BEYOND MICRO-PERCEPTION: THE EFFECT OF MACRO-STRUCTURAL FACTORS ON ACCEPTANCE OF NUCLEAR POWER STATION

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1. ABSTRACT

The psychometric paradigm dominates the explanation of social acceptance and risk perception about nuclear power facilities. Based on the model of men, 'cognitive miser', the paradigm has oriented to the theoretical generalization. However, this perspective has lacked in neglecting the macro-structure factors in explaining the acceptance of risk objects.

Our studies try to show the impacts of macro-structural variables, such as historical, political, economic and social factors, on the acceptance of nuclear power station in Korea. In Korea, there are four nuclear power stations in Kori site and six ones in Yeonggwang site. However, two local residents had shown the different attitude toward the acceptance of nuclear power stations. We assumed that such contrasting attitudes are caused by not only micro-cognitive variables such as risk and benefit perception but also macro-structural variables such as historical, political, economic and social factors.

By analyzing the quantitative survey data (samples of 254 residents in Yeonggwang and 336 ones in Kori) and qualitative data, we will show the significant impacts of macro-structural variables on two local residents’ contrasting attitude toward ‘perceived risk/benefit’ and ‘acceptance’ of nuclear power station.

Key words: psychometric paradigm, macro-structural factors, local context
2. RESEARCH QUESTIONS

1) Within cognitive miser
- People are generally speaking cognitive thinkers to judge the acceptance of risk object, for example, nuclear power station, based on perceived risk and benefits, i.e., micro-perception factors.

2) Beyond cognitive miser
- However, it often observes that not only micro-perception factors but also the structure factors such as historical, cultural, economical and social factors influence the judgment and acceptance about risk objects.

3) Basic research questions
- What kinds of role do these macro-structure factors in accepting the risky nuclear facilities in local arena (especially, Kori and Yeonggwang in Korea)?
- What kinds of relationships are there between micro-perception factors and macro-structure factors?
3. DOMINANT PARADIGM IN RISK STUDIES: PS (PSYCHOMETRIC PARADIGM)

☞ Normal PP (Psychometric Paradigm) in Risk Studies

1) Basic orientation
- PP has tried to measure directly about people’s perception of risk (benefits) and about their expressed preference, not revealed, for various kinds of risk-benefit trade-offs

2) Major findings
- Influential characteristics and qualities of hazard (voluntariness, catastrophic, potential, controllability, dread)
- Dimension of risk factors: technological risk (known, voluntary, immediate, controllable) and severity (dread, fatal, Catastrophic)
- Role of rational thinking and emotion affect (i.e., stigma)
- Mental models (judgment bias between laypeople and expert)

3) Method
- Use of a variety of psychometric scaling methods to produce quantitative measures of perceived risk/benefit and other perception
4. LIMIT OF PSYCHOMETRIC PARADIGM

1) Theoretical problem: Missing structure, social context and culture
- Douglas (1986, How Institution Thinks. Syracuse, N. Y.: Syracuse University) argued that ‘social’ context, institutions and organizations take a significant role to determine the risk perception.
- Wildavsky (1987, Choosing Preferences by Constructing by Institutions: A Cultural Theory of Preference Formation. American Political Science Review 81(1): 3-21.) said that psychometric paradigm shows the difference within individuals but does not the differences between individual effects.

2) Methodological limit: Overdependence on quantitative method
- Psychometric paradigm narrowly adopts quantities method such as the survey and experiments, Hence disregarded qualitative method such as the historical method and participant observation. Limited use of method produces the biased results.
5. RESEARCHES MODEL & METHOD

1) Research Focus
☞ First, micro-perception factor’s role in risk acceptance
☞ Second, macro-structural factors’ role in risk acceptance and perceived risk/benefit
☞ Third, relationship between micro- and macro-factors

2) Method: Mixed Method
(1) Qualitative: Documents, official statistic, historical data
(2) Quantitative: Empirical survey
☞ Valid sample of 590 (254 in Yeonggwang, 336 in Kori)
☞ Structured questionnaires administered via face-to-face interviews
☞ The multistage cluster sampling
6. RESULT EVIDENCE: DIFFERENT RESPONSES FROM RESIDENTS

- Residents from two locals (Yeonggwang and Kori) near NPS (Nuclear Power Station) show the contrasting response about acceptance for NPS.

- Residents in Kori show more acceptance for NPS than them in Yeonggwang.

Anova-Test (T=18.187, P<0.01) (T=15.467, P<0.01) (T=21.294, P<0.01)
### 7. MACRO-STRUCTURE1: HISTORICAL STRUCTURE

#### Construction of NPS

<table>
<thead>
<tr>
<th>Korl</th>
<th>Yeonggwang</th>
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</table>

#### Historical background

- **Age of authoritarian government**
- Development stage of economy
- Initial stage of environmental movement
- No accidents related with nuclear facilities

- Transition to democratic government
- Maturation stage of economy
- Growth of environmental movement
- Three Mile Island accident (1978), Chernobyl Disaster (1986)

#### Conflicts in construction process

- Non conflict around construction of NPS
- Trivial Issues of Construction of nuclear waste site (1st conflict period)

- Issuing conflicts around construction of NPS of #3, 4, 5, 6
- Social conflicts related with construction of nuclear waste facilities in Yeongdeuk (1989) and Anmyeondo (1991)

#### Civil organization

- Native & voluntary alliance within community
- Short-term campaign (4 months)

- NOT ONLY native & voluntary alliance within community But ALSO alliance with other actors (nationwide civil–environmental groups, local assembly, local self government) exist.
- Long-term campaign (78 months)

#### Stigma

- Symbol for economic development and high-technology

- Abnormal children (anencephaly, macrocephaly) & livestock
### 7. MACRO-STRUCTURE 2: POLITICAL STRUCTURE

<table>
<thead>
<tr>
<th>Ideological Background</th>
<th>Korl</th>
<th>Yeonggwang</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Right-oriented</td>
<td>-Left-oriented</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Political Geography</th>
<th>Korl</th>
<th>Yeonggwang</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Presidential election : Right side</td>
<td>-Presidential election : Left side</td>
<td></td>
</tr>
<tr>
<td>-Support to ruling party or the conservatives</td>
<td>-Support to an opposition party or the progressives</td>
<td></td>
</tr>
<tr>
<td>-No alliance between politicians and residents in nuclear opposition movement</td>
<td>-Alliance with politician and residents 1) Local government chief: cancellation of Yeonggwang 6th NPS construction permit in 1996 2) Local assembly: constitution of the Special Committee on Yeonggwang NPS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature of anti-nuclear groups</th>
<th>Korl</th>
<th>Yeonggwang</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Opposition group</th>
<th>Korl</th>
<th>Yeonggwang</th>
</tr>
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<tbody>
<tr>
<td>-Weak</td>
<td>-Strong (Influential Religious Groups (Catholic, Wonbulgyo))</td>
<td></td>
</tr>
</tbody>
</table>
### 7. MACRO-STRUCTURE 3: ECONOMY STRUCTURE

Kori has more healthy private economy (more auto per person, higher income level and land price), business structure (lower percent of agriculture households and farmers and higher percent of manufacture population) and public finance (more local tax and independent finance) than Yeonggwang does.

#### 1) Private Economy1: Auto per person

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator</td>
<td>Rank</td>
<td>Indicator</td>
</tr>
<tr>
<td>Kori (Kijang)</td>
<td>0.32</td>
<td>22</td>
</tr>
<tr>
<td>Yeonggwang</td>
<td>0.25</td>
<td>72</td>
</tr>
</tbody>
</table>

Source: National statistical office (e-local index)

#### 2) Private Economy2: Land Price Change Rate

#### 3) Business: household and population structure

<table>
<thead>
<tr>
<th>Year</th>
<th>Yeonggwang (percent)</th>
<th>Kori (Kijang) (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agricultural household</td>
<td>Farmer</td>
</tr>
<tr>
<td>1999</td>
<td>38.7</td>
<td>34.8</td>
</tr>
<tr>
<td>2005</td>
<td>37.2</td>
<td>36.9</td>
</tr>
</tbody>
</table>

Source: Official statistics from Yeonggwang, Kijang

#### 4) Public finance: local tax (Unit: million won)

Source: Official statistics from Yeonggwang, Kijang

Source: http://www.onnara.go.kr/
7. MACRO-STRUCTURE 4: SOCIAL BACKGROUND

Yeonggwang faces more social stagnations and slowdown (increase in the social security beneficiary and the population of the older while decrease in the education level and population growth) than Kori does.

1) % of beneficiary household of social security

2) Education Level (2005 Census data)

3) Annual population growth rate (%)

4) % of older people(65+)
8. MICRO-PERCEPTION: PERCEIVED RISK & BENEFIT

Residents from Yeonggwang and Kori show different attitude towards perceived risk and benefit from NPS.

Yeonggwang residents perceived the higher environmental risk and accident possibility from NPS than Kori residents do.

Also, the former less believes the economic growth and employment effects from NPS than the latter does.
## 9. MICRO- AND MACRO-CONNECTION

The micro-perception variables (perceived risk and benefit) have higher correlation with acceptance for NPS than do the macro-variables (① historical variable measured by satisfaction about natural environmental and local mood, ② political orientation measured by support for equity revolution and layer-centered decision making, ③ economic satisfaction about local economy and standard of living, ④ Social distrust measured by psychological distance with the employed in KHNP).

However, since macro-structure factors influence micro-perception factor, it implies that there is higher possibility of indirect effects by the former.

### Correlation between micro-macro variables in acceptance for NPS

<table>
<thead>
<tr>
<th>Micro-variables</th>
<th>Acceptance for NPS</th>
<th>Micro-variables</th>
<th>Macro-variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>risk</td>
<td>benefit</td>
</tr>
<tr>
<td>Risk</td>
<td>-0.364***</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Benefit</td>
<td>0.260***</td>
<td></td>
<td>-0.338***</td>
</tr>
<tr>
<td>History (Satisfaction about neighborhood)</td>
<td>0.151***</td>
<td>-0.218***</td>
<td>0.340***</td>
</tr>
<tr>
<td>Political Orientation (left)</td>
<td>0.026</td>
<td>0.111***</td>
<td>0.043</td>
</tr>
<tr>
<td>Economic Satisfaction</td>
<td>0.175***</td>
<td>-0.266***</td>
<td>0.481***</td>
</tr>
<tr>
<td>Social Distrust</td>
<td>-0.239***</td>
<td>0.310***</td>
<td>-0.169***</td>
</tr>
</tbody>
</table>
10. CONCLUSION

1) Empirical findings
☞ Residents from two locals (Yeonggwang and Kori) near NPS (Nuclear Power Station) show the contrasting response about acceptance for NPS; Residents in Kori show more acceptance for nuclear power station than them in Yeonggwang.
Those difference seems to reflect the different ‘historic, economic, political social structure’ in two locals.
☞ Analysis from survey data shows that the micro-perception variables (perceived risk and benefit) have the higher direct impact on acceptance for NPS than do the macro-variables.
☞ However, since macro-structure factors influence micro-perception factor, it implies that there is higher possibility of indirect effects by the macro-factor.

2) Implication
☞ As the macro factors which have been overlooked, contrasting with micro-perception factors, for long time, take role in determine the perceived risk and benefit and acceptance for risky objects, it demands further studies in macro-factors.
Thank You!

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