

The Diamond Bidding Game

Teaching Notes

By J. Keith Murnighan

The Diamond Bidding Game is an asymmetric prisoner's dilemma game. This game's format is very similar to the symmetric prisoners' dilemma, the Gas Station Game, which is also available from DRRC. The Diamond Bidding Game works well as a follow-up to the Gas Station Game. It can also be used in conjunction with it and incorporated as one of the changes that occurs during the Gas Station Game.

At a minimum, you might want to consider following the same sequence of rules as the Gas Station Game. That is, start with no communication, then allow intergroup interaction, then announce the end of the game. Each stage should last for several trials.

The changes in the payoff matrix now give the players different outcomes when they both choose cooperatively and different outcomes when they choose non-cooperatively. The off-diagonal outcomes remain symmetric. These changes have important effects on the bargaining process. In particular, they raise equity issues: When both cooperate, one does worse than the other, and both know it.

Profits for the two companies look like this:

		Company 2	
		Bid Low	Bid High
Company 1	Bid Low	\$ 240 \$ 360	\$ 0 \$ 400
	Bid High	\$ 400 \$ 0	\$ 200 \$ 40

(These profits are expressed in multiples of \$1000.)

Company 1's profits are the first number in each pair; Company 2's profits are the second number. Both firms have a good idea of the value of each other's outcomes. Because there are only the two companies, it's easy for them to keep track of each other. Everyone should record their outcomes each round of

the bidding.

Assign people to take the roles of Company 1 or Company 2; pair people randomly. Everyone will play as individuals. The game will be played face-to-face for several bidding periods.

You will control the pace of the bidding. After they've had some time (e.g., 4-5 minutes) for discussion, direct them to make their first bids. They should not reveal their bid to the other person until you tell both of them to reveal their bids to each other. Then you can record the outcomes from all the pairs for trial 1, or you can wait until the game is over. Let the pairs have some discussion time before they make each bid, but control the bidding time by announcing when they must make their choices.

Don't tell anyone when the game will terminate. After they have had time to settle into a strategy, which can range anywhere from 3 to 10 trials, announce that 3 trials remain. Then terminate the session after those three trials, post the results on the board, and begin discussion.

People should try to do as well as they can to increase their profits. Tell everyone that their outcomes will be compared to other players exactly like themselves. Thus, Company 1 players' outcomes will be compared with each other's, not with Company 2's, whose outcomes will also only be compared with each others'. Players' real competition is with the other bidders facing exactly the same contingencies. Players should not try to "beat" the other bidder in their market, as their outcomes aren't relevant. "The most important thing is to do as well as you can for yourself."

Typical Reactions

Bargainers in some of our experiments (Murnighan and King, 1990) and students in our classes have faced situations like the Diamond Bidding Game,

typically with the opportunity to send any kind of message they wish to their counterpart. Sometimes they meet face-to-face, sometimes not. As a result, some pairs only had limited opportunities to communicate; others had totally free and open communication, as you did for your bargaining.

At the beginning, many bargainers who play the role of Company 2 think they have the better deal: If both people bid low, they get 360 while the other person gets only 240. At first, this can look like a tremendous advantage.

With experience, as you might guess, it becomes clear that the advantage of the 360 payoff is more than offset by the disadvantage of the 40 payoff if both bargainers bid High. Knowing that the other bargainer has little incentive to bid Low makes Company 2's position tremendously precarious.

Company 1, on the other hand, is quite secure. The only thing that could hurt them badly is bidding Low when the other firm bids High. Otherwise, they are assured of a good profit (either \$200 or \$240) and possibly a very good profit (\$400). Company 2, on the other hand, faces either feast or famine. They either do very well (\$360 or \$400) or very badly (\$40 or 0). How each of them does depends not only on how they bid but also on how the other firm bids. Company 2 would very much like Company 1 to bid Low: When Company 1 bids Low, Company 2 feasts. Company 1, however, is less concerned about Company 2's bid since it doesn't affect them that much. In addition, while Company 2 wants Company 1 to bid Low, Company 1 has very little reason to do so. If Company 1 does bid Low, they risk getting no profits from this supply of diamonds and bidding Low only improves their profits to \$240. If, on the other hand, they bid High, they make the supplier happy (which may or may not have any value for them) and they assure themselves of at least a \$200 profit.

In many of our previous games, putting the shoe on the other foot has had only limited meaning, since both feet were identically situated. In the Diamond Bidding Game and other Asymmetric Dilemmas (our name for games like these), Company 1 has a distinct advantage: They can insure that they will get at least 200 every time and they may occasionally get 240 or even 400, as we have seen. Company 2, however, can only really hope to get 360 and avoid 40. It's not a pleasant prospect. Hopefully you avoided the situation, if you were Company 2, of getting repeated outcomes of only 40 each and every time. It's a prescription in real world bargaining (and possibly in

classroom games?) for high stress and severe depression.

Most groups who have not been involved in many of the other Bargaining Games in this book have a very difficult time with the Diamond Bidding Game. Without communication, they find it very hard to bid Low. This is especially true (as it should be) for Company 1 players. Once they do begin to communicate, Company 2's who tried cooperating in the "no communication" periods typically want a pay-back, as they have provided their counterpart with large early payoffs. Company 1 players are quite resistant to this idea. Their excuse/explanation is the lack of communication. They want to start fresh, but neither group is very trusting of the other.

As a result, agreements to both bid Low often fail: Someone double-crosses the other. When this happens, Company 1 is quite content to continue bidding Low and Company 2 doesn't see a way out of their miserable misfortune. It's not a pleasant outcome for them.

Some of the people who faced this game in our experiments, however, did much better. The fact that they didn't have any "no communication" periods allowed them to respond admirably: Some Company 2's suggested a creative solution where the players alternated between Low-Low bids and High-Low bids, where Company 1 would receive an occasional 400. They recognized that they had to be resolute in their Low bids and that the other person, instead of simply succumbing to the temptation of choosing to bid High occasionally, should be allowed to do so without guilt and with the strategically hampered Company 2's blessings.

This is what we have since called complex alternation: the disadvantaged party choosing cooperatively on a continuous basis and an advantaged party being allowed to choose non-cooperatively occasionally. The result is a string of choice pairs, some mutually cooperative, some that look like the advantaged party has defected. Unlike a defection in the Gas Station Game, however, the interaction does not deteriorate into mutual non-cooperation. Instead, since the apparently noncooperative choices are expected, and come at predetermined times, an unusual, but cooperative scheme can continue--to both parties' mutual benefit.

Other Company 2's were even cagier. They recognized the risks they were running in the game but began by pushing for mutual cooperation. They

tried to push this as much as they could and only retreated to the strategy of allowing Company 1's to make an occasional High bid if they couldn't convince them to choose cooperatively all the time. Thus, only if Company 1 defected and bid High did these Company 2's push for a strategy of as many Low-Low bidding combinations as possible, with as few High bids thrown in by Company 1 as possible. Some Company 2's were amazed to find that they were able to make all Low-Low bids: They usually came away from these situations thanking their lucky stars. Their counterparts, the Company 1's, simply said that this was their best long term outcome: 240 was better than 200, and they were happy to get it repeatedly.

In some sense, this is very reasonable. These Company 1's appeared to be concentrating strictly on what was best for them, without worrying about Company 2's' outcomes. They were not reverting to competition but were behaving individually -- they thought. In the process, they unfortunately missed a better solution for their firm. The possibility of alternating to make even greater use of their advantage and increase their outcomes did not occur to them.

Dilemmas like the Diamond Bidding Game provide both sides with the temptation to bid High when the other side expected them to bid Low. This is particularly true of Company 1. When the two parties could work out a mutually advantageous scheme of alternation, however, they also provided themselves with a pattern of bids that gave neither of them such strong temptations to defect. A pattern of complex alternation, where Company 2 bid Low each time and Company 1 alternates bids between Low and High (on some prearranged, negotiated schedule) removes much of this temptation. Company 1 can only gain an additional 160 from a single unexpected High bid (shifting their payoff that time from 240 to 400), but by doing so they risk getting considerable and consistent retaliation on subsequent trials, to their own long term detriment. At the same time, Company 2 has very little temptation to defect, as they can only improve their one trial outcomes from 360 to 400 or from 0 to 40.

Thus, perceptive pairs, especially those where the strategically inferior player (Company 2) had considerable insight, adopted this scheme and were very successful. Other pairs faced a different set of potential outcomes and were less likely to discover this more optimal solution. For instance, they may have played this game:

		Company 3	
		Bid Low	Bid High
Company 4	Bid Low	\$ 360 \$ 180	\$ 0 \$ 400
	Bid High	\$ 400 \$ 0	\$ 40 \$ 160

Here Company 3 still has an advantage but they now have worse outcomes from mutual High or mutual Low bids than before. Their only really positive outcome is 400. As a result, many pairs solved their dilemma of how to adequately satisfy Company 3 without hurting Company 4 too badly by alternating between 0,400 and 400,0 outcomes. We refer to this strategy as Simple Alternation. It is certainly an improvement from repeated 40,160 outcomes, but nowhere near as valuable as a creative combination of 360,180 and 0,400 outcomes (i.e., complex alternation).

Thus, typical reactions we see to these kinds of asymmetric dilemmas depend to a great extent on the perceptiveness of the bargainers, their ability to communicate effectively, and their payoff contingencies. When the bargainers are perceptive, they use all of the profit table's possible payoffs to construct a mutually beneficial pattern of alternating outcomes in a complex alternation scheme. When this perceptiveness can be communicated clearly (as it can be when people negotiate face-to-face but cannot always be between competitors in an industry, for example), the bargainers normally can convince each other of its value and can work out arrangements for alternating. Finally, when the payoffs themselves make it clear that something creative is necessary for either of the two parties to do well, then it's more likely that one or the other of them will actually be perceptive and discover a solution. Unfortunately for both parties, we have seen more instances of Simple Alternation than Complex Alternation in groups who haven't experienced these games before. Worse yet, many groups never establish sufficient trust in each other to effectively implement either of these two alternation schemes.

NOTE: This case comes from a collection of cases designed and created by J. Keith Murnighan. Each case can be used in conjunction with text materials that he also wrote in his book, *The Dynamics of Bargaining Games*, which was originally published by Prentice Hall in 1991. The entire book is available

for classroom use on DRRC's website DRRCExercises.com. Individual chapters of the text can be paired with any of the exercises to form a complete modular package. (Murnighan recommends that the text material be assigned and read after rather than before experiencing the exercises; they were written to augment hands-on understanding rather than prepare students for their negotiations.) User fees for each chapter are \$1 per student. The user fee for the entire text of 17 chapters is \$10 per student. For more information visit the DRRC website.