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Incorporating Imaginary Future Generations into Negotiations

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Abstract

People to be born in the future have no direct influence on current affairs. Given the disconnect between people who are currently living and those that will inherit the planet left for them, individuals who are currently alive tend to be more oriented toward the present, posing a fundamental problem related to sustainability. In this study, we propose a new framework for reconciling the disconnect between the present and the future whereby some individuals in the current generation serve as an imaginary future generation that negotiates with individuals in the real-world present. Through a laboratory-controlled intergenerational sustainability dilemma game (ISDG), we show how the presence of negotiators for a future generation increases the benefits of future generations. More specifically, we found that when faced with members of an imaginary future generation, 60% of participants selected an option that promoted sustainability. In contrast, when the imaginary future generation was not salient, only 28% of participants chose the sustainable option.

Keywords: Intergenerational Sustainability Dilemma Game, Imaginary Future Generation, Negotiation.

1. Introduction

One obvious, but important fact is that people to be born in the future are not present today. Although this fact is clear to the point of being redundant, it is of critical importance when considering its implications for the sustainability of communities, nations, and the world as a whole. When individuals discuss important issues, including pension reform, energy policy, or environmental protection—all of which affect future generations—individuals in those generations are (by nature) excluded from those discussions. This is problematic when agreements struck by individuals in the present are biased to present circumstances; this represents one of the fundamental problems facing issues related to sustainability (Saijo 2015).

To make a path towards sustainability, it is important to understand the global, social, and human systems that support it, as well as the linkages between them (Komiyama and Takeuchi 2006). Experimental studies are useful for gathering data on issues that influence the three systems across generations, as collection of reliable data over a long period is difficult due to changes in the social, political, and economic environments.

Compared to resource management within a single generation, the problem of inter multiple distinct generations differs intrinsically in the existence of a time lag (Garolleu et al. 2016) due to the longer time span, in the composition of society (Chaudhuri et al. 2006) and, thus, in the one-direction consequences of the interaction of their decision (i.e., the past generation affects the situation of the current and future generation, and

not vice versa) (Fisher et al. 2004, Hauser et al. 2014, Sherstyk et al. 2016). As the future generation is not in the present, communication (Carpenter 2000, Hackett et al. 1994) and sanctions (Fehr and Gachter 2000, Ostrom et al. 1992, Yamagishi 1986) that are well-known from the literature on experimental economics to work as a resolution to the common pool resource, are difficult to implement to the resource allocation problem across generations.

The number of the studies that explore the mechanisms to enhance the sustainability of a resource across multiple generations is limited. Previous studies experimentally investigate how the sustainability of a common pool resource across generations is affected by the growth rate of the resource (Fisher et al., 2004), the degree of altruistic preference for future generations (Sherstyk et al. 2016), and the democratic process (Hauser et al., 2014). In particular, Hauser et al. (2014) found that, when group members vote for the extraction level of resources and the median vote is extracted by all members, democratic decisions greatly reduce the probability of resource depletion. Hauser et al. (2014) noted, however, that this relationship only holds if all members within a given generation join this institution. That is, if some members of a generation are not required to adhere to a decision that was democratically taken, the democratic rule's effectiveness in preventing resource depletion is mitigated.

Independent of Hauser et al.'s (2014) work, there exists another limitation of democratically selected choices that exclude future generations from the political process. When there are conflicts of interest between individuals in the present and

74 individuals in the future, the decisions made by the former generation (and the degree to
75 which they benefit the latter) are strongly contingent on the degree of their altruism.
76 Although Hauser et al. (2014) argued that "voting can allow a majority of pro-social
77 individuals to override a purely selfish minority" (p. 222), some studies have shown that
78 the likelihood of this occurrence depends on specific situations (Croson and Gneezy
79 2009, Gintis 2014, Kamijo et al. 2015, Paxton and Glanville 2015). The possibility of
80 an individual to make prosocial decisions that benefit future generations is uncertain at
81 best. This uncertainty highlights the need for an instrument that prevents the traditional
82 democratic process from passing the debts (financial and otherwise) of current
83 generations to future generations. In other words, we need some device to enable the
84 current generation to also consider the welfare of the future generations when dealing
85 with issues that may have a long-term impact and thus affect the population of the
86 future generation.

87 To this end, we propose a new mechanism that allows members of the current
88 generation to virtually communicate and negotiate with members of future generations.
89 In this communicative mechanism, an individual from the present generation (referred
90 to as an *imaginary future generation*) interacts and negotiates with others as if he/she
91 were doing so on behalf of a future generation.[2] The imaginary future generation plays
92 the role of the negotiator on behalf of the future generation, the communicator who

[2] The idea of an imaginary future generation first appeared in Saijo (2015). The author proposed a way of transforming our society towards sustainability, and the key concept of his approach is the imaginary future generation. In addition to this laboratory experiment, our research team examines the idea through some practice exercises, as the citizen participation in local districts of Japan. A detailed explanation can be found in Section 4.

93 informs the present people of what the future generation would think about, and the
94 observer with future views. Through communication and negotiations with the
95 imaginary future generation, the present people are expected to gain significant
96 knowledge of what may benefit the future and their decisions are expected to reflect
97 such awareness.

98 In this paper, we examine this framework in a laboratory setting to determine how
99 well it reconciles the conflict of interest between present and future generations. More
100 specifically, we examine how the forced salience of an imaginary future generation
101 during negotiations improves benefits for that generation through an intergenerational
102 resource allocation problem. We expect the imaginary future generation to contribute to
103 the benefit of the future and to the total welfare of the present and the successive
104 generations.

105 To test this framework, we newly develop a simple distribution task that captures
106 the nature of the dilemma regarding sustainability. In the intergenerational sustainability
107 dilemma game (ISDG), players adopt one of two sides. On one side, participants
108 advocate positions that are beneficial to the present generation, exclusively maximizing
109 the benefits of the current generation. On the other side, players advocate positions that
110 are beneficial to future generations, supporting the principle of utilitarianism (providing
111 the greatest happiness of the greatest number of people), the maximin principle
112 (providing the greatest benefit of the least-advantaged members of society), and the
113 notion of sustainable development (World Commission on Environment and

Development, 1987). Each generation faces the tension between outcomes that maximize profits versus those that adhere to sound ethical standards.

For the purposes of our analysis, we introduced two conditions for the ISDG. In the treatment condition, one of the members in the present generation is assigned with the role of an imaginary future generation, who acts on behalf of future generations. Thus, in the treatment condition, negotiations take place with the "presence" of such negotiator. In contrast, in the control condition, the present people discuss without an individual who speaks for future generations.

Our analyses produced three notable findings. First, comparison of the two conditions shows that players choose a sustainable option in the treatment condition (60% of the time) to a significantly higher degree than the control condition (28% of the time). Second, this increase is associated with the increase of the statements for a sustainable option in the discussion of the treatment condition. The imaginary future generations, as well as other members (i.e., not-imaginary-future-generation members) in the treatment condition, produced more positive statements on a sustainable option than participants in the control condition. Third, our analyses demonstrate that this treatment works especially in situations characterized by fewer prosocial players. Indeed, the number of prosocial players in a negotiation significantly increases the likelihood that the players will choose a sustainable option in the control condition. However, even when there are less prosocial players, introducing an imaginary future generation enhances the likelihood at the same level as when all members are prosocial.

135 We discuss these results, and other issues surrounding them, in greater detail in the
136 subsequent sections. In Section 2, we explain the nature of the ISDG and describe the
137 experimental design and procedures we followed. We report the results of our
138 experiment in Section 3 and offer some concluding remarks in Section 4.
139
140 2. Experimental design and procedure
141 2.1 Intergenerational sustainability dilemma game
142 We first describe in detail the intergenerational sustainability dilemma game (ISDG).
143 In this game, a chain (which represents a "society") consists of five distinct generations,
144 each of which comprises of three participants.[3] Three participants in one generation are
145 required to choose between Option A and Option B (Table 1). These options entail the
146 pie (i.e., money) for the generation and, thus, each generation has to discuss and decide
147 how to redistribute it among themselves, in addition to the choice from Options A and
148 B.
149 An essential feature of the ISDG is that the choice of the current generation affects
150 the size of the next generation's pie (Table 1). Option A brings a larger benefit to the
151 current generation, but it is detrimental to the benefit of the next generation. This is
152 interpreted as exploiting the future generations or refraining from investing in the future.
153 In contrast, Option B brings less benefit to the current generation, but preserves the size
154 of the pie as it is. Therefore, Option B is a sustainable choice. For example, as shown in

[3] In our experiment, there was a sixth generation, who only receives benefits following the decisions of the fifth generation.

155 the last column on the left of Table 1, the first generation chooses between obtaining
156 3600 JPY (Option A) and 2700 JPY (Option B). When the first generation chooses
157 Option A, the second generation's pie decreases in size by 900 JPY; they have to
158 choose between 2700 JPY (Option A) or 1800 JPY (Option B). In contrast, when the
159 first generation chooses Option B, the size of the second generation's pie is not affected
160 (i.e., 3600 JPY vs. 2700 JPY). In a similar way, the choice of the second generation
161 affects the size of the third generation's pie and so on (see Table 1).[4] Thus, all
162 generations obtain 2700 JPY when they continue to choose Option B, but their pies
163 shrink gradually (3600 for the first generation, 2700 for the second, 1800 for the third,
164 etc.) if they continue to choose Option A.
165
166 << Insert Table 1 Here >>
167
168 While the equality, utilitarian, and maximin principles suggest that all generations
169 should choose Option B, the self-interested choice of each generation is Option A. Thus,
170 there is a conflict between the intergenerational rationality and the single-generational
171 rationality, like in the well-known prisoner dilemma, where the collective rationality
172 conflicts with the individual rationality. However, the ISDG game differs from the
173 prisoner dilemma on a number of key aspects. First, in the ISGD game, the payoff for

[4] We chose the reward sizes so that the total participation fee of participants should not deviate from the standard participation fee of experiments in Kochi University of Technology. Moreover, the cost of choosing a sustainable option is 900 JPY for a generation (i.e., 300 JPY for each generation member on average), which would be enough high for about 70% of participants to choose Option A when there is no additional mechanism to support the sustainable option.

people in a given generation is fixed as a function of their own decision; the decisions of future generations do not influence the payoff obtained by the original generation. Consequently, direct reciprocal behavior of between present and future generations is impossible; choosing the sustainable choice cannot be explained by reciprocal altruism (Trivers 1971). Second, each generation can only select Option A or B one time, and are therefore unable to exert influence the decisions of future generations beyond their one selection. Consider that even if the current generation chooses Option B, there is no guarantee that the next generation will also choose Option B, nor is there any way for the current generation to intervene in the next generation's decision-making process.

There are a few studies that experimentally investigate the sustainability of a resource across generations. Fisher et al. (2004), Hauser et al. (2014) and Sherstyk et al. (2016) (henceforth, FHS) carried on an experiment of dynamic games across generations, where members of a generation individually deicide their level of consumption of the inter-generational resource. In the FHS models, the larger the consumption of the resource by the members of some generation, the greater their benefit and the worse the situation of the subsequent generations. Thus, similar to the ISDG, past generations unilaterally affect the situation of future generations.

The ISDG has two specific features compared to the FHS models. First, the experimental task the participants work on is simple enough to eliminate the possibility of mistakes or misunderstanding of the participants. In particular, in the ISDG, the participants face a binary choice problem between the sustainable and the self-interested

options, while the FHS considers a rather complex dynamic problem with multiple choices, wherein a certain level of cognitive ability is required to understand what the best options are with regard to self interest and total welfare. Second, while people in the same generation should discuss and take a decision as a group in the ISDG, participants in the same generation take individual decisions separately in the FHS, and the combination of their choices determine their own payoff, as well as the situation of the next generation (i.e., how much resources remain in the future). Therefore, participants in the FHS choose considering not only the choices of the future people, but also the choices of others in the same generation. In particular, the over-consumption or the free-riding behavior of members of the same generation becomes important for the sake of sustainability. In contrast, eliminating the effect of intra-generational conflict, the ISDG directly considers the problem of intergenerational resource allocation and focuses on the moral dilemma of the current people between self-interest and sustainability.

2.2 Introducing an imaginary future generation

The difficulty associated with a generation's selection of Option B derives from the inability of future generations to communicate and negotiate with the current generation. The absence of voices from future generations makes it impossible for the current generation to consider their hopes and preferences.

We, thus, suggest introducing a person who acts on behalf of people of the future

generation into negotiations (i.e., the *imaginary future generation*). The imaginary future generation communicates and negotiates with individuals in the current generation, on behalf of the future generation. Note that, because the imaginary future generation is a part of the current generation, their delegate receives the benefit based on the decision of the current generation.

As already mentioned, in the present study, there are two conditions: the treatment and the control condition. In both conditions, three participants made a choice through discussion between Option A and Option B. In the treatment condition, one of the members was told to negotiate with other members as a representative of the later generations, whereas there was no imaginary future generation in the control condition. It is also explained that the payoff of the imaginary future generation is determined by the choice of the current three participants, including this person, and how they allocate the amount of money from their choice among the three. Comparing these conditions, we investigated whether the presence of the imaginary future generation helps people make sustainable choices in the context of an ISDG.

2.3 Experimental procedure

2.3.1 Subjects

We performed this experiment in two waves, respectively occurring in February and June of 2014. We recruited subjects from a subject-pool based at Kochi University of

Technology in Japan. In total, we recruited 210 graduate and undergraduate students (90 in February and 120 in June) to participate in the study.

The data from five generations from twelve chains (N = 180, 55 women, 125 men; mean age = 19.47) were submitted to the analyses reported below. The other 30 participants were assigned to the sixth generations, who only received benefits following the decisions of the former generations. Five chains were assigned to the control condition, whereas seven chains were assigned to the treatment condition.

2.3.2 Procedure

Upon arriving at the reception desk, they drew a card that indicated which chain and generation they belonged, as well as their identification numbers (i.e., 1, 2, and 3 in the control condition or 3α in the treatment condition).[5] They then were introduced to separate rooms, depending on whether they were in the treatment or control conditions. In each room, a member of the research team distributed instructions and explained the experimental procedures to participants (see Appendix for the specific instructions). Specifically, participants were told that each generation would make a decision between Option A and Option B and would receive a reward based on their choice. They knew all branches of the game tree (i.e., they saw Table 1), but did not know the total number of generations involved in the game. In the treatment condition, participants were also told that one of the three participants (i.e., the person who drew a card indicating 3α) should discuss with other members on behalf of later generations. In the instruction, the

[5] α has no special meaning in Japan, and is considered to be neutral.

role of α participant is explained as follows: "Subject α will negotiate with the other two members of the subgroup, not on behalf of him/herself, but on behalf of the people in the subgroups who follow the current subgroup. However, the reward of Subject α will be determined by how the subgroup allocates its money." The instructions did not refer to the context of the intergenerational resource allocation problem and did not allude to salient research objectives. For instance, rather than use the word "chain" and "generation" in the instructions, we instead used the word "group" and "subgroup." After receiving the instructions, the first generations were led to small rooms with respect to each chain, where they engaged in discussions. After arriving at their decisions, participants moved to another room to complete a questionnaire that measured social value orientation (Van Lange et al. 1997) and demographics (e.g., sex and age). Participants then received their payouts and were dismissed. The procedure was repeated five times.

Each generation in a chain used the same discussion room, in order. In each discussion room, there was a research assistant, who handled the flow of subjects (i.e., letting subjects who finished the decision move out and inviting the next participants) and followed the group discussion. The discussion was carried on orally and recorded through a voice recorder. The discussion was required to finish within 10 minutes; otherwise, the generation's reward regarding this task would be zero. In the treatment condition, at the beginning of the discussion, subject α (an imaginary future generation) had to inform the other two members that he/she drew the α card.

The group decisions were all written on a whiteboard.[6] Therefore, subjects were aware of the former generations' decisions. For example, members of the third generation could see the choices of the first and the second generations in the same chain, like "B, B." Each generation could not face and communicate with the former generation, as they came into the discussion room only after the former generation moved out. Also, they could not know the decisions of the other chains.

On average, the experiment took approximately 90 minutes. Since subjects were dismissed right after receiving the payout, the subjects assigned to the first generation were dismissed in 30-40 minutes, whereas those assigned to the fifth or sixth generation were dismissed in 90 minutes. For their participation, all subjects received a flat rate of 900 JPY, plus additional money as they decided in the ISDG.

2.4 Coding

To explore whether and the degree to which the presence of an imaginary future generation influenced the decision-making process, we transcribed all recordings of the negotiations. In total, participants produced 3034 statements.[7] We employed three coding types. The coding schema is shown in Table 2. Specifically, the coding took into account whether a statement was in support of or against Option A or Option B, neutral between the two, or about payout or not (Coding 1), whether each participant's final, pre-decision opinion was in support of Option A or Option B (Coding 2), and how the

[6] Later participants could only access to the group decision. They could not know individual decisions of the former generations.

[7] We defined a statement in terms of a speaking turn. We excluded conversations that took place between experimenters and subjects to clarify the procedures of the experiment.

298 generation's decision was taken (Coding 3). For each statement (Coding 1), each
299 individual (Coding 2), or each generation (Coding 3), two trained assistants applied a
300 code. When these two coders disagreed on or missed the code to be assigned, one of
301 authors made the determination.
302
303 << Insert Table 2 Here >>
304
305 3. Results
306 3.1 The influence of imaginary future generations on a generation's decisions in the
307 ISDG
308 We first explored the main research objective of this study. Specifically, we tested
309 whether the introduction of an imaginary future generation into negotiations affected a
310 generation's likelihood of selecting a more sustainable option (Option B). Each
311 generation's decision by each chain is shown in Table 3.
312
313 <<Insert Table 3 here>>
314
315 First, a chi-square test reveals that the presence of an imaginary future generation
316 significantly influenced the choice of the ISDG (χ^2 [1] = 6.00, p = .019). Whereas the
317 majority of the generations in the control condition chose Option A (72%, 18 of 25)
318 compared to Option B (28%, 7 of 25; z = -2.00, p = .046), those in the treatment

319 condition were as likely to choose Option B (60%, 21 of 35) as Option A (40%, 14 of
320 35; z = 1.00, p = .31).

321 Next, we conducted a hierarchical regression analysis to examine the effects of
322 contextual factors, such as the position in the chain and the size of pies. First, we
323 regressed the generation's choice (Option A = 1, Option B = 0) on the condition
324 (treatment condition = 1, control condition = 0; Table 4, Model 1). A Wald test revealed
325 that the 95% confidence interval ($CI_{95\%}$) surrounding the mean did not contain zero (χ^2
326 [1] = 5.74, p = .017). As the next step, we added contextual factors to the model (Table
327 4, Model 2). The results showed that the significant $CI_{95\%}$ persisted (χ^2 [1] = 5.23, p
328 = .022), suggesting that the effect of a future generation's presence in negotiations on
329 the decision outcome was not moderated by the position in the chain or by the size of
330 their potential payout.

331

332 << Insert Table 4 Here >>

333

334 Result 1: The presence of an imaginary future generation promoted a generation's
335 sustainable choice in the context of the ISDG.

336

337 3.2 The influence of imaginary future generations on individual decisions in the ISDG

338 3.2.1 Individual choices

Next, based on Coding 2 (Table 2), we examined how introducing an imaginary future generation influences *individual* choices. When comparing individual opinions on the different types of subjects (i.e., subjects in the control condition, non-α participants in the treatment condition, and α [imaginary future generations] in the treatment condition), preferences for Option A differed significantly (χ^2 [2] = 18.87, p < .001). Not surprisingly, most of the α participants (69.7%; 23 of 33) selected Option B rather than Option A (z = -2.263, p = .024), whereas the majority (72.0%; 54 of 75) of the subjects in the control condition preferred Option A to Option B (z = 3.811, p < .001). Interestingly, non-α participants in the treatment condition were relatively split (z = -0.611, p = .54); 46.3% (31 of 67) voiced a final opinion in preference for Option A, and 53.7% (36 of 67) were in support of Option B.

The distribution of the individual positions within a generation is shown in Table 5. As shown, the majority of the generations in the control condition (72%) unanimously preferred Option A. In the treatment condition, in contrast, over half of the generations showed at least two people who preferred Option B. This means that there was a person who had a preference for Option B, other than the imaginary future generation, in the treatment condition.

Result 2: Introducing an imaginary future generation also facilitated a sustainable choice at the individual level.

<< Insert Table 5 Here >>

3.2.2 Statements in the discussion

Did we facilitate a sustainable choice by introducing an imaginary future generation? To explore this point, we analyzed the statements of the discussion. The proportions of each type of statements over all statements across different types of participants are reported in Table 6. Not surprisingly, the α participants produced the largest number of statements in favor of Option B. Interestingly, it was followed by non-α participants in the treatment condition, and by subjects in the control condition (see Table 6). This rank order was reversed in terms of the proportion of statements in favor of Option A. That is, the presence of imaginary future generations promoted positive statements towards Option B of α participants, as well as of non-α participants.

<< Insert Table 6 Here >>

Result 3: Introducing an imaginary future generation increased the number of positive utterances towards a sustainable choice.

Finally, we calculated the correlation coefficients relating the generation's choice (Option A = 1, Option B = 0) to: (1) the number of members who supported A in the generation, and (2) the ratios of statements which were supportive of Option A to

Option B in the generation (see Table 7). These correlations were statistically significant, suggesting that the indicators outlined above were the driving factors behind the generation's decisions.

<< Insert Table 7 Here >>

Result 4: There were significant correlations across statements in the discussions, individual decisions, and generation's decisions.

In sum, the results suggest that introducing an imaginary future generation facilitates people to talk about and choose Option B at the individual level, and, thus, Option B was more likely to be chosen as a generation's decision in the treatment condition.

3.3 Did the presence of an imaginary future generation influence decision-making processes?

For this part of the analysis, we reported how the introduction of an imaginary future generation influenced the style of the group decision-making (i.e., the discussion rules and times). Because there have been few behavioral experiments using the ISDG, we believed it is also important to describe how a discussion proceeds.

Decision rules. Introducing a representative of the future did *not* significantly influence the type of decision rule the groups adopted, but a slightly greater number of

treatment groups used a decision rule than control groups (Table 8). This result was consistent with our findings related to individual choice, which showed greater disagreement among treatment groups relative to control groups.

<< Insert Table 8 Here >>

Discussion time. Across all conditions and groups, subjects spent nearly five minutes engaging in discussion (M = 292.71 seconds, SD = 171.68 seconds). As with the other moderators, however, discussion time was dependent on the condition. The generations in the treatment condition (M=351.23 seconds, SD = 158.60 seconds) tended to discuss longer than the generations in the control condition (M_{ctl} = 210.80 seconds, SD_{ctl} = 157.60). This difference was significant (t[58] = 3.39, p = .001, d = 0.88). This result was unsurprising given the high level of disagreement among individuals in the treatment groups. That level of disagreement takes a longer amount of time to sort through.

Results 5: Introducing an imaginary future generation did not significantly change the methods of achieving agreement (However, simply because it increases the number of individuals who are supportive of Option B, there were more conflicts in the treatment condition than in the control condition and, then, it took longer to reach an agreement).

3.4 The moderating effect of prosociality

We finally explored whether and how prosociality, that is, the orientation "to maximize outcomes for both themselves and others (cooperation) and to minimize differences between outcomes for themselves and others (equality) (Van Lange et al. 1997, p. 733)", moderates the effect between the treatment condition and the groups' decision-making. Prosocial people—who tend to have a general concern for the outcomes of others—would be also generous with future generations. Thus, if there are many prosocial individuals in a generation, the generation would be more likely to choose Option B, regardless of whether there is an imaginary future generation or not. In other words, prosocial people might be less sensitive to the presence of the imaginary future generation than non-prosocial people. The results of our analyses supported this hypothesis. The makeups of the generations that selected Option B (in terms of prosocial members relative to other members) are outlined in Table 9. When none or only some (i.e., one or two) in a generation were prosocial (n =30), the generations in the treatment condition were more likely to choose Option B than those in the control condition (Fisher's exact test, $p = .003$). In contrast, when all members of the generation were prosocial (n = 30), regardless of the conditions, almost half of the generations chose Option B (Fisher's exact test, $p = .72$)[8]. Moreover, in the treatment condition, the number of prosocial players in a generation did not predict whether the group selected Option B (Fisher's exact test, $p = .07$). However, in the control condition, groups only

[8] We did not conduct a logistic regression analysis entering the interaction term of the number of prosocial people and conditions here because this dataset has a problem of quasi-complete separation due to the small sample size. Therefore, a logistic regression model fails to converge and the parameters in the model could not be estimated.

443 comprising prosocial individuals selected Option B significantly more than Option A
444 (Fisher's exact test, p = .02). These results suggest that the inclusion of a member of an
445 imaginary future makes individuals choose a sustainable alternative, especially when
446 there are no or less prosocial individuals.
447
448 << Insert Table 9 Here >>
449
450 Result 6: When all members of the generation were prosocial, the generation was as
451 likely to choose a sustainable option in the treatment condition as in the control
452 condition in the ISDG. However, when there were less prosocial individuals, the
453 existence of an imaginary future generation induced people to choose a sustainable
454 option.
455
456 4. Discussion
457 Without accounting for the voices of individuals from distant future generations, it is
458 impossible to move towards a sustainable society. To address this difficulty, we propose
459 a new approach through which some individuals from the current generation serve as
460 representatives for future generations (called an imaginary future generation) during
461 negotiations. In this study, we have empirically explored how this approach works in
462 the laboratory with respect to resource allocation. Our analyses revealed that when
463 members of an imaginary future generation are present during negotiations, groups tend

464 to select more sustainable options.

465 This is the first study to show that introducing an imaginary future generation helps
466 people achieve a sustainable society. In previous studies, the median voter rule is the
467 only mechanism that is investigated as a means to enhance sustainability (Hauser et al.
468 2014), and it is a clear limitation, as it relies strongly on the altruistic preference of the
469 current people for the future. On the other hand, in the present study, we explore an
470 alternative mechanism that focuses on and solves the fundamental problem of the
471 intergenerational issue, i.e., the absence of the future generation in negotiations in the
472 present. We found that the presence of an imaginary future generation makes people
473 choose a sustainable option.

474 Moreover, contents analyses of discussions showed that the α participants (i.e.,
475 participants who were assigned to the imaginary future generation) served as effective
476 proxies for these imagined generations. Relative to those from the current generation in
477 the treatment condition, as well as those in the control condition, α participants tended
478 to: (1) be more supportive of sustainable options, and (2) maintain their preferences for
479 sustainable options at the end of the discussion. Interestingly, this tendency also
480 encourages other people in the treatment condition to foster positive attitudes towards a
481 sustainable option. Taken together, these results suggest that the presence of an
482 imaginary future generation provokes lively arguments and negotiations between the
483 current and the future generations.

484 We found that the introduction of an imaginary future generation works especially

485 when there are less prosocial people. Prosociality and altruism have long-been known to
486 contribute to cooperation in prisoners' dilemmas (McClintock and Liebrand 1988, Van
487 Lange 1992). In the control condition in this study, only groups comprised of three
488 prosocial people selected the sustainable option. In contrast, in the treatment condition,
489 participants tended to choose the sustainable option regardless of the number of
490 prosocial members in the group. We believe that the pursuit of a sustainable society
491 cannot be exclusively reliant on the prosociality of a generation's members. Introducing
492 an imaginary future generation is one of the options to create a sustainable society.

493 Our finding that the group becomes more altruistic in presence of an imaginary future
494 generation should be emphasized in the literature on group decision in experimental
495 economics and social psychology. The literature concludes that a group shows a
496 stronger self-interested preference than an individual (Charness and Matthias 2012).
497 The reason of this tendency is a mixture of several factors, such as in-group favoritism
498 and group discussion process (Wildschut and Insko 2007). It is also suggested that the
499 future payoff is further threatened by the self-interested bias of the group decision and
500 this is also the source of the present bias of our society. Our experiment shows that,
501 even under a group decision that is biased towards self-interest, the introduction of
502 imaginary future generations works to enhance the future profit and sustainability.

503 Even though we found that a positive effect on the sustainability of the treatment
504 condition, there were some limitations in the present study. First, we found that, when
505 people were designated to the imaginary future generation, many actively supported the

506 sustainable option and served as proxies for other generations, even without a monetary
507 incentive. However, this result might depend on the fact that we used Japanese
508 university students as participants and professors as instructors. Thus, the
509 norm-sensitive environment of the Japanese society may become a strong pressure for α
510 participants to behave as "experimenter demands," and the effect of the treatment
511 condition might be overestimated. Future research in this domain would benefit from
512 replication studies conducted in other societies, where there is a weak norm and
513 hierarchical relationship, like Australia (Gelfand et al. 2011).

514 Second, in our experiment, participants could see "the future generation" in the
515 waiting room, unlike in the real life. In a sense, our manipulation fails to realize an
516 inter-generational feature where people in different generations never meet,
517 communicate, and negotiate with each other, although participants neither had a chance
518 to talk to each other, nor knew the generation and the chain numbers of other
519 participants. We adopted this setting so that the participants could recognize that the
520 successive generation actually exists, but, at the same time, it is possible that this setting
521 affects their decision. For example, it might lessen the feeling of time discrepancy,
522 which should exist in intergenerational problems. In addition, the lack of time
523 dimension might influence psychological processes, such as time discounting. For
524 example, Yi et al. (2011) showed that adding a delay to the receipt of outcomes
525 decreases self-interests and increases altruism. Future research should address this issue
526 by designing experiments with delayed rewards.

Third, the three-person group may be sensitive to the adjustment of one person to the imaginary future generation. Although it is easily predicted that the efficacy of the imaginary future generation on the sustainable choice strongly depends on the ratio of α participants to the group size, it is useful to identify the boundary condition of the efficacy of the imaginary future generation. Moreover, other experimental parameters, such as the decision rule of each generation and the size of the stake, were arbitrarily determined. Future studies in various laboratory settings could confirm the robustness of the current findings.

Related to the second and third points, we have to consider how our experimental findings can be applied to the actual people's behaviors. The real-world is totally different from the laboratory environment in several aspects, such as the biased subject pool, the size and kinds of incentives, anonymity among people, and the choice set that people select (Levit and List 2007). Field experiments can help check the external validity of our findings in the laboratory and make a bridge between the laboratory and the real environment (Falk and Heckman 2009). Thus, by using the general public as participants, future studies should investigate how the imaginary future generation works on group decisions and how the people assigned to the imaginary future generation behave and interact with other participants.

Accordingly, under the encouragement of our success of the laboratory experiment, our research team currently collaborates with local districts in Japan and attempts to institutionalize our approach into citizen participation. In particular, we assign a group

548 of people to the imaginary future generation and others to the current generation and ask
549 them to build a future vision of the district through discussion between the two parties.[9]
550 This is one example of how we institutionalize and utilize the idea of an imaginary
551 future generation into the decision making of our society, and we expect that the
552 number and the variety of the applications will increase in the near future.
553
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[9] For a detail of this pioneering attempt, see Hara et al. (2015) and Hara (2016).

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625

626

627 **Table 1. Payoffs for each generation.**

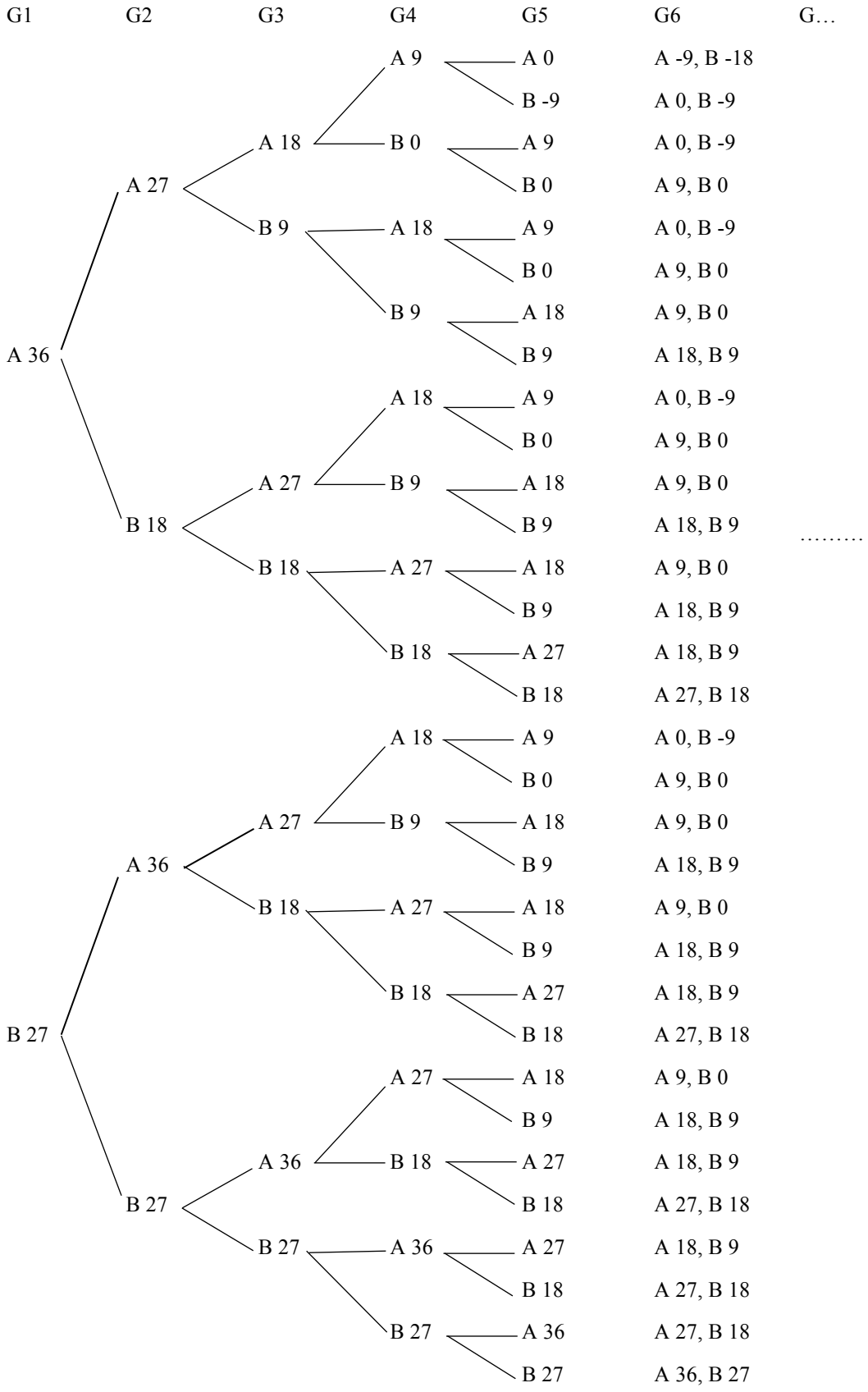

Table 2. Coding schema.

Coding	Coding schema	Proportions of all	Inter-coder reliability: Agreement ratio (%)	Inter-coder reliability: Cohen's kappa (k)
Coding 1[a]	In support of Option A	19.3%	90.9%	.71
	In support of Option B	17.8%	91.3%	.71
"The statement was…"	Against of Option A	4.7%	94.6%	.42
	Against of Option B	2.0%	97.9%	.45
	Neutral	45.0%	78.5%	.57
	Discussion about how to share	13.4%	93.1%	.71
Coding 2[b]	Participant's pre-decision opinion was in support of Option A	54.3%	98.3%	.97
Coding 3	A unanimous agreement without an opposing opinion	56.7%	66.7%	.42
"The group decision was made by…"	Using a decision-making device (e.g., majority voting, or a random-outcome mechanism like paper-rock-scissors)	13.3%		
	Reaching a consensus through discussion, though there is a conflict of opinion	26.7%		
	Miscellaneous/other methods[c]	3.3%		

Note. [a] A statement was defined by a speaking turn. This indicates that a statement can be classified into more than one category. Therefore, we treated types of statement as six independent categories, rather than mutually exclusive options of a single category. The percentages of types of statements did not sum up to 100%.

[b] Five subjects' final opinions could not be coded, as they did not express their opinion before the group's decision was made final.

[c] Two groups (3.3%) were rather unorthodox; they used a game of rock-paper-scissors to take their decisions, despite the absence of conflict among the group's members.

640 **Table 3. Raw data.**

641

Control					
Chain	**G1**	**G2**	**G3**	**G4**	**G5**
1	**A**	**A**	**A**	**A**	**A**
2	**A**	**A**	**A**	**A**	**B**
3	**A**	**A**	**A**	**A**	**B**
4	**A**	**A**	**B**	**B**	**A**
5	**B**	**B**	**A**	**A**	**B**

Treatment					
Chain	**G1**	**G2**	**G3**	**G4**	**G5**
6	**B**	**B**	**B**	**B**	**B**
7	**B**	**B**	**B**	**B**	**A**
8	**B**	**B**	**A**	**A**	**B**
9	**B**	**A**	**B**	**B**	**A**
10	**B**	**A**	**A**	**B**	**A**
11	**A**	**B**	**B**	**A**	**A**
12	**A**	**B**	**A**	**B**	**A**

642

643

644

645 **Table 4. Log-linear regression models of group decisions.**

646

Explanatory Variables	Model 1				Model 2			
	Coef. (SE)	z	*p*	$CI_{95\%}$	Coef. (SE)	z	p	$CI_{95\%}$
Intercept	0.94 (0.45)	2.12	.034	[0.07, 1.82]	-0.20 (1.66)	0.12	.904	[-3.45, 3.05]
Condition (0 = control, 1 = treatment)	-1.35 (0.56)	-2.40	**.017**	[-2.45,-0.25]	-1.59 (0.69)	-2.30	**.022**	[-2.95, -0.23]
Generation no.	-	-		-	0.20 (0.28)	0.70	.481	[-0.35, 0.74]
Payoff for A	-	-		-	0.0003 (0.0004)	0.62	.538	[-0.001,0.001]
Pseudo R^2	.0742				.0806			
AIC	80.76				84.23			
LR chi^2	6.15				6.68			
Prob > chi^2	.013				.083			
Log-likelihood value	-38.38				-38.11			

647

648

649 **Table 5. Proportion of generations that chose Option B, based on the final position of their**

650 **members. (N = 57)**

651

	Members who took the position of Option B					
Condition	None	1 person	2 people	3 people (all)	$\chi^2(3)$	p
Control	18 (72.00%)	0 (0.00%)	0 (0.00%)	7 (28.00%)		
					12.86	.005
Treatment	9 (28.13%)	5 (15.63%)	2 (6.25%)	16 (50.00%)		

652

653 **Table 6. Proportion of statements in support of Option A or Option B by condition.**

654

Statements	Control	Treatment		$\chi^2(2)$	*p*
		non-α	α		
Supportive statements for Option A	270 (27.55%)	247 (18.04%)	68 (9.94%)	82.78	< .001
Supportive statements for Option B	142 (14.49%)	234 (17.08%)	163 (23.83%)	24.86	< .001
Total statements (denominator)	980	1370	684	-	-

655

Table 7. Correlation matrix (N = 57).

	Statements for B	No. members for A	Chose Option A
Ratio of statements for A in each group	-.682**	.775**	.779**
Ratio of statements for B in each group	-	-.782**	-.725**
Number of members who ultimately endorsed A	-	-	.949**
Chose Option A (A = 1, B = 0)	-	-	-

** $p < .001$

661 **Table 8. Proportion of groups that adopted decision rules of various types. (N=60)**

662

	Decision rule					
Condition	Unanimity	Decision device	Consensus	Other	$\chi^2(3)$	p
Control (N=25)	18 (72.00%)	1 (4.00%)	6 (24.00%)	0 (0.00%)	6.12	.011
Treatment (N=35)	16 (45.71%)	7 (20.00%)	10 (28.57%)	2 (5.71%)		

663

664 **Table 9. Ratio of groups choosing Option B.**

	Number of prosocial people			
Condition	None	1 person	2 people	3 people
Treatment	-	80.0 % (4 of 5)	56.3% (9 of 16)	57.1% (8 of 14)
Control	0.0% (0 of 1)	0.0% (0 of 2)	0.0% (0 of 6)	43.8% (7 of 16)

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