

PRINCIPLES OF BEHAVIORAL ECONOMICS

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Lecture 57

Hello everyone, this is the course on Principles of Behavioral Economics. We are discussing strategic interactions. Under that, we first discussed analytical games, followed by a discussion on the problems of analytical games in terms of how valid they are empirically. And now we are going to talk about behavioral games. But I must tell you that there is no separate category of games that can be called behavioral games. Rather, behavioral games incorporate behavioral understanding or perspectives into the analytical games. As we have already discussed, experimentation shows us that the conclusions of the analytical game-theoretic approach may not always be valid. So that is where the relevance of behavioral games comes in. We devote the last four modules of strategic interactions to the discussion of behavioral games. Here, I begin with an introduction to behavioral games.

As we know, game theory is a way of understanding how people interact based on the constraints that limit their actions, their motives, and their beliefs about what others will do. Experiments and other evidence show that self-interest, a concern for others, and a preference for fairness are all important motives that explain how people interact. This is where the importance of behavioral components comes in. That is when we are driven by concern for others, preference for fairness, and similar factors. So not always driven solely by self-interest.

The outcomes may be different when people are driven by different motives. Behavioral game theory examines the degree to which analytical game theory succeeds in capturing the behavior of real people engaged in strategic interactions. And proposes extensions of analytical game theory to better capture that behavior. So, as you can understand, this is just an extension of the analytical game-theoretic approach. Some of the proposed extensions to analytical game theory do not, in fact, constitute deviations from neoclassical orthodoxy.

Thus, there is nothing distinctively behavioral about some of the models discussed under behavioral game theory. Other models, however, constitute real deviations from neoclassical orthodoxy and, as such, deserve to be called behavioral. Strategic interactions have important implications at levels from micro to global macro—that is, at various levels. For example, the problem of climate change is far from unique. It is an example of what is called a social dilemma.

So, we are now bringing in behavioral dimensions. Social dilemmas occur when people do not take adequate account of the effects of their decisions on others, whether these are positive or negative. Many nations in the developed world are pressing for strict global controls on carbon emissions, while others, whose economic catch-up has until recently been dependent on coal-burning technologies, have resisted these measures. Traffic jams happen when our choice of a way to get around—for example, driving alone to work rather than carpooling—

Does not take into account the contributions to congestion that we make, so we are calling this a social dilemma because, as you understand, there is a dilemma in deciding which one to go for. Both have certain contributions, maybe to personal well-being or to a greater social well-being, for example, as we talk about in this context. If I decide to drive alone to work, then that gives me a lot of freedom and the comfort of having my own vehicle, driving my own vehicle to work, so I have a lot of discretion and comfort as well. But a carpool may not give me that much discretion, freedom, and comfort, though it has certain positive aspects in the sense that a carpool reduces carbon emissions. So many people are getting into one car instead of driving their cars individually to the workplace.

So there lies the dilemma: whether I should think about society at large or only about my own benefit. So that's why this is called a social dilemma. Similarly, overusing antibiotics for minor illnesses may help the sick person who takes them recover more quickly, but it creates antibiotic-resistant bacteria that have a much more harmful effect on many others. A social dilemma is defined as a situation in which actions taken independently by individuals in pursuit of their own private objectives result in an outcome

that is inferior to some other feasible outcome that could have occurred if people had acted together rather than as individuals. So basically, when people act together—like they have concern for others and are concerned about society at large—then this results in some outcome that is superior to the outcomes when people only think about themselves. In this context, an idea was popularized in 1969 by Garrett Hardin, called 'The Tragedy of the

Commons'. Garrett Hardin, a biologist, published an article about social dilemmas in the journal *Science*, titled 'The Tragedy of the Commons'.

He argued that resources that are not owned by anyone, sometimes called common property or common pool resources, such as the Earth's atmosphere or fish stocks, are easily overexploited unless we control access in some way. Fishermen as a group would be better off not catching as much tuna, and consumers as a whole would be better off not eating too much of it. Humanity would be better off by emitting fewer pollutants, but if you as an individual decide to cut your consumption, your carbon footprint or the number of tuna you catch will hardly affect the global levels.

So at an individual level, maybe it does not have much impact, but collectively it tends to have a lot of impact. So that is why it is called the tragedy of the commons. Examples of Hardin's tragedies and other social dilemmas are all around us. If you live with roommates or in a family, you know just how difficult it is to keep a clean kitchen or bathroom. When one person cleans, everyone benefits.

But it is hard work. Whoever cleans up bears the cost. The others are sometimes called free riders. So in the context of the tragedy of the commons, there is another concept called free riders. Basically, those who ride on others free of cost or, as the example tells you,

That someone is cleaning or doing the cleaning business, others are enjoying it. If, as a student, you have ever done a group assignment, you understand the cost of effort. That is, to study the problem, gather evidence, or write up the results is individual, yet the benefits—a better grade, higher class standing, or simply the admiration of classmates—go to the whole group. So in a group, not everybody would be putting in an equal amount of effort, but then everybody gets equal grades, marks, or appreciation. So again, this is some people—this is an example of some people free-riding on others.

So there is nothing new about social dilemmas. We have been facing them since prehistory. More than 2,500 years ago, the Greek storyteller Aesop wrote about a social dilemma in his fable, "Belling the Cat." We all are familiar with this story: a group of mice needed one of its members to place a bell around a cat's neck. Once the bell is on, the cat cannot catch and eat the other mice.

But the outcome may not be so good for the mouse that takes the job. So who is going to bell the cat? Because the person or the mouse that is going to bell the cat is going to die for

sure. And it's quite possible that he or she will not even be successful. The mouse will not be successful.

So, there could be a few lives that would be lost. But then, that is going to result in the saving of other lives. There are countless examples during wars or natural catastrophes in which individuals sacrifice their lives for others who are not family members and may even be total strangers. So now we are talking about another behavioral concept, which is known as altruism. So, who is going to bell the cat?

The mouse that agrees to bell the cat is the one who is ready to sacrifice its life. We call them altruistic individuals. These actions are altruistic. Altruism is defined as the willingness to bear a cost in order to benefit somebody else or maybe a group of people, the larger society. Altruistic self-sacrifice is not the most important way that societies resolve social dilemmas and reduce free-riding.

Sometimes, the problems can be resolved by government policies as well. So, altruism is one possible way through which social dilemmas can be resolved. Some people need to sacrifice more than others. But then, We can also go for government policies, the imposition of certain rules and regulations, and restrictions that can help resolve social dilemmas.

For example, governments have successfully imposed quotas to prevent the overexploitation of cod stocks in the North Atlantic. In the UK, the amount of waste dumped in landfills rather than being recycled has been dramatically reduced by a landfill tax. Local communities also create institutions to regulate behavior. Irrigation communities need people to work to maintain the canals that benefit the whole community. Individuals also need to use scarce water sparingly so that other crops will flourish, although this will lead to smaller crops for themselves.

In Valencia, Spain, communities of farmers have used a set of customary rules for centuries to regulate communal tasks and to avoid using too much water. So as you can see, there are a large number of examples where there are either community-developed rules imposed on the community, and the members follow them, understanding that they are beneficial for the larger society, or the government may introduce certain taxes and regulations, that need to be followed, again resulting in the betterment of the larger community.

Even present-day global environmental problems have sometimes been tackled effectively. The Montreal Protocol has been remarkably successful. It was created to phase out and

eventually ban chlorofluorocarbons, or CFCs, which threaten to destroy the ozone layer that protects us from harmful ultraviolet radiation. Game theory tools are used to model social interactions in which individuals' decisions affect others as well as themselves. When people care not only about themselves but also about others, we say those individuals have social preferences.

Social preferences are preferences that place a value on what happens to other people and on acting morally, even if it results in lower payoffs for the individuals. Suppose there are n players in a game, and the game has an extensive-form representation. At any end node, player i (i can take any value, so there are n players, meaning i equals 1 to n) has a direct utility of u_i . So basically, we are talking about various behavioral dimensions. We talked about how social dilemmas can be resolved through altruistic behavior or through the imposition of rules and regulations.

When people tend to follow those rules and regulations, we may say that they have some social preferences. That is, preferences for society might be put ahead of individual preferences. I may not like to go to work in a carpool, but then social preferences ask me to go for a carpool, so now I'm setting aside my individual preference and following the rule of social preferences, or I'm more driven by social preferences. So that's the idea of social preference. Now we are trying to model social preferences, and in that context, let us consider a game

where there are n individuals or n players playing the game, and from each and every action, an individual gets a direct utility of u_i . Each player has a type that is characterized by some altruism coefficient. Now, note that a_i refers to the altruism coefficient of individual i . So, if I am somehow using the term a_j , then that refers to the altruism coefficient of another individual j . So, a_i basically refers to the altruism coefficient. We say that the individual is spiteful if a_i is less than 0 you can see that a_i belongs to the range minus 1 to 1 open ended and which means a_i can take negative values also

so if a_i is taking negative value then we say that the individual is spiteful I am going to talk about spiteful behavior a little later. Now for the time being we will define self regarding is a_i equals to 0 so basically I am not bothered about others. I am neither spiteful nor altruistic. So a_i is equals to 0 and I will be altruistic if a_i is greater than 0 which means I am getting some benefit when others utility also increases or others are better off. A higher value of a_i greater than 0 denotes a more altruistic player.

The altruism adjusted or composite utility of player i is given as so we are calling it v_i the composite utility or altruism adjusted utility so here first of all u_i is the direct utility I am getting from any action for example when I am going to the workplace using carpool so whatever utility I am getting from there that could be lower than my individual car driven to the workplace, but nevertheless some utility is there. I do not need to walk to the workplace, right.

So, the car could be good enough, quite comfortable, though may not be as comfortable as my individual vehicle. Now, whatever utility I am getting, that is denoted by u_i and then this is one component, where λ takes a value between 0 and 1. both included. So, this component is basically the altruism adjusted component. Now, what are the values it take?

$$\underline{v_i} = \check{u_i} + \sum_{j \neq i} \frac{a_i + \lambda a_j}{1 + \lambda} u_j$$

What does it imply? I have reproduced that expression here. The specification was given by Levine in 1998. In the special case of λ equals 0, when λ takes a value equal to 0, you can see in the denominator I have just 1, and in the numerator I have a_i . So, v_i becomes u_i plus a_i into u_j , right?

So, depending on the sign of a_i , we have a model of pure altruism or pure spite. When a_i equals 0 and λ equals 0 for all i , then we get the self-regarding case where the composite utility and individual utility from a particular act are basically the same. So, again, this is a self-regarding case. I am not bothered about other individuals altogether. Preferences are altruistic if one's utility is increasing in the consumption or well-being of others, and it is spiteful if one's utility is decreasing in the consumption or well-being of others.

So, basically, when a_i takes a negative value, then of course what value this will take also depends on the value of a_j and λ . So, here one needs to note that a_j belongs to the altruistic preferences of other individuals. Now, I could be altruistic, but the other individuals could be spiteful. If other individuals are also altruistic, then of course, these keep on increasing.

But if some other individuals are spiteful, some are altruistic, then some of the a_j 's would be negative, and some would be positive. They may cancel out depending on how large or small the values are. Altruism is unconditional kindness, while spite is unconditional unkindness, irrespective of the behavior of other players. Spiteful behavior can be viewed as the flip side of altruistic behavior. This is the behavior that imposes a cost on others while also involving a cost to the originator of the behavior, with no corresponding material benefit.

For example, punishing those who throw litter out of their car by yelling at them could be a spiteful behavior. Now, spiteful behavior is not necessarily bad for society. You have a concern for society, and that's why you are yelling at individuals who are throwing litter out of their car. So, in the above example, it may help to enforce valued social norms.

Both altruistic behavior and spiteful behavior confer benefits to the originator that are non-material or psychological. So basically, if altruistic behavior—for example, charity—is altruism. So when you do charity, of course, there is a cost to you, some monetary cost, but then you are getting some benefit out of it. And that benefit must be outweighing your cost. That's why you are doing the charity.

So there are certain positive psychological, non-material benefits. Similarly, in the case of spiteful behavior, in this example where somebody is shouting at other individuals who are throwing litter out of their car, they are also imposing a cost on themselves by yelling at them. So anger, frustration, and the effort to yell at others are all costs to the individual who is yelling. But you are doing this because you are getting some benefit, some satisfaction out of it—the satisfaction of punishing those individuals, right?

So here, this is an example which, despite being spiteful behavior, is beneficial for society. It is quite possible that spiteful behaviors are sometimes not beneficial for society. But in both cases, when somebody is doing it, then it implies that he or she is getting some non-material or psychological satisfaction or benefit out of that act. Examples of altruistic behavior include tipping waiters, giving to charity, voluntary unpaid work, monopolies not raising prices when there are shortages,

contributing to the provision of public goods, and punishing free riders even when there is a cost in doing so. Now we will talk about behavioral games. We begin with the ultimatum game, the most popular behavioral game. In 1982, Guth, Schmittberger, and Schwarze reported the kind of empirical finding that surprised only economists. They studied an ultimatum game in which one player, the proposer, makes a take-it-or-leave-it offer,

dividing some amount of money—say, 10 rupees or 10 dollars—between herself and another person.

So the format of the game is that there is one proposer who makes a proposal of dividing or splitting a certain amount of money. If the second person, we call them the responder, accepts the division, then both people earn the specified amounts. If the responder rejects it then both of them get nothing. In analytical game theory the proposer will propose the smallest amount possible say 0.1 or 0.25 and the responder will accept it because it is a positive amount, and anything positive is actually better than nothing. By rejecting, the responder is not going to get anything, so the proposer then the responder should accept any amount because any amount is better than getting nothing.

This is what economists understand, and this is the outcome of analytical game theory. So all is driven by self-interest, and it will be the sub-game perfect Nash equilibrium. By going first, the proposer has all the bargaining power and, in theory, can exploit it because a self-interested responder will take whatever she can get. If proposers maximize and expect responders to maximize, they should offer the smallest amount. So this is the format of the ultimatum game.

Here is the first player, the proposer. He can make offers like 0, 1, 2, 3, 4, and we can actually make a thousand smaller divisions of it. So 0.1, 0.2, and so on. These are the broad divisions up to a maximum of 10 that can be offered. Then, in the next move, there comes player 2, who is the responder.

The responder may accept or 0. So if say a proposal is made of 4 and 6 so player 1 gets 6 player 2 gets 4 if the responder accepts it this is the split. If the responder rejects it then both of them get 0. To many people, the lopsided distribution of the 10 rupees predicted by analytical game theory with self interest seems unfair because the allocation is considered unfair the way people actually bargain shows whether people are willing to take costly actions that express their concerns for fairness.

In dozens of experiments conducted in several different countries, proposers offer \$4 or \$5 out of \$10 on average, and offers do not vary much. Offers of \$2 or less are rejected about half the time. The responders think much less than half is unfair and are willing to reject such small offers to punish the proposer who behaved so unfairly. So here you see that the idea is to punish the proposer. Data from a study by Hoffman, McCabe and Smith in 1996 showed that most offers are close to half, and low offers are often rejected.

The same pattern of results occurs when stakes were multiplied by 10, and Arizona students bargained over \$100. So here is one result of one study where two different stakes are shown. So the left columns are of a \$10 pie, and the right columns are of a \$100 pie. The black portions are basically the amount of rejection. The white portions are the amount of acceptance.

These are different proportions of pie offered for both \$10 and \$100. And as you can see, as the amount of pie offered increases, the acceptance rate actually increases. Here, the acceptance rate is much smaller. The same basic result has been replicated with a \$400 stake in Florida and in countries with low disposable income, including Indonesia and Slovenia, where modest stakes by American standards represent several weeks' wages.

In experiments, proposers offer an average of 40% of the money; many offer half, and responders reject small offers of 20% or so half the time. The data falsified the assumption that players maximize their own payoffs, as clearly as experimental data can. Since the equilibria are so simple to compute, the responder's move is just a choice of a payoff allocation, the ultimatum game is a crisp way to measure social preferences rather than a deep test of strategic thinking.

There are many interpretations of what causes responders to reject substantial sums. There is little doubt that some players define a fair split of \$10 as close to half and have a preference for being treated fairly. Such rejections are evidence of negative reciprocity, another behavioral dimension. Responders reciprocate unfair behavior by harming the person who treated them unfairly at a substantial cost to themselves, provided the unfair proposer is harmed more than they are.

Reciprocity can be defined as a preference to be kind or to help others who are kind and helpful. And to withhold help and kindness from people who are not helpful or kind. Fairness can be defined as a way to evaluate an allocation based on one's conception of justice. This explanation for ultimatum rejections raises the question of where fairness preferences came from. A popular line of argument is that human experience in our ancestral past created

evolutionary adaptations in brain mechanisms or in the interaction of cognitive and emotional systems, which cause people to get angry when they are pushed around because getting angry had survival value when people interacted with the same individuals in a small group. A different line of argument is that cultures create different standards of fairness, perhaps owing to the closeness of kin relations or the degree of anonymous market

exchange with strangers compared to sharing among relatives. And these cultural standards are transmitted socially through oral traditions and the socialization of children.

Remarkable evidence for the cultural standards view comes from a study by 11 anthropologists who conducted ultimatum games in primitive cultures in Africa, the Amazon, Papua New Guinea, Indonesia, and Mongolia. In some of these cultures, people did not think that sharing fairly was necessary. Proposals in these cultures offered very little—the equivalent of \$1.50 out of \$10. And responders accepted virtually every offer.

Ironically, these simple societies are the only known populations that behave exactly as game theory predicts. Whatever is being offered is being accepted. Ultimatum game experiments with two players suggest how people may choose to share the rent arising from an economic interaction. So now we are bringing in the concept of competition in the ultimatum game. But the outcome of a negotiation may be different if it is affected by competition.

Imagine a new version of the ultimatum game in which a proposer offers a two-way split of \$100 to two responders instead of just one. If either of the responders accepts but not the other, that responder and the proposer get the split, and the other responder gets nothing. If no one accepts, no one gets anything, including the proposer. If both responders accept, one is chosen at random to receive the split. The figure below shows some laboratory evidence of a large group of subjects playing multiple rounds of this kind of ultimatum game.

So we have here also: these are the one-responder case, and these are the two-responder cases—the blue bars. Now you can see that in the case of two responders, the fraction of the pie or fraction of offers rejected is always lower. In the case of zero or the fraction of the pie offered by the proposer to the responder when it is zero percent, then in case of one responder there is hundred percent rejection but in case of two responders only 75 percent rejection. 25 percent accepts even zero offer. In a similar fashion all the blue bars up to 35 percent offer are lower than the red bars. When it is 40 percent, then the blue and red bars are of equal size.

In the sense the percent of or the fraction of offers rejected is the same. In case it is 45 percent blue bars are actually higher so competition leads to acceptance of lower offers, more rejections are less and proposers also tend to offer lower amounts more frequently as compared to the case of one proposer one responder. When there is competition responders are less likely to reject low offers Their behavior is more similar to what we would expect

of self-interested individuals concerned mostly about their own monetary payoffs. Unlike the situation in which there is a sole responder, the responder in a competitive situation cannot be sure the proposer will be punished

because the other responder may accept the lower offer, and as a result, overall rejection rates decrease. Consequently, even fair-minded people will accept low offers to avoid having the worst of both worlds. Of course, the proposers also know this, so they will make lower offers, which responders still accept. So with this, I conclude this module on the introduction of behavioral game theory. We also talked about the ultimatum game. In the next module, we will continue with further discussions on different variants of we call them dictator games and broadly the basic results related to both types of games.

These are the references used. Thank you.