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Original Article

Differentiated influences of risk perceptions on nuclear power acceptance according to acceptance targets: evidence from korea

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ABSTRACT

The determinants of the public's nuclear power acceptance have received considerable attention as decisive factors regarding nuclear power policy. However, the contingency of the relative importance of different determinants has been less explored. Building on the literature of psychological distance between the individual and the object, the present study demonstrates that the relative effects of different types of perceived risks regarding nuclear power generation differ across acceptance targets. Using a sample of Korea, our results show that, regarding national acceptance of nuclear power generation, perceived risk from nuclear power plants exerts a stronger negative effect than that from radioactive waste management; however, the latter exerts a stronger negative effect than the former on local acceptance of a nuclear power plant. This finding provides implications for efficient public communication strategy to raise nuclear power acceptance.

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1. Introduction

Nuclear power is an electric power production source that carries great risks while offering great benefits. It reduces dependency on fossil fuel, which is costly not only economically but also environmentally [1]; however, it is accompanied by potential risks of nuclear catastrophes such as those at Three Mile Island in the United States in 1979, Chernobyl in Ukraine in 1986, and Fukushima in Japan in 2011 [2]. Because of this double-sided nature of nuclear power, typically there are sharp conflicts over nuclear power policy among the stakeholders in a given country. Thus, the public's acceptance of nuclear power exerts a significant influence on a country's nuclear power policy [3,4].

Extant studies have accumulated a substantial amount of knowledge on the determinants of this acceptance. For example, individuals' psychological factors such as risk perception, trust, and knowledge [5–8] are found to be important determining factors of their nuclear power acceptance. These findings are of significance practically as well as theoretically. In particular, they provide guidelines regarding the types of public perceptions that communication should be focused on to enhance the public's nuclear power acceptance.

However, in order to leverage the efficiency of communication efforts, the following question, which has been relatively unexplored, should be answered: how do the relative effects of different types of perceived risks regarding nuclear power generation differ across acceptance targets? In terms of acceptance targets, an individual's nuclear power acceptance can be broadly grouped into two categories: the acceptance of nuclear power in the country (national acceptance) and that in the individual's own residential area (local acceptance) [9]. If the relative effects of different types of perceived risks on nuclear power acceptance differ across these two types of acceptance, the focus of a public communication strategy to raise nuclear power acceptance will need to be varied according to the goal.

Building on the literature of the effects of psychological distance between the perceiver (i.e., individual) and the object [10,11], the present study investigates the relative effects of different types of perceived risks regarding nuclear power generation, being contingent on acceptance targets. Using a sample of Korea, one of the leading countries in terms of nuclear power generation, our results demonstrate that, with respect to national acceptance of nuclear power generation, perceived risk from nuclear power plants exerts a stronger negative effect than that from radioactive waste management; however, the latter exerts a stronger negative effect than the former on local acceptance of a nuclear power plant.

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2. Methods

2.1. Theory and hypotheses development

2.1.1. Effects of risk perceptions on national acceptance of nuclear power generation

In elaborating on what acceptance refers to, the targets of an individual's nuclear power acceptance can be largely grouped into two categories: nuclear power generation at the national level and the establishment of a nuclear power plant in the individual's residential area. An individual perceives a group that he/she does not belong to (vs. does belongs to) as more distant (vs. proximal) [12]. To an individual, the country is an in-group at a broader level; however, it also includes not only his/her affiliated local community (i.e., in-group at local level) but also nonaffiliated local communities (i.e., out-groups at local level). Thus, to an individual, whether to accept nuclear power in the country is an issue that is psychologically more distant, whereas nuclear power in his/her residential area is psychologically more proximal.

Literature on psychological distance states that when an object is distant from an individual, the individual focuses more on the primary aspect of the object than on the secondary aspect in the perception and evaluation of that object [10,11]. Among risks accompanying nuclear power generation, those that occur directly during the operation of a nuclear power plant, rather than those from (postuse) radioactive waste management [13], have been the major source of nuclear catastrophes (e.g., the well-known disasters of Three Mile Island, Chernobyl, and Fukushima) [2]. In this sense, we can assume that, among risks from nuclear power, the public will generally regard the risk from nuclear power plants as a relatively primary factor compared with the risk from radioactive waste management. Thus, when the individual evaluates the acceptability of nuclear power generation at the national level (i.e., high psychological distance), perceived risk from nuclear power plants (i.e., a primary risk factor) will have a stronger influence than that from radioactive waste management (a secondary risk factor).

Hypothesis 1. For national acceptance of nuclear power generation, perceived risk from nuclear power plants will exert a stronger negative effect than that from radioactive waste management.

2.1.2. Relative effects of risk factors contingent on acceptance target

Compared with the case of whether to accept nuclear power generation at the national level, the issue of whether to accept it in the respondent's area is psychologically more proximal to the individual. Regarding perception/evaluation of a target that is more proximal, the literature states that the individual focuses relatively more on the secondary aspect of the object than on the primary aspect [10,11], compared to when the target is more distant. Thus, when the individual evaluates the acceptability of a nuclear power plant in his/her own residential area (i.e., low psychological distance), compared with when evaluating the acceptability of nuclear power generation at the national level (i.e., high psychological distance), the relative influence of perceived risk from radioactive waste management (i.e., the secondary aspect) compared with perceived risk from nuclear power plants (i.e., the primary aspect) will be greater. Thus, we arrive at our next hypothesis.

Hypothesis 2. For local acceptance of a nuclear power plant, compared with national acceptance of nuclear power generation, perceived risk from radioactive waste management will exert a stronger negative effect than that from nuclear power plants.

2.2. Methodology

2.2.1. Sample and data collection

We excerpted the data from a secondary survey dataset built by the Korea Nuclear Energy Agency (KNEA)—a Korean government-affiliated organization. The survey, targeting the population of adult residents aged 19 and older in South Korea, was conducted in 2015. The survey used a quota sampling method—selecting subjects or units from each segment based on a specified proportion of demographic and geographic subpopulations so that the sample could represent the population well. Out of the original sample of 1,009 respondents, we used 894, excepting those who gave a “don't know/would not answer” response regarding any of our study variables. Table 1 summarizes the characteristics of the sample.

2.2.2. Measures

Independent variables: Perceived risk from nuclear power plants was measured using a four-point scale: “Do you think nuclear power plants in our country are safe or not?” (1 = very safe and 4 = not safe at all). Perceived risk from radioactive waste management was also assessed: “Do you think radioactive waste in our country is managed safely or not?” (1 = very safely and 4 = not safely at all).

Dependent variable: National acceptance of nuclear power generation was measured by asking the respondents the following question: “Considering the situation of our country, do you think nuclear power generation is necessary or not?” Respondents answered using a four-point scale (1 = very necessary and 4 = not necessary at all) and the responses were reverse-coded. Local acceptance of a nuclear power plant was assessed by asking, “If a nuclear power plant is to be built in your residential area, will you agree with or oppose it?” Respondents answered using a four-point scale (1 = strongly agree and 4 = strongly oppose) and the responses were also reverse-coded.

Control variables: Gender, age, educational level, and household income level were measured as general socio-demographic control variables. As control variables that might be particularly related to the respondent's perception of power generation, the following were measured: monthly household electricity consumption and residential area (i.e., we classified the areas *a posteriori* according to whether the area had a nuclear power plant or not).

2.2.3. Common method bias

Our focus is the contingency of difference between two risk–acceptance relationships (i.e., perceived risk from nuclear power plants and that from radioactive waste management are related to nuclear power acceptance to different degrees) on the acceptance target, not the relationships themselves. Although common method variance [14] might positively bias the relationships between the variables overall, it is unlikely that the contingency of relationship differences would also be a result of such bias. Thus, common method bias is not likely to be a serious concern to our research goal (see Table 2).

3. Results

3.1. Model specifications

We adopted multivariate regression [15], which jointly runs multiple regressions with the same independent variables and different dependent variables, as in Eq. (1): the dependent variables are correlated to each other.

$$\text{Accept}_{\text{National}} = \alpha_1 + \beta_{11} \text{Risk}_{\text{NPP}} + \beta_{12} \text{Risk}_{\text{RWF}} + \mathbf{d}_1 \mathbf{C} + \varepsilon_1$$

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