The Knowledge of Radiation and Radioactive Waste and the Public Acceptance of Nuclear Power Generation

Byung-Deuk Woo[1] · Young Bae[2]

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Abstract What determines the public acceptance of nuclear power generation? Even though previous studies have emphasized the necessity and importance of nuclear power generation, empirical studies on the factors determining the public acceptance of nuclear power generation, especially in the East Asian context, have not been developed thoroughly. By focusing on the role of the knowledge of radiation and radioactive waste, this article relying on the survey (N=576) conducted in South Korea, aims to explain the variations in the acceptance of nuclear power generation among the public. Estimating ordered logistic regression models, we demonstrate that respondents with much knowledge of radiation and radioactive waste tend to have more positive attitudes toward nuclear power generation. The conducive influence of the knowledge of radiation and radioactive waste on the public acceptance of nuclear power generation is not merely statistically significant but also substantially meaningful in terms of average marginal effects and predicted probabilities.

Keywords Knowledge of Radiation and Radioactive Waste · Nuclear Power · Public Acceptance of Nuclear Power Generation · South Korea · Ordered Logistic Regression

✉ Byung-Deuk Woo
byungdeukwoo@gmail.com

Young Bae
youngbae@postech.ac.kr

1 First Author, Post-doctoral researcher, The Institute of Social Data Science, Pohang University of Science and Technology

2 Corresponding Author, Professor, The Division of Humanities and Social Science, Pohang University of Science and Technology

Introduction

Nowadays, nuclear power generation is a highly controversial issue regardless of the geopolitical region, including Europe (Ho, Leong, et al., 2019; Xia et al., 2019), Asia (Huang et al., 2018; J.-d. Kim & Byrne, 2020; Yang, Lee, Miwa, & Chen, 2018) and America (Dinçer, Lisin, Ubay, & Çağlayan, 2021; Sharpton, Lawrence, & Hall, 2020). Despite a series of potential benefits of nuclear power or energy, such as job creation, economic growth, and a stable supply of electricity (Ho, Oshita, Looi, Leong, & Chuah, 2019), people still continuously express their concerns about the risk of nuclear power generation and nuclear power plant.

What determines the public acceptance of nuclear power generation? Even though previous studies, including the ones above-mentioned, have emphasized the necessity and importance of nuclear power generation, empirical studies on the factors determining public acceptance toward nuclear power generation, especially in the East Asian context, have not been developed thoroughly. It has been regarded that the experience of the Fukushima nuclear disaster and the Chernobyl's disaster is one of the potential factors making the public have low acceptance rates toward nuclear power generation (Huang et al., 2018; S. Wang, Wang, Lin, & Li, 2019). However, despite the considerable impacts of such disasters on the public acceptance of nuclear power generation, it does not fully explain the variations of the acceptance among the public. Not many studies have devoted themselves to unveiling other factors of acceptance.

The case of South Korea is an ideal setting to evaluate the influence of the knowledge of radiation and radioactive waste on acceptance. South Korea has a long history of nuclear power generation, and it has six of the ten largest nuclear sites over the globe (Park & Sovacool, 2018). In addition, South Korea is a country where nuclear power generation advocacy and opposing coalitions contradict fiercely. Those coalitions have polarized over time (Nam, Weible, & Park, 2022), guaranteeing enough variations of public acceptance among the public. To address this academic void, this article relying on the survey (N=576) conducted in South Korea, aims to explain the variations among the public by focusing on the relationship between the knowledge of radiation or radioactive waste and the acceptance of nuclear power generation.

Estimating ordered logistic regression models, we demonstrate that respondents with much knowledge of radiation and radioactive waste tend to have more positive attitudes toward nuclear power generation. The conducive influence of the knowledge of radiation and radioactive waste on the public acceptance of nuclear power generation is not merely statistically significant but also substantially meaningful in terms of average marginal effects (AMEs) and predicted probabilities.

In the Literature Review section, we thoroughly review previous literature on potential determinants of the public acceptance of nuclear power generation and nuclear energy. Then, in the Theory and Hypothesis section, we will introduce a theory supporting the association between the knowledge of radiation and radioactive waste on the acceptance of nuclear power generation. Next, data, variables, modeling strategy, and empirical results will be presented. Finally, we conclude with a discussion of the potential limitations of our study and future research topic. The remainder of this article proceeds with the following orders.

Literature review

Given that our world is constantly changing and the speed of change has been accelerated, researchers have paid their academic attention to explaining the potential determinants of acceptance (Flynn, 2007; Liu, Yang, Wang, & Liu, 2019; J. Wu, Liao, Wang, & Chen, 2019). At the same time, it has been regarded that public rejection of new technologies, such as nuclear energy, has usually resulted in negative consequences for the marketability of such technologies (Gupta, Fischer, & Frewer, 2012). For instance, the commercialization of genetically modified (GM) food crops has been delayed due to the low public acceptance of the crops (Batrinou, Dimitriou, Liatsos, & Pletsa, 2005; Hall, 2007).

So, what determines the public acceptance or the public rejection of new technologies? The previous literature on the potential acceptance factors can be categorized into three main themes: risk and benefit perception and knowledge of nuclear energy. In this *Literature Review* section, we thoroughly review the previous studies questioning factors of public approval with a focus on nuclear power generation or nuclear power itself.

Some previous studies have continuously emphasized the crucial role of people's risk perception in determining the public acceptance of nuclear energy and nuclear power generation. This article defines risk perception as "an everyday subjective assessment process based on experience and available information without referring to reliable data, series, and complex models" (Plapp & Werner 2006, 101). As mentioned earlier, Fukushima and Chernobyl's disasters have increased the public's risk perception against nuclear energy and nuclear power generation (Huang et al., 2018; S. Wang et al., 2019). For instance, Huang et al. (2018), examining China's case, demonstrated that the Fukushima nuclear accident significantly decreased public acceptance toward nuclear power stations, while the negative impacts were minimized sharply after the disaster.

Along with the risk perception of nuclear energy and nuclear power generation, scholars have also paid attention to the role of benefit perception in determining the public acceptance of nuclear power generation (Ho, Looi, Chuah, Leong, & Pang, 2018; Visschers, Keller, & Siegrist, 2011; Visschers & Siegrist, 2013). Here, benefit perception refers to "individuals' intuitive judgment of possible positive consequences of nuclear energy or nuclear power generation" (Wang, Gu, & Wu 2020, 3). Wang, Gu, and Wu (2020) demonstrated that energy policy involvement is positively and significantly related to benefit perception toward nuclear energy.

Even though previous studies have argued that risk and benefit perceptions are powerful tools to explain variations in the public acceptance toward the public acceptance of nuclear energy and nuclear power generation, the acceptance is not solely determined by those perceptions. In addition to the risk and benefit perceptions of nuclear energy and nuclear power generation, the role of knowledge of nuclear energy and power has also been considered one of the determinants of public acceptance (S. Wang et al., 2019; W. Zhu, Wei, & Zhao, 2016).

There is still no academic consensus reached concerning such a relationship. Even though some studies have consistently supported the conducive role of knowledge in increasing public acceptance of nuclear energy and nuclear power generation, others have found a negative association between understanding and acceptance (Arikawa, Cao, & Matsumoto, 2014; Li, Fuhrmann, Early, & Vedlitz, 2012; Perko, Adam, & Stassen, 2015; Stoutenborough, Sturgess,

& Vedlitz, 2013, Ho, Leong, et al., 2019; Pidgeon, Henwood, Parkhill, Venables, & Simmons, 2008; Venables, Pidgeon, Parkhill, Henwood, & Simmons, 2012; Whitfield, Rosa, Dan, & Dietz, 2009). Furthermore, W. Zhu et al. (2016) provided evidence for the U-shape influence of knowledge on nuclear energy on anti-nuclear behavioral intentions.

At the same time, it has also been argued that the information public conditioned the relationship between risk and benefit perceptions and the acceptance of nuclear energy or nuclear power generation. For instance, S. Wang, Wang, Lin, and Li (2020), analyzing the case of China, showed that information publicity tends to strengthen the relationship between perceived benefits and risks and the public acceptance of nuclear energy and nuclear power generation. However, some studies also emphasized the influence of personal experiences and emotions (Gierlach, Belsher, & Beutler, 2010; Sugiawan & Managi, 2019), perceived trust, and cost (Ho, Oshita, et al., 2019; Vainio, Paloniemi, & Varho, 2017), engagement in nuclear power generation (S. Wang et al., 2019), and demographic characteristics such as gender and age (Keller, Visschers, & Siegrist, 2012; Vainio et al., 2017; Y. Wu, 2017). This article focuses on risk and benefit perceptions and the role of knowledge and reviews previous literature on potential factors of the public acceptance of nuclear power generation.

Despite the above-mentioned previous studies concerning the potential factors driving the public acceptance of nuclear power or nuclear power generation, the influence of the knowledge of radiation and radioactive waste on explaining the variations in the acceptance among the public has not been empirically examined thoroughly, especially in the East Asian context. Public knowledge about nuclear energy has non-negligible impacts on its acceptance (Hu, Zhu, & Wei, 2021; Odonkor & Adams, 2020; S. Wang et al., 2019). Radiation and radioactive waste are central issues of nuclear power generation (Y. Kim, Kim, & Kim, 2013; Y. Wu, 2017), and such academic lacuna is unexpected. It is even surprising given that intense fear of radiation after the two catastrophic disasters has pervaded people over decades (Yoshida et al., 2020).

The following Theories and hypotheses section will present the mechanisms behind the link between the knowledge of radiation and radioactive waste and the public acceptance of nuclear power generation.

Theories and Hypothesis

As mentioned earlier, even though it has been regarded that nuclear knowledge tends to include public understanding of nuclear energy, nuclear power generation, and operation. Nuclear radiation risks (Hao, Guo, Tian, & Shao, 2019), the direct and independent influence of the knowledge on radiation and radioactive waste on the public acceptance of nuclear energy has not been empirically tested. How and why does scientific knowledge on radiation and radioactive waste affect the public acceptance?

Borrowing the information deficit theory (also known as the deficit model, information deficit theory, and knowledge gap (or deficit) model propounded by Wynne (1982)[1], this article theorizes the relationship between the knowledge of radiation and radioactive waste and the public acceptance of nuclear power generation. The main thrust of the information deficit theory

[1] See also Wynne (1993) and Wynne (2006).

is that the public skepticism of new technologies is based on the gap between scientific knowledge and public knowledge about the technologies or issues (Abunyewah, Gajendran, Maund, & Okyere, 2020). Thus, the delivery of scientific information to the public to fill the gap can alleviate the public skepticism of new technologies (Brown, 2009; Cook & Overpeck, 2019).

Other mechanisms support the link between the knowledge of radiation and radioactive waste and the public acceptance of nuclear power generation. For instance, some scholars mention that the exchange of scientific knowledge or information between the public and experts in a platform in which social and cultural systems of the community are integrated helps to promote communication among them, which in turn reduces the public skepticism of new technologies (Kahan, 2010; McKenzie-Mohr, 2000; Scheufele, Corley, Shih, Dalrymple, & Ho, 2009). For instance, Scheufele et al. (2009) emphasized the importance of considering religious beliefs among the public to disseminate scientific knowledge and minimize skepticism.

In addition, other scholars based on the technology acceptance model developed by Davis (1989) have tried to explain the impacts of knowledge on the public acceptance of new technologies. He emphasized that personal acceptance of new technologies is primarily determined by perceived ease of use, perceived usefulness, and attitudes concerning the technologies. Under the theoretical framework of the technology acceptance model, the delivery of scientific knowledge promotes people's willingness to adopt new technologies by reducing the uncertainties of such technologies (R. Wang, Zhao, Wang, & Jiang, 2021). A series of previous studies support the mechanism proposed by the technology acceptance model related to the public acceptance of liquefied natural gas (Pfoser, Schauer, & Costa, 2018) and electric vehicles (Y.-h. Wang & Wang, 2013).

Previous studies have empirically supported the above-proposed mechanisms. For example, Abunyewah et al. (2020) demonstrated that the information or knowledge dissemination process with community participation is likely to reduce public skepticism and increase the preparedness of the public against potential disasters. Furthermore, Tarigan (2019) demonstrated that an appropriate provision of knowledge to the public tends to promote the public acceptance of hydrogen vehicles. Thus, based on the theories mentioned earlier and previous empirical findings, we expect that people with knowledge of radiation and radioactive waste are more likely to exhibit higher levels of acceptance toward nuclear power generation. Therefore, our hypothesis has been put forward.

Hypothesis: People with knowledge of radiation and radioactive waste tend to have higher public acceptance of nuclear power generation compared to people with such knowledge, while all other things being equal.

In the following *Empirical Analysis* section, we will describe the data and variables employed in this article to test the association between the knowledge of radiation and radioactive waste and the public acceptance of nuclear power generation. In addition, modeling strategies and empirical results will be presented sequentially.

Empirical Analysis

Data and Variables

To examine whether the knowledge of radiation and radioactive waste leads people to have a positive attitude toward nuclear power generation or not, we survey South Korea (N = 576). In the survey, respondents were asked to answer questionnaires about their acceptance of nuclear power generation, knowledge of radiation and radioactive waste, and questionnaires about individual characteristics such as gender and age. Among 576 respondents, 293 (50.87%) are male, and 283 (49.13%) are female. In addition, 343 (59.55%) are aged over 31. Table 1 shows the descriptive information about the total respondents in our survey.

Table 1 Descriptive Information about Survey Respondents

Variable		Frequency	Percentage
Age			
	Not More Than 31	233	40.45%
	Over 31	343	59.55%
Gender			
	Male	293	50.87%
	Female	283	49.13%
Job			
	Office Worker	293	50.87%
	Housemaker	92	15.97%
	Freelancer	127	22.05%
	Student	64	11.11%
Region			
	Geyongju	219	38.02%
	Other than Gyeongju	357	61.98%

Dependent Variable

As a dependent variable to measure the acceptance of nuclear energy, we rely on a questionnaire: “What do you think about nuclear power generation in general?”. Respondents can select from 1 (negative to nuclear power generation) to 10 (positive to nuclear power generation).

Independent Variable

To measure the knowledge of respondents about radiation and radioactive waste, we focus on three items: “Do you know that you are exposed to radiation during X-ray and CT scans, which are essential to health checkups?”, “Do you know that radioactive waste is also present in waste from hospitals?” and “Do you know that most of the low and medium level radioactive waste is used daily, such as clothes and gloves worn during radiation work?” Concerning the three questionnaires, respondents can select from 1 (absolutely I do not know) to 10 (absolutely I know). Then, we conduct a principal component analysis (PCA). This makes it possible to capture the underlying structure of the components (Afifi, May, Donatello, & Clark, 2019; Van

Belle, Fisher, Heagerty, & Lumley, 2004) to build an independent variable named *Knowledge on Radiation and Radioactive Waste*. The eigenvectors of each item are 0.571, 0.640, and 0.515.

Control Variables

The public acceptance of nuclear power generation or other issues is not solely determined by scientific knowledge. Thus, we include a series of control variables to properly examine the independent impact of the knowledge of radiation and radioactive waste on the acceptance of nuclear power generation. First, we control the influence of age and gender on acceptance based on the previous studies demonstrating that age and gender can affect people's attitudes toward nuclear power generation (Choi, Lee, Cho, & Lee, 1998; Visschers & Wallquist, 2013). Age and gender are binary variables. We assign 2 for respondents over 31; otherwise, 1 is set. Moreover, 0 is assigned to gender if respondents are male. Otherwise, 1 is given.

"Do you know about the Korea Hydro & Nuclear Power (KHNP) Co., Ltd.?" [1] and "Do you know the exact locations of the four nuclear power plants in South Korea?" Respondents can answer those questions by selecting two possible answers: "Yes" and "No". Given the previous literature on the relationship between knowledge of nuclear power and public acceptance of nuclear power generation (Huang et al., 2018; Kivimäki & Kalimo, 1993), we control respondents' knowledge of nuclear power based on the two survey items.

Furthermore, we also consider whether respondents have information that they will receive electricity tax relief in exchange for the installation of a radioactive waste disposal facility. The following item is employed: "Are you aware that electricity tax relief or exemption has been made in exchange for installing a radioactive waste disposal facility for people living around the facility?" Respondents can select "Yes" or "No."

Then, we control respondents' safety evaluation by considering two items: "How safe do you feel about nuclear power plants?" and "How do you feel about living near a nuclear power plant?" Respondents can answer the two questions by selecting a score from 0 (Absolutely not safe) to 11 (Absolutely safe). Including respondents' safety evaluation as control variables make it possible to parcel out the influence of safety evaluation on the acceptance of nuclear power generation (Cvetković et al., 2021; Lee & Harrison, 2000).

Lastly, we also control whether respondents agree with the statement, "In your opinion, is it reasonable to give additional points to residents living near nuclear power plants when they apply for positions at the Korean Hydro & Nuclear Power?" Respondents can answer by selecting "Agree" or "Disagree". Our decision to include this control variable is based on the expectation that people with a positive attitude toward giving extra points to the residents around nuclear power plants on job markets might have lower acceptance toward nuclear power plants. In addition, the potential influence of respondents' jobs and geographical regions of South Korea are also controlled by fixed effects. Including the fixed effects enables us to parcel out unmeasured and unobserved impacts of jobs and regions.

Table 2 presents descriptive statistics of the variables employed in the empirical analysis of our study. To examine whether there is a problematic correlation among the explanatory variables, we conduct a variation inflation factor (VIF) test. The mean VIFs are less than 2 across all models estimated in this article. The individual VIFs are also less than 4, indicating that empirical models introduced later do not suffer from multicollinearity problems.

Table 2 Descriptive Statistics of Variables

Variable	Mean	Std. dev.	Min	Max
Dependent Variable				
Acceptance of Nuclear Power Generation	5.998	2.613	1	10
Independent Variable				
Knowledge of Radiation and Radioactive Waste	0.000	1.355	-5.708	1.555
Control Variables				
Age	1.596	0.491	1	2
Gender	0.492	0.500	0	1
Knowledge on KHNP	0.896	0.306	0	1
Knowledge on the Positions of NPP	0.403	0.491	0	1
Knowledge on Electricity Tax Relief	0.442	0.497	0	1
Perception of NPP Safety	5.774	2.651	1	11
Perception on Living around NPP	4.429	2.546	1	11
Agree on Extra Points for Residents around NPP	6.436	3.043	1	11

Note: As mentioned earlier, fixed effects for regions where respondents live and jobs they have are included as control variables.

Modeling Strategy and Empirical Results

Given that the dependent variable ranges from 1 to 10 and the values are integers, we employ ordered logistic regression models to examine the relationship between the knowledge on radiation and radioactive waste and respondents' attitudes toward nuclear power generation.[2]

Table 3 presents the results from the four ordered logistic regression models. Model 1 and Model 2 are estimated only with the independent variable and individual respondents' characteristics (*Age* and *Gender*). Model 3 is based on the additional control variables except for variables concerning perceptions and *Agree on Extra Points for Residents around NPP*. Model 4 is estimated with control variables for the perceptions, and Model 5 is estimated with all control variables, including job and region fixed effects.

Starting from the independent variable, *Knowledge of Radiation and Radioactive Waste* is statistically significant at $p < 0.05$ across the five models in Table 3. As expected, respondents with more knowledge of radiation and radioactive waste are likelier to have a positive attitude toward nuclear power generation. Specifically, one unit increase in the independent variable increases the log odds of selecting higher categories of the dependent variable ranging from 1 to 10. This empirical result is consistent with our expectation that the knowledge of radiation and radioactive waste leads the public to support nuclear power generation.

Turning to control variables, *Gender* is statistically significant at the $p < 0.001$ with a negative sign in Model 2 and Model 3. However, after other control variables are included, *Gender* is not statistically significant at any level of a p-value. In addition, *Knowledge of the Positions of NPP*, *Knowledge of Electricity Tax Relief*, and *Agree on Extra Points for Residents around NPP* do not have statistically significant relationships with the dependent variable in Model 4 and Model 5. It indicates that the mere information about the facts related to nuclear power

[2] See Hilbe (2009) for more information about ordered logistic regression models.

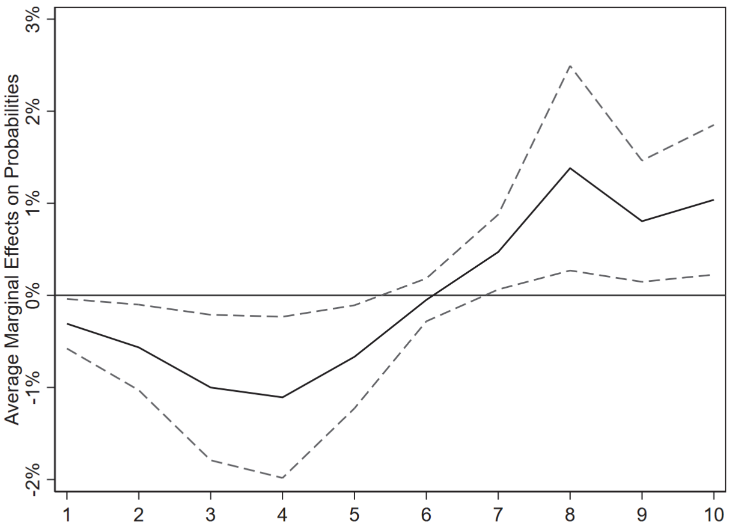
Table 3 Estimations from Ordered Logistic Regression Models

	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variable					
Knowledge of Radiation and Radioactive Waste	0.158**	0.164**	-0.120*	-0.152*	0.152*
	(0.056)	(0.056)	(0.058)	(0.060)	(0.059)
Control Variables					
Age		0.073	-0.087	-0.021	0.001
		(0.081)	(0.082)	(0.082)	(0.083)
Gender		-0.789***	-0.795***	-0.390	0.383
		(0.237)	(0.240)	(0.251)	(0.251)
Knowledge on KHNP			0.527*	0.534*	0.540*
			(0.234)	(0.238)	(0.239)
Knowledge on the Positions of NPP			0.368*	0.154	0.142
			(0.168)	(0.169)	(0.169)
Knowledge on Electricity Tax Relief			0.198	-0.036	-0.023
			(0.189)	(0.191)	(0.191)
Perception of NPP Safety				0.238***	0.235***
				(0.038)	(0.038)
Perception on Living around NPP				0.284***	0.287***
				(0.039)	(0.039)
Agree on Extra Points for Residents around NPP					0.048
					(0.026)
Job Fixed Effect	No	Yes	Yes	Yes	Yes
Region Fixed Effect	No	Yes	Yes	Yes	Yes
Number of Observations	576	576	576	576	576
Pseudo R2	0.003	0.016	0.017	0.088	0.090
Log Likelihood	-1287.592	-1271.359	-1269.833	-1177.865	-1175.846
AIC	2595.185	2584.932	2575.667	2395.729	2394.352
BIC	2638.746	2650.274	2654.076	2482.852	2485.830

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors in parentheses. The Akaike's Information Criteria (AIC) and Bayesian Information Criteria (BIC) are presented for the model comparison.

generation, such as the positions of the plants and tax relief, is not directly related to the acceptance. On the contrary, *Knowledge of KHNP* is statistically significant at $p < 0.05$ in Model 3, Model 4, and Model 5, meaning that respondents knowing about KHNP are more likely to have positive attitudes toward nuclear power generation. It can be regarded that people with more interest in nuclear power might have more information concerning KHNP, which oversees nuclear power generation in South Korea. Specifically, *Knowledge of KHNP* increases the log odds of selecting higher categories of the dependent variable by 0.527 (Model 3), 0.534 (Model 4), and 0.540 (Model 5), respectively.

Moreover, regarding respondents' safety perception of nuclear power plants (*Perception of NPP Safety* and *Perception of Living around NPP*), the two control variables are statistically significant in positive directions at $p < 0.001$. These empirical results support the findings from the previous studies demonstrating that people's safety evaluation concerning nuclear power plants is positively associated with the acceptance of nuclear power generation (Cvetković et al., 2021).



Note: The average marginal effects are estimated with the 95% confidence intervals. The average marginal effects are estimated based on the empirical results from Model 5.

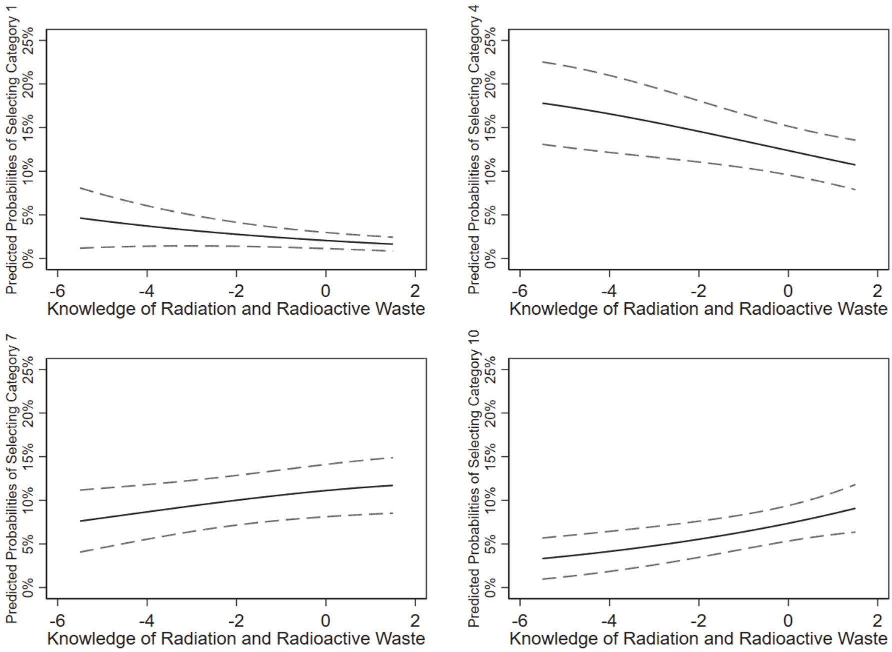
Fig. 1 Average Marginal Effects of Knowledge on Radiation and Radioactive Waste

Rather than only examining the coefficients of explanatory variables, we estimate the independent variable's average marginal effects (AMEs) on the acceptance of nuclear power generation. Figure 1 illustrates the AMEs based on each category of the dependent variable, and the AMEs are estimated while all other explanatory variables are held at their typical values.

In category 1 (negative to nuclear power generation), one unit increase of *Knowledge of Radiation and Radioactive Waste* decreases the probability of selecting category 1 by 0.307%. Moreover, from category 1 to category 5, the AMEs of the independent variable is negative. Even though the point estimate of the AME is -0.049% regarding category 6, the confidence interval ranges from -0.282% to 0.184%.

The AMEs of the independent variable change to a positive direction related to categories 7, 8, 9, and 10 (positive to nuclear power generation). It indicates that respondents with knowledge of radiation and radioactive waste tend to have a higher probability of selecting those categories than respondents without such knowledge. Thus, the impact of the independent variable is not merely statistically significant but also substantively meaningful.

There are various ways to evaluate the substantive effects of statistically significant variables in ordered logistic regression models. We estimate predicted probabilities of seeing whether the influence of *Knowledge of Radiation and Radioactive Waste* on *Acceptance of Nuclear Power Generation* is meaningful or not. Figure 2 shows the predicted probabilities of selecting each category of the dependent variable.



Note: The predicted probabilities are estimated with the 95% confidence intervals.

Fig. 2 Predicted Probabilities of Selecting Each Category

As presented, the increase in the independent variable substantially decreases the predicted probabilities of selecting categories 1 and 4. For instance, if *Knowledge of Radiation and Radioactive Waste* increases from -4 to 1.5, the predicted probability of selecting category 4 decreases from 16.569% to 10.727%. It means that respondents with much knowledge on radiation and radioactive waste are less likely to choose category 4. On the contrary, the independent variable tends to increase the predicted probabilities of selecting higher categories, such as category 7 or 10 (positive to nuclear power generation). In category 10, the predicted probability increases from 4.148% to 9.083% if the independent variable increases from -4 to 1.5.

To sum up, the knowledge of radiation and radioactive waste tends to lead respondents to take a positive attitude or show higher acceptance toward nuclear power generation. In contrast, other things, including knowledge of nuclear power plants, are controlled, as expected. The role of *Knowledge of Radiation and Radioactive Waste* is one of the driving factors in determining the respondents' attitudes. Its influence is not merely statistically significant but also substantially significant regarding average marginal effects and predicted probabilities.

Conclusion And Discussion

By focusing on the role of the knowledge of radiation and radioactive waste, this article relying on the survey (N=576) conducted in South Korea, aims to explain the variations in the acceptance of nuclear power generation among the public. Employing ordered logistic regression models, we demonstrate that respondents with knowledge of radiation and radioactive waste are more likely to support nuclear power generation than respondents without such knowledge. Specifically, respondents with higher expertise support nuclear power generation strongly. The empirical results are consistently robust in various model specifications with different control variables. Moreover, as expected, the association between the knowledge of radiation and radioactive waste and the public acceptance of nuclear power generation is not merely statistically significant but also substantially meaningful.

The findings from this article make an academic contribution to the literature on the public acceptance of nuclear energy or nuclear power generation by demonstrating the robust positive relationship between the knowledge of radiation and radioactive waste and the acceptance of nuclear power generation. We also provide empirical evidence for the positive impacts of safety perception on the public acceptance of nuclear power plants, which supports arguments from previous studies emphasizing the crucial risk (or safety) perception on the acceptance (Huang et al., 2018; S. Wang et al., 2019). Moreover, previous studies do not reach an academic consensus on the conducive role of knowledge concerning nuclear energy (Ho, Leong, et al., 2019; Perko et al., 2015; L. Zhu, Zhan, & Li, 2021). Our empirical results emphasize the importance of examining the influence of knowledge.

Along with the academic contribution, this article also contributes by proposing potential strategies to increase the public acceptance of nuclear power generation. Even though the growing importance of nuclear energy with the increasing environmental pollution such as carbon dioxide (CO2) emissions (Hao et al., 2019), policy proposals on how to promote the public acceptance of nuclear power generation and nuclear energy have not been systemically developed based on academic research. A relative lack of studies on the influence of radiation and radioactive waste on the public acceptance of nuclear power generation. Governments aiming to proceed with nuclear power generation tend to persuade the public with the argument that, even though nuclear power generation is innate to radiation, it will not harm people's everyday life. However, the findings from this article show that even delivering scientific knowledge about radiation and radioactive waste can promote the public acceptance of nuclear energy and nuclear power generation.

Despite this article's potential contributions, some limitations should be overcome. First, since this article employs statistical models to examine the relationship between the knowledge of radiation and radioactive waste and public acceptance of nuclear energy or nuclear power generation, it only tests the hypothesis, not the mechanism itself. Therefore, the empirical results should not be the absolute conclusion. Investigating the mechanism behind the association through other approaches, such as qualitative methods, including surveys or interviews, will be a natural extension of this article. In addition, given that the empirical analysis of this article is based on the study conducted in South Korea, the generalizability of the findings from this article should be double-checked with the case of other countries, and more sophisticated sampling strategies should be implemented. Also, it is worthwhile to examine when the influence of knowledge on radiation and radioactive waste is weakened or strengthened and which personal characteristics lead people to be more sensitive to such knowledge.

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