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A short note on the prisoner's dilemma as applied to public procurement

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Abstract

The prisoner's dilemma is sometimes invoked to describe the situation facing participants in tenders. Reasoning on the basis of the dilemma metaphor, it is contended that agreeing not to bribe public officials in order to win contracts (collaboration) leads to better outcomes than bribing (confrontation). Here it is argued that the prisoner's dilemma does not correspond to an adequate metaphor for public tenders. Incidentally, it is also argued that the assumption that bribery financially harms participants, which stimulates the allusion to the prisoner's dilemma in the first place, is arbitrary.

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The prisoner's dilemma

> Individuals A and B have been arrested for a crime they committed as accomplices. The prosecutor separately presents to each of them the following options: "If you confess, point the finger to your accomplice and the latter remains silent, I will drop all charges against you and use your testimony to ensure that your accomplice is condemned to a long term in prison. Likewise, if your accomplice confesses while you remain silent, he will go free while you will go to prison. If both of you confess I get two convictions, but I'll see to it that you both get early parole. If you both remain silent, I'll have to settle for token sentences on a misdemeanor. If you wish to confess, you must leave a note with the jailer before my return tomorrow morning."

The problem is to ascertain what would be the best strategy to adopt under such circumstances. This is a symmetrical non-zero-sum game with two outcomes, "Confesses" or "Stays put". The possible outcomes are:

> R – Reward for both if both stay put (cooperation).
> P – Reward for both if both confess (mutual confrontation).
> If one chooses to confess and the other to stays put, then the one who has confessed gets T points, while the other gets S points (one-sided confrontation).

Also, the following holds:

$$T > R > P > S$$

$$2R > T + S.$$

The diagram below summarizes the situation with $T = 5$ (the reward for confessing when the other stays silent), $R = 3$ (the reward both get when both stay silent), $P = 1$ (the reward both get when both confess) and $S = 0$ (the result of staying silent while the other confesses); the indexes 1 and 2 respectively refer to the outcomes for players 1 and 2 – the colours of the outcomes in the diagram also correspond to the respective players:

		Player 1	
		Stays put	Confesses
Player 2	Stays put	$R_1 = 3$	$T_1 = 5$
		$R_2 = 3$	$S_2 = 0$
	Confesses	$S_1 = 0$	$P_1 = 1$
		$T_2 = 5$	$P_2 = 1$

Given those values for the various parameters, whatever the other does, each is better off ratting on the other than remaining silent. However, the outcome obtained when both confess is worse for each than the outcome they would have obtained had both remained silent. As both would reason similarly (they are supposed to be rational), it would appear that cooperation between the players (both remaining silent) is a better strategy than any of them (or both) entering into confrontation with the other. That is the dilemma.

One single instance of the game is of limited interest. If the participants iterate the game, then the best course for a player to follow is claimed to be the so-called "tit for tat" strategy – whereby the player starts by cooperating in the first move but afterwards copies the opponent's last move. According to [Axelrod and Hamilton 1981] and many others, this strategy consistently yields better outcomes than all others tested in computer simulation tournaments in which the "players" are populations that adopt different strategies while competing to survive.

Although the prisoner's dilemma is sometimes mentioned in reference to bribery in public procurement, it is not clear how exactly it enters the problem. Written references to the analogy appear sporadically in the literature, as e.g. [Rose-Ackerman 1999] p. 31 and [Andvig and Fjeldstad 2000] p. 22 (but see below, footnote 2).

As a matter of formal adequacy, such a parallel is not possible, because the application of the prisoner's dilemma metaphor to the problem facing firms participating in procurement (to bribe or not to bribe) is not strictly appropriate. Directly applying the

dilemma to the procurement situation would entail substituting "Doesn't bribe" for "Stays put" and "Bribes" for "Confesses". This would lead to the following game diagram:

		Bidder A	
		Doesn't bribe	Bribes
Bidder B	Doesn't bribe	$R_1 = 3$	$T_1 = 5$
		$R_2 = 3$	$S_2 = 0$
	Bribes	$S_1 = 0$	$P_1 = 1$
		$T_2 = 5$	$P_2 = 1$

However, in a two-participant tender, what would be the meaning of both bidders paying bribes, each of them being equally rewarded with a pittance? In a typical corrupted tender, one of the participants bribes public officials in order to win the contract, but the others do not (of course, there can be a previous "bribery tender" whereby one single participant gets the upper hand).[1] So, the lower right-hand cell is not a possible outcome in such a game. Likewise, the upper left-hand cell also lacks meaning. The aim of procurement is not to partition a contract between participants, but to select a unique winner.

If the metaphor refers to repetitions of the game and not to one single instantiation, then the parameters *R*, *T*, *S*, *P* would represent the aggregation of a series of individual outcomes. In order to get to a similar numerical set-up, the probabilities of each outcome would have to be equally distributed. But, then, enters a further difficulty, that was not mentioned before because it was not necessary for the argument: What is the justification to posit that $P < R$ (the outcome of winning contracts with bribery is less for the participant than the outcome of winning cleanly)? If this held in the real world, then firms that participate in public procurement in environments affected by bribery would consistently

[1] In tenders with three or more participants, two of them can simultaneously bribe in order to get rid of some or all the others. This is what happens when cartels operate.

and irrationally lose money. As this is not plausible, and in view of the previous reasoning, it is concluded that the prisoner's dilemma does not properly describe the problem facing firms participating in public procurement.[2]

References

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[2] [Andvig et. al. 2000] p. 22 footnote rises doubts about the applicability of the prisoner's dilemma analogy to the context of public contracting.