

Strategic Decision Making and the Perils of Betting to Win: Battling Aspiration and Survival Goals in Jeopardy!'s Tournament of Champions

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Abstract

Many unresolved questions about strategic behavior concern the extent to which decisions reflect a competitor's ability to take other competitors incentives and decisions into account. We use data from a realistic high stakes strategic decision making setting, *Jeopardy!'s* Tournament of Champions (TOC), to investigate whether contestants consider the likely decisions of their competitors when making decisions. At the end of each TOC contest players participate in a simultaneous move game in which the decision of a competitor impacts the success of their own decision. Our analyses suggest that players do not consider the likely actions of their competitors despite the ease of accessing competitive information in this context. This result is somewhat surprising because the TOC is contested by the best and most experienced players of the game. To explain this result we suggest that the competitive context of the decision making process leads competitors to focus on winning (aspiration) and away from the less-risky alternatives available to attain the same goal.

The behavioral theory of the firm (Cyert and March, 1963) suggests that strategy involves cognitive analysis of the decision maker as well as the economic and sociological analyses of the firm's environment. Cognitive research has demonstrated the importance of a firm's strategic decision-makers and their abilities to assess the effects of current conditions and the decisions of their competitors on their own firm's performance (Durand, 2003; Hedden and Zhang, 2002; Makadok and Walker, 2000; Zajac and Bazerman, 1991). Eisenhardt and Martin (2000) reported that errors in forecasting can lead firms to over or under invest in resources that may cause them to lose their competitive edge. In a competitive setting the attractiveness of a strategy is often influenced by competitors' actions (Abramson, Currim and Sarin, 2005). Many unresolved questions about strategic behavior concern the extent to which decisions reflect a competitor's ability to take other competitors' incentives and decisions into account. Boeker (1991, p. 13) notes that "the interaction of competitors is a critical element in strategic management since the success of one firm's strategy often depends on the action of others".

The extent to which a firm's decisions reflect its ability to take its competitors incentives and decisions into account is a major issue in the behavioral analysis of strategic decision making. Such issues may play a role in decisions that involve, for example, timing and size of capacity increases, acquisitions and business entry which are often referred to as "big-bet decisions" (Ireland & Miller, 2004, p. 9). Determining the best course of action in these situations often requires iterated thinking of the type, "I think he thinks that, I think...." or "what do you think I think you think". Research concerning the propensity of individuals to take into account the likely decisions of their competitors can be found mainly in the behavioral game theory literature (see Camerer, 2003 for an extensive review). Some studies show that individuals can and do conduct one step of iterated reasoning, "I think he thinks," in making decisions (Gneezy, 2005), and Camerer, (2003, pp. 203-205) suggests that only in a minority of cases do subjects display more than one-step of iterated reasoning.

Recent research in strategy-process has devoted more attention to integrating behavioral aspects of competitive decision making into the analysis of strategic decision making. For instance, Chen's (1996) interfirm rivalry framework examined the role that context awareness plays in such decisions including the challenges resulting from competitive interdependence. Ferrier (2001) found

that the sequence of a firm's competitive actions is influenced by top management team heterogeneity which was used as a proxy for cognition and breadth of experience. Song, Calantone, and di Benedetto (2002) reported that managers differ in their consideration of competitive effects and that these differences are strongly influenced by managerial perceptions. More recently, Chen, Su and Tsai (2007) studied the effects of perceived competitive tension on the likelihood that a firm will take action against a rival. They study firm dyads in the airline industry and find that competitive tension increases as the relative size of a rival goes up and as firm similarity in terms of capabilities rises. They also found that as perceptions of competitive tension increase, the likelihood of a firm taking an action against a rival goes up. They argue that although competitive tension could occur at the group or industry level, the appropriate level of analysis is the firm dyad because "each firm experiences a different degree of tension with each rival, and from the firm's point of view each rival is unique".

Studying competitive decision making may be conducted in different forms and in a variety of contexts. Behavioral game theorists generally conduct their research in experimental settings while studies of strategic decision making outside of the laboratory setting tend to rely on case studies and survey data. Even though lab experiments are well designed and offer controls, they lack in not being able to offer significant incentives to the subjects. Case studies and survey responses are rich in detail but they lack in their ability to isolate the factors effecting individual decisions. However, most of these studies cannot provide direct observation of the elements affecting risky choice, such as potential competitor actions. In this paper we examine the behavior of competitors in the *Jeopardy!* Game show's Tournament of Champions (TOC). This tournament offers a setting where such variables can be observed. The game provides an opportunity to study decision making in a real, high-stakes competitive situation. During this game each contestant must make a decision whose 'success' depends, in part, on the decisions made by their competitor(s). The TOC is contested by the best 15 players from the prior year of regular season play and is the apex of each season. The Jeopardy show is the longest running general knowledge quiz show in the United States. Over 17 million loyal fans tune in to see who will win the top prize in the TOC, \$100,000¹. It would cost well over a million dollars to

¹The show doubled this amount to 200,000 in 2003 after our data collection ended.

replicate this set of incentives in a laboratory setting. Data from the TOC can provide many nuances and insights about behavioral aspects of competitive decision making.

The Game, the Decision and the Data

Fifteen players participate each year in the TOC which is played in three rounds—qualifying, semi-finals and finals (see Appendix A for detailed game and TOC rules). The qualifying round determines which nine of the fifteen players advance to the semi-finals. This round consists of five games, each played by three players². During this round each player can qualify for the semi-finals by either winning their game or by getting a wild card. Wildcards are awarded to the four highest scorers amongst the non-winners. The five winners and the four wild card holders advance to the semi-final round that consists of three games and the winner of each of these games advances to the final round. The rules of the TOC establish two focal points for the players in the qualifying round—winning and wildcard.

Each Jeopardy game concludes with the Final Jeopardy (FJ) round, where all three players answer the same question. This is the decision we focus on in this study. In this concluding round of play all three players *simultaneously* determine how many points they are going to bet *before* the FJ question is revealed. In other words all three players are confronted with a one-shot simultaneous move decision to determine their final score and the winner of their qualifying game. Note that before determining the bet amount, players are aware of (1) the knowledge category from which the FJ question will be drawn, (2) their competitors' scores, and, (3) the two ways of qualifying for the semi-finals. With these pieces of information players must decide whether they are going to try to win their game or whether they are going to try to qualify as a wildcard. They then must decide how many points they are going to bet before the actual FJ question is revealed. We want to emphasize that betting to qualify for the semi-finals in the TOC differs from games in the regular season in that the only thing that counts is qualifying or the semi-finals. Players get no reward whatsoever based on their actual score at the end of the qualifying round and their score is set to zero at the beginning of the semi-final round. Therefore there is no value associated with the score except for qualification for the semi-finals. The two ways of qualifying for

²All players are sequestered and therefore do not know the results of the games played prior to their own.

the semi-finals differ only in the degree of certainty a player has at the end of their game that will advance to the next round. Winners are 100% certain that they will advance while non-winners are not.

Winning a game is a function of the combination of players that answer the FJ question correctly and the amount bet by each player. In our 11 year database players in first, second and third place answered the FJ question correctly, 62.5%, 50% and 48% respectively. Qualifying for the semi-finals as a wildcard requires being one of the top four scorers among the non-winners in the qualifying round. Figure 1 shows the cumulative probability distribution for qualification as a wild card as a function of a players' final score. No player has ever qualified as a wildcard with a score lower than 2,000 and all players with scores equal to or greater than 9,300 have qualified for the semi-finals as a wildcard. To calculate the probability of qualifying as a wildcard we divided the cumulative number of players that qualified at each score level by the total number of players qualifying for the semi-finals with scores between 2,000 and 9,300.

Insert Figure 1 about here

Figure 1 shows that with just a 500-point increase in score from 7,500 to 8,000 the probability that a player would qualify for the semi-finals jumps from 50% to 80%. An additional 1,000 increase in score, for a total of 9,000, raises a player's chance of qualifying by only 10%. Therefore, 8,000 appears to be a pivotal threshold for qualifying as a wildcard. Evidence that the players' have this threshold in mind were provided by the TOC Diary (2001) and in our interview of a TOC contestant. During the 2001 TOC one of the contestants interviewed and documented his fellow competitors' thoughts about the competition throughout the tournament. In this report one contestant is quoted as saying: "A couple of strategy points, for those who might be interested. Going into the game, I figured it would take a minimum of 8,000 to advance to the next round." In our interview the contestant stated that it would take approximately 8,000 to qualify for the semi-finals. He also said that he viewed qualifying as an "exercise in game theory."³ The 8,000 threshold and the probability distribution can

³ We considered the possibility that the 8,000 threshold was not perceived by all of the players as corresponding to an 80% chance of qualifying for the semi-finals because it was identified based on all eleven seasons of data. To address this concern we calculated the median score and the score that affords an 80% of qualifying for the wildcard by season based on all the preceding seasons data (e.g. for season 3 we used the data from seasons 1 and 2; for season 7 we used the data from seasons

best be put into perspective with an example. In a game in which the leader has a score of 8,000 and the follower has a score of 5,000 the shut-out⁴ bet equals 2,001 for the leader. On average the leader has a 62.5% chance of answering the FJ question correctly. If the leader answers correctly their final score is 10,001 and he will win the game. If the leader answers incorrectly his final score will be 5,999 which corresponds to a 29% chance of qualifying for the semi-finals as a wildcard. In this example the leader sacrifices his 80% chance of qualifying for the semi-finals with a Zero bet for the more risky Shut-out bet with a corresponding probability of qualifying as a wildcard of 73%.

Our data include the FJ bets made by all players in the qualifying round of the eleven TOCs staged between 1990 and 2001 (a total of 55 games). This is the universe of available data. The data was provided by the producers of the Jeopardy show for the years 1990 through 1999. We videotaped the TOC in 2000 and 2001 and transcribed them into spreadsheet form. We excluded 7 of the 55 games played because in these games the first place player had already won the game before the start of FJ. These games are often referred to as “runaway games” (Metrick, 1995) because the first place player’s score is more than double that of the second place player at the start of the Final Jeopardy round. In these cases the first place player can be assured of winning the game with a zero bet. We exclude these games because they are not instances of competitive decision making. The first place players do not have any decision to make and the second place players can only strive to qualify for a wildcard position in the semi-finals. Our final data set therefore includes 48 games.

In the analyses that follow we consider all 48 bets made by the first place players in the qualifying round of the TOC. We refer to these players as the Leaders. From these same games we consider 34 decisions by players in second place and 20 decisions by players in third place. We refer to these players as Followers. We excluded bets made by players in second and third place when they had scores less than 4,000, because even if these players bet all of their points they could not reach the 8,000 threshold and therefore did not have to make the kind of decision of interest in this paper.

1 to 6). For the first two seasons the median score was 6,000 and the score corresponding to an 80% of qualifying as a wildcard was between 7,400 and 7,600. For the remaining seasons the median score ranged between 7,400 and 7,675 and the score corresponding to an 80% chance of qualifying settled to the 8,000 we use in our analyses. When seasons 1 and 2 are excluded from our analyses the results were unchanged so we report the results based on the entire data set in this paper.

⁴ The shut-out bet ensures that the leader will win the game as long as they answer the FJ question correctly even if the second place player bets all of their points and answers the FJ question correctly.

Strategic Best Response

To assess whether the contestants are considering the likely actions of their competitors we examine the FJ bet decision as a one-shot simultaneous-move game. We define the strategic best response (SBR) as the FJ bet with the highest probability of advancing the player to the semi-finals of the TOC. Following Metrick (1995) bets are grouped by size. From largest to smallest the bets for the leaders are Shutout, High, Low and Zero; and the bets for the followers are All, High, Low and Zero.

The shutout bet is the largest bet a leader ever needs to make and it is a key bet in the Jeopardy game. The shutout bet ensures that the leader wins the game when she answers correctly even if the second place player bets all his points and also answers correctly. For example, if the scores before FJ are 10,000 for the leader and 6,000 for the player in second place, the shutout bet is 2,001. The highest score that the second place player can achieve is 12,000. When the first place player bets 2,001 (i.e., the shutout bet) and answers correctly her final score is 12,001 and she wins the game. The High and Low bets vary based on whether the player's score before FJ is equal to or greater than 8,000; or less than 8,000. Table 1 provides a summary description of the High and Low bets.

Insert Table 1 about here

For players with scores equal to or greater than 8,000 (before FJ) Low bets are defined as those that keep a player's score equal to or greater than 8,000 if the player answers *incorrectly*; and increases a player's score to no higher than 9,300 when the player answers *correctly*. For these players High bets are defined as those that decrease a player's score to below 8,000 if the player answers *incorrectly*; and increase a player's score to no higher than 9,300 when the player answers *correctly*. For players with scores below 8,000 (before FJ) High bets increase a player's score to between 8,000 and 9,300 if the player answers *correctly*. For these players Low bets do not increase a player's score to 8,000 if they answer *correctly*. We consider 9,300 as an upper bound for the High and Low bets because all players with scores equal to or greater than 9,300 have qualified for the semi-finals as a wildcard. Players cannot improve their chances of qualifying by increasing the size of their bet to an

amount greater than that required to reach 9,300. Bet amounts greater than the difference between a player's score and 9,300 can only reduce a player's chances of qualifying if he answers incorrectly. For example, a player with a score of 8,600 that bets 700 and answers incorrectly has a 79% chance of qualifying as a wild card. If the same player bets 1,400 and answers incorrectly, his chance of qualifying as a wild card drops to 38%.

To identify the SBR for each player we develop a 4 x 4 payoff matrix for three score conditions or combinations: (1) both players have scores that are equal to or greater than 8,000; (2) the leader's score is equal to or greater than 8,000 and the followers' (2nd and/or 3rd place players) score is below 8,000; and (3) all players' scores are below 8,000. An example of our calculations is provided below as part of our development of the SBR in Condition 1.

SBR Condition 1: Both players' scores are equal to or greater than 8,000. In ten of the games both the leaders (N=10) and followers (N=10) had a score equal to or greater than 8,000 before FJ. All of the followers in this condition were in 2nd place before FJ. The average score was 10,210 for the leaders and 8,600 for the followers. For players with scores equal to or greater than 8,000 the Low bet keeps the players score equal to or greater than 8,000 if the player answers *incorrectly* and does not increase the players score above 9,300 if the player answers *correctly*. For these players, High bets lower the player's score below 8,000 if the player answers *incorrectly* and increases their score to no higher than 9,300 if she answer the FJ question *correctly*. The range of final scores for the players and the corresponding probability of qualifying for the semi-finals as a wildcard are presented in Table 2a. For each bet we calculate the highest and lowest score that could result based on whether a player answers correctly or incorrectly. For example, the High bet for a follower with a score of 8,600 ranges from 601 to 700. If this player answers the FJ question correctly the resulting final score ranges between 9,201 and 9,300; and the final score range if the player makes the same bet and answers the FJ question incorrectly is 7,700 and 7,999. To calculate the probability of qualifying as a wildcard we divided the cumulative number of players that qualified at each score level by the total number of players qualifying for the semi-finals with scores between 2,000 and 9,300 (as depicted in Figure 1). We then assign the corresponding probability of qualifying as a wildcard to each of these scores based on the cumulative probability distribution. For example, with a score of 7,700 a player has a 65%

chance of qualifying as a wildcard and with a score of 9,201 a player has a 99% chance of qualifying as a wildcard⁵.

As discussed above we develop a 4 x 4 payoff matrix to identify the SBR for leader and follower in each condition. The payoffs in each cell of the matrix are calculated using the probabilities that the Leader (row) and Follower (column) answer the FJ question correctly, 62.5% and 50% respectively; and the probability that a player will win their game or qualify as a wildcard based on the score resulting from each bet. To calculate these payoffs we constructed decision trees (see Appendix B for an example) with four branches that reflect the four possible combinations of correct and incorrect answers by the leaders and the followers⁶. The four combinations (branches of the decision tree) occur with the following frequency: both players are correct, .3125 (.625*.50); both players are incorrect, .1875 (.375*.50); the leader is correct and the follower is incorrect, .3125, (.625*.50); and leader is incorrect and the second place player is correct, .1875 (.375*.50). If a player can win the game a payoff of 1.0 is assigned. Otherwise a payoff corresponding to the probability of qualifying as a wildcard is assigned. For example (see Appendix B), to calculate the probability that the leader will qualify for the semi-finals if they bet Shutout and the follower bets All, which is .84, when both players have scores greater than 8,000 before FJ (see Table 2b) we sum the probabilities from the four branches of the decision tree. When the leader answers correctly (the top two branches of the decision tree) he wins the game and a 100% probability of qualifying for semi-finals is assigned. The leader also wins the game when both players answer incorrectly (the bottom branch of the decision tree) and again a 100% chance of qualifying for the semi-finals are assigned. The leader can only lose the game if they answer the FJ question incorrectly and the follower betting All answers correctly. In this case the resulting score for a leader will be, on average, 3,219 (see Table 2a). The corresponding probability of qualifying for the semi-finals with this score is only .15. We sum the probabilities of qualifying for

⁵ Note that in this condition (e.g. both players have scores equal to or greater than 8,000) the leaders do not have a High or Low bet to make according to these definitions because with an average score of 10,210 any non-zero bet made by the leaders would increase their score well above 9,300 if they answer the FJ question correctly.

⁶Consistent with the arguments made by Chen et al (2007) that the appropriate level of analysis for studying competitive dynamics is the firm dyad we used the average scores at the beginning of the FJ round, of the first and second place players in each condition to develop the payoff matrices. In separate analyses, not shown here, we found that the strategic best response for the third place player was the same as the one for the second place player. This is also consistent with the fact that the probability that 2nd and 3rd place players answer the Final Jeopardy question correctly is just about equal at 50% and 48% respectively.

each branch of the tree $[.3125 + .3125 + .0281 + .1875]$ to arrive at a .84 probability for the leader of qualifying for the semi-finals when the leader bets Shutout and the follower bets All. Note that in some cases the payoffs in each cell signify a range. This is a consequence of the fact that the High and Low bets themselves represent a collection of bets in the ranges defined above.

Insert Tables 2a & 2b about here

The payoff matrix (Table 2b) shows that the SBR for the leaders is Zero and the SBRs for the followers are Zero or Low. To identify the SBR for the leaders we compare the payoffs by row (lower left-hand portion of each cell). For example, the payoffs for a leader for the Zero bet is 100% for any bet the follower could make. The payoffs for the Shutout bet range from 68% to 84%. Because the payoffs to the Zero bet are higher than the Shutout bet in all cells of the payoff matrix we consider the Zero bet as the SBR for the leader. To identify the SBR for the follower we compare the payoffs by column (upper right-hand portion of each cell). The payoff for the Zero bet is 95% which is greater than or equal to the payoffs for the High and All bets in all cells of the matrix. The payoffs to the Low bet range from 88% to 97% when the leader bets Zero, and from 93% to 98% when the leader bets Shutout. Therefore, we cannot say that Zero always affords a higher payoff, though it is intuitively appealing to say that a player should not risk 7% on the downside to attain at most 2% on the upside. Thus, the SBRs for the followers are Zero and Low.

Only one of the leaders (10%) and none of the followers bet the SBR. Among the nine leaders not betting the SBR, four bet Shutout (40%), and five (50%) bet Other. Other bets can best be characterized as ‘super high’ bets. These bets result in scores well in excess of 9,300 when a player answers correctly. We created this category because these ‘super high’ bets indicate that a player is taking on greater risks without a commensurate (actually none) increase in reward. It is a straight forward exercise to show that these ‘super high’ bets would be inferior in terms of qualifying the player for the semi-finals in comparison with the High bet. These larger bets cannot increase the chances that a player would qualify with a score above 1.0, which the less risky High bet can also achieve, but they result in a lower probability of qualifying if the player answers incorrectly by reducing the players score by a larger amount. Four of the five leaders betting Other had scores greater

than 9,300 before FJ. These players had scores of 9,300, 9900, 11,400, 11,700 and bet 1,200, 1,898, 1,500, 1,300 respectively. The fifth leader betting Other had a score of 8,500 and bet 1,500. One of the followers bet All (10%), two bet High (20%) and seven bet Other (70%). The followers betting Other had scores between 8,000 and 9,600. These players made such large bets that, if they answered correctly, their score would have significantly exceeded 9,300, and if they answered incorrectly their chances of qualifying for the semi-finals would be seriously diminished.

As observers we can see that had the players considered only the rules of the game they would have realized that they could qualify for the semi-finals as a wildcard without worrying about the likely actions of their competitors (e.g. that they can qualify as a wildcard with 8,000 or more). This pattern of bets suggests that the players lose sight of the fact that qualification for the semi-finals is not a zero-sum game and he tends to regress to the strategy they used in the regular season where a player must win the game to get the award. At first glance it may appear that this is a case of hubris (e.g. overestimating own capabilities). In this condition the players would have had to believe that their chances of answering the Final Jeopardy correctly were 100%. However, because these are experienced players we think it is unlikely that all of these players estimated their likely performance at 100%. We think that the more likely cause is the competitive context in which the decision is made. Alternatively, it is possible that contestants may get a positive feeling from winning their game and a negative feeling from losing their game. Research shows that when making decisions people take into account the emotions they anticipate they will have when the decisions are realized (Maitlis & Ozcelik, 2004; Mellers 2000; Schwarz 2000; Zeelenberg, 1999). Thus, a desire to avoid disappointment may also explain why many of the players were willing to pay a substantial premium to reach a score of 9,300 that guarantees qualifying for a wildcard slot even though a Zero bet had a probability of 80% or more of achieving the same goal.

SBR Condition 2: Leaders score is equal to or greater than 8,000 and the Followers score is below 8,000. In 20 of the games the leaders (N=20) score was equal to or greater than 8,000 while the followers (players in second or third place) scores were below 8,000 (N=34). As shown in Table 3a the average score before FJ was 9,257 for the leader and 6,504 for the follower. The Low bet for the leader ranges from 1 to 43 because it is capped at reaching 9,300 and the average score is 9,257.

As in the case where both players had scores greater than 8,000, the leader does not have a High bet because any bet that would reduce a player's score to below 8,000 would increase their score significantly above 9,300 if the FJ question is answered correctly. The Low bet for a follower ranges from 1 to 1,495 and the High bet ranges from 1,496 to 2,796. The range of final scores for the players and the corresponding probability of qualifying for the semi-finals are presented in Table 3a. The corresponding payoff matrix is provided in Table 3b. The probability of qualifying for the semi-finals and the payoff matrix are developed in exactly the same way as for Condition 1.

Insert Tables 3a & 3b about here

As in Condition 1 the Zero bet is the SBR for the leaders and the leaders do not have to consider the likely actions of their competitors to identify this bet. No one bet affords the follower the highest probability of qualifying for the semi-finals independent of the leaders' bet. The followers have to consider the likely decision of the leader to identify their SBR. If the followers believe that the leader would bet their SBR which is Zero, then All dominates Zero and the bet with the highest probability of qualifying a follower for the semi-finals is High. The High bet corresponds to a 48% to 63% probability of qualifying for the semi-finals. The Zero bet for the follower corresponds to a probability of qualifying for the semi-finals of 35%; and the Low bet corresponds to a 30% and 57% probability of qualifying. We conclude that the High bet is superior to the Low and Zero bets for the followers because both ends of the range are greater for the High bet than those of the Low bet. The probability of qualifying with an All bet is 50%. Although 50% is 2% greater than the low-end of the High bet payoff range (48%), these probabilities suggest that the High bet is superior to the All bet as well. We also believe that it is unlikely that the players were making ultra fine distinctions such as between .48 and .50 when considering the likely results of their bets. Therefore the low end of the range for the High (.48) appears to be equal to the .50 probability of qualifying as a wildcard with the All bet. It follows that the low end of the range 'matches' the probability afforded by the All bet with the added benefit of a .63 probability of qualifying at the high end of the range. Thus, in practical terms the High bet is a better choice than the All bet. Therefore, in this condition the SBR for the leader is to bet Zero and the SBR for a follower is High. None of the leaders bet the SBR. Eleven of

them bet the Shutout bet (55%), one bet High (5%), and eight bet Other (40%). As described in Condition 1 Other bets can best be characterized as ‘super high’ bets that are associated with high downside risk and little or no increase in the upside payoffs. Four (12%) of the followers bet the SBR. The remaining thirty bets were distributed as follows: fifteen All (44%), two Zero (6%), two Low (6%) and eleven Other (33%). Almost all of the players (93%) ignored the strategic alternative of qualifying for the semi-finals as a wildcard.

SBR Condition 3: All players’ scores are below 8,000. In eighteen of the games all players had scores below 8,000 before FJ. The range of final scores for the leaders (N=18) and followers (players in second or third place, N=20), the corresponding probability of qualifying for the semi-finals and the payoff matrix are presented in Tables 4a and 4b. The payoff matrix reveals that no bet affords a leader or a follower the highest probability of qualifying for the semi-finals independent of the bet made by their opponent. What behavior should we expect in such a case?

We first look at the bet choice from the perspective of the leader. First the leader needs to determine whether the follower would bet some positive amount or Zero. Given that a follower has on average 5,720 points that offers only a 28% chance of qualifying as wildcard we believe that it is safe to assume (and supported by the data) that the follower would bet some positive amount (e.g. All, High or Low). Based on this assumption the bets with the highest payoffs for the leader are High and Shutout. To choose between the High and Shutout bets the leader must determine whether the follower would bet All. An examination of the payoff matrix for the followers shows that the High bet is superior to the All bet for a follower with the exception of the 48% on the low-end of the range, when the leader bets High or Shutout. As suggested above it is unlikely that the players were calculating payoffs to this degree of accuracy (i.e. distinguish between 48% at 50%). In addition, it is clear that the High bet preserves some chance of qualifying if the follower answers the FJ question incorrectly, while the All bet corresponds to a 0% chance of qualifying in such a case. With this in mind the leader is likely to conclude that the follower would bet High. Thus, the SBR for the leader is the High bet.

Insert Tables 4a & 4b about here

The followers' reasoning is similar. First the follower eliminates betting Zero due to its low probability of qualifying the player as a wildcard. The follower also eliminates All because of the higher upside payoffs to the High bet. This leaves the follower with a choice between Low and High. The follower must then determine which bet the leader would make. The payoff matrix reveals that the High bet offers significantly greater payoffs for the leader than the three other bets. Therefore, the followers conclude that their own SBR is High. Alternatively, if a follower believes the leader would bet Shutout their SBR is also High. We find that only one (6%) of the leaders bet the SBR, High, and 14 (77%) bet Shutout. The followers performed a bit better with four players (25%) choosing the SBR, High. However, the most frequent bets by the followers were All (42%) and Other (25%). Our analysis suggests that most of the players took excessive risks to qualify for the semi-finals.

As Goeree and Holt (2001) write "the best way for one to play a game depends on how others actually play, not on how some theory dictates that rational people should play". If players in the TOC were aware that their opponents often do not bet in accord with the SBR, they might have taken into account their opponents' most likely bets. Forecasting the likely bet of their opponent may be based on the frequency of bets made by players in similar situations in earlier TOCs. If the TOC players were using history as their guide we would expect them to choose the bets affording them the highest probability of qualifying, against the bets most frequently chosen by similar competitors. Our data however does not support this conjecture. The payoff matrices (Tables 3b, 4b & 5b) show that the bets affording the highest probability of qualifying for the leader are the same as the SBR in each of the three conditions. In all three conditions the most frequent bets made by the second place player were High, Other, and All. In Conditions 1 and 2 the bet with the highest probability of qualifying for the leader is Zero when the follower chooses any of these bets. The SBR in these conditions was also Zero. Only one of the leaders chose this bet in either condition. The payoff matrices show that the bet affording the follower with the highest probability of qualifying based on the leaders' betting history is the same as the SBR in Conditions 1 and 3. In Condition 2 the leader bet Shutout in 55% of these games. When the leader bets Shutout, the Zero and High bets afford the followers a greater probability of qualifying than the All bet (see Table 3b). This leaves the High, Low and Zero as the followers' best responses yet only 28% of the followers chose one of these bets. Clearly, the players

do not seem to be using the TOC historical betting frequencies as a guide to choosing their bet in the qualifying round of the TOC.

Table 5 provides a summary of the bets made by the leaders and followers in each of the three conditions analyzed above. In Conditions 1 and 2 the leaders did not have to anticipate the bet of their competitor to identify the SBR yet only one (3%) chose this bet. In Condition 3 the leader had to anticipate that the follower would bet High to identify the bet that would afford the highest probability of qualifying, but only one (6%) chose this bet. In Condition 1 the followers did not have to anticipate the bet of their competitor to identify the SBR but none of the players chose this bet. In Conditions 2 and 3 the followers had to anticipate the likely bet of the leader to identify their SBR. In these conditions a greater, but still unimpressive, 15% of the followers chose the SBR. It appears that consideration of the likely action of the leader improved the followers' ability to identify the SBR. In the next section we consider potential reasons why the leaders and followers did not bet the SBR.

Insert Table 5 about here

The Effects of Aspiration and Survival Goals on Betting Behavior

Behavioral models of risk taking suggest that individuals, and by implication firms, evaluate their performance relative to some benchmark before making decisions (Bromiley, 1991; Cyert and March, 1963; Figenbaum and Thomas, 1988; Kahneman and Tversky, 1979; March and Shapira, 1992). Such benchmarks have been called aspiration levels and reference points, and it has been demonstrated that risk attitudes vary if one considers gains versus losses from such reference points (Kahneman and Tversky, 1979). Natural reference points can vary when considered from a strategic decision making perspective. Industry average performance and performance levels of competitors are examples of aspiration levels. Survival is another salient reference point that attracts managerial attention (March and Shapira, 1987, 1992). The idea of survival as an important determinant of risk taking behavior is well established in the areas of medicine and health, environmental protection,

insurance (Stone, 1973), as well as the deployment of the “safety first” rule in financial decision making (Roy, 1952) and insurance.

March and Shapira (1992) introduced the idea that two targets or reference points affect risky choice in their variable risk preferences (VRP) model. They proposed that two simple rules determine risk taking with regard to the target a decision maker is focusing on. The first rule suggests that when resources are *above* the focal reference point (be it either aspiration or survival), risk or bet size is set so that in case of failure resources would not fall below the focal reference point. The second rule applies when resources are *below* the focal reference point. In this case risk or bet size is set so that resources will surpass the aspiration point anticipating that the bet would be a success. These two rules make risk-taking behavior sensitive to: (1) the risk taker’s resources relative to the survival and aspiration points, and (2) whether the risk taker focuses on the survival reference point or on the aspiration level reference point. The two basic risk functions are plotted in Figure 2.

Insert Figure 2 about here

The decision we study requires the player to choose between two ways of qualifying for the semi-finals: winning their game or qualify as a wildcard. Because players can qualify as a wildcard one would expect players to decrease the size of their bet as their score increases. In this view Player Assets (e.g. number of points a player has prior to FJ) is the driving factor behind the choice of bet. The VRP model, on the other hand, suggests that the driving factors are the distances between Player Assets and aspiration on the one hand, and distance between the Player Assets and survival on the other. We conducted regression analyses to determine which of these models fits best the betting behavior of the players in the TOC. We first describe the dependent and independent variables that were included in the models and then report the results.

Dependent variable. The dependent variable, Bet, is the number of points placed at risk, namely the bet size.

Independent variables. In addition to Player Assets (e.g. scores) the two main independent variables are the distances from the focal reference points. That is, distance from aspiration point (DAP) and distance from survival point (DSP). The aspiration point is the score needed to win the

game. Therefore the primary concern for a leader is staying above the second place player's score and the primary concern for a follower is closing the gap with the leader. Thus, the leaders DAP equals the distance between their score and the second place player's score. For the followers DAP is the difference between their score and the score of the leader.

The variable risk preferences model (March and Shapira, 1992) equates survival with extinction. In their model extinction is reached when cumulative resources are zero. We modify the model to fit the competitive situation presented by the qualifying round of TOC. Players may have positive resources (score) after the FJ round but still may not be able to advance to the semi-finals and would, as a result, be eliminated from the contest. Therefore, we equate survival with the score a player needs to qualify as a wildcard in the semi-finals of the TOC. The survival point is defined in line with our prior analyses as 8,000. Distance from Survival Point (DSP) is the absolute difference between a player's score and 8,000.

In addition to the distances described above we include an additional independent variable, Correct. Following Metrick (1995) we used a player's realized success to capture the level of confidence of a player that he would answer the FJ question correctly. Even though this measure is ex-post it arguably reflects players estimates of their chances of answering the FJ question correctly. Correct enters the model as a dummy variable coded 1 for correct answers and 0 for incorrect answers.

Table 6 reports the regression results for the model including Player Assets and Correct in each of the three conditions. Table 7 reports the regression results for the models where we substitute the distance from the focal reference points, DAP and DSP, for Player Assets. The models including the distances from the reference points explain much more variance than do the models that include only Player Assets in every single case. For the leaders DAP is negative in all conditions and negative and significant in Conditions 2 (leader above and follower below 8,000) and 3 (both below 8,000). DSP is not significant for the leaders. For the followers DAP is negative in all conditions and negative and significant in Conditions 1 and 2. DSP is positive and significant for the followers in all conditions. Correct is positive and significant for the followers only in Condition 1, and is positive but not significant for the leaders in all conditions. Overall, the relatively high R^2 values (.34 to .67 for the leaders; and .34 to .81 for the followers) suggest that accounting for multiple reference points does a

good job of modeling the players' behavior. As a robustness check we considered all bets regardless of whether a players' score was above or below the 8,000 threshold identified as the survival point. Our results remain the same. The only exception is that Correct is marginally significant ($p < .10$) for the leaders and followers.

Insert Tables 6 & 7 about here

Discussion and Conclusion

We set out in this study to investigate whether players consider the likely decisions of their competitors when making decisions. We examined how skilled and experienced players behave in a highly competitive context. We found that the majority of competitors do not make decisions consistent with the use of this information. Our finding is consistent with the assertion by Zajac and Bazerman (1991) that competitors have blind-spots (particularly in areas such as acquisitions and capacity building). To explain this result we suggested that the competitive context of the decision making process focuses contestants on winning (aspiration) and away from less-risky alternatives. In addition to the overwhelming number of contestants (over 60%) that bet to win their qualifying game, additional evidence that competition fosters a focus on aspiration levels comes from our analysis of condition 1. In this condition the contestants did not have to take the likely actions of their competitor into account to identify the strategic best response because their scores exceeded 8,000. Even in this condition 50% of the players bet to win their game when qualifying as a wildcard was virtually assured given their already high scores.

There is a large body of work that suggests that when confronted with complex problems, strategists' adopt a variety of heuristics to guide their decisions that may lead them to make suboptimal choices. Decision makers fall prey to framing (Hodgkinson, et. Al., 2002; Wright and Goodwin, 2002), attention to reference points (March and Shapira, 1992), insensitivity to outcome probabilities, illusion of control (Das and Teng, 1999; Goodwin and Ziegler, 1998), and overconfidence or hubris. All of which have been shown to introduce biases and errors into decision making. Our analysis points at the importance of reference points in explaining the behavior of

competitors in the TOC. The behavior of both the leaders and followers is consistent with the VRP model of decision making. The driving factor behind the choice of bet for the leaders was the distance from their aspiration point, winning the game. Whether the leaders score was above or below the 8,000 threshold seemed to play little or no role in their decision making. Our results indicate that for the followers the distances from both reference points were important in their decision making.

Furthermore, as Tversky and Kahneman (1986) argued, judgmental biases are unlikely be corrected in the real world because feedback is untimely and may be inaccurate due to delays, environmental variability and little availability of information about what the outcome could have been had a different decision been made. As the TOC Diary (2001) reveals players prepare for their matches extensively. In addition, these players are aficionados of the game who are highly likely to have viewed prior seasons of tournament play. Therefore contestants have ample opportunities to learn from the outcome of decisions made by their predecessors in which feedback is immediate, there is little or no environmental variability and information regarding what the outcome would have been had a different decision been made is readily available. Given that these factors are unlikely to explain the less than optimal decisions of the TOC competitors our conclusion that the focus on reference points is the culprit is further supported.

Our study adds two aspects uncommon in prior studies: very high incentives and direct competition, two aspects that are assumed to sharpen the behavior of decision makers. Our findings do not bear this out. Instead our results indicate that the majority of both leaders and followers bet to win their qualifying game. We also found that the tendency to bet to win increased as the complexity of the decision increased (e.g. as the levels of iterated thinking needed to identify the SBR increased). Players focused on betting to win while apparently ignoring the choices that were available to themselves and to their competitors. The players in the TOC appear to either not perceive or highly discount their ability to achieve the objective of qualifying for the semi-finals without betting to win (Ma, 2003). We think that this apparent inability to conduct at most two-steps of iterated reasoning and/or the disinclination to follow this type of thinking invites a reconsideration of the effect of very high incentives on the behavior of players in competitive settings. Our findings resonate with Montgomery, Moore and Urbany (2005) who found little evidence of strategic

competitive reasoning. They report that competitive intelligence experts and other experienced managers' perceive the returns to anticipating competitor reactions as much lower than the costs of doing so. They suggest that both the difficulty of obtaining competitive information and the uncertainty associated with predicting competitive behavior contribute to these perceptions. In the TOC, contestants do not experience high costs to obtain competitive information but we still find little evidence that they take their competitors likely decisions into account.

The Jeopardy! TOC is a high-stakes natural experiment that allows us to study competitive decision-making. Although the benefits of this context are numerous the fact that the decisions are made by individuals leaves open the question as to whether a group (e.g. top management team) would make better decisions. Given that both the ego and the personality of the strategist have been shown to have strong effects on the strategy decision process, strategic choices and firm performance (Hutzschenreuter and Kleindienst, 2006; Watson, 2003) we think the results may vary with the strength a leader exerts over his team. The discrepancy between normative models and descriptive aspects of choice behavior has been a major instigating force for the development of behavioral decision-making. In a lucid treatise, Bell, Raiffa and Tversky (1988) argue that without developing both normative and descriptive models of decision making our ability to provide prescriptions for improving choice behavior is minimal. Future research should look at ways which will allow such experienced players to overcome their natural tendencies to pursue (sometimes) wrong goals and to focus on their own targets while ignoring other alternatives open to them and to their competitors. The SBRs in this game, which are not that complicated and were known to the contestants, proved not easy to pursue.

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Table 1 Bet Definition Summary

	8,000 & Above		1-7,999	
	Low Bet	High Bet	Low Bet	High Bet
Correct	Increases score to a maximum of 9,300	Increases score to a maximum of 9,300	Increases score to a maximum of 7,999	Increases score to between 8,000 and 9,300
Incorrect	Reduces score to a minimum of 8,000	Reduces score to less than 8,000	Reduces score by bet amount	Reduces score by bet amount

Table 2a Probability of Qualifying By Bet Type—Both Above 8,000^a

Leader			Follower		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	17,201	1.0	All+	17,200	1.0
SO-	3,219	0.15	All-	0	0
High+	n/a	n/a	High+	9,201-9,300	0.99-1.0
High-	n/a	n/a	High-	7,700-7,999	0.65-0.79
Low+	n/a	n/a	Low+	8,601-9,200	0.95-0.99
Low-	n/a	n/a	Low-	8,000-8,599	0.80-0.95
0	10,210	1.0	0	8,600	0.95

^a +indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly.

Table 2b Both Above 8,000 Payoff Matrix*

		Follower			
		0	Low	High	All
Leader	0	0.95 1.0	0.88-0.97 1.0	0.82-0.90 1.0	0.50 1.0
	Low				
	High				
	Shutout	0.95 0.68	0.93-0.98 0.68	0.91-0.95 0.68	0.50 0.84

Leader payoffs are in the lower left-hand portion of each cell. Follower payoffs are in the upper-right hand portion of each cell.

Table 3a Probability of Qualifying By Bet Type—1st Above & 2nd Below 8,000 ^a

Leader			Follower		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	13,009	1.0	All+	13,008	1.0
SO-	5,505	0.25	All-	0	0
High+	n/a	n/a	High+	8,000-9,300	0.80-1.0
High-	n/a	n/a	High-	3,708-5,008	0.15-0.25
Low+	9,258-9,300	0.99-1.0	Low+	6,505-7,999	0.35-0.79
Low-	9,014-9,256	0.97-0.99	Low-	5,009-6,503	0.25-0.35
0	9,257	0.99	0	6,504	0.35

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

Table 3b 1st Above & 2nd Below 8,000 Payoff Matrix*

		Follower			
		0	Low	High	All
Leader	0	0.35 1.0	0.30-0.57 1.0	0.48-0.63 1.0	0.50 1.0
	Low	0.35 1.0	0.30-0.57 1.0	0.48-0.63 0.99-1.0	0.50 0.99-1.0
	High				
	Shutout	0.59 0.72	0.38-0.79 0.72-0.86	0.50-0.63 0.86	0.50 0.86

*Leader payoffs are in the lower left-hand portion of each cell. Follower payoffs are in the upper-right hand portion of each cell.

Table 4a Probability of Qualifying By Bet Type—Both Below 8,000 ^a

Leader			Follower		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	11,441	1.0	All+	11,440	1.0
SO-	2,679	.10	All-	0	0
High+	8,000-9,300	.80-1.0	High+	8,000-9,300	.80-1.0
High-	4,820-6,120	.26-.30	High-	2,140-3,440	.10-.12
Low+	7,061-7,999	.35-.79	Low+	5,721-7,999	.28-.79
Low-	6,121-7,059	.28-.35	Low-	3,441-5,719	.12-.28
0	7,060	.35	0	5,720	0.28

^a +indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

Table 4b Both Below 8,000 Payoff Matrix *

		Follower			
		0	Low	High	All
Leader	0	.28 1.0	.20-.64 .67-1.0	.55-.56 .67	.50 .67
	Low	.28 1.0	.20-.77 .67-1.0	.55-.56 .67-.84	.50 .67-.84
	High	.55 .72-1.0	.20-.74 .72-1.0	.48-.56 .83-.91	.50 .83-.91
	Shutout	.28 .66	.29-.56 .66	.48-.78 .66	.50 .91

*Leader payoffs are in the lower left-hand portion of each cell. Follower payoffs are in the upper-right hand portion of each cell.

Table 5 Strategic Best Response Summary

Player	Both Above 8,000					Leaders Above & Followers Below 8,000					Both Below 8,000				
	Zero	Low	High	SO/ All	Other	Zero	Low	High	SO/ All	Other	Zero	Low	High	SO/ All	Other
Leader	1* (0.1)	0	0	4 (0.4)	5 (0.5)	0* ^p	0	1 (0.05)	11 (0.55)	8 (0.4)	1 (.06)	0	1* (.06)	14 (.77)	2 (.11)
Follower	0*	0*	2 (0.2)	1 (0.1)	7 (0.7)	2 (0.06)	2 (0.06)	4* (0.12)	15 (0.44)	11 (0.33)	0	2 (0.165)	4* (0.165)	6 (0.25)	8 (0.42)

Note: An “*” indicates the strategic best response. Frequencies are provided in the parentheses.

Table 6 Final Jeopardy Bet: Player Assets (OLS Regression Results)

Variable	Leaders			Followers		
	Both Above	Leader Above & Followers Below	Both Below	Both Above	Leader Above & Followers Below	Both Below
Player Assets (Score)	-1.128* (.654)	-.561* (.422)	-.156 (.716)	1.384 (1.498)	-.490** (.284)	-.861** (.485)
Correct	1206.499 (2137.549)	925.903 (1168.000)	595.953 (995.791)	3908.553** (1521.269)	-665.076 (624.501)	1155.490* (711.387)
Constant	14407.82 (6579.605)**	7047.744** (3768.187)	3811.46 (5076.693)	-10902.34 (13243.460)	7244.254*** (1691.469)	8250.48*** (2776.243)
R ²	.30	.10	.03	.48	.15	.27
N	10	20	18	10	34	20

*p<.10, **p<.05, ***p<.01; Standard errors are reported in the parentheses.

Table 7 Final Jeopardy Bet: Distance from Reference Points (OLS Regression Results)

Variable	Leaders			Followers		
	Leader Above & Followers			Leader Above & Followers		
	Both Above	Below	Both Below	Both Above	Below	Both Below
Distance from Aspiration Point (DAP)	-1.468 (2.744)	-1.321*** (.441)	-1.574*** (.304)	-1.326*** (.419)	-.448** (.249)	-.819 (.641)
Distance from Survival Point (DSP)	-2.256 (2.201)	.482 (.493)	-.245 (.441)	2.879** (1.096)	.929*** (.367)	1.492** (.687)
Correct	1091.208 (2265.963)	1161.829 (967.356)	93.529 (611.842)	4221.783*** (1010.029)	-639.57 (614.704)	801.695 (751.392)
Constant	5488.756** (2210.088)	4743.5*** (1101.691)	5909.182*** (871.004)	12467.625 (1088.641)	3961.407*** (849.368)	1152.959 (1230.739)
R ²	.34	.42	.67	.81	.24	.34
N	10	20	18	10	34	20

*p<.10, **p<.05, ***p<.01; Standard errors are reported in the parentheses.

Figure 1: Probability of Qualifying as a Wild Card

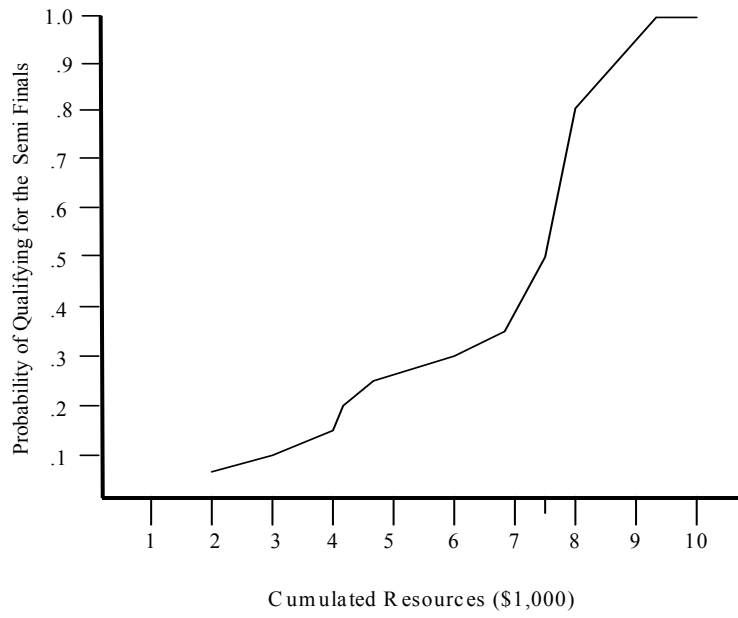
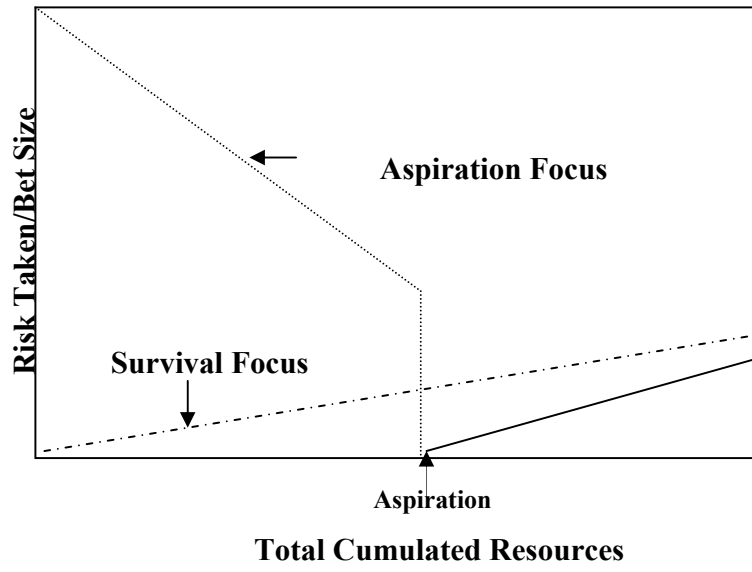


Figure 2 Variable Risk Preferences Model



Appendix A Jeopardy! Game and Tournament of Champions Rules

Rules of the Jeopardy game. Three players play the Jeopardy game. The game is divided into three rounds named: Jeopardy, Double Jeopardy, and FJ (Trebeck & Barsocchini, 1990). Each of the first two rounds contains 30 questions. The 30 questions are divided into six categories with five questions in each. Within a category, the dollar value for each question ranges from 100 to 500 in the Jeopardy round and from 200 to 1,000 in the Double Jeopardy round.

After the host, Alex Trebeck reads each question the player who "rings in" first gets to answer the question (e.g. players is equipped with a buzzer). If the player answers correctly, that player picks the category and dollar amount of the next question. If the player answers incorrectly, the question can then be answered by one of the two remaining players. Again, the player who "rings in" first is given the opportunity to answer the question. Correct answers increase and incorrect answers decrease the player's score by the dollar value of the question.

During the Jeopardy and Double Jeopardy rounds of play, players encounter Daily Doubles. When a Daily Double opportunity arises, players determine how much they wager on the success of their answer. The player can bet up to the total amount of money they have accumulated to that point in the game. If a player's score is below 500 in the Jeopardy round or 1000 in the Double Jeopardy round they are permitted to bet up to 500 and 1000 respectively. Daily Doubles are questions that can only be answered by the player selecting the question.

All players with a positive score at the end of the Double Jeopardy round play the final round of the game, FJ. In FJ the players are shown a single category from which they are asked one question. All players answer the same question and write down their answers simultaneously. The players know only the category, not the question before they decide how much to bet. Players cannot bet more than their score or less than zero. During a regular game, not a TOC game, the player with the highest score after FJ gets to keep the money they have won and return to play another game with two new competitors. The other two players do not get to keep the money; they get a consolation prize. In the next section we describe the special features of the annual Tournament of Champions.

Rules for the Tournament of Champions. The 10 years of data used in our analyses were taken from the Jeopardy program's annual *Tournament of Champions* (TOC) held between 1991 and 2000. Fifteen contestants are selected to participate in the TOC based on their performance earlier in the given year. These players have either won 5 consecutive games during the prior year or have had the highest dollar winnings among those winning 4 games in a row. Also included in the TOC are the winners of two special tournaments held during the year, the Teen and College Championships¹³.

The TOC consists of ten games spread over a two-week period. Each of the fifteen contestants plays in one of the first five games. The winners of each game and the four players with highest score among the non-winners become semi-finalists. We refer to the 4 players that progress to the semi-finals based on being among the 4 players with the highest scores amongst the non-winners in their qualifying round as Wildcards. Each of the nine semi-finalists plays in one of three games and the winner of each game becomes a finalist. The three finalists play two games on two consecutive days and the player having the highest score in the two games combined becomes the champion. The champion wins \$100,000. The remaining 2 finalists receive the money they won in the two games but are guaranteed a minimum of \$15,000 for second place and \$10,000 for third place. Semi-finalists who do not become finalists receive \$5,000 for participating in the show.

**Appendix B Payoff Calculation—Both Above 8,000
(SO/All in Table 2b)**

