Social Image or Social Norm?: Re-examining the Audience Effect in Dictator Game Experiments *

Chulyoung Kim and Sang-Hyun Kim

School of Economics, Yonsei University, Seoul 03722, South Korea

Abstract

Andreoni and Bernheim (2009) considers a variant of the dictator game in which an exogenous force, called "nature", overturns the dictator's decision with some known probability. They find that as the likelihood of nature's intervention increased, more subjects mimicked the nature's move. We replicate their experiment, and examine a new treatment in which the dictator's decision is revealed to the recipient even when the dictator mimics nature's move. We find that (i) many dictators' decisions were affected by nature's intervention even when their choice was observed by the recipient, which suggests that the intervention altered not only the incentive to signal one's fair-mindedness but also the perception of appropriate action, but (ii) still dictators' behavior under the two treatments differed significantly, which suggests that the audience effect also matters greatly in AB's and our experiments.

Keywords: Social image, Social norm, Dictator game, Altruism

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* Corresponding author: Sang-Hyun Kim (sang.kim@yonsei.ac.kr)

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1. Introduction

Social scientists have long recognized explicit and implicit social norms as a powerful influence on human behavior.[1] The influence is supposed to be stronger when the behavior is observable to others than when it is not,[2] which motivates a few experimental studies that demonstrate the importance of social norms by manipulating whether one's decision was observed by others and/or how it was perceived.[3] For instance, in a variant of the dictator game experiment, Andreoni and Bernheim (2009, AB henceforth) manipulated the beliefs of the recipients by altering the probability of an intervention. Specifically, a dictator was given a chance to make a decision with some known probability, and "nature" intervened and made a predetermined amount of transfer with the complementary probability. More importantly, the recipient could not observe directly whether the transfer was made by the dictator or nature. Therefore, if the dictator mimicked nature's move as many did in the experiment, the recipient could not tell who made the decision. Their analysis shows that the number of subjects who mimicked nature's move increased as the probability of the intervention grew larger.

AB develops a theoretical model explaining this and some other widely observed patterns in dictator game experiments. One of the key assumptions of their model is that people share a fairness ideal, namely the "50-50 norm", which is not affected by nature's intervention. Indeed, both in the field and the laboratory, many economic agents divide a surplus equally even when slightly less equal division makes someone better off significantly.[4] There is, however,

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[1] This tradition dates back at least to Adam Smith's *The Theory of Moral Sentiments*. Relatively recent comprehensive assessments of this issue include Sherif (1936), Merton (1957), Coleman (1990), and Elster (2007).

[2] Schram and Charness (2015), following Elster (2007), distinguish moral norms from social norms: the former requires introspection rather than external observation, while external observation is a critical element of the latter.

[3] Hoffman et al. (1996) show that only a few subjects divided the surplus equally in double-blind trials, whereas Bohnet and Frey (1999) show that a significant fraction of subjects did so when they face each other in experiments. See also Andreoni and Petrie (2004), Rege and Telle (2004), and Koch and Normann (2008) for related results. Haley and Fessler (2005) find that showing eyespots on computer screens increases giving by almost twice, which suggests that the feeling of being watched is enough to change ones' giving behavior. Recently, using a meta-analysis, Bradley, Lawrence, and Ferguson (2018) find a positive association between observability and prosociality.

[4] See for example Andreoni and Miller (2002) who show that a sizable fraction of subjects split the stake equally despite the cost from doing so.

evidence that social norms and behavior influenced by them can be quite sensitive to subtle changes in decision making environment. Dictator subjects in the experiment of List (2007), for example, gave substantial amounts of money to their matched partners when they were not allowed to take money from their partner, but when allowed, more than 40% of them took the maximum amount.[5]

This paper reconsiders AB's interpretation of their findings by investigating a situation where the dictator's decision is revealed to the recipient even when the dictator mimics nature's move. The rationale for this consideration is that in contrast to AB's assumption, the intervention of nature might affect not only the incentive to appear fair but also the notion of what the fair or appropriate allocation is. In particular, some dictators might justify their mimicking nature's move by telling themselves "this is the amount that the recipient could have got or the amount that he or she deserves." Such a justification might be easier when the probability of nature's intervention is higher. If so, AB's results might be driven not only by the audience effect as in their interpretation but also by the "norm-altering" effect.[6] The goals of this study are (i) to isolate the audience effect and (ii) to detect and appreciate the norm-altering effect.

We first replicate AB's experiment, and compare it to the new treatment in which the action is always observable. In the experiment, a pair of subjects were given a fixed surplus to be divided between them. Nature intervened with a known probability, and transferred a predetermined amount, 10% or 90% of the total surplus, to the recipient.[7] In case that nature did not intervene, the dictator subject made a decision. The entire structure of the game including the probability of the intervention and the amount to be transferred by nature was known to everybody from the beginning. In the unobserved action treatment, the recipients could not tell if the transfer was made by nature or the dictator when 10% (or 90%) was given. In contrast, they could always observe who made the decision in the observed action treatment.

The analysis shows that dictators behaved significantly differently under the two treatments.

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[5] See also Hoffman and Spitzer (1985), Eckel and Grossman (1996), Goeree and Holt (2001), and Bardsley (2008).

[6] Another (not mutually exclusive) possibility is that the intervention influences the "reference" of the dictator who may have a reference-dependent, loss-averse utility. In such a case, the dictator's incentive to make a transfer similar to nature's may increase as the probability of the intervention goes up. See Section 5 for a discussion.

[7] AB made nature's choice symmetric to neutralize the tendency among dictators to compensate for any ex ante asymmetry in nature's choice. In a robustness check, we made nature's choice asymmetric, but do not find clear evidence of ex ante fairness concern.

Unlike in the unobserved action treatment where many dictators mimicked nature's move exactly, not so many dictators did so in the observed action treatment. Instead, they gave a little bit more than what nature would have transferred, e.g. 20 or 30%, and such a tendency became more apparent as the probability of the intervention increased. Therefore, we conclude that the intervention of nature might indeed affect the perception on which action is appropriate in AB's experiment, but one cannot fully appreciate their results without the audience effect.

We further examine the validity of the findings by investigating a slightly different situation. More specifically, in AB's experiment, a dictator's decision was made ex post rather than ex ante in the sense that the dictator could make a decision only when nature did not intervene. However, their theory applies equally well to the situation with ex ante decision making, i.e., the dictator makes a decision without knowing whether nature would intervene. We again find that the proportion of dictator subjects who allocated 10% of the money to the partner increased as the probability of the intervention goes up. More interestingly, such a pattern is also found in that with observed action, which suggests that the norm-altering effect may drive such a behavior alone if the decision is made ex ante. However, we also find evidence of social image concern: significantly more dictator subjects divided the surplus equally in the observed action treatment than in the unobserved action treatment.

AB's experimental manipulation is applicable to many other experiments (e.g. in the ultimatum game experiment, the responder may accept an unfair offer more often if the proposer believes that it is nature who accepts the offer). Our findings suggest that one should be careful when interpreting results of experiments with such a design. In particular, to isolate the signaling motive from others, one may have to consider a treatment with observable actions, and compare it to the one with unobservable actions as we do in this paper.

A growing literature in experimental economics identifies the influence of social norms on human behavior. Krupka and Weber (2013) propose a coordination game to identify social norms or shared understanding of which action is most (and least) appropriate in a specific situation. They demonstrate that variations of social norms can explain a large part of variations of behavior in dictator game experiments. Kimbrough and Vostroknutov (2016) explore individual heterogeneity in sensitivity to social norms using a rule-following task.

Also, there have been theoretical and experimental investigations on the economic consequences of social image concern (Bagwell and Bernheim, 1996; Bernheim, 1994; Glazer and Konrad, 1996; Ireland, 1994).Similar to AB, Levine (1998) studies a model in which players have incentive to give generously to signal their altruism in ultimatum games.

Rotemberg (2008) applies Levine's work to the dictator game.

The rest of the paper continues as follows. Section 2 describes the experimental design and hypotheses. Section 3 reports the results. The experiment with ex ante decision is described and analyzed in Section 4. Section 5 concludes. The experimental instruction can be found in the Appendix.

2. Experiment and Hypotheses

A session consisted of 10 rounds, and each round unfolded as follows.[8] Subjects were randomly paired and assigned a role. Matched subjects were asked to stand up and say hello to each other.[9] The dictator subject was given KRW 10,000 (= about USD 9.25 with an exchange rate of USD 1 = KRW 1081.1), and the server computer decided whether or not a predetermined amount of money would be transferred to the recipient automatically (i.e., nature's intervention). In case that nature intervened, KRW 1,000 or 9,000 was transferred to the recipient with equal probability, and the round ended there. Otherwise, the dictator was given a chance to decide how much to transfer, from nothing to KRW 10,000 with KRW 1,000 increment. The probability of nature's intervention, denoted by p, was either 0, 0.3 or 0.7, and p was randomly determined by the computer and known to both subjects at the beginning of each round. The probability that p=0.3 was 0.3, and the probability that p=0.7 was 0.7. In some sessions, at the fifth round, p was fixed to zero. Hence, subjects on average faced the situation with p=0.7 more often than those with p=0 or 0.3. Note that with p=0.7, the dictator was not given a chance to make a decision with a very high probability. So, our design, following AB's design as closely as possible, is to get at least one observation for each situation.[10] After ten

[8] The computer interface was programmed with the software oTree (Chen, Schonger and Wickens, 2016).

[9] In this, we follow AB's procedure which is designed to make the audience effect salient. However, this is rather an unusual procedure in a dictator game experiment where subjects usually remain anonymous throughout the experiment. In Section 4, we consider an experiment following the standard protocol.

[10] In AB's experiment, each dictator subject was given nine sets of "private number", {1}, {2}, {3}, {4}, {1,2}, {3,4}, {1,2,3}, {2,3,4}, {1,2,3,4}. Then, they fixed a set of private number, and rolled a die. When 5 or 6 showed up, they rolled it again. In case that a number in the set was up, the dictator was given a chance to make a decision. So, when the set was either {1}, {2}, {3} or {4}, the dictator made a decision with probability 1/4, i.e., p=0.75. When the set was either {1,2} or {3,4}, the dictator made a decision with probability 1/2, i.e., p=0.5, and so forth.

rounds of play, we picked one round, and paid accordingly. Subjects were informed of the entire structure of the session and the payment scheme at the beginning, but did not know the exact probabilities of p=0, p=0.3 and p=0.7.

To reexamine AB's experimental findings, we compare the case with unobserved to that with observed action. In the unobserved action treatment, like in AB's experiment, recipients were not informed of who had made the decision. Thus, if a dictator transferred KRW 1,000, the recipient could not tell whether nature had intervened, unless p=0. In contrast, recipients in the observed action treatment were always informed of who made the decision. That is, a dictator's decision was shown to the partner even when KRW 1,000 was chosen, and thus the incentive to signal one's fair-mindedness should not be affected by a change in p, unless p also affected the notion of fair division itself. Formally, we test the following hypotheses:

H1: The distribution of the transferred money to the recipient is affected by the probability of nature's intervention even in the observed action treatment.

H2: The distribution in the unobserved action treatment significantly differs from that in the observed action treatment.

H1 is about the norm-altering effect, while H2 is about the audience effect remained after the norm-altering effect being taken into account. Note that both hypotheses can be true simultaneously.

All sessions were conducted at the lab managed by the Center for Research in Experimental and Theoretical Economics (CREATE) at Yonsei University, South Korea. We invited 144 undergraduate and graduate students from the subject pool, and a half of them were assigned a role of dictator (i.e., 72 independent observations). Each subject was assigned to a single treatment (i.e., between-subject design). The instructions were in Korean, and a translated version of the instruction is in the Appendix. Immediately after the experiment the subjects went to another room one by one, and were paid the earned money and a show-up payment (KRW 3,000 = USD 2.77). A session took about 40 minutes, and the average payment was KRW 8,000 (= USD 7.4).

3. Results

Throughout the analysis, we focus on the first decision of each dictator subject in each new situation so as to avoid double counting (e.g. if subject 1 was given three chances to make a decision when p=0.3 and twice when p=0.7, we drop out the last two observations with p=0.3 and the last observation with p=0.7.) Obviously, this is neither the only way to avoid double counting nor the optimal one, but is a reasonable way to proceed, we believe. Table 1 reports the descriptive statistics across treatments.

Table 1. Descriptive statistics of giving decision

	Observed			Unobserved	
	p=0	p=0.3	p=0.7	p=0.3	p=0.7
Average	2875	3000	2566.7	2266.7	2200
Std Dev	3125.9	2059.7	2112.1	2434.4	2578.4
N	48	34	30	30	30

In total, 36 subjects participated in each treatment as a dictator, and all of them made at least one decision over the ten rounds. However, some of them did not have an opportunity to make a decision in all situations, so in the observed action treatment only 34 subjects were given a chance when p=0.3, and only 30 subjects when p=0.7. Likewise, in the unobserved action treatment only 30 subjects made a decision when p=0.3 and p=0.7, respectively. We made subjects consider the case with p=0 only in some sessions, and the number of dictator subjects who participated in those sessions is 48. It is noteworthy that the average amount transferred to the recipient is significantly lower in the unobserved action treatment than that in the observed action treatment, which may be because more subjects gave KRW 1,000 in the treatment with unobserved action. However, they are not statistically different from each other.[11]

[11] We did not use the observations with p=0 for the test.

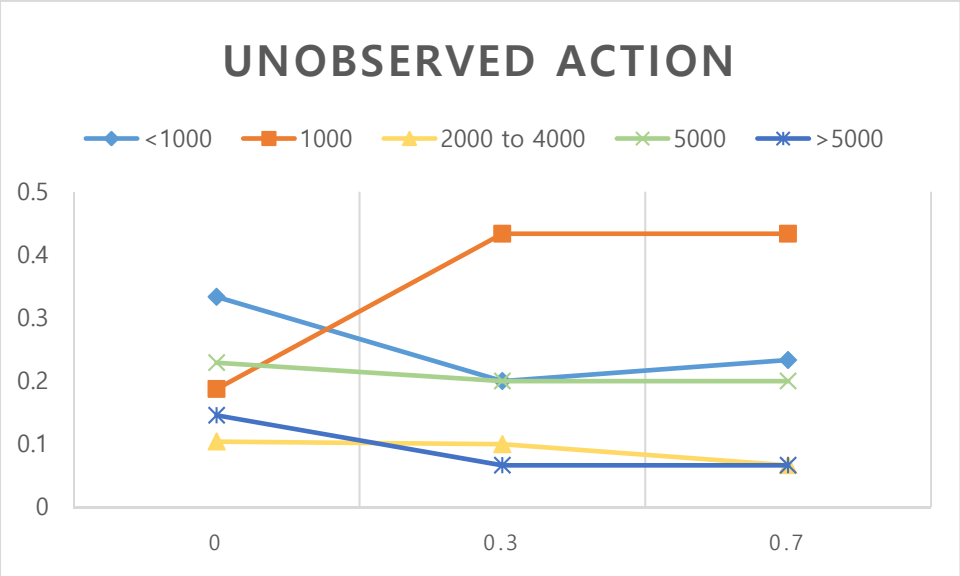

Figure 1. Distribution of amounts allocated to partners, unobserved action treatment

We next investigate the effects of the intervention probability on giving. Figure 1 shows how the distribution of transferred money in the unobserved action treatment changes in response to the change of p. The horizontal axis represents p, and the vertical the frequency. Most notably, the proportion of subjects who gave exactly KRW 1,000 is significantly higher when p was greater than zero in the unobserved action treatment. This finding resonates AB's finding, although there are some minor quantitative differences. Here, the proportion of subjects who gave 50% is not significantly affected by the change in p. Many of those who gave nothing to the recipient when p=0 decided to give 10% of the surplus instead when p was greater than zero. Nevertheless, the fraction of dictators dividing the stake equally is stable at 20%, which is in line with the extant literature (see Camerer, 1997).

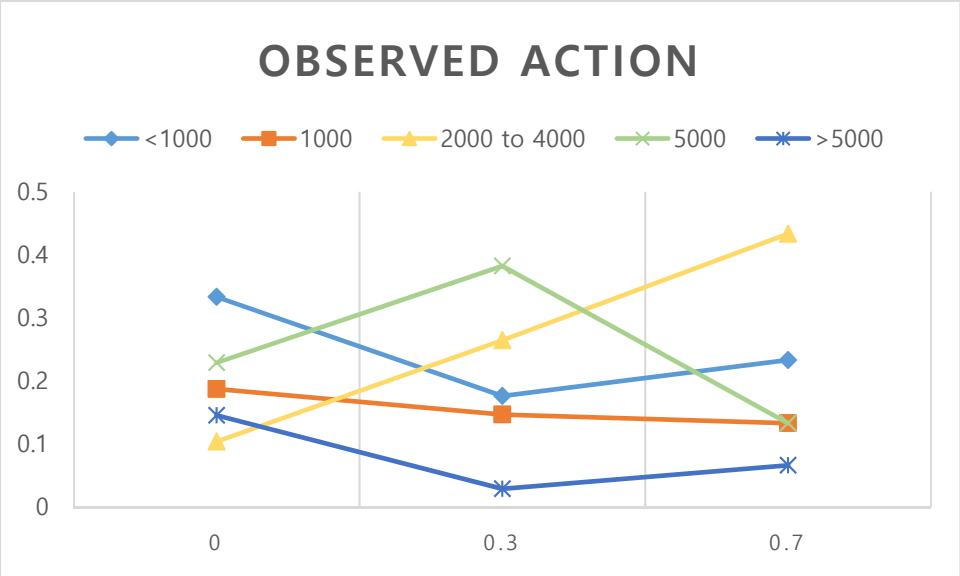

Figure 2. Distribution of amounts allocated to partners, observed action condition

It turns out that the distributions are substantially different in the observed action treatment from those in the unobserved action treatment as shown in Figure 2. In sharp contrast, the proportion of subjects who gave KRW 1,000 slightly decreases as p increases. Instead, many subjects decided to allocate a bit more than what nature would have allocated, e.g. KRW 2,000 or 3,000 when p was large, which suggests that the intervention and its probability might alter the norm of fairness, and in turn the benefit and cost of being fair and/or generous. Because KRW 1,000 was the amount that the recipient could have got in case of nature's intervention, giving a bit more than that might signal one's generosity, and moreover, the cost of doing so was lower than in the situation where one must give KRW 5,000 to signal one's generosity. The proportion of subjects who gave KRW 5,000 turns out to be non-monotonic in p; increases first and then decreases. This may suggest that the social norm and the incentive to follow it might interact in a complicated way.

Figures 1 and 2 together demonstrate that the intervention indeed influences the norm itself. However, it does not necessarily mean that people would always follow nature's lead exactly. Figure 2 shows that subjects, instead of mimicking nature's move, might "use" it as a reference point to signal one's generosity and to enjoy social recognition ("I am giving you more than the amount that nature would have given."). So, the audience effect matters greatly in appreciating AB's result.

Table 2 reports the results of formal tests. The first three columns show the estimates of linear probability models of which dependent variable is a binary indicator of giving KRW 1,000.

When we use the entire sample (the first column), the only factor significantly affecting the probability of choosing KRW 1,000 turns out to be the observability of dictators' action. In other words, subjects in the unobserved action treatment allocated KRW 1,000 significantly more often than those in the observed action treatment. As we saw in Figure 1, the proportion of subjects who gave 10% was significantly higher when p was greater than zero in the unobserved action treatment (see the second column), but when the action was observed, not many dictators mimicked nature's move (the third column).

Table 2. Estimated treatment effects

	Probability of Choosing 1,000			Probability of Choosing x in [2000, 4000]		
	All	Unobserved	Observed	All	Unobserved	Observed
p=0.3	0.1036	0.2458**	-0.0404	0.0763	-0.0041	0.1605
	(0.0781)	(0.1066)	(0.0833)	(0.0712)	(0.0683)	(0.0922)
p=0.7	0.0958	0.2458**	-0.0542	0.1458**	-0.0375	0.3292***
	(0.0793)	(0.1066)	(0.0864)	(0.0721)	(0.0683)	(0.0958)
Observed	-0.3158***			0.2241***		
	(0.0625)			(0.0568)		
N	172	108	112	172	108	112

For the next three columns, we adopt a binary indicator of giving an amount greater than 1,000 and smaller than 5,000 as the dependent variable. The fourth column shows that such a transfer was more frequent in the observed action treatment. Confirming the observation from Figure 2, significantly more subjects allocated KRW 2,000 ~ 4,000 to the partner when p=0.7 and the action was observed (see the sixth column).

4. Robustness Check

In this section, we further explore the validity of the findings of the previous section by investigating a slightly different setup, which is arguably more similar to the standard procedure of a dictator game experiment. In particular, we modified the experimental procedure

as follows:

(i) Ex ante decision making: In this experiment, a dictator made a decision without knowing whether nature would intervene. After a decision had been made by the dictator, the server computer determined whether to implement the dictator's decision or not.

(ii) No repetition: Each subject played just one round, i.e., given p, each made a decision only once, and the session ended.

(iii) Anonymity: Subjects remained anonymous throughout the experiment.

(iv) Asymmetric intervention: Upon intervention, nature transferred KRW 1,000 to the recipient (in our main experiment, KRW 1,000 or 9,000 was transferred).

(v) Finer increment allowed: A dictator decided how much to transfer, from nothing to KRW 10,000 with KRW 100 increment, instead of KRW 1,000 increment.

We consider these modifications to check whether the findings are robust to small changes in experimental environment. Apparently, anonymity will weaken the audience effect, and ex ante decision making may strengthen or weaken the norm-altering effect. In total, 197 subjects who had not participated in the main experiment were newly recruited for this experiment.

Table 3 reports the basic statistics of giving decision. The average amounts allocated to the recipients are lower than their counterparts in Table 1, which is probably because the participants were anonymous in this experiment. Also, observe that the sum of transferred amounts is largest when p=0.

Table 3. Descriptive statistics of giving decision (ex ante decision)

	Observed			Unobserved	
	p=0	p=0.3	p=0.7	p=0.3	p=0.7
Average	2435.1	1607.1	2078.5	1584.2	1631.6
Std Dev	2580.6	2203.5	2290.4	1979.7	2256.2
N	37	42	42	38	38

Figures 3 and 4 show how the distribution of transferred amounts in each treatment changes in response to the change of p. In both figures, one can clearly see that the proportion of subjects who allocated KRW 1,000 to their partners increases as p goes up. At the same time, the number

of people who gave KRW 1100-4900 goes down.[12] One notable difference between the two distributions is the fact that the proportion of subjects who equally divided the money declines in the unobserved action treatment, but it slightly increases in the observed action treatment, although none of these changes are statistically significant. As in ex post decision making, the equal split behavior is relatively constant across different likelihoods of nature's intervention.

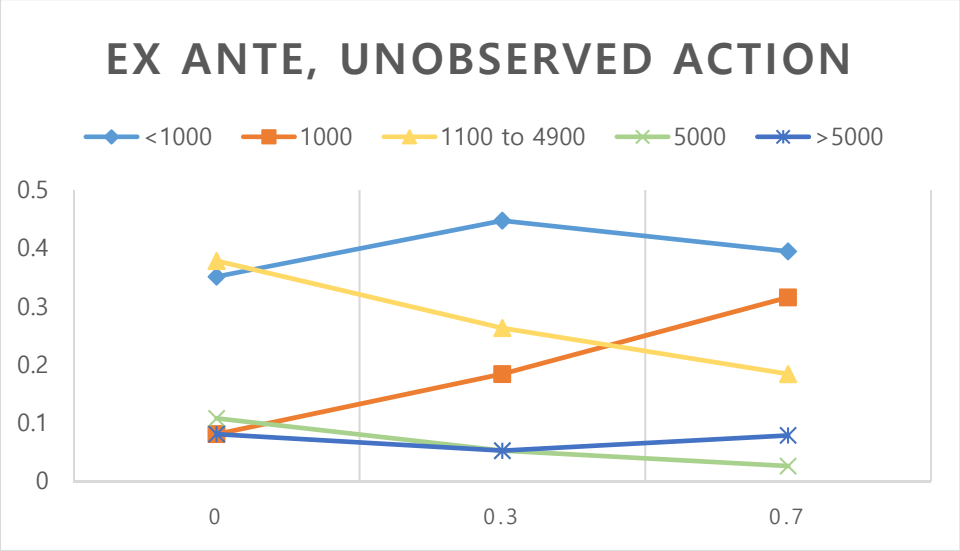

Figure 3. Distribution of amounts allocated to partners, ex ante, unobserved action

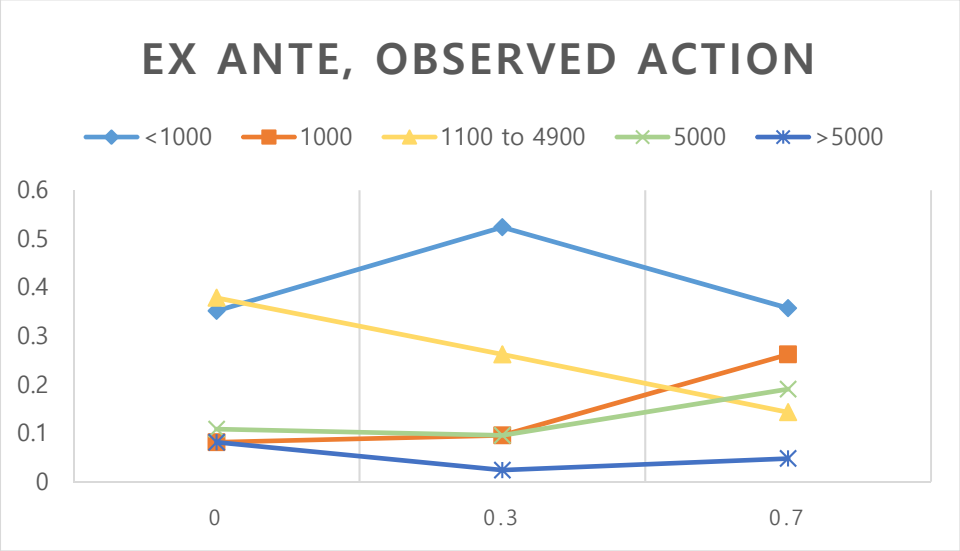

Figure 4. Distribution of amounts allocated to partners, ex ante, observed action

[12] This is in contrast to the increasing trend that we observe in Figure 2. We conjecture that the difference is from the fact that in the ex ante decision experiment, subjects remained anonymous, and thus the incentive to signal one's generosity was significantly smaller than in the ex post decision experiment.

Table 4. Estimated treatment effects (ex ante decision)

	Probability of Choosing 1,000			Probability of Choosing 5,000		
	All	Unobserved	Observed	All	Unobserved	Observed
p=0.3	0.0939	0.1031	0.0141	-0.0874	-0.0555	-0.0129
	(0.0827)	(0.0899)	(0.0790)	(0.0633)	(0.0559)	(0.0767)
p=0.7	0.2439***	0.2347***	0.1808**	-0.0499	-0.0817	0.0823
	(0.0827)	(0.0899)	(0.0790)	(0.0633)	(0.0559)	(0.0767)
Observed	-0.0714			0.1034**		
	(0.0607)			(0.0465)		
N	197	113	121	197	113	121

Table 4 confirms the above observations. Although the size of the change is bigger in the unobserved treatment, even when the action was observable, significantly more subjects gave KRW 1,000 when p=0.7 in comparison to when p=0 (see the second and the third columns). This suggests that the norm-altering effect may be strong enough to generate single-handedly the pattern found in our ex ante experiment. However, it is important to note that the audience effect played a non-trivial role in this experiment: much more subjects gave 50% of the money when the action was observed than when it was unobserved (the fourth column). Thus, again, these findings provide a mixed picture of the audience effect and the norm-altering effect.

As this second set of treatments was implemented in an ex ante setting, a natural question is whether dictators' behavior was influenced by ex ante fairness concern. If so, such a dictator might give more, even more than KRW 5,000, to compensate the unfair treatment by nature. Such a tendency would become stronger as p increases, because recipients are more likely to receive a small amount. Figures 3 and 4, however, show that our subjects did not put much emphasis on ex ante fairness: dictators *reduce* their giving as p increases, with a higher mass of dictators choosing KRW 1,000 and a lower mass of them choosing KRW 1,100 to 4,900. Thus, it seems that ex ante fairness is not a major factor behind our subjects' behavior.

5. Discussion

The results presented above suggest that in contrast to AB's assumption, the social norm itself

was influenced by the intervention of nature, or by the changes in the expected outcome. Thus, the interpretation of AB's experimental results would also need to be revised accordingly. Specifically, about 70% of subjects in AB's experiment mimicked nature's move when nature was supposed to transfer zero dollar. To appreciate this observation, we may have to compare it to the fact that only 60% of people in experiments adopting the double-blind protocol (Hoffman et al., 1996) gave zero dollar. We, educated by the new findings, suspect that subjects in AB's experiment might find it easier to mimic nature's move, because it was the amount that their partners could have got with high probability.

In this study we identify changes in the norm indirectly by analyzing the behavior of subjects in the varying environment. Alternatively, one can measure social norms using the method proposed by Krupka and Weber (2013), which would provide more direct evidence that the intervention of nature influences the appropriateness of a certain action. It is noteworthy however that such a direct measure and our study are complements rather than substitutes in the sense that although it is important to figure out what the most appropriate action is in a certain situation, people do not always choose the most appropriate action.

Thus far, our discussion has focused on that the intervention of nature altered the incentive to signal one's fair-mindedness and the notion of fair allocation. However, it might also influence *loss-averse* dictators' behavior by changing the *reference*. In particular, some dictators might have experienced a feeling of loss if they gave more than what nature would have given, and to avoid it they might give less than or equal to KRW 1,000. In this scenario, the expected outcome, i.e., some combination of one's own plan and nature's move, plays the role of reference as in Gul (1991) and Koszegi and Rabin (2006). Moreover, as the probability of nature's intervention increases, the weight on KRW 1,000 would get heavier, making more subjects transfer an amount close to it.[13] Our design does not allow to distinguish the effects of changing the reference and of changing the norm. We conjecture that dictators' loss aversion might play a role in forming the norm.

In Section 4, we modified the previous setting in many aspects at once. It was to check the robustness of the main findings with a limited budget. The main message (i.e., the norm-altering effect plays a significant role, but the audience effect still matters greatly) survives, but

[13] In a real-effort experiment, Abeler et al. (2011) manipulated the rational expectations of subjects, and find that subjects worked longer and earned more money when they expected to earn more due to nature's intervention than when expected less.

we find many quantitative differences as well. Because we changed the experimental environment in many ways, it is not clear whether it is anonymity or the timing of decision making that generated those differences. It could be an interesting future work to implement the ex ante treatment with more salient audience effects to clarify this issue.

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Appendix: Instructions

<Experiment 1: Ex Post Decision>

Page 1:

Experiment Explanation

Thank you for participating in the experiment. Please read the following instruction carefully.

Every participant's decisions in the experiment are anonymously collected and used only for research.

Everyone obtains KRW 3,000 for participating in the experiment. In addition, every participant obtains money in his/her "box." The amount of money in the box will be determined in the experiment. Therefore, every participant obtains at least KRW 3,000 in the experiment.

You will be paired with someone in this room, and a group number will be assigned to each pair.

Please check your group number in the next page. Please follow the instruction of the experimenter and say hello to your partner beginning from the first group.

Page 2:

Partner Checking

Group Number: _____

Please follow the instruction of the experimenter and say hello to your partner beginning from the first group.

Please do not proceed to the next page until all groups finish checking partners.

Page 3:

Experiment Explanation

KRW 10,000 will be put either in your box or in your partner's box.

If KRW 10,000 is in your partner's box, you do not make any decision. If KRW 10,000 is in your box, you can transfer KRW X out of KRW 10,000 in your box to your partner's box. The following instruction supposes that KRW 10,000 is in your box.

When the experiment begins, one of the following two situations occurs. The probability for the first situation is 1-P, and the probability for the second situation is P. P is 0%, 30% or 70%. You know which situation occurs. But your partner does not know which situation occurs. [Treatment: You know which situation occurs. Your partner knows which situation occurs.]

1. You choose the value of X. X is the amount of money, out of KRW 10,000 in your box, that you want to transfer to your partner's box. Your choice is not known to your partner. [In the treatment: Your choice is known to your partner.] In this case, the total amount of money you obtain is KRW (3,000 + 10,000 – X) and the total amount of money your partner obtains is KRW (3,000 + X).
2. The computer randomly chooses the value of X to be either KRW 1,000 or KRW 9,000. If the computer chooses X=1,000, the total amount of money you obtain is KRW (3,000 + 10,000 – 1,000), and the total amount of money your partner obtains is KRW (3,000 + 1,000). If the computer chooses X=9,000, the total amount of money you obtain is KRW (3,000 + 10,000 – 9,000), and the total amount of money your partner obtains is KRW (3,000 + 9,000).

The experiment ends after the above process is repeated 10 times. After the experiment ends, KRW 10,000 will be randomly put either in your box or in your partner's box. If KRW 10,000

is put in your box, one of the ten decisions that either you or the computer made will be randomly executed. If KRW 10,000 is put in your partner's box, one of the ten decisions that either your partner or the computer made will be randomly executed.

The next page explains the experiment with an example.

Page 4:

Consider the following example.

Suppose P is 70% in your first decision making round. That is, the probability that the second situation occurs is 70%.

In this case, suppose the second situation occurs and the computer randomly chooses the value of X to be KRW 1,000. Then, you do not make any decision and the first round ends.

The second round follows. Suppose P is 30%. That is, the probability that the second situation occurs is 30%.

In this case, suppose the first situation occurs. You choose the value of X, and the second round ends.

The third round follows, and the above process is repeated. After ten rounds, the experiment ends.

Suppose KRW 10,000 is put in your box after the experiment. And suppose the choice in your second round is executed. In this case, the total amount of money you obtain is KRW (3,000 + 10,000 – X) and the total amount of money your partner obtains is KRW (3,000 + X).

Your partner sees the following screen:

****

The End of Experiment
KRW 10,000 is put in your partner's box.
The choice in your partner's Round _____ is executed.
P is 30% in your partner's Round _____.
The total amount of money you obtain is KRW (3,000 + X).
Thank you for participating in the experiment.
****

You know how much money you decided to transfer to your partner's box because you chose the value of X. Although your partner does not know how much money you decided to transfer to his/her box because your choice is not known to your partner, he/she can guess about your decision from the total amount of money he/she obtains. For example, suppose you chose X=1,000. Then, your partner obtains the total amount of money equal to KRW (3,000 + 1,000), and he/she does not know whether you chose X=1,000 in the first situation or the computer chose X=1,000 in the second situation. Your partner only knows that the probability of the second situation is 30% because P was 30% in the second round. However, if you chose X=2,000, your partner obtains the total amount of money equal to KRW (3,000 + 2,000). In this case, your partner knows that you chose X=2,000 because the computer can only choose either X=1,000 or X=9,000 in the second situation.

[In the treatment:

Your partner sees the following screen:

****
The End of Experiment
KRW 10,000 is put in your partner's box.
The choice in your partner's Round _____ is executed.
P is 30% and the first situation (your partner chooses) occurred.
The total amount of money you obtain is KRW (3,000 + X).
Thank you for participating in the experiment.
****

Regardless of the value of X, your partner knows the value of X you chose because he/she knows that the first situation occurred.
]

Please do not talk with other persons or use your phone/internet until the experiment ends. You do not have to hurry when other persons finish the experiment early.

If you have any question, please raise your hand. Please wait for further instruction from the experimenter.

Page 5:

Group Number: _____

Round: _____

P=___ and the first situation occurred. Your partner does not know which situation occurred. [In the treatment: Your partner will know that the first situation occurred.] You choose the value of X.

Please choose the value of X between KRW 0 and KRW 10,000 in a multiple of KRW 1,000.
₩ _____

Page 6:

The End of the Experiment

KRW 10,000 is put in your partner's box.

The choice in your partner's Round _____ is executed.

P is 30% in your partner's Round _____. [Treatment: P is 30% and the first situation (your partner chooses) occurred.]

The total amount of money you will obtain is KRW (3,000 + _____).

Thank you for participating in the experiment.

<Experiment 2: Ex Ante Decisions>

Page 1:

Thank you for participating in the experiment. Please read the following instruction carefully.

Every participant's decisions in the experiment are anonymously collected and used only for research. No one knows your decisions in the experiment.

Everyone obtains KRW 3,000 for participating in the experiment. In addition, every participant obtains money in his/her "box." The amount of money in the box will be determined in the experiment. Therefore, every participant obtains at least KRW 3,000 in the experiment.

You will be paired with someone in this room. You and your partner do not know each other during the experiment and after the experiment. KRW 10,000 is in your box and KRW 0 is in your partner's box. You can transfer KRW X out of KRW 10,000 in your box to your partner's box. [For Recipient: KRW 0 is in your box and KRW 10,000 is in your partner's box. Your partner can transfer KRW X out of KRW 10,000 in his/her box to your box.] The experiment proceeds as follows.

1. You choose the value of X. X is the amount of money, out of KRW 10,000 in your box, that you want to transfer to your partner's box. Your choice of X is not known to your partner. But he/she can guess about the value of X from the total amount of money he/she obtains. [Treatment: *The underlined sentences do not appear.*] [For Recipient: Your partner chooses the value of X. X is the amount of money, out of KRW 10,000 in your partner's box, that your partner wants to transfer to your box. Your partner's choice of X is not known to you.]
2. After you choose the value of X, one of the following two situations occurs. [For Recipient: After your partner chooses the value of X, one of the following two situations occurs.] The probability of the first situation is 70% and the probability of the second situation is 30%.
   A. KRW (10,000 – X) remains in your box, and KRW X is transferred to your partner's box. [For Recipient: KRW (10,000 – X) remains in your partner's box,

and KRW X is transferred to your box.]

B. KRW 9,000 remains in your box, and KRW 1,000 is transferred to your partner's box. [For Recipient: KRW 9,000 remains in your partner's box, and KRW 1,000 is transferred to your box.]

One of the two situations above occurs and the experiment ends. The total amount of money you obtain is as follows:

1. If the first situation occurs, the total amount of money you obtain is KRW (3,000 + 10,000 – X), and the total amount of money your partner obtains is KRW (3,000 + X). [For Recipient: If the first situation occurs, the total amount of money your partner obtains is KRW (3,000 + 10,000 – X), and the total amount of money you obtain is KRW (3,000 + X).]
2. If the second situation occurs, the total amount of money you obtain is KRW (3,000 + 9,000), and the total amount of money your partner obtains is KRW (3,000 + 1,000). [For Recipient: If the second situation occurs, the total amount of money your partner obtains is KRW (3,000 + 9,000), and the total amount of money you obtain is KRW (3,000 + 1,000).]

[Treatment: After the experiment ends, your choice of X and the occurred situation are known to your partner.]

Please do not talk with other persons or use your phone/internet until the experiment ends. You do not have to hurry when other persons finish the experiment early.

If you have any question, please raise your hand. Please wait for further instruction from the experimenter.

<u>Page 2:</u>

You are paired with someone in this room.

Please choose the value of X between KRW 0 and KRW 10,000 in a multiple of KRW 100. [For Recipient: Please wait until your partner chooses the value of X.]

₩ _____

Page 3:

The End of the Experiment

The value of X you chose is _____. [For Recipient: *This sentence does not appear*.] [For Recipient in Treatment: The value of X your partner chose is _____.]

The second situation occurred. [For Recipient: *This sentence does not appear*.] [For Recipient in Treatment: The second situation occurred.]

The total amount of money you will obtain is KRW (3,000 + _____).

Thank you for participating in the experiment.