Coase Bargaining[1]

A. The Problem

<u>Introduction</u>
In many situations that generate conflicts of interest, negotiations must take place between two or more parties. In some cases, it requires one of the parties to make a transfer or payment to the other, in order to obtain the socially desirable result. Depending on the payment or transfer and the rationality of each party, the resulting social outcome may be better or worse, and a distribution more or less equitable for each of the parties.

One particular application is the case in which two agents develop a relationship through an activity that generates beneficial economic outcomes for one of them at the cost of generating environmental impact for the other. In this scenario, depending on the gravity of the environmental impact, a reduction in economic activity might imply a social benefit for those in the affected environment, and at the same time an economic reduction for those that generate the impact and benefit from the contaminating/degrading activity. To what extent would the polluter be willing to reduce their activity to benefit the one that is receiving the contamination effects? Or seen from another perspective, how much environmental impact would the polluted person tolerate in order to avoid affecting the polluting economic activity of the other? Is it possible to think of agreements between the parties? And if this is possible, could economic transfer agreements or compensation be generated to achieve mutually beneficial results? It is worth clarifying that both in this example and in this financial year, situations of environmental damage that involve severe threats to human health are excluded given the degrees of uncertainty and irreversibility.

<u>Purpose of this Game</u>
It is a game in which two parties must negotiate the allocation of resources. The framework of the negotiation is one in which one of them can offer transfers or payments to the other to produce socially better results.

<u>Economic Model of Analysis</u>
The design of this economic model of negotiation is inspired especially by the seminal work of Ronald Coase (1960). The experimental design used here was taken from the work of Elizabeth Hoffman and Matthew L. Spitzer (1982) and adapted from the experimental design used by Professor James Murphy (Department of Resource Economics, University of Massachusetts Amherst).

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[1] Translated from Juan-Camilo Cardenas and Pablos Andres Ramos (2006) Manual de juegos economicos para el analisis del uso colectivo de los recursos naturales, Centro Internacional de la Papa
https://economia.uniandes.edu.co/files/profesores/juan_camilo_cardenas/docs/Archivos%20para%20descargar/MANUAL_JUEGOS_CARDENAS_RAMOS.pdf

In this model there are two players, A and B. One of them will act as "controller" and the other as "non-controller". Each one will try to maximize their profits; both will be subject to the possibility of establishing an agreement, the controller decides a level of activity that defines the distribution of profits for the parties. The non-controller may try to influence the controller to change their level of activity by offering a transfer of money or compensation.

The following table of points contains the basic principles of negotiation. The activity level (columns) of the winnings will be for each player A and B. If, for example, A is the controller, he/she will try to negotiate results that go to the right of the table, but B will have the possibility to offer a transfer of earnings in exchange for A choosing a lower level of activity.

Point Table	Activity Level						
	0	1	2	3	4	5	6
Earnings for Player A	$0	$4	$6	$8	$9	$10	$11
Earnings for Player B	$12	$10	$6	$4	$2	$1	$0

If an agreement is not reached, the controller will probably decide in his/her favor to the detriment of the other player. Another alternative is for the controller to accept a payment from the non-controller, so that he/she changes his/her level of activity in favor of the second player. Among the possible options, there is one that is socially efficient: when the level of activity is chosen equal to 1 and $ 14 of total earnings are produced. The challenge in the negotiation is that, to achieve this result, A, as controller, only gets $ 4 and the other player gets $ 10. There would be incentives for B to offer a transfer to A in exchange for choosing this level of activity.

The following table summarizes the different possibilities of agreement, whether the controller is player A or player B:

Controller	Disagreement			Nash Equilibrium			Pareto		
	Level of Activity	A Earns	B Earns	Level of Activity	A Earns	B Earns	Level of Activity	A Earns	B Earns
A	6	11	0	1	13	1	1	$A + $B = 14	
B	0	0	12	1	1	13	1	$A + $B = 14	

Note in this design that in the Nash equilibrium social gains are maximized but a socially unequal result is generated, in which the controller captures most of the rents ($ 13) and leaves the other player with only $ 1.

B. Set-Up of the Game or Experiment

Sample Size (suggested minimum)

It is suggested that at least 10 pairs (20 players) participate with the same design, in order to generate representative data. Logically, a greater number of pairs improves the statistical representation to test the aforementioned hypotheses.

Session Design (N players, T Rounds)

The game can be applied from one round onwards, according to the availability of time and the need or interest in analyzing the repetition of the exercise with fixed pairs or randomly assigned couples.

Type of Participants

All types of people may participate in this game.

Estimating the Payment Incentives for Players

Depending on the income levels of the participants - and as in the other games - we will try to compensate them for the time they spent participating in the experiment. The values in the table can be symbolic, but they must have a real allocation to a monetary unit that generates the necessary incentives for negotiation between the players.

C. Tools and Logistis

Location for the Game

The experiment should be carried out in a room where the instructions can be read to the entire group of participants. Each person will have a chair and everyone will be able to move freely in the room.

Field Team (roles)

For this game, a moderator is needed to explain the instructions of the exercise as well as an assistant who collects the decision forms/cards of the players.

The Role of the Moderator: To introduce the group, explain the intentions of the game and as well as the instructions

The Role of the Assistant: Help the moderator in distributing materials to players, collecting materials from players, and watching the time.

D. Necessary Formats/Materials for the Game Session

For Explaining the Game Instructions

Once the participants know the intentions of the study, they should be informed about the dynamics of the exercise and it should be made sure that they understand it. For this reason, it is important to have an enlarged sample of the tables and materials that they will be given later on; in this extended sample the moderator will be able to write examples, so that the players are familiarized with the formats and the explanation is more useful. The following two tables below should be enlarged and the also each player should receive a copy on a smaller sheet of paper for their use during the game.

Point Table for the Players:

Point Table	Activity Level						
	0	1	2	3	4	5	6
Earnings for Player A	$0	$4	$6	$8	$9	$10	$11
Earnings for Player B	$12	$10	$6	$4	$2	$1	$0

Accounting Sheet:

Name:					Player Code Number:				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					According to the table		Transfer of Payments		
Round	Paired with Player Number:	Am I player A or B?	Who is the controller? (me or the other?)	Activity Level	My Earnings	Earnings of the Other	I pay? I receive?	How much?	My net Earnings
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
					Total Earnings				

Instructions for Introducing and Explaining the Game

For the Moderator

Introduction: Thank you for being here. [Greeting and presentation of the group in charge. If necessary, talk about the general objective of the research and the funding agency, the general project, the working time, the relevance of the study, etc.].

The following exercise is a different and entertaining way to participate actively in a study about people's economic decisions. Depending on the decisions you make today, you can earn a certain amount of money or prizes; that is why it is important that you pay close attention to these instructions.

You may wonder why money is used in these exercises. Money is used because the exercise requires people to make economic decisions; that is to say, they are decisions with consequences for the pocket, as happens in reality. At no time is money expected to be a payment for participating in the study, nor is it the sole reason for your presence here.

Explanation of the game: In each round, you will be assigned as to another person in this room and that person will be your partner. You will play with that person only once during the experiment. As there will be 10 rounds, you will deal with 10 different people.

At the beginning of each round, the monitor will announce the pairs and you will need to find the other person. Once you have found them, write your player code on your account sheet.

You and the partner assigned to you will participate in a joint decision. First, you all must determine who will be player A and who will be player B, and to do this you will throw a coin. The designation of A and B will determine which of the points table is for you in this round. The table of points is as follows [show the group the expanded point table and explain it].

Next, you must decide who the controller will be. Again throw the coin and in the column (4) write who is the controller.

You must now decide the level of economic activity. The person designated as the controller can, if desired, choose the number itself. In that case, the two persons should write the level of the activity in column (5) of their tally sheet [read the instructions pointing to the enlarged sample of the tally sheet], and then use the table of points to write the earnings of each person in columns (6) and (7), as the case may be.

The person who is not the controller may try to influence the controller so that they reach an agreement acceptable to both; this person can offer to pay part or all of their profits to the controller.

If they reach a joint agreement on a transfer of payments, in columns (8) and (9) each one will write which is the agreed transfer amount. In column (8), you must indicate if you are the one who pays or who receives a transfer, and in column (9) you must enter the amount. If there is no agreement on a transfer, write 0 in column (9). Record your net earnings in column (10). The net earnings are the sum of columns (6) and (9) in the case that it is the controller (the one that receives), and the subtraction of columns (6) and (9) in the case that be you are the one who pays, the non-controller. After all the groups have completed their decisions, the round is over. You will then repeat the process with a different person.

EXAMPLE

[All the steps in this example should be written on the extended/enlarged sample of the account sheet with the enlarged table of points to serve as reference; the examples can be designed by the moderator].

Suppose you are player number 2, and in the first round your partner will be player number 12 [mark it in column 1 of the extended account sheet]. When you find the player number, you must make the first "draw" with the coin; at that moment, you will determine who is player A and who is player B. Let's suppose that you (player 2) are player A [mark it in column 3 of the extended account sheet], so your possible points will be (0, 4, 6, 8, 9, 10, 11, depending on the negotiation) [indicate to the points table].

 Now you will determine who the controller will be; throw the coin again. Suppose that the controller for this round will be player number 12, so we mark in column (4), 'other.'

At this time, the level of economic activity must be decided. You have the opportunity to negotiate, but the player number 12 decides that the level of activity is 1 and is not willing to negotiate, so you both write down that decision in column (5) of the account sheet. In column (6) record the gain for player 2 (4 points) and in column (7) the gains for the other (10 points) [do this in the extended account sheet].

In this example there was no negotiation, so we write 0 in columns (8) and (9) [this is written on the extended account sheet].

Last, player 2 must mark his/her net earnings in column (10), (4 points).

The account sheet for player 2 in this example should look like this:

Name:					Player Code Number:				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					According to the table		Transfer of Payments		
Round	Paired with Player Number:	Am I player A or B?	Who is the controller? (me or the other?)	Activity Level	My Earnings	Earnings of the Other	I pay? I receive?	How much?	My net Earnings
1	12	A	Other	1	4	10	0	0	4
2									
3									
4									

After all of the group have completed their decisions, the round is finished. You will repeat the process with a different person.

The assigned pairs might be like this:

Player	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
1	11	20	19	18	17	16	15	14	13	12
2	12	11	20	19	18	17	16	15	14	13
3	13	12	11	20	19	18	17	16	15	14
4	14	13	12	11	20	19	18	17	16	15
5	15	14	13	12	11	20	19	18	17	16
6	16	15	14	13	12	11	20	19	18	17
7	17	16	15	14	13	12	11	20	19	18
8	18	17	16	15	14	13	12	11	20	19
9	19	18	17	16	15	14	13	12	11	20
10	20	19	18	17	16	15	14	13	12	11

Informed Consent
It is necessary that you, as participants, review the acceptance or informed consent form. In this sheet, we assure you that we will handle all the information collected in the exercises in a detailed manner; In addition, we point out that participating in these exercises does not present any risk. Your signature means that you are accepting to participate in the project and the exercises that will be carried out [read the informed consent to the whole group, aloud].

 If you agree to participate, please fill in your acceptance form, and do not forget to write your player number on it.

Materials For the Assistant

Player Decision Registration Recording Sheet:

Coase Bargaining Game

Date:___/___/___   **Place:**_____   **Monitor/Assistant:**_____

Round	Partner	Controller	Activity Level	Payments	How much?	Controller Earnings	Earnings of the Other
1							
2							
3							

4							
5							

E. Digitally Capturing the Data

In this example, we will use the data from two rounds (the following data tables are in Spanish but the English reference is the table above)

JUEGO DE NEGOCIACIÓN DE COASE

Fecha: 19 / 10 / 2004 Lugar: Cuenca   Monitor: Juan Camilo

Ronda	Pareja	Control	Nivel de actividad	Pagos	Cuánto	Ganancia control.	Ganancia otro
1	1-11	11	2	No	0	6	6
	2-12	2	2	No	0	6	6
	3-13	3	3	No	0	8	4
	4-14	14	4	Si	2	7	4
	5-15	5	2	No	0	6	6
	6-16	16	2	No	0	6	6
	7-17	17	0	Si	6	6	6
	8-18	8	2	No	0	6	6
	9-19	19	2	No	0	6	6
	10-20	20	1	Si	3	7	7
2	1-20	1	2	No	0	6	6
	2-11	2	2	No	0	6	6
	3-12	12	1	Si	3	7	7
	4-13	13	2	No	0	6	6
	5-4	5	1	Si	3	7	7
	6-15	15	1	Si	3	7	7
	7-16	16	1	Si	3	7	7
	8-17	8	1	Si	3	7	7
	9-18	9	1	Si	3	7	7
	10-19	10	1	Si	3	7	7

Simply transfer the handwritten data into an excel spreadsheet:

Ronda	Pareja	Jugadores pareja	Controlador	Nivel actividad	Pagos	Cuánto	Ganancias control	Ganancias otro.
1	1	1 - 11	11	2	no	0	6	6
1	2	2 - 12	2	2	no	0	6	6
1	3	3 - 13	3	3	no	0	8	4
1	4	4 - 14	14	4	sí	2	7	4
1	5	5 - 15	5	2	no	0	6	6
1	6	6 - 16	16	2	no	0	6	6
1	7	7 - 17	17	0	sí	6	6	6
1	8	8 - 18	8	2	no	0	6	6
1	9	9 - 19	19	2	no	0	6	6
1	10	10 - 20	20	1	sí	3	7	7
2	1	1 - 20	1	2	no	0	6	6
2	2	2 - 11	2	2	no	0	6	6
2	3	3 - 12	12	1	sí	3	7	7
2	4	4 - 13	13	2	no	0	6	6
2	5	5 - 14	5	1	sí	3	7	7
2	6	6 - 15	15	1	sí	3	7	7
2	7	7 - 16	16	1	sí	3	7	7
2	8	8 - 17	8	1	sí	3	7	7
2	9	9 - 18	9	1	sí	3	7	7
2	10	10 - 19	10	1	sí	3	7	7

F. Presenting the Results

The results of this game can be presented in reference to the general features of the decisions of the participants, that is, the best option is to present the theoretical basis developed at the beginning of this chapter and find out, by a discussion led through prompting players with various questions, the reasoning behind the behavior of some of the players. Each person is free to talk about the decisions they made and the way in which they came to establish agreements with their peers.

In accordance with and following the presentation of the social optimums of this exercise compared to the features of the decisions of the players, discussions can be led about the coordination and the social forms of agreements made to solve the problem (what was done, what could have been done, etc). For the analysis of the social dynamics of negotiation, you can use instructions from the third game in this manual.

G. Materials to Photocopy

-Accounting sheets for each of the participants
-Point tables for each of the participants
-Decision registration sheet for the assistant

Accounting Sheet:

Name:					Player Code Number:				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					According to the table		Transfer of Payments		
Round	Paired with Player Number:	Am I player A or B?	Who is the controller? (me or the other?)	Activity Level	My Earnings	Earnings of the Other	I pay? I receive?	How much?	My net Earnings
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
					Total Earnings				

Point Table	Activity Level						
	0	1	2	3	4	5	6
Earnings for Player A	$0	$4	$6	$8	$9	$10	$11
Earnings for Player B	$12	$10	$6	$4	$2	$1	$0

Point Table	Activity Level						
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Earnings for Player A	$0	$4	$6	$8	$9	$10	$11
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Player Decision Registration Recording Sheet:

Coase Bargaining Game

Date:___/___/___   **Place:**_____   **Monitor/Assistant:**_____

Round	Partner	Controller	Activity Level	Payments	How much?	Controller Earnings	Earnings of the Other
1							
2							
3							
4							

5						
6						
7						
8						

9						
10						

References

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Hoffman, Elizabeth and Matthew L. Spitzer. 1982 "The Coase Theorem: Some Experimental Tests". *Journal of Law and Economics*, n. 25, pp. 73-98.