Are Prizes in Professional Golf Too High?

Thomas A. Rhoads*
Department of Economics
Towson University
8000 York Road
Towson, MD 21252
Phone: 410.704.2954
Fax: 410.704.3424
Email: trhoads@towson.edu

November 2008

Abstract

Payoff structures in professional golf tournaments are intended to provide incentives to elicit maximum effort from players near the lead. While a growing literature has emerged in studying these types of tournaments, there is no consistent story. Perhaps it is because the impact of practice and preparation for tournament play has not been included in effort functions. Using data from the 2006 PGA TOUR, I test the linear model of eliciting effort from professional golfers. Unlike earlier results, I find that professional golfers’ effort decrease with a larger prize gradient. This result points to the need to better understand effort before the tournament begins and for including practice and preparation as explanatory variables in these models.

* This is a preliminary draft prepared for the First Annual Myrtle Beach Golf Conference, Myrtle Beach, SC. Comments are welcome.
1. Introduction

Professional golf tournaments offer payoff structures intended to provide incentives to elicit maximum effort among players near the lead. By offering a larger prize gradient for top finishers than for those finishing near the bottom of the tournament, players close to the top of the leaderboard as the tournament is closing are expected to provide more effort since the marginal product of their labor is relatively large. Since fans of individual sports like golf are generally responsive to quality of play, this prize structure is preferred over competing prize structures since additional effort often results in higher quality performance from golfers.

While a growing literature has emerged as economists examine the incentives in these types of tournaments (see Ehrenberg and Bognanno 1990a, 1990b, Orszag 1994, Melton and Zorn 2000 and Matthews et al 2007), there remains some ambiguity in understanding the impact of these payoffs on golfers’ effort as measured by total tournament score. Notably, no consistent story has emerged linking the incentives generated from the prize structure found in professional golf tournaments and the performance in those tournaments. Perhaps this is because considerations of how practice and preparation affect tournament performance have been largely ignored in this literature. All else equal, more practice and preparation should lead to lower tournament scores; less practice and preparation should lead to higher tournament scores. With practice and preparation excluded from these models, the effect of tournament prize structure on effort and the resulting effect of effort on scores cannot be fully determined.

Although Shmanske (1992) has examined human capital formation on the PGA TOUR, prior work on tournament incentive effects has ignored the possibility that effort in practice and preparation before a tournament could affect scores as much as the effort
expended during a tournament. In this paper, I suggest that tournament scores may vary with practice and preparation before a tournament even though maximum effort levels are still elicited during a tournament. There would be a negative relationship between total score and tournament purse if on-course earnings are large compared to off-course earnings and a positive relationship between total score and tournament purse if off-course earnings are large compared to on-course earnings.

In fact, I find that increasing tournament purses increased total scores on the 2006 PGA TOUR. Using earlier studies as a guide, my result would be interpreted as larger prize differentials in the tournament prize structure having a dampening effect on effort during the tournament. But it is highly unlikely that PGA TOUR players have decreased their effort levels during golf tournaments. Shogren (1997) finds that tournaments featuring large prize gradients for top finishers elicit self-interest, or top effort, among participants in an experimental setting so we should expect golfers in tournaments offering tournament-type prize structures to elicit top effort also. Assuming that effort levels during tournaments remain high suggests the slight decrease in scores on the PGA TOUR over the past decade (see Pennington 2005) could be at least partly explained by a decrease in time spent practicing and preparing. I do not attempt here to empirically determine the precise relationship between practice and preparation and tournament effort. However, my results show strong evidence that this relationship needs to be established so a more complete understanding of how prize structure affects effort can be attained.

During the past ten years as official PGA TOUR prize money has increased substantially—from $80 million in 1997 to $265 million in 2007—professional golfers
are also finding more lucrative endorsement deals to supplement their on-course earnings. Professional golfers as a group received approximately $265 million in endorsements in 2005 (Golf 20/20 2007) and first-year PGA TOUR players are now routinely receiving equipment endorsement deals of around $250,000 (Paris 2008). At the margin, if these endorsements cause golfers to substitute away from practice time to meet the demands of the richer endorsement contracts, tournament performance would be expected to decrease and total scores would increase.

Getting a better handle on this dynamic requires knowledge about how players practice and is something that has not been studied in depth. Shmanske (1992) estimated the value of the marginal product (VMP) for practicing in 1986 was at most about $500 per hour (about $1000 per hour in 2008$) for PGA TOUR players. And while the much higher purses in place on the PGA TOUR now likely make the VMP for practicing even higher still, increasing off-course earnings could cause professional golfers to increase the amount of time devoted to honoring endorsement contracts and decrease the amount of time spent practicing and preparing for competition. Therefore, if PGA TOUR players are substituting away from practice time, quality of play could decrease even if effort levels do not. For those players that attract the larger endorsement contracts and generally play in tournaments with higher purses, on-course earnings are usually a smaller fraction of overall earnings. All else equal, it follows that if these players are practicing less in order to honor the requirements of their endorsement contracts scores would be higher at these tournaments.

Taking a similar modeling approach to the previous studies in the literature, I use data from the 2006 PGA TOUR to estimate the affect of tournament purse on total score.
for a golfer, controlling for course quality and golfer skill. The results suggest that a
golfer’s pre-tournament practice and preparation may be impacting performance in a
tournament. The findings developed here are counter to those found by Ehrenberg and
Bognanno (1990a, 1990b and Orszag 1994) and point to a need to better highlight and
update the explicit relationship between practice and performance that was first examined
by Shmanske (1992). In short, consideration must be given to how professional golfers
prepare for competition if we are to fully understand how effort is affected by tournament
purse size. The remainder of this paper is structured as follows. Section 2 reviews the
literature and section 3 introduces the data and provides a model. Section 4 offers
empirical results before section 5 concludes and provides some extensions.

2. Literature and Data

Beginning with Lazear and Rosen (1981), economists have generally understood
that rank-order tournaments offer special incentives for eliciting maximum effort from
participants. Using a prize structure that provides larger prize gradient for top finishers
than for those finishing near the bottom, incentives exist that allow a principal to elicit
top effort from an agent. In the case of professional golf tournaments, tournament theory
predicts increased effort from golfers coming in the form of lower golf scores as
differences in prizes due to rank become larger provided that the golfer has a better
chance of achieving better rank with greater effort.

The primary means of testing this relationship has been to capture the change in
prize differential through changes in tournament prize money. Because the relative prize
structure is the same at all PGA TOUR tournaments, the assumption is that the level of
prize money will elicit effort effects. Ehrenberg and Bognanno (1990a, 1990b) were the
first of a number of researchers to examine the incentive effects of professional golf tournaments on effort and performance. These studies have ranged across the years and across the professional golf tours. The two original papers concluded that the tournament structure on the 1984 PGA TOUR (Ehrenberg and Bognanno 1990a) and the 1987 European Tour (Ehrenberg and Bognanno 1990b) provided incentive effects that lead to better performance, just as tournament theory predicts. But using data from the 1992 PGA TOUR, Orszag (1994) noted that an included weather variable in Ehrenberg and Bognanno (1990a) somehow distorted the true impact of the tournament payoff structure on effort and that there really was no statistically significant relationship on effort stemming from larger prize gradients. Melton and Zorn (2000) examined the 1994 and 1995 Senior PGA Tour, pointing out that survival bias lead to the conflicting results in the literature. They concluded that payoffs in professional golf actually do provide incentives to enhance effort as predicted by tournament theory. But then Matthews et al (2007) use a fixed effects model to show that unmeasured differences in players and courses for the 2000 LPGA Tour likely drove perceived differences in effort, and therefore conclude that payoffs in professional golf tournaments do not provide incentive effects as tournament theory predicted. Further, their results suggest that some gender differences may exist.

Returning to Orszag’s (1994) result, it is curious that he suggests effort and concentration are not important in determining total scores and that luck is. While luck can certainly explain some of the things that happen on a golf course, there is more to shooting low scores than simply chance. Further, relying on luck to establish this claim runs counter to theory (Lazear and Rosen 1981) and intuition: Given the growth in purses
and popularity on the PGA TOUR, why would luck be rewarded so highly? I use data from the 2006 PGA TOUR to suggest a model examining effort of PGA TOUR players must include the practice and preparation that takes place before a tournament.

Table 1. Purse sizes for Tournament Incentive Papers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ehrenberg and Bognanno</td>
<td>PGA TOUR</td>
<td>1984</td>
<td>$21,251,382</td>
<td>$41,234,635</td>
<td>46</td>
<td>$896,405</td>
</tr>
<tr>
<td>(1990a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ehrenberg and Bognanno</td>
<td>European Tour</td>
<td>1987</td>
<td>£5,250,533</td>
<td>£15,227,226</td>
<td>28</td>
<td>$543,830</td>
</tr>
<tr>
<td>(1990b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orszag (1994)</td>
<td>PGA TOUR</td>
<td>1992</td>
<td>$49,386,906</td>
<td>$70,965,077</td>
<td>44</td>
<td>$1,612,843</td>
</tr>
<tr>
<td>Melton and Zorn (2000)</td>
<td>Senior PGA Tour</td>
<td>1994</td>
<td>$28,850,000</td>
<td>$38,163,780</td>
<td>37</td>
<td>$1,031,454</td>
</tr>
<tr>
<td>Melton and Zorn (2000)</td>
<td>Senior PGA Tour</td>
<td>1995</td>
<td>$33,300,000</td>
<td>$45,298,785</td>
<td>38</td>
<td>$1,192,073</td>
</tr>
<tr>
<td>CURRENT</td>
<td>PGA TOUR</td>
<td>2006</td>
<td>$256,850,000</td>
<td>$256,850,000</td>
<td>48</td>
<td>$5,351,042</td>
</tr>
</tbody>
</table>

Table 1 above shows the total purses available for each of the noted studies. The average purse size for each of the years and tours under study is highlighted. Note, for example, that the average purse size for the PGA TOUR in 1992 at the time of the Orszag (1994) study is almost double the average purse size in 1984 at the time of the Ehrenberg and Bognanno (1990a) study. And the average purse in 2006 was about 3.5 times the average purse in 1992. It is expected that this large difference is at least correlated with what drives the different results in all of these papers. To be more precise, re-examining this topic at this time using the most recent data from the PGA TOUR provides for a chance to see if effort may show up in places other than the actual tournament setting. The discussion of modeling the effect of effort on score is left to the next section.
3. Data and Model

Data for this analysis were collected from the PGA TOUR’s website and from the PGA TOUR 2007 Official Guide. A total of 148 players that played in at least five PGA TOUR tournaments in 2006 were included. Performance in major tournaments is not included here because I assume that in major golf tournaments money prizes are not the dominant incentive for putting forth maximum effort. Instead, a green jacket from the Masters Tournament, for example, is the kind of incentive players respond to in playing and preparing with the highest level of effort, regardless of the total purse that is available. Regular PGA TOUR events, however, offer differing levels of incentives to perform and provide top effort as the total prize money available differs.

Table 2. Descriptive Statistics and Definitions

<table>
<thead>
<tr>
<th>Definition</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCORE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score for all rounds of tournament</td>
<td>281.00</td>
<td>7.09</td>
<td>260</td>
<td>306</td>
</tr>
<tr>
<td><strong>TPRIZE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total prize money, in millions of dollars</td>
<td>$5,156,874</td>
<td>$954,908</td>
<td>$3,000,000</td>
<td>$8,000,000</td>
</tr>
<tr>
<td><strong>PAR</strong></td>
<td>71.29</td>
<td>0.80</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td><strong>YDS</strong></td>
<td>7212</td>
<td>209.73</td>
<td>6759</td>
<td>7568</td>
</tr>
<tr>
<td><strong>SAVE</strong></td>
<td>70.82</td>
<td>0.63</td>
<td>68.11</td>
<td>75.46</td>
</tr>
<tr>
<td><strong>AGE</strong></td>
<td>35.47</td>
<td>6.49</td>
<td>23</td>
<td>50</td>
</tr>
<tr>
<td><strong>MERIT</strong></td>
<td>72.68</td>
<td>45.45</td>
<td>1</td>
<td>263</td>
</tr>
<tr>
<td><strong>XMPT</strong></td>
<td>0.31</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>MSAVE</strong></td>
<td>70.82</td>
<td>0.12</td>
<td>70.61</td>
<td>71.14</td>
</tr>
<tr>
<td><strong>TOP20</strong></td>
<td>7.37</td>
<td>4.33</td>
<td>0</td>
<td>16</td>
</tr>
</tbody>
</table>
Having exempt status for the 2006 season was not required for inclusion in the
data set since season-long behavior is not being analyzed, but rather behavior at
individual tournaments and exempt status is not required for PGA TOUR play. But, as is
standard in the literature, a designation is included for whether or not a player has exempt
status for the 2007 season. Descriptive statistics and the definition of variables are
provided in Table 2. Overall, there are 1833 observations in the data set, giving an
average of just over 12 tournament observations for each golfer in the data set. Only
those tournaments for which a golfer completes all four rounds are included, so there are
no observations of golfers that do not make it past the 36-hole cut.

Effort can only be measured indirectly by total score, SCORE, where total score
is a function of effort, skill, and some other course specific factors, such as length of
course and general course layout. Previous studies implicitly model total score as

\[ (1) \quad \text{SCORE} = f(\text{EFFORT}, \text{SKILL}, \text{COURSE}, \text{OTHER}), \]

where the effects of increased effort in equation (1) are assumed to show up in lower total
scores and decreased effort shows up in higher total scores. It is further assumed that
effort is a function of the total prize money available which affects effort monotonically
through expected earnings and other variables such as mental and physical capacity of the
golfer and can be modeled as \( \text{EFFORT} = f(T\text{PRIZE}, OTHER) \) where \( \frac{\partial \text{EFFORT}}{\partial T\text{PRIZE}} > 0 \).

That is, larger purses lead to larger prize gradients for top finishers, which are assumed to
lead to more effort as the marginal product of labor increases.

But what is ignored in this model is that effort also includes the practice and
preparation that takes place before tournament play occurs. Anything that makes effort
increase prior to the tournament will lead to lower total scores; anything making effort
decrease prior to the tournament will increase total scores. The higher purses that are correlated with higher endorsement deals for professional golfers have possibly led to more off-course business opportunities for golfers. In turn, this would cut into practice and preparation time. Thus, even though effort in the tournament remains high, effort before the tournament may have decreased, which could lead to an increase in total scores. This can be tested using the models already in place from the prior studies. Finding that total scores have increased with an increase in total prize money would be consistent with this story.

The model that I use to estimate total scores is virtually the same as the one used by Ehrenberg and Bognanno (1990a, 1990b) and Orszag (1994) and others. Equation (2) highlights the effect of total prize, TPRIZE, on total score, SCORE while controlling for player and tournament specific effects.

\[
(2) \quad \text{SCORE}_{ij} = \beta_0 + \beta_1 \text{TPRIZE}_j + \beta_2 X_j + \beta_3 Y_i + \beta_4 Z_j + \epsilon_{ij}
\]

The analysis keeps many of the core features from the earlier models that appear in the literature. Total score of player \(i\) in tournament \(j\), \(\text{SCORE}_{ij}\), is included as the dependent variable to be estimated. Since the relative distribution of prizes from the total purse is constant across tournaments on the PGA TOUR, only changes in total purse will lead to changes in the level of the differences in prizes between ranks. Thus, total prize in tournament \(j\), \(\text{TPRIZE}_j\), is included to determine the effect of prize differential on effort. But note that \(\text{TPRIZE}_j\) may be correlated with golfer type, so increases in \(\text{TPRIZE}_j\) could attract players with more endorsement commitments who practice less, all else equal. That is, a player making more money in endorsements will likely have a higher
opportunity cost of playing in a tournament, so he will be more likely to play in a
tournament with high \( TPRIZE_j \) as opposed to a tournament with low \( TPRIZE_j \).

Other independent variables are included to control for the difficulty of the golf
course, the skill level of the golfer, and the quality of the field playing in a tournament.
\( X_j \) is a vector of variables that allows control of tournament-specific effects. \( PAR \) is a
measure of the par for a golf course, usually 72, and \( YDS \) is a measure of the length of a
golf course, in yards. \( Y_i \) is a vector of variables that controls for player skill and ability.
A golfer’s scoring average, \( SAVE \), is the scoring average for 2006. \( MERIT \) is the final
rank on the 2006 money list for a player and \( AGE \) is the player’s age in 2006. Finally, \( Z_j \)
is a vector of variables that controls for the quality of the field playing in the tournament.
\( MSAVE \) is the mean scoring average for all players entered in a tournament and \( TOP20 \)
is the number of golfers in the field that were in the top 20 money winners for 2006. I
use data from the 2006 PGA TOUR in a stylized version of the standard model. The next
section presents empirical results to compare to the previous studies.

4. Empirical Results

The total score equation is an ordinary least squares model similar to those found
in Ehrenberg and Bognanno (1990a) and Orszag (1994) and others is estimated and
reported in Table 3. Estimates for the equation are generated with the data pooled across
individual golfers and tournaments.

The results below can be easily compared to prior studies on tournament payoffs
where an OLS model is used to estimate the effect of total prize money on total score.
The adjusted \( R^2 \) of 0.37 is similar to other models. The control variables except for
XMPT and AGE are significant, have the expected sign and line up with what other studies have found.

*Table 3. Total Score Equation for 2006 PGA TOUR*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPRIZE</td>
<td>2.80*</td>
<td>(15.46)</td>
</tr>
<tr>
<td>PAR</td>
<td>1.55*</td>
<td>(6.76)</td>
</tr>
<tr>
<td>YDS</td>
<td>0.0045*</td>
<td>(5.21)</td>
</tr>
<tr>
<td>SAVE</td>
<td>2.12*</td>
<td>(6.59)</td>
</tr>
<tr>
<td>MSAVE</td>
<td>7.19*</td>
<td>(3.76)</td>
</tr>
<tr>
<td>TOP20</td>
<td>0.46*</td>
<td>(9.65)</td>
</tr>
<tr>
<td>XMPT</td>
<td>-0.26</td>
<td>(-0.88)</td>
</tr>
<tr>
<td>AGE</td>
<td>0.024</td>
<td>(1.11)</td>
</tr>
<tr>
<td>MERIT</td>
<td>0.013*</td>
<td>(2.81)</td>
</tr>
<tr>
<td>Constant</td>
<td>-541.11*</td>
<td>(-4.06)</td>
</tr>
</tbody>
</table>

$R^2 = 0.37$

F = 119.91

N = 1833

NOTE: T-statistics are in parentheses.

* indicates statistically significant at the 1% level.

The positive coefficients on PAR and YDS are intuitive—as par and length of the course increase, total scores increase as well. Players with a higher scoring average for the year, SAVE, will have a higher total score and this is reflected with the positive and significant coefficient on SAVE. The positive and significant coefficient on MERIT is expected—a worse golfer will have a higher rank and thus will be expected to shoot higher scores. MSAVE is lower when the field is stronger, so the positive and significant coefficient is expected. TOP20 is higher when the field is stronger and the positive and
significant coefficient is likely picking up the difficulty of the course not measured by length or par as the top players will often play the tougher events.

The positive and significant results on TPRIZE differ from the negative and significant results found in Ehrenberg and Bognanno (1990a) and from the insignificant results found in Orszag (1994). The coefficient of 2.80 for TPRIZE reported in Table 3 suggests that an increased total prize and the larger prize differential that goes with it will lead to an increased total score in 2006. Specifically, increasing the total prize by $1 million will lead to an increase in the total score of 2.8 over four rounds, or 0.7 strokes per round. Assuming that players continue to put forth high effort levels during the tournament, this result is consistent with a claim that effort levels are decreasing before the tournament. But a better understanding of the practice and preparation habits of professional golfers is required if we are to make precise conclusions about the incentive effects of large prize gradients in professional golf tournaments.

5. Conclusion and extensions

Modeling the effects of total purse on performance for golfers on the PGA TOUR in 2006 using a stylized model similar to previous studies yields different results from the earlier studies. Higher purse size leads to higher scores, which would be interpreted as lower effort provided by players during the tournament competition. But it is unlikely that players are putting forth less effort during competition; something else must be going on that has been omitted from the analysis. I suggest that effort levels prior to tournament competition were incorrectly ignored in earlier studies. The inability of a model to show incentive effects at the practice and preparation stage needs to be corrected. The results in this paper point to the need to incorporate practice and
preparation into a model that links effort with success. Using Shmanske’s (1992) earlier work, including practice and preparation in a model of effort should yield better insights into how professional golfers invest in human capital formation and how prize structures impact effort both before and during tournament play. Subsequently, this could provide a unifying link for all of the seemingly disparate results that have been generated in the literature to this point.

There are some other possible reasons for the positive and significant relationship between scoring and total prize. The better tournaments that offer the higher purses may be played on better golf courses that result in higher average scores. And as Orszag (1994) posits, the choke factor may be more prevalent in the better tournaments with higher purses. Incorporating these elements as well as the nonlinear elements of the tournament prize structure into the model of effort and performance is a direction future research should go.
References


