Intergenerational retrospective viewpoints and individual policy preferences for future: A deliberative experiment for forest management

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\textbf{ABSTRACT}

Brain scientists have established that projecting future events can influence the functioning of human brains and possibly current decisions (Schultz et al., 1997; Gilbert and Wilson, 2007; Gerlach et al., 2014, Szpunara et al., 2014). We design and institute a deliberative experiment to test whether the acquisition and experience of intergenerational retrospective viewpoints as one way of projecting future events affect individual preferences for policies. To this end, we employ a case-method approach for forest management policies in Kochi prefecture, Japan, because these environmental issues extend over multiple generations. We prepare two treatments of non-retrospective and retrospective settings where subjects are asked to read through a case-method material on forest management and reveal preferences for policies at the individual and group levels through deliberative discussions. Subjects in the retrospective treatment experience a series of procedures to acquire intergenerational retrospective viewpoints, while those in the non-retrospective treatment do not. The results reveal that the acquisition and experience of intergenerational retrospective viewpoints affect individual preferences for forest policies in that the most favored policies chosen by subjects in the retrospective treatment differ from those in the non-retrospective treatment. Subjects in the retrospective treatment tend to choose the policies that fundamentally change the status quo, while those in the non-retrospective treatment show the opposite tendency. Overall, this result suggests that acquiring intergenerational retrospective viewpoints as part of projecting the future could possibly affect ways of thinking and preferences for possible betterment of the future.

1. Introduction

Intergenerational sustainability is pivotal for survival of human societies. However, it has been claimed that intergenerational sustainability is compromised when societies are developed and modernized under capitalism and democracy, as demonstrated by the emergence of many environmental and natural resource problems such as climate change (Maxwell, Fuller, Brooks, & Watson, 2007).
These issues emerge because, under capitalism and democracy, the current generation tends to choose actions or policies that are to their benefit without considering future generations’ needs, incurring an irreversible cost for future generations; we call this an “intergenerational sustainability dilemma” (Shahrier et al., 2017). Social and brain scientists claim that the introduction of some devices, institutions, or mechanisms to imagine future events may influence how humans think, possibly affecting current decisions or strategies (see, e.g., Corcoran, Weakland, & Wals, 2017; Gonzalez-Ricoy & Gosseries, 2017; Szpunara, Spreng, & Schacter, 2014). This paper addresses whether and how projecting future events can influence individual ways of thinking and preferences for policies in intergenerational settings.

There have been several “future studies” approaches to induce people to think about the future. Among them, the two approaches of backcasting and scenario planning attract substantial attention and have been applied to businesses and public policies. In the backcasting approach, a desirable future is specified, and then how to reach that desirable future from the current generation’s standpoint is considered by working backward (see, e.g., Robinson, 1990). In the scenario planning approach, several scenarios depicting how the future might be and how future events might affect an issue of interest over time are discussed and predicted, and then possible decisions are evaluated and updated based on the scenarios (see, e.g., Schoemaker, 1995; van Notten, Rotmans, van Asselt, & Rothman, 2003). The boundary between these two approaches is unclear because a combination of these two approaches is utilized in applications (see, e.g., Kok, van Vliet, Barlund, Dubel, & Sendzimir, 2011).

Psychologists and economists study how specific interventions and experiences can affect people’s intentions, preferences and subsequent behaviors (Callen, Isagzadeh, Long, & Sprenger, 2014; Kim & Lee, 2014; Norton, 2017; Prediger, Vollan, & Hermann, 2014; Sheeran, Klein, & Rothman, 2017; Voors et al., 2012; Webb & Sheeram, 2006). It is also reported that people’s preferences and behaviors can be affected by simple circumstantial events or whims, especially when they face unfamiliar situations (see, e.g., List, 2002; Webb & Sheeram, 2006). Brain scientists establish that projecting future events can influence how human brains function and possibly current decisions (Gerlach, Spreng, Madore, & Schacter, 2014; Gilbert & Wilson, 2007; Schultz, Dayan, & Montague, 1997; Szpunara et al., 2014). A number of previous works apply backcasting and scenario planning to environmental problems and sustainability issues involving stakeholders and report that these two approaches are effective in generating a variety of scenarios and ideas for the future and for sustainability as well as possible strategies that should be taken over time (Kok et al., 2011; Neuvonen et al., 2014; Peterson, Cumming, & Carpenter, 2003; Street, 1997).

Recently, a new variant of future-study approach called “future design” has been proposed and utilized in planning by municipal governments (Hara, Yoshioka, Kuroda, Kurimoto, & Saijo, 2017). In this proposed framework, citizens in the participatory planning process are asked to play the role of members of a future generation (hereafter called the imaginary future generation) and to design strategies to be adopted by the present generation. Nakagawa, Hara, and Saijo (2017) identify the hypothetical structure behind the subjective experiences of the workshop participants that leads them to become more sympathetic toward the needs of the future generations. However, none of the previous studies experimentally and empirically examine how projecting future events influences the ways of thinking about and preferences for environmental policies and natural resource management in comparison to the baseline situations of “no future projection” or “no future design.”

Given this state of affairs, we design and institute a deliberative experiment to test whether the acquisition and experience of intergenerational retrospective viewpoints as one way of projecting future events affect individual preferences for policies. To this end, we employ a case-method approach for forest management policies in Kochi prefecture, Japan, because these types of environmental problems extend over multiple generations. We prepare two treatments of non-retrospective and retrospective settings where subjects are asked to read through a forest management case and to reveal preferences for policies at the individual and group levels through deliberative discussions. Subjects in the retrospective treatment experience a series of procedures to acquire intergenerational retrospective viewpoints, while those in the non-retrospective treatment do not.

2. Methods and materials

The experiments were implemented in Kochi University of Technology by inviting local residents as subjects. Kochi is a prefecture in Japan facing various forest management problems, and the question of how to utilize forest resources has been an important item on the policy agenda over generations. In fact, forests cover nearly 84% of the total area in Kochi, and this number is the highest among the 47 prefectures in Japan. Additionally, Kochi can be considered to be a typical Japanese prefecture, located far from major cities in Japan such as Osaka, Kyoto and Tokyo and struggling with various social problems beyond forest management such as population decline and low regional economic growth. We prepare the two treatments in this experiment, non-retrospective and retrospective, to see how the acquisition or experience of intergenerational retrospective viewpoints can affect the preferences for forest management policies in Kochi prefecture.

For the deliberative field experiments, we employ and develop a case-method approach to provide local residents with sufficient scientific information and facts for the forest management policy agenda in Kochi prefecture within 30 min, following Barnes, Christensen, and Hansen (1994), Wassermann (1994) and Andersen and Schiano (2014). The case consists of a story that describes the forest management problems that have occurred over the last 100 years in Kochi and can be readily read and understood by typical Japanese adults (Section A.1). Presenting such a story is a good way of telling participants how the problem has been dealt with in the story in relation to their own and subsequent generations. This is in line with some participatory backcasting studies that effectively utilize stories or narratives in workshops (Robinson, Burch, Talwar, O’Shea, & Walsh, 2011).

In the non-retrospective treatment, each subject is first asked to read and understand the case. Second, subjects are asked to choose the order of preferences for the forest management policy options in Kochi prefecture as an “initial choice.” We prepare the
five policy options for Kochi prefecture, and people may follow if they wish (see Section A.1.3 for detailed descriptions of the five policy options). Each policy option is designed to have its pros and cons in that each option can be justified from one aspect and not be justified from another.¹

Option 1: Maintain the status quo
Option 2: Intentionally neglect inefficient forests
Option 3: Minimal management of inefficient forests
Option 4: Develop forest roads to sustain the forest industry
Option 5: Convert to recreational mountain forest

From viewpoints of the amount of investment, the five options can be classified into two groups.² While options 1 (status quo option), 2 and 3 are intended to require less money invested for forest management, with option 2 being the extreme case, options 4 and 5 are more proactive and require large investment because both include the development of forest roads so that future generations can benefit from forest resources. The argument that options 4 and 5 are in favor of sustainability is partly supported by Meyer, Johnson, Lilieholm, and Cronan (2014), who identify factors contributing to forestry sustainability such as “distance (from forests) to road,” “access to (lumber) markets” and “proximity to recreation” among others. The difference between options 4 and 5 is that only the latter perceives the recreational value of forests per se. After each subject fills the order of preferences for the policy options, we randomly match subjects to form a group of four people for discussions. We ask each group to discuss and exchange ideas for approximately 30 minutes about what to do with forest management in Kochi prefecture. After that, each group is asked to determine the order of group preferences for the policy options without relying on majority voting. After the group discussions and the revelation of the group preferences, each subject fills out the final order of preferences among the policy options to see whether individual preferences change after the group discussions as a “final choice” (see Fig. 1 for a whole procedure of the non-retrospective treatment).

In the retrospective treatment, we start with a procedure allowing each subject to acquire or experience an intergenerational retrospective viewpoint before starting to read the case. We distribute an article from a newspaper published in 30 years ago regarding the Japanese government's research and development policies for nuclear technologies in electric power plants, called a “Monjyu” policy debate (Section A.2). This topic is popular and famous among Japanese people because the Japanese government made substantial investments in one type of very promising nuclear power plant technology (or a fast breeder reactor) “Monjyu,” which was highly expected to enhance energy efficiency compared to existing plants. Although there was extensive debate about and opposition to Monjyu, the Japanese government continued investing in it for decades without achieving clear success. Therefore, the Monjyu project has remained very much controversial until today since its start of 1960.

The newspaper article was carefully selected so that the content does not address the policy issue of forest management. By doing so, it was expected that reading the newspaper article would serve to assist the research subject in obtaining intergenerational retrospective viewpoints rather than as a source of information to be utilized to form attitudes on forest management policy. This is in contrast to Noblet, Anderson, and Teisl (2015), who investigate whether retrospective assessment of a past public policy decision influences citizens’ preferences on a current policy that is analogous (i.e., in the same policy area, such as land conservation and energy). In the retrospective treatment, we ask subjects to carefully read the Monjyu article and to respond to the question “what would you want people that lived 30 years ago to consider and do about the Monjyu projects at the individual and group levels if you could do so?” First, each subject is asked to write her individual request about the Monjyu problem to the people who lived 30 years ago. Second, subjects are randomly matched to form a group of four people and asked to discuss and exchange their opinions about possible requests. Next, each group writes and summarizes the request as well. We call this process the intergenerational retrospective treatment because it gives a new perspective on judging what past people did to the current generation of subjects in the experiment and induces the subjects to think about what should have been done if they had been the people in the article 30 years ago. We also consider this process to be part of the acquisition or experience of obtaining an intergenerational retrospective viewpoint.

Next, the subjects proceed to the case-method procedure for the forest management case at the individual and group levels, just as those in the non-retrospective treatment did. The only difference is the viewpoint they take in choosing the order of preferences for the policy options. First, each subject is asked to read and understand the case. Second, subjects are asked to choose the order of preferences for the forest management policy options in Kochi prefecture as an “initial choice” from a standpoint of the people living 30 years from today (meaning those living in 2046). This experimental design is inspired by the concept of “the veil of ignorance” suggested by Rawls (1971) that discusses the issues of justice between generations. A novelty in our research lies in the attempt to empirically measure the effect of veiling the fact that participants belong to the present generation on individual preferences and decisions in intergenerational settings. Specifically, they are requested to assume that they have traveled into the future 30 years from 2017 without altering their age and now live there. Then they are asked to individually consider which of the five options they want

¹ Robinson et al. (2011) discuss that allowing backcasting workshop participants to articulate their own desirable futures has the merit of giving them the learning opportunity and helping them to reach an informed set of preferences. In contrast, in the present study, participants were presented with the options of the present society that are associated with specific futures. The reason was that rather than to give the learning opportunities to participants, the present study aims to quantitatively measures the preferences of participants.

² The list of five options was created by the third author. She participates in the Forest Council of Kochi prefecture as an expert of sustainable forest policy. She is one of the most knowledgeable persons about the current situation of the forests and the forest policy of the prefecture.
the generation living in 2017 to have adopted.

Next, we ask groups of four people to discuss and exchange ideas for approximately 30 minutes about what to do with forest management in Kochi prefecture from the standpoint of the people alive 30 years later (those living in 2046). After that, each group is asked to determine the order of preferences for the policy options as a group opinion without relying on majority voting as if they are the people living 30 years later. After the group discussions, each subject is asked to return to the original position where they live "today" and to rank the order of preferences among the policy options to see whether individual preferences change before and after the group discussions as a "final choice" from the current generation's standpoint (see Fig. 1 for a whole procedure of the retro-

Overall, one session in the non-retrospective treatment consists of a case-method section on forest management for Kochi prefecture and a post-questionnaire collecting subjects' sociodemographic information, taking approximately 1 h 30 min. One session in the retrospective treatment consists of an intergenerational retrospective section ("Monjyu"), a case-method section and a post-questionnaire, taking approximately 2 h 30 min. We have run two sessions for each treatment, and approximately 36 subjects participated in one session. In total, four sessions have been conducted and 144 local residents participated in the experiments. These subjects were recruited from advertisements in local newspapers or magazines, and they are paid 5000 Japanese yen for their participation per session. We randomly assigned each subject to the non-retrospective or retrospective treatment, and a majority of subjects report that they enjoyed participating in the experiments and are grateful for the opportunity to think about and discuss an important policy agenda addressing the Kochi forest management problems in their locality.

One thing should be noted regarding the aforementioned design. According to our experimental procedures, the subjects in the retrospective treatment undergo two additional treatments as compared to those in the non-retrospective one: (i) reading the past newspaper articles and (ii) taking the perspective of the future generation in 2047 to prioritize policy options for society in 2017. Most conventional experimental social scientists may consider that we should examine the individual effects of these different treatments on the subjects' preference changes rather than examining the combination of these effects. However, the present study decides to choose the latter for the following reason. While some recent studies do observe the effects of taking a future generation's perspective on preference changes, these studies also identify the difficulties participants encounter in detaching from the present and adopting a future generation perspective (Hara et al., 2017; Nakagawa et al., 2017). Thus, we newly include treatment (i) to help subjects to acquire intergenerational retrospective viewpoints.

The objective of the present study is to prove the existence of a package of treatments taking a short period of time (e.g., approximately 1 h) that helps people to change preferences in a sustainable manner rather than to investigate the contributions of the individual components of the package. Conducting the latter is an important future task but is out of the focus in the present study. Also note that we attempted to help our participants to view the present from the standpoint of the future generation through the experience of reading the past newspaper article and acquisition of the retrospective viewpoint. This seems to have a common feature with Retrospective Technology Assessment (hereafter, RTA) (see, e.g., Coates, Fabian, & McDonald, 1982; Noblet et al., 2015; Segal,
which aim to assess the current state of impacts for a maturing technology and then determine those actual impacts that might have been seen before their adoption. The present study and RTA commonly seek to make use of histories for improving the present generation’s decisions.

3. Results

Table 1 presents summary statistics of the sociodemographic information and generativity scores for subjects. Approximately 70% of subjects are female, and the majority consists of people older than 40. This reflects the daily life and culture in Kochi prefecture in that the population is aging and females are more interested in participating in seminars or workshops held in universities or research institutes. Young people do not have strong motivations to participate. Because a majority of subjects are female in our experiment, the employment status in Table 1 demonstrates that only 40% of subjects are employed as a full-time or permanent worker. With respect to education and generativity scores, approximately half of subjects are university graduates, and the generativity scores in subjects do not differ from those in other areas of Japan.

It is confirmed that the subjects between non-retrospective and retrospective treatments are almost homogeneous with respect to the individual characteristics ((i) 33% and 27% male, respectively; (ii) 38% and 29% aged 39 or less; (iii) 42% and 40% aged between 40 and 59; (iv) 22% and 31% aged 60 or older; (v) 47% and 52% with higher educational background; (vi) 47% and 32% employed in full-time and permanently; (vii) 47% and 39% married). More importantly, regarding Generative Behavior Checklist scores, a candidate’s predictor of preferring policy options in favor of future generations (see, e.g., McAdams, de, & Aubin, 1992), the averages were 25.6 and 25.8. These suggest that participants were appropriately and randomly allocated to the non-retrospective and retrospective treatments.

Table 2 displays the distributions of individual most favored policies chosen by subjects per treatment for initial and final choices. Some differences are found in the distributions between non-retrospective and retrospective treatments in initial and final choices.

<table>
<thead>
<tr>
<th>Policy option</th>
<th>Non-retrospective</th>
<th>Retrospective</th>
<th>p-Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 Total</td>
<td>1 2 3 4 5 Total</td>
<td></td>
</tr>
<tr>
<td>Initial choice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>2 7 19 32 78</td>
<td>0 2 16 30 29 77</td>
<td>0.1062</td>
</tr>
<tr>
<td>Percent</td>
<td>2.6 9.0 24.4 41.0 100.0</td>
<td>0.0 2.6 20.8 39.0 37.7 100.0</td>
<td></td>
</tr>
<tr>
<td>Final choiceb</td>
<td></td>
<td></td>
<td>0.0076</td>
</tr>
<tr>
<td>Frequency</td>
<td>0 2 35 25 77</td>
<td>2 4 17 30 24 77</td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>0.0 2.6 45.5 19.5 32.5 100.0</td>
<td>2.6 5.2 22.1 39.1 31.2 100.0</td>
<td></td>
</tr>
</tbody>
</table>

a p-Value in chi-squared tests of independence for frequency distributions between non-retrospective and retrospective treatments.

b The choice after the group discussions.

c One subject has not properly answered preferences for the final choice in the non-retrospective treatment, and the subject’s observation is removed for the analysis. Therefore, the total observations are 77 for the final choice in the non-retrospective treatment.
(See the “frequency” and “percent” rows for initial and final choices in Table 2). A notable difference between the non-retrospective and retrospective treatments in both initial and final choices is the frequency of choosing policy option 3 (Minimum care for economically insufficient forests) and option 4 (Installation of forest roads for the sustainability of forests), while we do not find any obvious gap with respect to other policy options. In the non-retrospective treatment, a considerable portion of the subjects choose policy options 3 and 4 as the most favored policy. However, in the retrospective treatment, more subjects choose policy option 4 than policy option 3 as the most favored policy.

To statistically confirm the difference, we run pairwise chi-squared tests of frequency distributions between non-retrospective and retrospective treatments for each of the initial and final choices. The null hypothesis is that the frequency distributions of non-retrospective and retrospective treatments for each of the initial and final choices are the same. Concerning the initial choice, a statistical difference in the frequency distributions between the non-retrospective and retrospective treatments at the 10% level is confirmed (See the last column of p-value of chi-squared tests in Table 2 for the initial choice). As mentioned earlier, the result is mainly attributed to the difference in the frequencies between policy options 3 and 4 in the initial choice. In the non-retrospective treatment, the frequencies of policy options 3 and 4 are, respectively, 19 and 18, while those are 16 and 30 in the retrospective treatment.

For the final choice, the result shows a difference in statistical significance at a 1% level (see the last column, the p-value of chi-squared tests in Table 2 for the final choice, and the corresponding p-value is 0.0076). The statistical significance for the final choice increases to a 1% level compared with that for the initial choice, mainly because the frequency of choosing policy option 3 as the favorite policy doubles in the non-retrospective treatment. That is, in the initial choice, the frequency of choosing policy option 3 is 19 in the non-retrospective treatment, while it increases to 35 in the final choice. This result implies that a considerable portion of subjects in the non-retrospective treatment see their policy preferences affected in a direction where the favorite policy option shifts toward policy option 3 as the final choice but not as the initial choice.

To quantify the impact of the treatment in the experiment, we have further run logit regressions. In the regression, we classify the most favored policy choices into two categories: When a subject chooses one of options 1, 2, and 3 as her favorite, the choice is considered “status quo.” When a subject chooses options 4 or 5 as the favorite, it is “non-status quo.” With this classification, we define a dependent variable in the logit regressions as a “non-status quo” dummy variable that takes 1 when a subject’s favorite choice falls into the “non-status quo” policy options, and otherwise 0. Independent variables in the regressions include age, gender, employment status, education, generativity score and the treatment dummy that takes 1 when a subject is under the treatment and 0 otherwise. The logit regression confirms whether the intergenerational retrospective viewpoint treatment affects the most favored policy choices made by subjects considering non-status quo versus status quo, even after controlling for key sociodemographic factors and generativity scores.

Model 1 in Table 3 presents the results in the baseline logit regression. It demonstrates that the treatment dummy is statistically significant at a 5% level, while the other independent variables are all insignificant. The odds ratio of the treatment dummy in model 1 is 2.32, implying that subjects under the treatment are more likely to choose a non-status quo policy as the favorite by a factor of approximately 2.32. This treatment impact in model 1 can be considered large enough to be economically significant. Although we try different types of regression analyses by changing the set of independent variables, we consistently find that sociodemographic variables and generativity scores remain insignificant. Therefore, it is our belief that the baseline logit regression of model 1 is quite robust. For a further robustness check, we try a different regression specification by including the interaction between the treatment dummy and education, age, and gender. The results of this regression are presented in models 2 and 3.

Table 3
Logit regression results.

<table>
<thead>
<tr>
<th>Treatment dummy</th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment = 0</td>
<td>B</td>
<td>s.e.</td>
<td>OR***</td>
<td>B</td>
<td>s.e.</td>
<td>OR***</td>
</tr>
<tr>
<td>Treatment = 1</td>
<td>0.84</td>
<td>0.35</td>
<td>2.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment = 0 × Education = High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment = 0 × Education = Low</td>
<td>0.64</td>
<td>0.48</td>
<td>1.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment = 1 × Education = High</td>
<td>1.38</td>
<td>0.51</td>
<td>3.97</td>
<td>1.04</td>
<td>0.44</td>
<td>2.84</td>
</tr>
<tr>
<td>Treatment = 1 × Education = Low</td>
<td>0.97</td>
<td>0.51</td>
<td>2.64</td>
<td>0.62</td>
<td>0.43</td>
<td>1.85</td>
</tr>
<tr>
<td>Age ≤ 39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age = 40–59</td>
<td>0.56</td>
<td>0.42</td>
<td>1.75</td>
<td>0.54</td>
<td>0.42</td>
<td>1.72</td>
</tr>
<tr>
<td>Age ≥ 60</td>
<td>0.27</td>
<td>0.45</td>
<td>1.31</td>
<td>0.27</td>
<td>0.45</td>
<td>1.31</td>
</tr>
<tr>
<td>Male</td>
<td>0.35</td>
<td>0.40</td>
<td>1.42</td>
<td>0.36</td>
<td>0.41</td>
<td>1.43</td>
</tr>
<tr>
<td>Full time and permanent</td>
<td>0.17</td>
<td>0.37</td>
<td>1.19</td>
<td>0.20</td>
<td>0.37</td>
<td>1.22</td>
</tr>
<tr>
<td>Education = High</td>
<td>−0.16</td>
<td>0.35</td>
<td>0.85</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Generativity = High</td>
<td>−0.29</td>
<td>0.35</td>
<td>0.75</td>
<td>−0.30</td>
<td>0.36</td>
<td>0.74</td>
</tr>
</tbody>
</table>

*** Significant at 1%.
** Significant at 5%.
* Significant at 10%.
* The “OR” stands for an odds ratio in the logit regressions.
dummy and other variables in the regression. Models 2 and 3 in Table 3 present the result, including the interaction variable between the treatment dummy and education. Consistent with the result in model 1, the results in models 2 and 3 demonstrate the statistical and economic significance of the treatment dummy, even with the interaction terms, while sociodemographic factors and generativity scores are statistically insignificant.

The interaction terms of the treatment dummy with education in models 2 and 3 consistently shows that subjects with a high education are more likely to choose non-status quo policies as their favorite under the retrospective treatment compared to the non-retrospective treatment. The odds ratio is approximately 4 or 3, meaning that the impact of the treatment is significant. In the same way, the interaction term of the treatment dummy with low education is statistically significant at 10% and the odds ratio is 2.64 in model 2. We try all possible combinations of interaction terms between the treatment dummy and other independent variables, but the results remain qualitatively the same as those in models 2 and 3.3 Overall, these results suggest that the impact of the treatment remains strong and significant for individual policy choices irrespective of the model specifications.

Our finding that the retrospective treatment encourages participants to support sustainable policy options can be better understood in reference to the literature on the psychology of regret (i.e., the emotion experienced when people look back on bad decisions) (Zeelenberg, Van den Bos, Van Dijk, & Pieters, 2002). One of the central issues in this field concerns a question of whether people regret the actions they have taken more than the actions they have foregone (i.e., inactions) (e.g. Bonnefon & Zhang, 2008; Gleicher et al., 1990; Kahneman & Tversky, 1982; Landman, 1987; Zeelenberg et al., 2002; Zeelenberg, Van Dijk, & Manstead, 2000). Among them, Gilovich and Medvec (1994, 1995) are related to our finding in that they study the temporal pattern of regret, demonstrating that while actions generate more regret in the short term, the pain of regrettable inaction bolsters over time in the long run. In the present study, participants in the retrospective treatment might have learned to regret decisions far in the past (i.e., 30 years ago), and became sensitive to the pains of regrettable inactions. Additionally, they might have maintained this sensitiveness in choosing preferable options from the standpoint of people living 30 years from today. This explains why they became in favor of actions toward forest sustainability in spite of the risk that these costly actions would not bring about expected effects.

4. Conclusion

We design and institute a deliberative experiment to test whether the acquisition and experience of intergenerational retrospective viewpoints as a way to project future events affect individual policy preferences. The results reveal that the acquisition and experience of intergenerational retrospective viewpoints affect individual preferences for forest policies in that subjects’ most favored policies in the retrospective treatment differ from those in the non-retrospective treatment. Subjects in the retrospective treatment tend to choose a favorite policy that fundamentally changes the status quo for the possible betterment of the future, while those in the non-retrospective treatment have the opposite tendency. In other words, in the presence of the tension which is often “experienced when values do not align with the most feasible or realistic scenario” (Robinson et al., 2011), the retrospective treatment facilitates participants to avoid risks threatening sustainability caused by inaction. Overall, this result suggests that some education or training in adopting intergenerational retrospective viewpoints as part of projecting the future could affect ways of thinking and preferences for future policy debates.

The result is in line with Noblet et al. (2015), who find that retrospective policy assessment influences citizens’ current policy preferences. One important distinction is that the present study observes a clear tendency for participants in the treatment group to become in favor of sustainable options on a political issue not analogous to the past information provided in the retrospective assessment. Although the present study cannot clarify the mechanism explaining the emergence for the effect of the retrospective treatment on participants’ policy preferences, it might be the case that the retrospective treatment induces participants to understand and take the viewpoint of people living 30 years from today, which is obviously infeasible in a rigorous manner. In fact, once participants undergo the task of sending requests to past generations and aim to link this experience with the next task of choosing options to be taken by the society of 2017, the only alternative is to stand in the position of the future generation. It might also be the case that only those with higher educational background find this linkage on the basis of our statistical analysis.

The present study has two important implications to the practices of stakeholder workshops such as scenario development ones. First, considering the liveliness of the discussions among the participants (which is difficult to be represented in a scientific paper), our attempt to convey expert knowledge to participants using the case method material in a short period of time seems to be successful to some extent. This was enabled by the joint work of the third author (an expert in forest management) and the first author (an expert in narrative analysis) as well as the workshop design by the second and fourth authors (experts in experimental economics). Although the first author is aware that the story we developed could have been much better from a narratological viewpoint, the current design of our workshop successfully induce the participants to feel the problem referred to in the story very relevant. Second, the present study presents a set of policy options (and associated future scenarios) to participants. Considering again the vividness of the group discussions, it is considered a good strategy for letting participants to understand the variations...
among possible options and scenarios. Although this strategy has the risk of restricting the free imagination of participants, it may also help them to come up with their own creative scenarios in the context where the options (or associated future scenario) selected by them shall be treated only as the default.

We note several limitations and future directions of our study. First, our sample is concentrated on older people, since young people are not as attracted to participation in workshops or field experiments in Japan, especially in areas such as Kochi prefecture. Field experiments in the future should try to collect more young people to generalize our results. Second, the article published 30 years ago in the newspaper is used to provide an intergenerational retrospective viewpoint to subjects in this experiment. However, we think that there may be a better method to effectively achieve the same result. In fact, our result could be interpreted as a finding that the treatment is not effective for those with lower educational background. Future research should address more effective and efficient ways of imparting intergenerational retrospective viewpoints. These caveats notwithstanding, it is our belief that this research is the first to design and institute a deliberative experiment applicable to future policies that extend over multiple generations and represents an important first step in establishing how an intergenerational retrospective viewpoint is influential. We hope that further deliberative experiments ensue after this research to establish a new mechanism to determine future policies.

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Appendix A

A.1 A case of forest management problems in Kochi

A.1.1 A narrative account

It's Sunday. The sky spreads out clear and blue since morning.

- **Shokichi**: “The perfect weather for a walk!”

Shokichi makes it a habit to take a walk once every week to stay healthy. On sunny days like this, after having breakfast while reading the newspaper as usual, he strolls around the premises of the castle until he got tired. As Shokichi was ascending the slope on the north side of the castle, someone called out to him from the top of the steps. Shokichi, with his cheerful disposition and wide circle of friends, often meets acquaintances by chance. It was Sachiko, one of his walking mates. Sachiko's hobby has been mountain climbing ever since she was young, and even now, she goes mountain climbing once a month. Shokichi searched for an interesting topic they could talk about and recalled an article he had read that morning.

- **Sachiko**: “I read in today's newspaper that deer are causing serious damage in mountains recently.”

Sachiko's expression suddenly became serious. This took Shokichi slightly by surprise.

- **Sachiko**: “About ten years ago, climbing mountains was like pushing through a thick green wall of trees and shrubs, and I could really feel the overflowing energy of the forest. But now, the only place I see greenery is overhead. All that is left on the ground is dry grass eaten by deer, though admittedly, that makes it easier to walk. There are a lot of dead trees too, since deer also eat trees. The forest's energy seems to be diminishing more and more, every time I go climbing.”

- **Shokichi**: “I didn't know that.”

- **Sachiko**: “I’m actually participating in a volunteer activity for deer damage prevention. Our next activity is on the second Sunday of next month. Won’t you join us? We are going to Mt. Miune on the border between Kochi and Tokushima. I think you would like to join then.”

- **Shokichi**: “Is that so? I’d like to join then.”

Shokichi, who had never gone mountain climbing before, decided to join the volunteer activity simply because he thought it would be a good way to kill time. Although Sachiko noticed that Shokichi was not taking the matter as seriously as she was, she didn’t mind.

On the day of the volunteer activity, Shokichi and Sachiko met at the Shikoku Shinrin Kanri-kyoku (Shikoku Forest Management Bureau). They got on a bus with the other participants and headed to a piazza in the Monobe District where the opening ceremony was to be held. When they arrived, there were already several other buses and many people gathered in the parking lot. Shokichi was surprised to see the piazza overflowing with participants. Their ages varied, ranging from high school students to the elderly, and there were many women too (Fig. 2). It seemed like everyone besides Shokichi knew one another, so despite his outgoing character, Shokichi couldn’t help feeling slightly out of place and followed Sachiko around to join in on the conversations.

The participants got on the bus once again and were dropped off at the entrance of a hiking trail. Everyone hauled their luggage...
and started climbing the trail. Shokichi glanced up at the sky. He could see sunlight seeping in through the green trees, and a pleasant feeling swept over him. Just then, the staff member leading the group made everyone halt. There was no greenery on the ground on which they were standing; only withered bamboo stems growing like pins. The staff took out a photo and started explaining (Fig. 3(a) and (b))

**Staff:** “10 years ago, this area was covered with fresh green bamboo. See that large rock over there, about two meters high? You couldn’t even see that rock from here, since it was hidden by all the bamboo. This is a photo that was taken here 10 years ago. Back then, we had to push our way through the thick bamboo.”

However, over the past decade, deer had eaten up all the bamboo. So the ground became exposed, causing surface runoff from rainfall to increase. This place, where the staff made everyone stand, was a place symbolizing the environmental destruction of the

(a) Comparing the current state with an old photo

(b) Closeup of the old photo

Fig. 3. Current forests and forest in old times at Kochi.
mountains in the vicinity. Shokichi was slightly shocked: not about the drastic environmental change that had occurred over the past decade, but about his ignorance for not noticing any of the drastic changes taking place around him.

After walking a bit farther, they arrived at the location where the activity was to take place. That day’s activity was to set up a net to prevent feeding damage. On the surface of the trees, there is an important tissue called the cambium layer that transports water and nutrients. When this tissue is eaten by animals, water and nutrients cannot be transported above or below that area, causing most trees to die. The area where they were standing had received severe feeding damage, and there were virtually no living trees left. Their mission was to set up a net to prevent feeding damage (Fig. 4). The volunteers first determined a starting point, then dug stake holes at equal intervals, drove in the stakes, and set up the net using clamps. They also added reinforcement materials on the hem of the net. Since the net had wires in it and was quite heavy, working on a steep hill was more difficult than Shokichi had expected.

By the time they finished, descended the mountain, and returned to the piazza where the opening ceremony had been held, the sun was beginning to set. Shokichi felt that the opening ceremony had taken place ages ago, rather than just a few hours back. On their bus ride back, Shokichi spoke to Sachiko.

**Shokichi:** “To tell you the truth, when you invited me to this volunteer that day at the castle, I was assuming it would be like going on a hike or picnic...”

**Sachiko:** “That’s alright. One can’t understand the serious situation of the mountains unless one actually sees it. Now it’s your turn to encourage as many people as you can to take notice of this situation.”

### A.1.2 Why the sudden increase in feeding damage by deer?

Since the 1990s, it has been reported that deer damage has increased rapidly across Japan, Kochi prefecture included. There are various theories for the cause. Among the various potential causes, Ryozo Yorimitsu, Honorary Professor at Kochi University states that the largest impact came from “changing life styles of people living in hilly and mountainous areas (namely, the downfall of communities in such areas).” He argues that the ecosystem was disturbed due to the downturn in the forest industry, the de-population in hilly and mountainous areas, and the fact that people no longer hunted for deer as a source of protein. If this is true, the environmental destruction of mountain forests by deer damage is most likely the consequence of Japan’s post-war forest policies. Let us therefore review the environment surrounding Japan’s post-war forest industry.

Prior to World War II, broad-leaved trees covered many of Japan’s forests, and such forests were part of people’s daily lives, as they offered such necessities as sansai (mountain vegetables), firewood and coal. After the war, these mountain forests were replanted with coniferous trees, which grow faster, in response to surging demand for lumber. However, accompanying the growth of these coniferous trees, forest resources including sansai disappeared, leaving lumber as the only available resource (Fig. 5).

Thus, after the 1980s, when lumber prices began to decline due to the increase in cheap lumber imported from overseas and changes in the domestic housing landscape (Fig. 6), people no longer found value in mountain forests. This was something that post-war mountain forest owners, who sought to turn their forests into coniferous forests, had not anticipated. We can concur that there was a decline in people associating themselves with mountain forests, as well as in deer hunters.

The fading interest in mountain forests is also corroborated by results of a survey targeting forest businessmen and managers (Fig. 7). Of all forest business managers, only 10% earn revenue from selling lumber.

### A.1.3 What actions should society take in 2017?

In Section A.1.1, we introduced a narrative about Shokichi and Sachiko, who participated in a volunteer activity to prevent...
Fig. 5. Temporal changes in Japan’s forests.

Fig. 6. Temporal changes in lumber price.

Fig. 7. Results of a survey of forest businessmen and managers. Source: Ministry of Agriculture, Forestry and Fisheries, Ringyo Keiei Ni Kansuru Iko Chosa (Survey on Forest Management), March 2011 (in Japanese).
feeding damage. In Section A.1.2, we reviewed the transition of the environment surrounding forests from the pre-war and post-war period to now, with an aim to better understand the background of deer damage. Based on these premises, there are approximately five forest policy options that the current society can choose from.

**Option 1 (Maintain the status quo).** Continue current forest measures and not make significant investments for future growth. In artificial coniferous forests, neglecting forest management such as tree thinning can lead to deterioration in watershed protection and landslide prevention functions, thereby raising the risk of rainfall disasters. Also, as fewer people set foot on mountains, villages in hilly and mountainous areas may fall apart and end up vanishing. Consequently, forests may be divided into vast areas of unutilized forests, and utilized forests in the plains. In unutilized forests, the weaker trees will gradually die (or die all at once in locations prone to meteorological damage). Once that happens, the sunlight will reach the forest ground, and dormant seeds underground or seeds flying in the surrounding air will sprout, mainly growing into grass plants and broad-leaved trees. If the soil is degraded to the point that its foundation is lost, pine trees, which can adapt in wasteland, will grow.

**Option 2 (Intentionally neglect inefficient forests).** Only utilize forests that offer business benefits, while neglecting the rest. This option tries to achieve the outcomes expected in option 1 (Maintain the Status Quo) at a faster rate. By immediately disinvesting in forests that would most likely not be utilized or in villages that would most likely disappear, unnecessary investments can be prevented, but at the same time, this would also nip the bud of the thin thread of hope for forest restoration.

**Option 3 (Minimal management of inefficient forests).** Only utilize forests that offer business benefits, while neglecting the rest. However, regular tree thinning would be necessary in artificial coniferous forests, otherwise the functions of the forest that benefit the society, such as watershed protection and landslide disaster prevention functions would deteriorate, leading to higher risk of rainfall disasters. Hence, investment would be made to replant all or part of the coniferous trees with broad-leaved trees. It should be noted that “neglecting management of artificial coniferous forests” is the least desirable option from the perspective of watershed protection and landslide disasters prevention functions. Also, the gap between “well-managed artificial coniferous forests” and “forests with both coniferous and broad-leaved trees or forests with only broad-leaved trees” is considered to be small.

**Option 4 (Develop forest roads to sustain the forest industry).** Start developing forest roads through large public investments. The aim is to increase the efficiency of lumber transport and various silvicultural activities, thereby securing forestry's position as an industry. In addition, watershed protection and landslide disaster prevention functions will be sustained through continued management of artificial coniferous forests. It should be noted that developing such forest roads is costly, since the roads will be used to transport very long and heavy lumber and should therefore be designed to have gentle slopes and not too many sharp turns. The main, ring-route forest roads will be developed together with strip roads for respective logging areas (vehicle roads that have dead ends). This large public investment, once made, could potentially lead to sustained advancement of the forest industry, forest products industry, and related industries such as lumber processing, as well as to economic revitalization in Kochi prefecture.

**Option 4 (Convert to recreational mountain forest).** Develop and improve forest roads to improve access to forests and also replace coniferous trees with broad-leaved trees. This would enhance the utilization of forests for purposes other than lumber (i.e., production of medicinal materials, craft work materials including dyes, and food including sansai), which are currently depressed. This may lead to an increase in the production of local specialty goods. Forests could be utilized for sightseeing purposes also (i.e., buggy trails, forest attractions and moss tours), helping revitalize Kochi prefecture's economy. Note that the forest roads to be built are mostly in line with the main, ring-route forest roads mentioned in option 4, making minimal management of artificial coniferous forests possible. However, extra investment will be necessary to build parking lots, pedestrian trails and bicycle trails in addition to the main forest roads.

A.2 An article on the fast breeder reactor “Monjyu”

Monjyu is a fast breeder reactor that Japan had tried to successfully develop to achieve electricity self-sufficiency. This “Monjyu” technology in nuclear power plants is believed to be able to successfully and safely produce more nuclear fuels as byproducts than those used as inputs for electricity generation. The nuclear fuels are again used as inputs in the power plants. It is a “dream” technology. However, the Japanese government announced that “Monjyu” projects would be terminated in 2016, while research and development into similar technologies would be continued. All of the money spent on “Monjyu” can be considered wasted at this point in time.

A.2.1 An opinion from person A: Steady efforts for “Monjyu”

Nuclear power plants were believed to be more economical than other types of power plants, such as thermal power plants utilizing coal or petroleum. However, this belief has been betrayed by the fact that coal and other energy sources are becoming cheaper. However, should we care only about which energy source is economical or cheap to choose electricity power plants? Consider a scenario in which Japan has relied on thermal power plants and will continue to do so in the future. In this case, the Japanese people need to keep importing energy sources from foreign countries, implying that the electricity fees we pay become payment to foreign countries. By contrast, consider a scenario in which Japan successfully develops electricity power plants equipped with “Monjyu.” In this case, the electricity fees we pay become a contribution to the profit of Japanese companies because “Monjyu” is a promising technology and capital that Japanese companies can provide for electricity. In summary, if Japan relies on thermal plants, we need to keep paying money to foreign countries. If Japan successfully develops “Monjyu,” it will contribute more to the national economy with less payment to foreign countries.

At this point in time, it appears that research and development for “Monjyu” is not attractive because other energy sources are becoming cheaper. However, we should not change our minds in the face of such trends. “Monjyu” is an attractive option to pursue in consideration of its contribution to the national economy, enabling Japan to self-produce and self-consume electricity. In the long
run, “Monjyu” will be a technology that helps and supports the Japanese economy due to its promising properties as a technology for nuclear power plants.

A2.2 An opinion from person B: No need of nuclear power plants

There is a hot debate about whether Japan should further pursue the research and development of nuclear power plants for electricity because of other recent trends in which other energy sources are becoming cheaper. When other energy sources such as coal and petroleum are cheap, Japan should not rely on nuclear technologies for electricity, considering the major risk of accidents and their associated problems.

In particular, not only nuclear power plant accidents but also radioactive waste could be a huge concern in the future Japanese economy because Japan is a small country surrounded by ocean. Once a huge accident related to nuclear power plants occurs in Japan, the adverse effects such as radiation pollution will cause irreversible damage in many ways. Considering the aforementioned risk of nuclear technologies for electricity, I think that Japan should shift its efforts and attention to more promising and less risky energy sources such as renewable sources, such as solar and hydro power plants. I believe that changing the policy of electricity generation toward developing renewable energy is necessary. Once a nuclear power plant accident occurs, it is too late and irreversible. We should recall, “one is always sorry after the event.”

References


