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A Strategic View of Promising

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1 Introduction

The aim of this paper is to explain why people make a promise and keep it. I try to achieve it from the strategic point of view but not the traditional. Traditionally, it is thought to be a rule (or code, contract, convention, and so on) that a promisor should keep her promise unless the promisee releases her.[1] Theorists who agree to it say that, thus, people are following this rule when they keep a promise. However, my view is that a promisor is choosing the action which maximizes her interest when she keeps the promise and the action belongs to an equilibrium. Promising and fulfilling it is a kind of strategy to get the maximum in the situation.

The remainder of this paper is organized as follows. First, I bring forward a general argument about how to explain regularity of human social behavior. I pose some doubts about the rule-following model of social actions, which is very common in philosophy and sociology, and then defend a view based on the concept of equilibrium. Second, I introduce game theory and apply it to the problems of promising. It is shown that giving and keeping a promise is the best strategy and a part of a Nash equilibrium in some repeated games.

2 Rule-Following and Equilibrium

People often do the same actions as others do. For example, they say “Good morning” (or just “Morning”) seeing someone in the morning, and they keep the promises they made. Most of these actions do not appear to be determined causally like natural phenomena, because they are done intentionally. Showing why people do these similar actions requires different justifications from those in natural sciences.

Philosophy, sociology, and other social sciences have been trying to explain such non-causal regularity of human behavior. A common explanation is that there is a rule telling people to do the actions in question and they are following it. It is very persuasive in some cases since the subjects who do the actions admit it. For example, we, as participants in the regularity, know that saying “Good morning” is the correct way of offering a greeting in the morning. In other words, it is a constitutive rule known to English speakers that saying “Good morning” counts as a greeting in the

[1] I refer to a promisor, speaker, or player 1 by “she” and to a promisee, hearer, or player 2 by “he”.

morning.[2]

However, I think that this rule-following model of social behavior has at least five weaknesses. First, we do not know who, when, where, and how decided such a rule. This aporia is of the same type as that of social contract theory. Second, even if there was a historical fact that someone had enacted legislation for it, it would not imply that we should obey it. For instance, suppose that some Mesopotamians set a rule for promising thousands of years ago. Does it have any practical meaning to us? Third, hypothesizing a rule behind a horde of similar actions raises other problems: why should people follow the rule, and why do they follow it regularly actually? Obviously, a rule in itself never forces people to do what it tells. Here, we must find another reason why people follow the rule and, moreover, we can not appeal to another rule, to prevent infinite regress. Fourth, when we deal with some illocutionary acts, they are so basic that it is impossible to make the rules of them. For example, as for proposing and agreeing, you can neither propose the rule of proposing nor agree to the rule of agreeing, if they are rule-following actions. Also, we do not know how to promise to follow the rule of promising. How can these rules be established without these actions? Lastly, the rule-following model is involved in not a few philosophical controversies.[3] Resolving them looks much more difficult than getting around them.

Another way to deal with the regularity of human behavior is to analyze it as an equilibrium in the given circumstance. Roughly, "equilibrium" means that each of all agents is doing her or his best. If a set of actions is an equilibrium, it entails that any agent's deviating from the set of actions will make her or his profit smaller. Accordingly, an equilibrium has a kind of self-enforcing power and stability, if it is achieved, for rational agents. In other words, it is reasonable to suppose that people do spontaneously the actions which belong to an equilibrium. Therefore, explanations based on the concept of equilibrium can avoid the above defects of the rule-following model.

Let me describe my basic scheme for the analysis. It has two hypotheses. The first one is that a person is rational or tries to maximize her or his profit. Here, "profit" does not mean money or pleasure. It is utility value given as a real number measured technically by the order of those things the person prefers.[4] The second hypothesis is that a person is intelligent enough to calculate the profit which will be gained through an action in question depending on how much relevant information she or he has. On these hypotheses, we can formulate people's social actions in a given

[2] For the idea of constitutive rule, see Searle, 1969, section 2.5 and Searle, 1995, 43-51.
[3] One of the most famous ones will be the paradox of rule-following. See Wittgenstein, 1953, and Kripke, 1983. There have been many disputes about what Wittgenstein really thought on it.
[4] Strictly speaking, this is so called von Neumann-Morgenstern utility. See von Neumann and Morgenstern, 1953, Appendix.

situation and work out its equilibrium by game theory. If the result supports the actual behavior, it should be recognized as a correct explanation of it.

Some might argue, against these hypotheses, that a human does not seem so rational since many experiments and observations have revealed surprising examples of human irrationality. Though it has some plausibility, but I think that humans usually pursue the maximization of their profits. Otherwise, we would have to say that they did something intentionally with no reason. In fact, when someone does not appear to be rational, we will commonly expect to find some causes of it such as causal interference and luck of relevant information in her or his decision process. The cases that people act unaccountably irrationally, if they are, are very rare and extraordinary. I think that we can let them go out of range of formal analysis. They will be a matter of causal studies.

The question why people keep their promises is a case to which the equilibrium-based view can be applied. According to the traditional view, it is a rule that people should fulfill their promises.[5] Especially, some speech act theorists assert that this is a part of constitutive rules for the speech act of promising or their logical derivation.[6] But supposing such a rule does not necessitate people's observing promises. Actually, many philosophers have been considering why a promise is not or should not be broken even if they admit the existence of such a rule.[7] I think that this problem can be solved with the ideas of rationality and equilibrium as I discuss in the following section. If this is right, we will have a more promising method of understanding human behavior, in some sense, and can avert at least some defects of the rule-following model.

3 Promising

3. 1 Game Theory

In this subsection, I introduce game theory. My targets are Nash equilibrium and folk theorem. Readers who already know them can skip this subsection.

We use the theory of non-cooperative games. A non-cooperative game is such that two or more players compete with each other. Because we require just two persons, that is, a promisor and a promisee, I mention two-person games. Let us call the two persons player 1 and player 2. In a non-cooperative game, each player chooses one strategy independently and gains a utility value

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5 Typically, Prichard, 1949.
6 Searle, 1969, chapter 8.
7 For example, classically, Hume, 1978, book III, part II, section V. Recently, Owens, 2006.

according to the both players' choices. A strategy is a sequence of actions a player can do. If a player can do one action in a game, her or his strategy consists of one action.

Now, first, let us see Nash equilibrium. A Nash equilibrium is a pair of strategies which are the best responses to each other.[8] For example, (A, B) is the Nash equilibrium of the game shown in Table 1.[9] The table means that player 1 chooses doing A or not doing A and that player 2 doing B or not doing B. The number in the left side of each box shows the utility value player 1 gains and the right one player 2's if the pair of actions indicated by the box is selected. For instance, when (A, B) is chosen, player 1 has 4 and player 2 also has 4. Clearly, doing A is better than not doing A for player 1 and doing B is better than not doing B for player 2. Therefore, the set of strategies (A, B) is composed of the best responses to each other. A Nash equilibrium is understood as a stable point such that no player will change the choice.

	B	not B
A	4, 4	3, 2
not A	2, 3	1, 1

Table 1

A Nash equilibrium is not always the optimal. In other words, it may not be the pair of strategies that gives both players the highest utility values among the possible ones. An example is shown in Table 2. The Nash equilibrium is (not A, not B) since, for player 1, not doing A is better than doing A whichever player 2 chooses, and, for player 2, not doing B is better for the similar reason. But (A, B) gives the higher values to both A and B than (not A, not B). Thus, in this game, the Nash equilibrium is not the optimal. This type of game is called "Prisoner's Dilemma."

	B	not B
A	3, 3	1, 4
not A	4, 1	2, 2

Table 2

Next, we see folk theorem. Is (A, B) in Table 2 impossible in any way? No. It is possible in repeated games. Suppose that players 1 and 2 play the game infinitely many times.[10] In the repeated game,

8 For the formal definition of Nash equilibrium, see Nash, 1950 and 1951.
9 I limit the values to being from 1 to 4, for simplicity. Fixing the range of utility values does not harm the generality of the discussion. See Von Neumann and Morgenstern, 1953, 24, 25, and 627.
10 Compared to a repeated game, an original game of it is called "stage (game)".

each player has an uncountable set of strategies. For instance, player 1's strategy might be {A, A, A …}, {A, not A, A, not A …}, or {not A, not A, not A …}. Among these, she can choose the trigger strategy such that she does A as far as player 2 does B but, once he does not do B at any stage, then she keeps on not doing A from the following stage. Player 2 also can take his trigger strategy in the same way. Then, it is provable that the pair of these trigger strategies is a Nash equilibrium of the repeated game under certain conditions. Consequently, (A, B) is chosen repeatedly. This is called folk theorem.

Proof.

Let δ1 and δ2 be the discount factors of players 1 and 2 respectively and $0<\delta_1<1$, $0<\delta_2<1$.

Suppose that player 2 uses a trigger strategy described above.

On the one hand, if player 1 keeps doing A, her expected utility value is

$$3+3\delta_1+3\delta_1{}^2+3\delta_1{}^3+\ldots=\frac{3}{1-\delta_1}.$$

On the other hand, if player 1 does not do A from a stage, her expected utility value is

$$4+2\delta_1+2\delta_1{}^2+2\delta_1{}^3+\ldots=2+\frac{2}{1-\delta_1}.$$

Then, we have

$$\frac{3}{1-\delta_1}\geq 2+\frac{2}{1-\delta_1}\quad \text{if and only if}\quad \delta_1\geq\frac{1}{2}.$$

This means that doing A is the better for player 1 as far as player 2 chooses a trigger strategy and her discount rate is not less than 1/2.

In the same way, it can be shown that doing B is the better for player 2 as far as player 1 chooses a trigger strategy and his discount rate is not less than 1/2.

These entail that the pair of trigger strategies is a Nash equilibrium of the repeated game.

Folk theorem has great importance for understanding social actions. It supplies rational foundations of social cooperation in the long run. That is, socially cooperative attitude can be the best strategy for individuals in the repeated game of lifetime. If this is right, mutual altruistic actions can be interpreted as rational actions in the sense that they lead their agents to the maximization of profit.

3. 2 Analysis of Promising

In this subsection, we extend folk theorem and apply it to promising. The idea is that many promises are made and kept in give-and-take relationships. While all players take helpful actions at one turn in the game in Table 2, we often see that a person helps another earlier and the latter helps back the former later. This can be described as that each player helps the other in turn in a repeated game.

First, we extend folk theorem. Suppose that two players play a repeated game. But the games are mixture of the two kinds of stage game. One is in Table 3-1 and the other is in Table 3-2. These two stage games are randomly repeated infinitely. Strictly, the repeated game is such that each stage game is either one in Table 4-1 or one in Table 4-2 with the same probabilities of 1/2.[11]

	B	not B
A	1, 4	1, 2
not A	2, 2	2, 2

Table 3-1

	B	not B
A	4, 1	2, 2
not A	2, 1	2, 2

Table 3-2

Table 3-1 means that player 1 can altruistically help player 2 by doing A and he can reject her help by not doing B, and Table 3-2 means that player 2 can altruistically help player 1 by doing B and she can reject his help by not doing A.

Trigger strategies can be devised in these games too. Player1's trigger strategy is such that she begins by doing A and, if player 2 does not do B at any stage, then she does not do A at the next stage and keeps it later on. Similarly, player 2's trigger strategy is such that he begins by doing B and, if player 1 does not do A, then he does not do B and keeps it later on.

Then, it can be proved that, under a certain condition, a Nash equilibrium of the repeated game is the pair of these trigger strategies. In this equilibrium, the repetition of (A, B) or helping each other continually is rationally realized.

Proof.

Since the games are symmetrical for the two players, just considering the choice of player 1 at a stage in Table 3-1, which gives the only chance for her to get more by not doing A, is enough.

[11] This is not a game with incomplete information in the proper sense. Each player knows her or his and the other's types at every turn in this repeated game. They just can not predict which types they have at later turns.

Suppose that player 1 is playing a stage game in Table 3-1 and player 2 uses a trigger strategy. Note that the next stage game can be one in Table 3-1 or one in Table 3-2 with the probability of 1/2. Thus, if player 1 does A at a stage, the utility value she will gain at the next game is

$$1\times\frac{1}{2}+4\times\frac{1}{2}=\frac{5}{2}.$$

On the one hand, if she does A, her expected utility is

$$1+\frac{5}{2}\delta_1+\frac{5}{2}\delta_1^{\,2}+\frac{5}{2}\delta_1^{\,2}+\ldots=-\frac{3}{2}+\frac{5/2}{1-\delta_1}.$$

On the other hand, if she does not do A, her expected utility is

$$2+2\delta_1+2\delta_1^{\,2}+2\delta_1^{\,3}+\ldots=\frac{2}{1-\delta_1}.$$

Then, we have

$$-\frac{3}{2}+\frac{5/2}{1-\delta_1}\geq\frac{2}{1-\delta_1}\quad\text{if and only if}\quad\delta_1\geq\frac{2}{3}.$$

Therefore, under the condition that each player's discount factor is not less than 2/3, the pair of trigger strategies is a Nash equilibrium of the repeated game.

Now, the general result of these games can be shown. The generalized form of the games is given in the following tables. The assumptions are $x_1\leq z_1$, $y_1\leq w_1$, $x_2\geq z_2$, $x'_2\leq y'_2$, $z'_2\leq w'_2$, $x'_1\geq y'_1$, $(x_1+x'_1)/2\geq(w_1+w'_1)/2$, and $(x_2+x'_2)/2\geq(w_2+w'_2)/2$.

	B	not B
A	x_1, x_2	y_1, y_2
not A	z_1, z_2	w_1, w_2

Table 3'-1

	B	not B
A	x'_1, x'_2	y'_1, y'_2
not A	z'_1, z'_2	w'_1, w'_2

Table 3'-2

In the repeated game, the pair of trigger strategies is a Nash equilibrium if and only if

$$\delta_1\geq\frac{z_1-x_1}{z_1-x_1+\left(\dfrac{x_1+x'_1}{2}-\dfrac{w_1+w'_1}{2}\right)}$$

and

$$\delta_2 \geq \frac{y_2' - x_2'}{y_2' - x_2' + \left(\frac{x_2 + x_2'}{2} - \frac{w_2 + w_2'}{2}\right)}.$$

Proof.

Consider player 1's choice at a stage in Table 3'-1 while player 2 uses a trigger strategy.

On the one hand, if she does A, her expected utility value is

$$x_1 + \frac{x_1 + x_1'}{2}\delta_1 + \frac{x_1 + x_1'}{2}\delta_1{}^2 + \ldots = x_1 - \frac{x_1 + x_1'}{2} + \frac{(x_1 + x_1')/2}{1 - \delta_1}.$$

On the other hand, if she does not do A, her expected utility value is

$$z_1 + \frac{w_1 + w_1'}{2}\delta_1 + \frac{w_1 + w_1'}{2}\delta_1{}^2 + \ldots = z_1 - \frac{w_1 + w_1'}{2} + \frac{(w_1 + w_1')/2}{1 - \delta_1}.$$

Then, we have

$$x_1 - \frac{x_1 + x_1'}{2} + \frac{(x_1 + x_1')/2}{1 - \delta_1} \geq z_1 - \frac{w_1 + w_1'}{2} + \frac{(w_1 + w_1')/2}{1 - \delta_1}$$

if and only if $\delta_1 \geq \dfrac{z_1 - x_1}{z_1 - x_1 + \left(\frac{x_1 + x_1'}{2} - \frac{w_1 + w_1'}{2}\right)}$.

In the same way, we have the result about δ2.

From these results, we can say that people are cooperative generally, even in a probable sequence of different situations, because being cooperative makes their profits larger than not being cooperative. Of course, the above propositions are not perfectly general and natural, but I do not think it is very unreasonable to say that they describe some important features of social behavior. In addition, this seems consistent with our ordinary experience. We tend to be kind to those who are kind to us and unkind to those unkind to us. These suggest that our life is like repeated games and our attitudes are close to trigger strategies.

Next, we apply this to promising. I take the following conversation between players 1 and 2 as a standard example of promising.

Example 1

1 "Would you lend me the book? I promise to give it back next Monday."

2 "OK. Here you are."

1 "Thanks."

The situation where this conversation occurs is as follows: player 2 owns the book, and player 1 does not have another copy of it but has to read it for, say, an examination, but he will be troubled if he loses the book. For player 1, the best is that player 2 lends her the book and she does not give it back to him. The second is that he lends it and she gives it back. The worst is that he does not lend it. For player 2, the best is that he does not lend the book to player 1. The second is that he lends it to her and she gives it back. The worst is that he lends it and she does not return it. These preferences are expressed in Table 4.

	lending	not lending
giving back	3, 3	1, 4
not giving back	4, 1	1, 4

Table 4

This game just as shown in Table 4 does not imply that (giving back, lending) is chosen. The Nash equilibria are (giving back, not lending) and (not giving back, not lending).[12] This means that player 2 will not pass the book to player 1 in the short run.

Yet, considering it as a part of the repeated game given in Table 4'-1 and Table 4'-2 can make his lending the book rationally possible.

	cooperating	not cooperating
cooperating	3, 3	1, 4
not cooperating	4, 1	1, 4

Table 4'-1

	cooperating	not cooperating
cooperating	3, 3	1, 4
not cooperating	4, 1	4, 1

Table 4'-2

Suppose that the games in Table 4'-1 and in Table 4'-2 are repeated infinitely. Let the probability that either game is played at a stage be 1/2. In the same way as the above repeated game (Tables 3-1 and 3-2), we can show that the pair of trigger strategies is a Nash equilibrium and (cooperating, cooperating) can be realized in these games.

[12] This game has two Nash equilibria, but it has just one subgame perfect equilibrium (not giving back, not lending). The latter equilibrium is more refined than the former.

Proof.

Since the games are symmetrical for the two players, just considering the choice of player 1 is enough.

According to the general result, the pair of trigger strategies is a Nash equilibrium if and only if

$$\delta_1 \geq \frac{z_1 - x_1}{z_1 - x_1 + \left(\frac{x_1 + x_1'}{2} - \frac{w_1 + w_1'}{2}\right)}.$$

In this repeated game, it means

$$\delta_1 \geq \frac{4-3}{4-3+\left(\frac{3+3}{2} - \frac{1+4}{2}\right)} = \frac{1}{1+1/2} = \frac{2}{3}.$$

Therefore, under the condition that each player's discount factor is not less than 2/3, the pair of trigger strategies is a Nash equilibrium of this repeated game.

It is very plausible that the players' particular actions in the situation, say, lending the book and giving it back, are cooperative actions. This makes the game shown in Table 4 one stage of the repeated game in Tables 4'-1 and 4'-2. Therefore, (lending, giving back) in Table 4 can be seen as a part of a Nash equilibrium of this repeated game. Thus, it is justified that player 2 lends his book to player 1 and she gives it back to him, i.e. she keeps her promise. In short, keeping a promise is doing a cooperative action. Not doing it makes the other player pull the trigger. I think that this example is common enough for us to say that the scheme generally explains why people keep their promises.

Now, the remaining problem is why people make a promise. The above example suggests that it is because they need to persuade others to do something difficult to do in the short run. Actually, (lending, giving back) is not a Nash equilibrium of the one-shot game in Table 4. Arguably, promising, in such a circumstance, works as showing clearly the promisor's recognition of the promisee's action as a cooperative action in the long relationship between them. It places the actions the players are considering in the context of a repeated game.

This view will be supported by the following two facts. First, it also explains why just an intention-communicating is not as effective as a promise. An intention-communicating is telling what the speaker intends to do.[13] See the example below.

Example 2

1 "Would you lend me the book? I will give it back next Monday."

[13] Owens, 2006. "Communicating" seems to include stating, describing, saying, etc.

2 “Do you promise?”
1 “Yes. I promise.”
2 “OK. Here you are.”
1 “Thanks.”

The utterance “I will give it back next Monday” does not unequivocally mean a promise. It may be an intention-communicating. Asking “Do you promise?” is trying to make it clear which it is. Thus, it is reasonable to infer that player 2 would not decide to lend the book if player 1 did not promise to put it back. Why was not her intention enough for him?

The game-theoretic view can supply an answer. If player 1 does not promise but only tells her intention, it implies that she thinks that what she hopes player 2 to do is a part of a Nash equilibrium of the situation as one shot game. It follows from this that her evaluation of his having the book for *him* may be lower than player 2’s himself, that is, she may think that if she takes the book away he will not be troubled as much as he will actually be. If so, she will not behave as he expects rationally on the basis of his own evaluation of it. Therefore, a mere intention-communicating is not enough. Player 2 must confirm how much player 1 evaluates the utility value of that thing for *him*. Her saying that she will promise informs him of her good evaluation of it.

We now can see an important difference between promising and intention-communicating. It is the value of the hearer’s action to be done in exchange of the speaker’s action she promises or says she intends to do. If this value is high enough, then she should promise to do something for it. If it is not, she should not promise but just intention-communicate to do something for it. This difference comes from the fact that promising puts the exchange in some repeated game but intention-communicating in one-shot game.

Second, it also explains when and why a promise does not work well. See the example below.

Example 3
1 “Would you lend me one million dollars? I promise to give it back next Monday.”
2 “No way.”

Suppose that player 2 can afford to pay one million dollars if he collects all his money. But it is very natural that he hesitates to lend so much money even when player 2 promises to pay it back. This is a typical case that promising is not effective.

Why is not a promise effective in this case? An answer is given by the scheme of repeated game. Ordinarily, people do not give and take one million dollars. It means that they are not dealing with so much money in their repeated game. In other words, player 2 will not have adequately many chances to borrow one million dollars or more from player 1. It entails that, for her, the cost caused by his trigger strategy will be smaller than the profit of her taking away his one million dollars. Therefore, the promise to pay back one million dollars is easy to breach and does not have practical effect. Lending one million dollars or more is too much to be secured only by the long term relationships. This points the other limit of promising. If the value of the action for the promisee to do is too high, then the promisor should do something more than promising, such as giving a mortgage.

4 Conclusions

I have posed the two questions: why do people make a promise and why do they keep it? I have argued that it is because they try to maximize their profits and put their interactions in the context of a repeated game which has a new equilibrium.

In conclusion, I mention the role of a rule for promising. I know that many people think that it is a rule that you should keep your promise and that they actually keep their promises being conscious of the rule. I do not think it is completely false. In my view, the *rule* plays the role of heuristics or a guide to the best for you to do after you made a promise. Many elements of a real situation where you are interacting with others are often so obscure and complicated that you can not calculate a Nash equilibrium of the situation. In that case, it is very reasonable to decide to keep your promise following the rule, which is a kind of lesson learned from many people's experience. Possibly, it will reflect the general fact that cooperating with others is more valuable than you are inclined to feel. But this does not mean that it is an inviolable rule. It may be broken when trigger strategies are known not to be strong enough in the circumstance where a promise is made. For example, suppose that you promised to play golf with your friend today, but just when you were about to go, you found that your child was very sick. Clearly, you should break the rule, and take the child to the doctor. It is since taking care of your kid is more important than what your friend will do in revenge for your omitting playing golf with her or him.[14]

[14] Actually, people seem to be very flexible toward promise-breaking. At least, they hardly pull the trigger against only one or two violations. It will be because they know that the future is unpredictable and that individuals often must respond to unexpected accidents. I think that the social mechanism of mutually admitting promise-breaking can be analyzed from the strategic point of view.

Bibliography

D. Hume, 1978[1739-40] *A Treatise of Human Nature,* P. H. Nidditch ed., 2nd edition, Oxford University.

S. Kripke, 1983, *Wittgenstein on Rules and Private Language,* Blackwell.

H. W. Kuhn, 1997, *Classics in Game Theory,* Princeton University Press.

J. F. Nash, Jr., 1950, "Equilibrium Points in n-Person Games," *PNAS*, 36, 48-49. Reprinted in Kuhn, 1997, 3-4.

J. Nash, 1951, "Non-Cooperative Games," *Annals of Mathematics,* 54, 286-295. Reprinted in Kuhn, 1997, 14-26.

David Owens, "A Simple Theory of Promising," *Philosophical Review,* 115, 1, 51-77.

H. A. Prichard, 1949, "The Obligation to Keep a Promise." In his *Moral Obligation,* Clarendon Press, 169-179.

J. Searle, 1969, *Speech Acts,* Cambridge University Press.

J. Searle, 1995, *The Construction of Social Reality,* Free Press.

J. von Neumann and O. Morgenstern, 1953, *Theory of Games and Economic Behavior,* 3rd edition, Princeton University Press.

L. Wittgenstein, 1953, *Philosophical Investigations,* G. E. M. Anscombe tr., Blackwell.