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ADAM SMITH AND THE PRISONERS' DILEMMA

GORDON TULLOCK

In ordinary life we engage in many transactions with other people in which there is potential profit for both parties from some kind of cheating. Normally, we do not see much of this cheating. I have no doubt that the merchant will put in the package the merchandise which I buy, or which I ordered, even though if he put in something else cheaper it is quite dubious that I would be able to win a lawsuit. On my part, if I decide I did not like the product and returned it with the remark that it was defective, having first damaged it so that it is indeed defective, I could get a gain. Neither I nor the merchant worries particularly about this kind of behavior, although the merchant worries more than I do for reasons that will become plain below. If we worried about it, we would both take precautions, with the result that socially we would be worse off by the cost of these precautions. We have here what appears to be a prisoners' dilemma matrix, but the two parties are behaving cooperatively.

What Adam Smith called "the discipline of continuous dealings" takes care of the matter. The point of this article is to work out Adam Smith's insight in the terminology of a modern game theory. We shall see that Smith was right, and there are some cases, indeed practically very important cases, where what appears to be a prisoners' dilemma in fact leads to cooperative behavior.

Consider the prisoners' dilemma game shown in Figure I. It is orthodox that if *A* and *B* are playing a single turn of this particular game, they will end up in the lower right-hand corner with a net loss of one dollar each. If we go from a single game to a long series of games played by the same players, however, there is no agreed-upon solution.¹ Experimental evidence seems to indicate that the players play a mixed strategy with some cooperative plays and some noncooperative plays, and the mixture can be modified by changing the payoffs.² All of these situations are simplifications of the real world, and it is a point of this article to suggest that if we make the game more like many real world

1. The author of this article is one of the people who has attempted to solve the problem. See Overcast and Tullock [1971].

2. *The Journal of Conflict Resolution* has run an immense number of articles with varying payoffs.

		A	
		Cooperate	Defect
B	Cooperate	1	2
	Defect	-2	-1
	Defect	2	-2

FIGURE I

games, then there will be a very high tendency for play to concentrate in the upper left-hand corner.

If we compare a prisoners' dilemma game and an ordinary competitive market, there is an immediate, obvious difference. The partners in the prisoners' dilemma game are pre-selected and cannot change. The partners in the competitive market select their opposite numbers.³

To illustrate, let us follow the physicists and perform a thought experiment. Suppose that we have a large room and along one wall a series of isolation booths. There are about 30 experimental subjects in the room. They are free to communicate with each other in any way they want, and if they wish to make side payments, they are also free to do that, but it does not seem likely that they will. It is, however, possible for any two of them who wish to play the game shown in Figure I. They simply go into two adjacent isolation booths and make their strategy choices on a game matrix on a computer terminal. They are immediately paid the amount that they win or charged the amount that they lose. They are free, of course, to communicate the outcome of the game to anyone else they wish, and they are free to play more games if they wish or to change partners. All that is required is that the people who play the games do so in voluntarily chosen pairs.

I take it that all of my readers will agree that under these

3. Robert Rosenthal and Henry J. Landau have looked into the situation in which prisoners' dilemma games are played by pairs of people who are changed randomly but who know the reputation for the previous players. This mathematically fascinating situation turns out to have a reasonably well specified equilibrium. See Rosenthal [1979] and Rosenthal and Landau [1979].

circumstances all plays would be in the upper left-hand corner except possibly by mistake or possibly in the "end game" if the time at which the experiment was to be ended was announced in advance. In the real world; of course, the game or, to be more precise, the series of games never ends, although individual players are removed by death, etc. If some individual player did for some reason, possibly mental pathology, make a mistake and play a noncooperative strategy, he would find it very difficult to get people to play with him in the future. Almost certainly, he would have to offer some side-payments until he had established something in the way of a reputation.

We can complicate the game yet further by, for example, assuming that the experimenters charge a small fee for playing the game. This fee could be high enough so that the two parties only made a modest profit if they played the cooperative strategy, but the person who double-crosses his cooperative partner would do quite well—for example, a 50 cent fee or even a 75 cent fee.

This is one type of ownership price; another type would be to assume that some of the people in our room are landlords and some peasants. The landlords each own the right to one pair of isolation booths and the games played there. The peasants own only themselves. Assuming that the peasants are numerous, we would presumably reach an equilibrium solution in which the peasants received only the value of their services. If the peasants were less numerous than the landlords, there would be nothing to prevent landlords from playing with each other, so the peasants' bargaining situation would not be perfect, but nevertheless, they should be able to do well.

Games are not necessarily two-party. Figure II represents the payoff to one player in a five-sided prisoner dilemma game. He has the choices represented by the columns of either cooperating or defecting, and the rows show the payoff to him, granted that the other four players cooperated or defected in the numbers shown. It will be seen that the defect column always dominates the cooperating column, but if we repeat our experiment, i.e., permit people voluntarily to make up little groups of five in which each individual is free to enter or leave as he wishes and permit public communication so that the reputation of the individual is well-known, all of them would play the cooperative strategy, and the payoff to each would be nine in each game played. Anyone who chose to defect in any given game would, in essence, put

		Cooperate	Defect
4	Cooperate	9	10
3	Cooperate 1 Defect	7	8
2	Cooperate 2 Defect	5	6
1	Cooperate 3 Defect	3	4
0	Cooperate 4 Defect	1	2

FIGURE II

himself in a situation where it would be extremely difficult for him to get partners for any future game.⁴

In all of these cases, the prisoners' dilemma vanishes because the individual players have a strong desire to establish credibility so that they can play in future games. The basic reason is simply that people voluntarily choose their own partners. As far as I know, this aspect of the prisoners' dilemma has never been discussed before. It has pretty clearly, however, been in at least the subconscious mind of almost everybody who has written in this field. All of the previous articles that I have seen are situations in which the individual does not have a choice of partners. Either he is stuck with his colleague, like the two prisoners in the initial story, or the state of nature is such that he cannot change partners. Consider, for example, an industry in which there are five firms. They get together and form a cartel. Any individual member of this cartel has a motive to cheat, and it is not possible for the other partners to exclude him from the cartel because that, in essence, would give him the best of all possible worlds. He would be under no obligation whatsoever to restrict production, and the other four companies would be attempting to raise prices. The only threat that the other four companies have against a possible cheater is that they shall all stop cooperating, and that threat has limitations which are known to all economists. Simi-

4. He could perhaps get back into the game by elaborate promises of good behavior and side-payments, but certainly a second defection would finish that.

larly, in international relations problems, countries cannot chose their neighbors.

Although this is true of existing games, in the real world something can be done to make credibility valuable. The two prisoners in *The Prisoners' Dilemma* could have originally formed their partnership in crime because each had a well-established reputation for keeping his mouth shut. Each could think that talking under these circumstances would reduce his prospects for future profitable criminal activity jointly with any partner, not just with this particular partner and, hence, remain silent. With the flexibility of modern economic production, the possibility of companies chosing industries to enter in terms of the cooperativeness of other members is real, and establishing a reputation of being a good cartel partner might be quite valuable to a company that produced products in a number of different lines. Only in those particular industries where all members had a reputation for keeping their cartel agreements would any cartel agreements be entered into. As far as I know, this is not a conscious part of the strategy of any American conglomerate, but it is at least possible.

There are, of course, other techniques for establishing credibility. The businessman who regularly goes to church and regularly makes contributions to all kinds of worthy causes may be attempting to convince people that he is a safe partner. It is after all true that in a very large number of economic dealings it is possible for either, and in most cases both, parties to cheat. We do not usually tie our transactions so tightly in legal strings that there is not some room for uncooperative behavior on the part of either or both parties. Parties presumably refrain from this because of Adam Smith's discipline of continuous dealings or, in my more modern terminology, because they want to be partners in further prisoners' dilemma games.

Novelists and other critics have frequently made fun of the conformists' attitude that we frequently see in American business communities. As a matter of fact, conformism is found in all sorts of communities, including those of letters and social critics, although they, of course, conform to a different set of standards. This conformism is, in a way, an effort to convince people that you are the standard individual; i.e., the individual who, in the prisoners' dilemma situation, will not choose the noncooperative play. Similarly, if you have considerable hostages, you are, for

example, a member of a fairly tight social group, and you and your family would be severely injured if you were, in essence, removed from the social group for bad behavior; you are more trustworthy.

The same rule applies to politicians, and for that matter to a somewhat limited extent in international dealings. Dishonesty is, of course, so common in international dealings that it would take a long time for anyone to produce a reputation for honesty (see Beilsenson [1969]). A reputation for being "sound" is a valuable asset, and we should expect people to make every effort to get it. In many cases these efforts seem to an outsider prosaic, dull, or even foolish, but there is every reason to believe that most of us would, in fact, prefer to enter into deals with the prosaic, conventional businessman with a well-established business, than with a long-haired radical poet if there was something we could lose if the person we were dealing with decided to take advantage of us.⁵

We can see here also why I can be much more trusting in dealing with a merchant than he can in dealing with me. His reputation spreads over far more people, and it is harder for him to change partners readily. Blacksburg is a small town, but I am about to move to Washington. In Washington I presumably could spend a long time regularly returning products because I decided I did not want them, damaging them and claiming that they were damaged when I received them, without running out of new merchants to deal with. Merchants knowing this do take rather more precautions than the customer needs to. They are particularly concerned, of course, about the creditworthiness of their customers.

Of course, the game does not have to be symmetric. I referred earlier to the fact that I do not worry very much about stores cheating me, but they may worry about my credit card. The explanation here is simple: they are heavily dependent on their reputation, but probably they do not know me. It is, of course, true that credit card companies do their best to make holders of bogus or stolen credit cards known, i.e., to create a negative reputation for them, and checking that list is probably the only thing the store will do. Still, the situation is, with respect to reputation,

5. Of course, the radical, long-haired poet might simply behave erratically without any calculation.

asymmetrical in the sense that the store has to do research to find out the reputation of its customers.

It is likely that almost all interactions between human beings can be drawn as prisoners' dilemmas because it is possible for one party, or all parties, to make a one-time gain by cheating. In practice, almost no one even thinks of this opportunity in a competitive market in which he intends to remain for a while because the cost of getting a reputation for cheating is too high. In essence, the two-strategy prisoners' dilemmas' matrix is extended by a third strategy—refuse to play with some specified person as shown in Figure III. Under these circumstances, the cooperative solution is usually an optimum.

There is another application of this analysis. If an individual has lost reputation, there is little or no reason why he should play cooperative strategies in the future. If anyone agrees to play with him, which is not terribly likely, it would take a large number of plays before his reputation for reliability was as good as that of the person who had not already blotted his copy book even if he played cooperatively each time. Under the circumstances, he should attempt to con people into games, and when he gets them in, the decision to play noncooperatively may well be perfectly rational.

All of this would provide one more explanation for the tendency of people who once slipped to continue on that course of action. Thus, the habitual criminal or the "shady" businessman who continues to be "shady" are both responding rationally to their situation. Once they have a bad reputation, the cost of building up a reputation for reliability is extremely high.

There are many other examples. When individuals can freely

	Cooperate	Defect	Don't Play
Cooperate	1 1	2 -2	0 0
Defect	-2 2	-1 -1	0 0
Don't Play	0 0	0 0	0 0

FIGURE III

change the jurisdiction in which they live, then governmental "cheating" has only short-run payoffs. Note that there usually are at least some barriers to changing one's residence, and the height of these barriers in a way provides a threshold. With respect to a small suburban town, outside a major city, this threshold is apt to be very low, indeed. For a major nation, on the other hand, it can be quite large.

It is notable that this kind of threshold can be increased. The United States has elaborate and not very effective procedures along its border that are supposed to prevent outsiders from coming in. The Soviet Union has much more elaborate, and much more effective barriers around its border, the purpose of which is to prevent its own citizens from going out. The direction of the American barriers indicates that the American polity must be rather attractive by world standards. The need to have such extremely high barriers around the Soviet Union indicates that its internal practices are much more objectionable to the average Russian than the practices of most countries.

Hirschman, in a famous book, *Exit Voice and Loyalty* [1970], argued that if people for one reason or another do not want to change their bargaining partners, the railroads they use, etc., then they will exert pressure to improve the quality of the services they receive. This may indeed be so, but if it is, we are dealing there with a quite different phenomenon. It is certainly true that the individual who can readily change from the railroad in Nigeria, with which Hirschman [1970] starts, to trucks is better off than he would be if he were compelled to use the railroads. Perhaps, of course, Hirschman is correct that railway service would be markedly better if this alternative did not exist.

But this is more an exercise in general political philosophy than a discussion of the market. It is, indeed, true that the freedom to change what government you serve under will make it easier for you to better your lot. It is also true that this privilege will mean that governments, regardless of their formal structure, will find it necessary to pay considerable attention to the wishes of their citizenry. Individuals in a democracy must consider to at least some extent when they vote, not only the effect of that vote on themselves but its effect on their neighbors who might conceivably decide to move to the next suburb, thus lowering real estate values in this suburb if they are sufficiently offended.

But the main theme of this discussion has been that the prisoners' dilemma, strictly speaking, occurs only in a rather nar-

row area. Where there are a number of potential players available, the dilemma is proportionately weakened. Indeed, here we have what amounts to a mapping of the usual economic distinction between monopoly on the one side and competition on the other. If there is only one person with whom I can play the game, both he and I very likely will decide not to cooperate. As the number of people playing increases, the prospect that either he or I can get another partner, if we find our current partner objectionable, exerts steadily increasing pressure to always play cooperatively. In the limit, as in the limit of perfect competition, behavior is always mutually advantageous with the individual not taking a course of action which with respect to a particular play of the game seems desirable.

It is not only numbers here, it is also improved information. Brokers are specialists in this kind of thing. I have just finished selling a house in Blacksburg and buying an apartment in Washington. Brokers who assisted me were, among other things, very knowledgeable not only on what was in the market and the legal precautions necessary to see to it that I was not cheated, but also on the reputation of various parties. Additional precautions were sometimes suggested. Brokers themselves, of course, live and die with a reputation for efficiency and fairness.

All of this, however, was known to Adam Smith and has probably been known to successful merchants from time immemorial. Where the market is broad and there are many alternatives, you had better cooperate. If you choose the noncooperative solution, you may find you have no one to noncooperate with.

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