with international standards. Therefore, in terms of diplomatic relations, it is important to consider the domestic politics of the importing countries.

According to our study, when partisanship emerges this clearly, it is fair to say that the result of the Fukushima food import referendum is the result of politics. This was especially true for elderly or under-educated citizens, whose receptivity to scientific information was lower than that for political information. Political information is an important variable in the approval or disapproval of food safety issues. In conclusion, food safety should be fundamentally based on scientific risk assessments, and institutions should be established to disseminate accurate scientific information to the public. When people become accustomed to judging food safety based on scientific evidence, they will be more likely to avoid potential food safety problems. These results are relevant not only in Taiwan but also in any other countries where food safety issues can be politically manipulated.

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