RESEARCH ARTICLE

GOLFERS' MOTIVES TO COMPETE

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ARTICLE INFO	ABSTRACT
	The PGA Tour has seen a tremendous increase in purse sizes in the twelve years since Tiger Woods' arrival. Considering this large increase, one wonders whether or not players have become less incentivized to win week-to-week if they know they will be guaranteed large winnings just for making the cut. This hypothesis is tested using scoring differentials before and after the cut as a measure of a golfer's motivation level. The results show a positive, significant relationship between increased purse sizes and decreased motivation to win, albeit with small explanatory power.

INTRODUCTION

Purse sizes on the PGA Tour have dramatically increased since the arrival of Tiger Woods. For instance, at the Wyndham Championship in Greensboro, N.C., tournament officials said attendance reached 145,000 for the week to set a modern tournament record. Sales of concessions and clothing were up 40% to 50%. TV ratings climbed, too. Saturday's 3.2 rating on CBS was 220% higher compared to 2014; Sunday's 3.9 was 160% higher (PGATour.com).

In 1993, four seasons before Woods' first full season, 17 players surpassed the $1 million mark in season earnings[1]. In 2008, twelve seasons into the 'Tiger-era', that number sky-rocketed to 104 players. Perhaps more staggering, is the amount of money earned by the 'lower – tier' players on tour. Taking the 125th ranked[2] player as a representative of this tier, earnings have increased over 380 percent during this time frame. Ronnie Black, the 125th ranked player on the money list in 1993 made $176,700. In comparison, the 2008 recipient, Martin Laird made a staggering $852,752. In the 2009 season alone, there are 25 tournaments in which the winner will receive a prize of over $1 million. Purse sizes top out at over $9 million for the Players Championship, and fall to a *paltry* $3 million for the Reno-Tahoe Open. This is considered a side event, reserved for lower tier players, as the highest ranking players play in a World Golf Championship event that same weekend. These are just some of the statistics that help pronounce the increase in tour purse sizes over the years.

Before Woods' arrival, the tour saw a steady increase from 3 to 5 percent in total money allotted through the year. In 1999, his third full season, the season purse size increased by an astonishing 34 percent! Since this time, purse sizes have grown around 10 to 20 percent a year, with a slight decrease in 2001[3]. The increase in purse sizes can be attributed to numerous items, mainly increased viewership, revenue from ticket sales, and corporate sponsorship that has accompanied Tiger's rise. Regardless of the exact reason for purse size increases, one thing is certain; players' incomes had a much better chance to increase. This includes not just the higher-profiled players but the lower-profiled ones as well.

Looking at two tournament purses from the 2009 season and using the PGA purse distribution system, it is easy to calculate how much the lower-profile players might be getting on a weekly basis. In the previously mentioned Player's Championship, just for making the cut (top 70 and ties after first two rounds) a player is guaranteed slightly over $18,000. Minus compensation for caddies and expenses for traveling, a player could expect to take home nearly $15,000 just for making the cut, in one week. For finishing in 50th position, they could bring home $26,245 in gross value, and approximately $22,000 in net earnings. If they had a relatively good week and finished in 20th place they would earn $144,800 in gross earnings. Since the Player's is the most lucrative tournament of the season, it is

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somewhat misleading to solely rely on this data to gain perspective. A more appropriate tournament to examine is the St. Jude Championship, a second-tier tournament played the week before the U.S. Open, which many higher ranked players skip. This 'lower-profile' tournament has a purse of $6.1 million. For making the cut, a player would gross $12,200. For finishing 50th they could earn over $17,000, and if they climb to 20th, a $97,000 prize would await. Considering the average tour pro plays 35 events of the possible forty-two each season, there is great opportunity to generate a very healthy living just by making the cut every week, and having a few good weeks tossed in here and there.

Considering the large increase in purse size, it is easy to wonder whether or not players have become less incentivized to win week-to-week. Particularly of interest are the lower-ranked players who might have tried harder to win before the purse sizes were so large, but once the winnings for even the lower-finishing players have increased to sizeable amounts, they are comfortable with just trying to make the cut every week. In examining this, it is important to be mindful of qualifying rules of the PGA tour, obviously a player wants to make enough money or even win an event if possible, in order to guarantee their spot on the tour for the next year or years to come. In this paper research is exclusively aimed at how much, if at all, the exponential increase in purse sizes since Tiger Woods arrival has decreased other tour players' incentive to win tournaments. The hypothesis of this paper reasons that such an increase in purse size will have a positive, which is bad in golf, impact on players scoring average differentials, thus showing their decreased motivation to win.

By gathering golfer's before and after cut scoring averages (1st and 2nd rounds vs. 3rd and 4th rounds) and using a fixed-effects regression model to determine how much of their increase in after cut scoring average is attributable to an increase in total money available for a given season, we will try to test our hypothesis. This measurement will determine if players shoot lower scores before the cut (in order to guarantee prize money) and then subsequently "slack" off in the next two rounds once they are guaranteed a certain amount. If a player's after-cut average is increased as his earnings are increased, it could be said they experience less incentive to win, and therefore play simply to make the cut and settle with lower places, since these places are guaranteed a relatively large sum of money relative to the 'pre-Tiger' era. On the other hand, according to the tournament model theory, properly structured spreads in the prize money, should induce players' effort and we should observe decrease in average scores on Saturday and Sunday.

Literature Review

Ronald G. Ehrenberg and Michael L. Bognanno (1990) have one of the most cited articles on tournament theory using professional golf as the setting. They look at data from the 1987 European PGA Tour and find that increased prize money in tournaments positively affects players' performance. They also test the effect of a tournament's prize structure-concluding that a golfer will face a higher marginal return in the final round if they shoot lower scores in the first three rounds. In other words, when players are closer to the lead going into the final round, they will perform better relative to the players who shot higher scores in the first three rounds. They argue that the marginal return to improving a golfer's position by one rank (for players near the top of the lead) is greater than players who are further down the leader board. Therefore, these lower ranked players have little incentive to improve their scores. Both of these findings are related to the hypothesis of this paper. Their first finding is that players will shoot lower scores as prize money increases, but that is related to the purse and the quality of players that enter the event. The second of their findings, indirectly supports the claim that "career" golfers will be less incentivized to win once they make the cut, because unless they can reach the top 15 (where a majority of the prize money is distributed), they have little incentive to shoot lower scores in the final rounds.

Jennifer Brown (2008) examines the adverse incentive effects of having a superstar in a competition. This is the first known research to examine the impact of Tiger Woods on other PGA Tour players. Although this is not her main subject -rather it is examining whether perceived higher abilities in competitors reduces incentives- the effect of Tiger is used as the empirical framework and is of much interest to this research. Using round-to-round data from the PGA Tour for the years 1999-2006, she finds, ceteris paribus, that higher-skill golfers shoot higher scores (a bad thing in golf) when Tiger Woods participates relative to tournaments in which he is absent. An interesting fact present in her article: Tiger Woods was able to earn $4.9 million in additional earnings simply because of reduced effort of other golfers.

Brown's research is particularly relevant and of interest to the research conducted in this paper. The relation is indirect, but important nonetheless. She raises questions as to whether the increase in scoring is because of Tiger's presence or because of increases in prize money. In all, Brown's article shows that the presence of a superstar (Tiger Woods) adversely affects players' incentives to win. In relation, this paper examines whether this affect is not Tiger Woods per se, but rather the exponential increase in purse size that can almost entirely be attributed to his presence on the tour.

Melton and Zorn (2000) conduct the most closely related research, using evidence from the 1994 and 1995 Senior PGA Tour to find that player's performance and prize money increase simultaneously. Unlike all previous golf tournament research, Melton and Zorn study the senior circuit, which lacks a survival bias because of their unique format. There are no cuts and therefore players are guaranteed some portion of the prize, unless they get disqualified or drop out due to injury or other reasons. With the lack of a cut, they are able to test how players' performance is affected when tournament prize money is increased, knowing that everyone is guaranteed a portion of the purse. This is extremely related to this research as scoring averages are looked at before and after a survival bias is removed (once players make the cut).

Gerald Scully (2002) examines the distribution of earnings on the PGA Tour and its effect on performance. Using the 2000 season and 251 golfers as a cross-sectional data set, Scully finds that there is vast difference between players' earnings in tournaments (44.4% go to top 5 players). Alternatively, he finds that there is a slight separation (scoring average has a standard deviation of .91) between the top player on tour and

the worst. Given this non-linear relationship, he sets all variables to logarithm. Using these values and holding age and number of events constant, he estimates if a player lowers his scoring average by 1/10 he would increase his winnings by $32,000. In other words, small increases in performance can lead to a large impact in winnings; given the inequality present in the PGA Tour tournament structure. Scully's article is relevant to this research in that, if player's were to recognize this fact, especially considering the increased purse sizes over the 1993-2004 era, they could receive far greater monetary gains just by increasing effort by a relatively small amount.

Sherwin Rosen (1986) explores the relationship between prizes in sequential elimination events and performance incentives. Using tennis as his sport of study, he finds that as the survival option in a tournament is reduced, an increased weight needs to be placed on the winning value, because players' advancement options are gone. In other words, once a player has reached the last possible stage (i.e. championship match), they need extra incentive to win because the value they put on advancing is gone. In order to get players to compete at their optimal level they must be incentivized accordingly. If top prizes are not set high enough, the players will tend to slack off in their "attempts" to win.

Rosen's article can provide evidence as to why the PGA Tour chooses to utilize an unequal purse distribution system. They are looking to provide an incentive for players to achieve the top prize. However, his findings have relevance also to the lower-end of the distribution system as well. In this research a sequential tournament may be found in the form of before and after the cut. Once a player makes the cut, how much incentive do they have to win, considering the 3rd and 4th round are the highest possible levels reached?

Becker and Huselid (1992) examine tournament theory using racing series competition data. They use the racing sector because, unlike on all golf tours, each racing event has different prize distributions set by the race's promoter. From both NASCAR and IMSA (International Motor Sports Association) panel data sets, Becker and Huselid find that increasing the prize differential between the 1st and 2nd place finishers increased driver performance. Also, they examined whether incentive effects are changed over the level of the spread and find that incentive effects in auto racing are limited. Their article relates to Rosen's findings that increased incentives at the top provide enough incentive for players to increase performance. More relevant to this paper are their findings regarding limitations in spread incentives. Increasing the prize differential only works to a certain degree as player's will justify the cost of achieving such a high top prize may not be worth their time, and thus decrease their performance.

Ivankovic (2007) uses actual professional tennis data and observes that spreads on the professional tour are not set up in a way that the players will be motivated to exert maximum effort from one round to the other. In many professional tournaments, Rosen's spread is at its highest (percent change in the prize money between winning and losing a match) in the early rounds, and spreads decline as the players move toward a final round. Tournament model suggest just the opposite. It is also very obvious that professional players are heterogeneous

in their abilities since as the ranking spread increases, match time decreases.

Theoretical Considerations

This research relates to tournament theory, which focuses on wage differences in terms of relative performance rather than absolute performance. Numerous studies have examined how participants perform in a tournament (or tournament setting) relative to their expected compensation or the compensation they have received for making it a certain distance. Of interest in this research is performance related to guaranteed compensation and expected future earnings (both relating to purse size). There is no better setting for this theory to be tested than the professional golf ranks, which explains why numerous studies have already been conducted. Many of these studies relate tournament theory to firms, executive compensation, or internal competitions to improve worker productivity. This research aims at determining whether or not golfers become less motivated to win once their expected earnings for not winning have grown perhaps too large.

Let us assume that P is a tournament purse. Purse will vary based on tournament's prestige. Thus the higher the P, the more important is the tournament. Size of the purse determines the quality of the entries. Thus, the higher the P, the better ranked players will be in the tournament. Let assign W for players' earnings, thus, expected earnings, E (W) = Fn (P| X) where X is round 3 and beyond and P > 0. Players, who do not make X, make zero earnings. Therefore, best players will line up the higher the P, simply because the probability of higher earnings will increase.

R = Fn (X, A) where R is the revenue between winning something by qualifying for day 3and zero. A is the player's ability level, so A is an inverse function of players' cost and is normally distributed with a mean = 0 and standard deviation = 1. Players with higher ability will incur lower costs (effort, focus, fitness, etc...) as they progress into day 3 and 4 w.r.t. lower ability players. We assume that A per player is constant, at least in the short run, but cost C is not; C' and C ' ' > 0.

Thus we can write that E (W) = Fn (P| X, R, A, C). P is relevant just when it comes to entry decision (higher P, better players will enter) and P becomes relevant only from round 3 and on. Thus R is the subject to making a cut. Once the cut is secured, certain R is guaranteed.

Real E (W) = fn (R, A, C); since A is constant, E (W) = A fn (R, C). Since financial outcomes in a tournament are based on the final rank, players receive different R. To adjust for that, we can write the function as, real E (W) = A fn (delta R – delta C), where delta represents a change. Delta R is a change in revenue (marginal revenue) earned by a better rank, which is the spread between 2 ranks. Thus delta R = S, where S is a spread. Delta C is the additional cost required to obtain certain S. Delta C = marginal cost associated with player's effort (C') for given A. Real E (W) for player 1 = A fn (S, C').

E (W) for player 1 = (S – C') + Ω + ε̇ where Ω is tournament specific characteristics and ε̇ is a random error term. In rounds 1 and 2, S = 0 so players incur only the C' but C' is based on the E (S). We can treat the C' as an investment in rounds 1 and 2. Once the cut is obtained, (S – C') will dictate player's decision

on how much additional effort to supply. It is safe to assume that P and S are positively correlated while C' remains constant since it is based on player's A. Since Tiger Woods "effect" caused P to increase, S increased as well. Now, if you finish in the middle, or close to last, your pay is much greater than prior to Tiger Woods "effect." We are arguing that higher P and S can cause a negative effect on C' past round 2.

Empirical Strategy

To determine whether or not golfers are less motivated to win once purse sizes become large, a fixed effects regression model will be utilized. The dependent variable will be players scoring difference before and after the cut. The rationale for this measurement being: a player must shoot well enough before the first two rounds in order to guarantee a portion of the prize money, once they make the cut they might elevate their scores if they are already guaranteed a set amount of money, since they are not concerned with winning the tournament. Therefore, a player who shoots low before the cut but shoots high scores after the cut, could be deemed as less motivated to win then a player who, say, shoots low enough to make the cut but then lowers his scores further after the cut in pursuit of a win.

There are of course many other factors that will go into effect that might cause a player to shoot worse after the cut i.e. bad physical conditioning, "choking" under pressure of the last two rounds, etc. For purposes of this paper, scoring differential is the main determinant as to how much a change in purse sizes increases or decreases a golfer's motivation for winning, or even for playing well enough to be in contention. Increases in purse sizes are relative to the 1996 season, which was Tiger Wood's first appearance on the PGA tour. The resulting fixed-effects regression will be the main determinate of purse size impact on scoring differentials:

$$Difference_{it} = \beta_0 + \beta_1 Money1996_{it} + \beta_2 Event_{it} + \alpha_i + \lambda_t + u_{it}$$

A control variable for the number of events played per player per season will help smooth out differences in scoring averages that could be attributed to playing fewer rounds in a particular year. A time fixed effect variable (λ) is added to the regression to help control for changes on the tour in technology, changes in course layouts, and any other factors that might vary across time but not across players. An entity fixed effect variable (α) will be added to control for any differences between players that are constant over time. A robust standard error will also be utilized.

Data Description

Data was gathered from the Professional Golf Association (PGA) Tour's website, PGATOUR.com. A panel data set was constructed covering twelve seasons (1993-2004) and seventy-four golfers, all of whom played during this time. Of this group, only three golfers missed a single season within this time frame. The sole criteria for being included was being a PGA member these twelve seasons, the ones who missed seasons were due to injury. Every level of player is included, taken that they must obtain a certain level of skill to remain on tour, whether they won $10 million in one year or $16 thousand in one season was irrelevant for inclusion into this sample. The number of tournaments in a season varies across

years and players, as some players might not be eligible to play in every tournament. Winning certain tournaments, say major championships, can guarantee a golfer's tour card for more than one season.

The time period from 1993 to 2004 was chosen as an appropriate representation of seasons before the Tiger Woods era began and as ones in the midst of it. It was important to include the four full seasons (1993-1995) before Tiger Woods played on tour, to capture any scoring average differentials that might have been present before greater purse sizes were the norm. Also, since Tiger Woods would by all accounts be considered an outlier, using this time period automatically eliminates him as possible player entity for this research.

Table 1. Descriptive Statistics.

Variable	Observations	Mean	Standard Deviation	Min	Max
DIFFERENCE	875	.00584	.8823065	-7.2	5.5
MONEY1996	876	.8408333	.9058851	-.22	2.38
EVENT	874	23.8238	6.505339	0	36
WINS	872	.3337156	.7681136	0	9
TOP10	872	1.729358	2.312083	0	13

The dependent variable, *Difference,* is the golfers scoring average differential. It is constructed by subtracting before-cut (1st and 2nd rounds) scoring averages from after-cut (3rd and 4th rounds) averages. If this number is positive for a given year, a golfer has shot worse, on average, after the cut then he did before the cut. A desired outcome for golfers is to shoot better scores after the cut; this means being in contention and ensures 'strong finishes' which are desired in any sport. A positive scoring differential is translated, albeit with weak argument[4] to mean a player is unmotivated to win. These players will shoot good enough scores to make the cut, and thus guarantee a portion of the prize money. Once they make the cut, they may be content with the minimum prize money, or more likely content with obtaining a check of around $100,000- which is the norm now for finishing in the top 50. As a result, they will not try as hard in the final two rounds, maybe not practicing as much before and after the rounds, not taking as much time when lining up a putt, before hitting a shot, or simply by not putting forth as much grit and determination they would as if they were trying to win. It is also possible that player's A is good enough for a cut, but around left tail of the distribution after the cut. A positive scoring differential should not be the only indicator for whether or not a player is less or more motivated to win in a given tournament or season. It is merely a representation in this research, a way to measure changes in players scoring patterns that have occurred as purse sizes have increased. Only the player accurately knows whether or not he is motivated to win.

The main independent variable for the estimation is *Money1996*. This measures the percent change in total purse size available in a given year from 1996, which was chosen as the base year because it marks the arrival of Tiger Woods on the PGA Tour. Purse sizes were steadily increasing (ranging from 3 to 5 percent) in the years before his emergence- in 1997, his first full season purse sizes increased by 11 percent. They have been growing at incredible rates since then, even seeing an increase of over 34 percent (in real terms) in one year. The hypothesis

shall be accepted if this coefficient is positive, affirming that as money increases in a given year, scoring differentials will increase because players are less motivated to win because they are guaranteed larger prizes for finishing in the same relative position.

The number of tournaments a golfer plays in each year, *Event,* is added as a control variable. This will help account for any changes in scoring averages that have been caused by playing in a low number of tournaments in a given season (averages can be skewed when divided by a lower number). Also, this variable can control for any differences a player might have in scoring averages caused by playing in a large number of tournaments in a given season (playing more, causing fatigue, and subsequently shooting worse scores in later rounds).

Two variables- *Wins* and *Top10*- are added in various regressions to control for differences among player's skill levels in a given year. These also can be added to determine how well a player of a certain rank or level performs in the final two rounds. Every tournament follows the same purse allotment: 18% of purse to winner, 10% for 2nd place, and 6% for 3rd, down to .2% for finishing last (PGA Tour, 2009). *Wins* is the number of tournament victories a player has in a given season. The variable *Top10* is a broader version of *Wins*, in that it amounts to number of top ten finishes a golfer has in a given season rather than just victories. The same hypothesis should hold true for both variables. A player with more wins and/or top ten finishes can be expected to shoot lower scores in the final rounds. It could also be reasonable to assume that such a player could have no differences between before and after cut scoring averages, asserting that a good player would tend to be more consistent from each round than a weaker player.

RESULTS

Table 2 Regression Results

DIFFERENCE	(1)	(2)	(3)	(4)	(5)
MONEY1996	0.059	0.059	0.167*	0.185**	0.209**
	(0.038)	(0.041)	(0.084)	(0.087)	(0.099)
EVENT				0.009	0.009
				(0.011)	(0.011)
WINS					0.031
					(0.040)
TOP10					0.018
					(0.021)
_cons	-0.043	-0.044	-0.135	-0.364	-0.433
	(0.038)	(0.035)	(0.120)	(0.314)	(0.341)
Player effects?	no	yes	yes	yes	yes
Time effects?	no	no	yes	yes	yes
^Time effects = 0			5.29	5.18	5.07
			(<.001)	(<.001)	(<.001)
N	875	875	875	873	872
R-sq	0.004	0.004	0.040	0.043	0.045

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01
^F-statistics and corresponding p-values (in parentheses) test for exclusion of time variables

The first regression run is a basic Ordinary Least Squares (OLS) estimation testing the effect of money increase on scoring differential. There is no significance, as player and time effects are not controlled for. The second regression accounts for player but not time fixed effects, a lack of significance remains. There is a large possibility of omitted variable bias in the first two regressions, as there are many factors that vary between the twelve seasons included in the data. Among them, better technology, better player fitness, and varying course conditions could all account for changes in

better play and perhaps better scoring differentials through these years.

To eliminate any potential omitted variables bias, time fixed effects and player fixed effects are controlled for in regression three. When doing this, *Money1996,* becomes significant at the 10 percent level. Thus, after accounting for previously omitted variations across the twelve seasons, a purse size increase of one-percent leads to a .185 increase in scoring differential.

The variables for number of events, wins, and top ten finishes are added in fixed-effects regressions four and five. These variables are insignificant, but by controlling for number of events in regression four, the coefficient for *Money1996* becomes significant at the 5 percent level and increases slightly in value. In regression five, when all control variables are included, the coefficient for *Money1996* remains significant at the 5 percent level and once again slightly increases in value. Therefore, the statement can be made, ceteris paribus, that increasing the purse size by one percent leads to a .209 increase in scoring differential. This number may seem small, but it is important to remember that a .185 or .209 increase in scoring averages is a significant number in golf. As Scully (2002) ascertained, a 1/10 improvement in overall scoring average can increase a players winnings by $32,000 in a season, holding age and number of events constant. It is safe to assume that slight increases in scoring differential after the cut can have similar effects on player's winnings.

No conclusions can be drawn regarding player's quality and the effect of purse increases, as the two variables, *Wins* and *Top10,* are insignificant. In hindsight, this effect would be better captured if a variable for player's world rank or position on the money leader board were used. The number of wins and top ten finishes a player has in a given season can be a representative of the quality of a given player, but not as efficiently as a world or money rank might be.

F-tests are conducted for the three regressions where time fixed effects are utilized. All three tests are rejected, reaffirming the notion that there are variations between the time periods, and there inclusion is pertinent.

The R-square remains extremely low for all regressions; even after the fixed-effects models are utilized. This is attributed to the previous disclaimer, that this estimation is merely a symbol for lack of motivation rather than a true indicator of it. Player's scoring differentials before and after the cut can be attributed to many causes. There are, by own admission, perhaps a dozen or so variables that should be added to this regression to capture the true change in scoring differentials. The acceptance of the original hypothesis can be justified, in that golfers scoring averages are in some respect influenced by increases in purse sizes. This can provide some insight to player's being more or less motivated to win once this happens, but as cautioned a literal translation of increasing purse sizes leading to no motivation to win is not warranted. It is only the players themselves that truly know whether or not they are more or less motivated to win during a given tournament or season.

CONCLUSION

This research was done out of curiosity about golf players' behavior. A further application of tournament theory and motivation based on purse sizes has and will continue to be done in academic circles. The results of fixed-effects regressions provide significant results, stating that scoring differentials between before and after the cut are in some way positively (a bad thing in golf) influenced by increases in purse sizes on the PGA tour. This increase in purse sizes, given the tour's invariable distribution system, may lead some golfers to settle for lower places in the tournament once they have made the cut- because they are guaranteed a significant sum of money. Importantly, this is a much larger sum then they would have received for finishing in the same position in a given tournament during the years pre-Tiger Woods, when purse sizes were much smaller. By showing a positive, significant relationship between purse size increases and scoring differential, the original hypothesis can be accepted. This acceptance is conditional and should be taken with prudence, as it is hard to justify a full relationship between these two. The results of this research merely offer a glimpse into the possible relationship that exists between increased expected monetary gains and disincentives for winning.

Notes

1. All monetary figures are denominated in 2008 dollars, unless noted otherwise.
2. A ranking of 125 on the year-end money list is the cut-off for automatic qualification for the next PGA Tour season.

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