Senior Project

Department of Economics

"Gender, Skill, and Earnings PGA vs. LPGA"

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Summer, 2013

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Acknowledgments:

I would like to thank Dr. Michael Nelson for his guidance in making this writing possible. Dr. Nelson did well at keeping me motivated and on task giving me ample time to complete my work. Dr. Nelson has always kept my focus on completing my work and in a way in which I can succeed. My interest around Sports Economics was fueled by his expertise and teachings in previous courses and without him it would have been difficult to form my model and interpret my results. Dr. Nelson is a specialist in Econometrics at The University of Akron and teaches an Applied Econometrics section every spring semester.

Abstract

Using 2012 data, this work is a revamped comparison of a similar study done by Steven Shmanske in the year 2000. Within this work we compare the PGA Tour to the LPGA examining the relationship between skills and earnings between the men and the women. Men on the PGA Tour play for bigger purses than do the women of the LPGA tournaments. However, the men also play more rounds of golf over longer golf courses and exhibit greater levels of skill than the women. The statistical results show which golf skills are the most valuable by estimating the effect of the skill on earnings. Furthermore, the results show that once skill levels are accounted for, women are not underpaid compared to men. Even though the tournament form of compensation rewards the relative skill levels within each tournament, the professional golf industry appears to reward the absolute level of skill with no gender bias.

Keywords: PGA Tour, LPGA, skill on earnings, gender bias

Introduction:

In the 2012 season of the Professional Golfers' Association Tour, the purse values for the 49 official tournaments ranged from $1.05 to $9.5 million, with the average purse totaling $6,054,234. Comparatively, women in the same year competed in 28 official Ladies Professional Golfers' Association events; their purse values ranged from $1 million to $3.25 million and averaged $1,746,428. The leading money winner on the PGA tour was Rory McIlroy netting a yearly total of $8,047,952. Inbee Park took the crown for most earnings on the LPGA bringing in $2,287,080[1]. Given these figures, some would assume that there is a clear gender bias in the sport of golf. It is not saying that tournament promoters particularly lean a certain way, but we have to infer that the fans might. The lower prizes for the LPGA events are attributed to actual attendance and television ratings being lower. However, the idea that fan support may be lower due to gender discrimination is still up for debate; or are men just better players?

Lower prize money and lower attendance cannot prove discrimination because men play in more events and play more rounds of golf over longer courses[2]. We justify the higher earnings of the PGA tour to the simple idea that men exhibit higher levels of skill; the following will provide evidence using multiple regression analysis to determine if there is an earnings discrepancy.

The typical consensus is that the larger build of male golfers gives them the ability to drive the ball further than women. Most professional golf instructors would disagree, attributing the driving distance as a function of technique rather than power or strength and even more so, several of the smaller players on the PGA tour are among the long drive leaders. Using a fans

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[1] All financial data collected using the official PGA and LPGA tour website with enhanced support using data collected from espn.go.com/golf. See Table 1

[2] Course length data not used in regression analysis; data collected from espn.go.com/golf.

perspective, it is more intriguing as a spectator to watch a player hit a long drive, giving way to the work done by Alexander and Kearns (2005). If we assume their analysis on putting is true, then it must be the putting skills that are the most important in winning tournaments or events. Given that, there is no apparent gender bias knowing women have the ablility to putt as good as men. We infer that since women have this abiliy and are not putting for the same amount of dough that there may be a bias on the part of fans who follow golf but would rather watch the men. Also, because the course length for women is shorter, putting may be even more important. Further analysis done in the contained work will give ample evidence as to how important driving, putting skills and other factors are on the PGA and LPGA tour in terms of earning the most money.

Comparing the PGA tour versus the LPGA tour is a curious subject matter in the world of professional golf. It is always interesting comparing professional men versus professional women because there are many people that believe men and women should be getting paid the same amount of money for playing the same game. In golf particularly this subject matter is peculiar because as of more recent times, it seems that golf is becoming a very widely broadcasted sport. Not only on paid cable programming but even on the local broadcasts across the nation.

In this replication of the work done by Stephen Shmanske (2000) we attempt to shed more light on the original idea presented back in 2000. In this analysis our main data sets come from 2012 data whereas Shmankse used data from 1998. We will be updating his study and replicating his model to compare and contrast how professional golf has changed. In Shmanske's work he determined that there was no gender bias in golf and based on skill levels, men and women are better off staying in their respected tours if they wish to earn the most money.

The fact is that since Shmanske's earlier studies, the sport of golf has grown. We would have to argue that the growth of more popular players on the PGA tour and the publicity behind each player has contributed siginifcantly to the growth of the interest in mens golf, thus adding more to purse values for each tournament. On the other hand, when looking at womens golf, there has not been a stand out, highly publicized player. Drawing conclusions about these circumstances, women simply do not make as much per tournament. The positive fact is that since the work done by Shmanske in 2000, the women of the LPGA have seen increasing average earnings from $139,440 in 1998 to $340,403 in 2012 (Table 7); making all this work relevant in determining where men's and women's professional golf stands since Shmanske's work done 13 years ago.

The aim of this paper is to determine if an inequality in earnings exists when comparing mens and womens professional golf. Women earn less than men do playing the same game at the pro level; so what we are attempting to figure out is if the difference in earnings disappears once we account for the differences in skills. Using our model we hope to support the initial work done by Shmanske and shed new light on the impact that skills have on earnings in the world of professional golf.

The remainder of this writing contains a discussion of previous works done on golf and economics, a description and measure of the skills necessary to be successful in the game of golf, presenting and discussing the regression analysis done, and finally a summarization and conclusion of the findings and what we determine.

Literature Review

Professional golf is an area that is particularly intriguing because payoffs are directly related to individual productivity as opposed to other sports where your paid under contract whether you play or not. Considering the fact that ones earnings on the PGA and LPGA tours are based on individual performance, different skill factors and other variables can be compared to determine which variables significantly improve the chances of a player bringing in the winnings. The PGA Tour and LPGA Tour bases earnings on a prize system in which players receive compensation for how they place in tournaments. Within this analysis of both professional tours we will estimate the particular skills it takes to win a tournament and its connection with the amount of winnings (purse) of each tournament. We will also compare the women of the LPGA tour's winnings and performance statistics versus the men's PGA tour purse amount and performance statistics.

Shmanske (2000) performed a similar study analyzing gender, skill and performance in professional golf. He used the data from the 1998 PGA and LPGA tours and ran a multiple regression model involving five skills to offer an explanation of earnings. The skills estimated are driving distance, driving accuracy, greens in regulation, sand save shots, and putting. In Shmanske's model, putting and driving distance were shown to be the most significant skills for males and their chances of winning a tournament and earning more. For women it was putting. His results show that once skills are accounted for, women are not underpaid compared to men. He attributed those results to the predicted earnings when placing the men's data into the women's model and the women's data into the men's model, saying either sex is better off staying within their tournament where returns to their skills are higher (Shmanske, 2000).

Shmanske continued his research on golf and economics and followed up his studies by writing and publishing a book titled *Golfonomics*. In this work he studies many aspects of golf; from a player's weight and its effects on driving distance, to the economics of golf carts; he even studied the course itself. Our main focus from his work will derive from Chapter 12. He once again addressed the gender discrimination on earnings in professional golf however he focuses mainly on what we can do as analysts to "ferret out discrimination in statistical analysis" by running a similar model as he did in 2000 only to conclude the same relative results (Shmanske, 2004). In this work, there were similar regression analysis done and it differed enough from his previous works giving more in depth descriptions of factors and skills considered when analyzing golf and players effectiveness as a professional. However because of the very detailed nature of this work, no statistically significant findings attributed to the results in my analysis. Also the fact that this work is less statistical and more descriptive and factual makes it irrelevant to his initial presentation on the LPGA and PGA tours from 2000.

His most recent study done in 2008, Shmanske used PGA Tour micro data from the 2006 season to create an empirical model regressing skills and performance on earnings. This analysis is done to improve upon his earlier studies though he focuses on the PGA tour only. Within this study he tracked the weekly performances of the 2005 PGA Tour top 100 money earners throughout the 2006 PGA Tour. In order to evaluate the effects of PGA micro data as a replacement for yearly averages, Shmanske tests the model with the micro level data, or the data he attained himself by following each individual player as he played various courses, and his reported yearly averages to allow for comparisons. The use of tournament-level data can help to account for the different levels of difficulty of the courses on the PGA Tour. For instance, if a player were scoring lower on the most difficult courses of the PGA Tour the gap between his score and others would be even wider if he participated in all the other courses. By doing this Shmanske is able to eliminate some measurement error by using tournament-level data (Shmanske, 2008). It also accounts for the skewness and differences of the golfers skills because every course is not the same, also how and where he plays the ball will change. Because this analysis was done only using the PGA tour, he does not relate it back to the LPGA tour. However, the results for the men helped support his previous works in determining the particular skills necessary to win events. Using individual, tournament-level data, this article makes three improvements. First, the use of tournament-level data removes measurement error in the skills by adjusting the data for tournament-level characteristics such as the effect of altitude on driving distance. Second, the collection of micro data allowed him to examine the difference and skewness of the skills distributions by focusing more on which courses a player plays, how he plays certain holes and courses and what changes per event, in addition to just the mean. Finally, it estimates a structural model in which golfers use their skills to perform well in competitions by shooting low scores at one level, while those score distributions inspire the tournament earnings of the golfers at the other level (Shmanske, 2008).

Another approach to an empirical study of professional golf is evaluating the change in the returns to skills over time. Alexander and Kerns (2005) work focused only on the PGA tour with an article titled "Drive for Show and Putt for Dough". This analysis concluded that, while fans are drawn in at the sight of a long drive, tournaments are won on the putting greens. If this were to hold, then we can attribute most of players practice time to their short game where most of their money is made. Directly from the article, they are quoted saying:

> "This article examines the determinants of the earnings of PGA Tour golfers from the period 1992-2001. Our goal is to determine whether the returns to various golf skills have changed over time. In recent years, golf analysts have claimed that driving distance has become the preeminent skill in professional golf, and thus they believe that the old adage "drive for show and putt for dough" no longer holds true in professional golf. Our results lend some limited support for this view because we find that the return to driving distance

has increased relative to that of putting ability. Nonetheless, it still remains true that putting ability is still by far the single most important determinant of earnings." (Page 2)

Examination of both sides of these skills in Alexander and Kern's regression, as stated, reveals that over time average driving distance and putting have the largest impact on a PGA Tour golfers' earnings (Alexander and Kerns, 2005).

Rinehart (2009) took a similar approach using a lot of the same data to improve upon Alexander and Kerns' model. Her analysis included data from the 2002 and the 2008 PGA tour season only and compares them to determine the returns to skills over time. Greens in regulation, putts per greens in regulation, and sand saves are found to be statistically significant as found by several other studies (Rinehart, 2009). The intriguing fact is that she found variables other than just driving distance and putting that contributed to an increase in earnings and because she used several of the same sources, it supports the conclusions found in this work.

The final study to consider in my analysis is that done by Peters (2008). His study differs from previous research in that it examines how a players experience, the number of years on the PGA Tour, and the number of events played per year contribute to scoring average and earnings, focusing only on the men's PGA tour (Peters, 2008). He also attributed a lot of his study to the work done previously by Alexander and Kerns and all the work done by Stephen Shmanske by incorporating the skill variables they used in their analyses and applying it to his unique study.

Empirical Model

This writing will use two models in determining if there is a gender bias in professional golf. To see how their skills affect their earnings individually, first we will compare mens and womens skill factors seperately and note how they effect earnings. Using these estimations, we get an overall reflection of which skills effect earnings the most and we can compute how much women would earn if they were to play as men to assess if they would be earning more.

1) $WINPER_i = \beta_0 + \beta_1\ DRIVDIST_i + \beta_2\ DRIVACC_i + \beta_3\ GIR_i\ (percent) + \beta_4\ SANDSAVE_i + \beta_5\ PUTTPER_i\ (percent) + \varepsilon$[3] $\quad i = men, women$

Second, we will pool together data for both men and women and compare them against one another using the FEMALE variable as a dummy measure. If the coefficient on the dummy variable shows a negative, then we hope to prove our hypothesis of a possible inequality in pay existing. The models will go as follows:

2) $WINPER = \beta_0 + \beta_1\ DRIVDIST + \beta_2\ DRIVACC + \beta_3\ GIR\ (percent) + \beta_4\ SANDSAVE + \beta_5\ PUTTPER\ (percent) + \beta_6\ FEMALE + \varepsilon$[4]

The dependent variable in this model is WINPER for professionals. WINPER is the winnings per tournament entered as an average; measured using EARN12/EVENTS where EARN12 is the earnings for the entire 2012 season and EVENTS is the number of events played throughout. This average only includes official PGA and LPGA Tour events. Golfers included in the sample may have played other events on other tours, but in order to keep the sample standardized only earnings from the PGA and LPGA Tour were included.

With each stroke of the ball, a player is attempting to do something different. Starting out, the first stroke a golfer takes is typically called the drive. With the drive, the golfer is trying to advance the ball towards the hole as far as possible, without losing accuracy. We measure this

[3] Model will be used to analyze men's statistics separate of women statistics and results.
[4] Same models used by Shmanske in 2000.

skill in two ways; DRIVDIST, or the distance in yards the golfer averages on his or her drive, and DRIVACC; the percentage of times that the drive lands in the fairway.

After the drive, a player attempts an approach shot. In an approach shot the player tries to hit the ball the exact distance to the hole so it lands on the putting surface. If for instance on a par four hole, the players second shot ends on the green, then he/she is said to have reached the green in regulation. GIR measures the percentage of time that the golfer achieves that result (Shmanske, 2000). If either of those shots were misplayed, the ball may end up in what is known as a sand bunker. The ideal scenario would have a player recover from a bunker and still make par. The percentage of times that he/she does recover from a bunker, is measured in SANDSAVE, thus SANDSAVE is our measure of skillful play from a sand bunker. The way we measure putting skill is controlled by accounting for only the season average number of putts taken on greens that were hit in regulation; we call it PUTTPER and it is the superior putting statistic. So, the five main skills we use to explain earnings are driving distance, driving accuracy, greens in regulation, sand save shots, and putting.

Other measures considered are EVENTS, or the total number of tournaments that a golfer has played during the 2012 season. EARN12 is the earnings for the entire 2012 golfing season. SCOREAVE is the average score per round for the golfer and FEMALE is our dummy variable being equal to 1 for LPGA golfers.

All data collected comes from the official PGA and LPGA tour websites. Each tour keeps track of statistics on a players performance and considers them to be official if the player plays at least a certain amount of rounds. [5]

Data Description

The most credible source for statistical data collected and used in this analysis of the PGA and LPGA tours derives directly from the PGA and LPGA tour official websites.[6] This analysis of the skill, gender and earnings of professional golfers will include sample data from the 2012 PGA and LPGA tours. Contained within the data are the statistical figures of 147 male players on the PGA tour and 123 female players on the LPGA tour. Several players from the LPGA and PGA tour were eliminated due to incomplete statistics. Comprehensive data on the two tours is collected by the official tour affiliates and reported on the PGA Tour and LPGA Tour. These officials measure a variety of skill factors for each individual participant on the tours throughout the year long season. (www.pgatour.com/stats), (www.lpgatour.com/stats.html), (Table 8).

Data collected in this work will be mirroring that of the data collected by Shmanske in 2000. The main difference we must take away from the data collected by Shmanske and the data presented here lies with the statistics on putting. As stated in Shmanske's work, the year 2000 did not provide as in depth information on LPGA statistics, particularly putting. With limited data available for the 1998 LPGA season, when Shmanske did his write up in 2000 he created a variable for putting he called PUTTPRED. This variable is a predicted series used to proxy the PUTTPER statistic used in this analysis. Since his work, the LPGA has kept a full data set for almost all players on the tour.

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[5] Amount of rounds to be considered official not specified on either websites.
[6] See Table 8 for complete breakdown of information gathered.

We determined our results using the data sets of the 270 players who have full official records on the PGA and LPGA tours. The 147 players of the PGA tour participated in 49 events throughout the year with 48 of those events having 4 rounds per event and only 1 having 5+ rounds. The 123 players of the LPGA tour participated in 28 events, of which 22 events had 4 rounds, 5 events had only 3 rounds, 1 event having only 2 rounds and they had no events going 5+ rounds. More so, as stated earlier there is a difference in the length of the courses that these events are held at. The PGA tours longest course length reached 7,791 yards; their shortest course being 6,841 yards and an average length of nearly 7,000 yards. For the LPGA, their longest course is near the mens at 7,643 yards. However their shortest course was only 6,108 yards and their average course length was significantly lower than the mens reaching only 6,281 yards; a difference of around 700 yards, or in other words, one extra long par 5 hole, or even 2 extra par 4 holes.[7] The clear differences in the two tours are evident and this may be a reasonable explainaton as to the differences in earnings between the LPGA and PGA tours.

Results

WINPER is the dependent variable, and the regressors include the skill variables and the FEMALE dummy variable when appropriate. Using our model we run three separate estimates. Our main function includes both men and women using the dummy variable, followed by two separate analyses done for the PGA only and LPGA only. Upon comparison of the models for only PGA and only LPGA, a comparison of the parameter estimates leads one to conclude that because both men and women require a different focus on skills, there is no support for the proposition that both men and women professional golfers' incomes depend on skills in the same

[7] See Table 1

way. All the variables have the right sign, and over half are statistically significant, but the men earn much more per skill for every skill. As far as significance is concerned, for the men, the most impactful statistic to better their chances of bringing in a win lies in putting and sand save shots. For the women, significance comes mainly from greens in regulation and putting, with all other factors showing little support.

With the random nature of the variables collected, we assume heteroscedasticity in all of our models, and we look at the results of the PGA tour data first. We determine that an improvement in each category yields higher earnings per tournament. The most significant by far is the statistic SANDSAVE. For every one percent increase in shots that land in a sand bunker and saved with one stroke, a player increases his earnings by $63; and we can say this at the 99% confidence interval. That is roughly two times as much as Shmanske (2000) found for the 1998 season.

Secondly, our other standout variable of significance is PUTTPER, as most of the previous researchers have already determined. With PUTTPER we can again can say that at the 99% confidence interval for every extra putt a player takes on the green, he decreases his potential earnings by over $1.23 million dollars for any given event; and vice versa if he needs one less putt; an awfully large figure to consider. So to put it into perspective, we will consider one less putt per event. In a four round event, about two-thirds, or 48 of the 72 holes, are reached in regulation; therefore one less putt would lower PUTTPER by about 1/48. Hence, one less putt would raise earnings by roughly $25,000, a much more reasonable figure.

DRIVDIST is one variable we heard about a lot with this subject and fittingly so because the fact is, it is significant for the men on the PGA tour given the results. With DRIVDIST, at the

99% confidence level we can attest that for every extra yard on a drive, the players can increase their earnings by $2,061; a little over two times more than Shmanske (2000) found in 1998. All other things being equal, a golfer would have to work on every aspect of his game every day, and then he will most certainly have a better chance at bringing home the big money. However, as this is not the ideal scenario, there are areas of his game that will need more attention (Table 3).

The statistically significant variables found for the women were GIR and PUTTPER. In this estimation, for every one less putt needed on a hole, women increase their potential earnings for an event by $154,091, or $3,210 using the 1/48 approach stated earlier. Not as great a number as for the PGA but considering our mean values for the LPGA, it is a pretty hefty sum of money to potentially earn. For GIR, every one percent increase in greens reached in the appropriate number of strokes, player's earnings increased by $1,464; that is two times the amount found by Shmanske (2000) in 1998. Given this, LPGA players, to better their earnings, should focus on putting and reaching the green in regulation (Table 4).

Regressing the men and the women together yields similar results. SANDSAVE being the most significant, most likely due to the fact of the previously mentioned significance it had on the PGA tour. As expected, PUTTPER becomes extremely significant followed by DRIVDIST. Also, GIR sneaks in to claim a significant role and DRIVACC shows little significance to warrant further analysis (Table 5).

Further examination, the t-value for SANDSAVE in the PGA is nearing 25 supporting the idea of the strength of the variable. Also giving heavy support to the significance of the variable, PUTTPER t-value is -7.13 making it another statistically significant variable. Whether it is because of the amount of events men enter compared to women, giving them more opportunities to earn more money, they can focus on any one skill to earn more money. Whereas with women, it is the two particular skills that ultimately decide how much they could potentially earn. Respectively, the general statistical output of our the estimations run in our first model seem to prove that women are much better off staying on the LPGA tour and men on the PGA tour to earn the most money they can.

Following Shmanske, an interesting technique that can be used to ferret out gender discrimination is to estimate an equation for one group and substitute the means from the other group to compare the predicted earnings from the equation with the actual earnings based on the means (Shamnske, 2000). For example the men's mean for WINPER is $74,845. When they are placed into the women's function, the predicted value for WINPER would only be $29,068, making it more beneficial for men to play on the PGA Tour. Shmanske in 1998 found the same idea to yield a predicted value of only $13,517. Separately, the women's mean value for WINPER is $15,534. When we place the women's means into the men's function the predicted value of WINPER would be -$56,575. For the 1998 season data run by Shmanske in 2000, he found the same idea to produce an output of -31,762. Clearly, the women are much better off playing in the LPGA if they intend to maximize their earnings and the men earn more on the PGA tour.

With the increase in popularity of professional golf today, we run these estimates and compare them to the original work done by Shmanske in 2000. His work proved to be a good representation of the results yielded in this work. Some variables proved to hold true in accordance to Shmanske, however there are also certain discrepancies between the two works worth mentioning. First the similarities; we learn that the final result yielded is the same. Men should stay in their respective tour and women in theirs. Also, the estimation on the variable

PUTTPER was that of significance in every aspect as Shmanske also predicted. DRIVDIST for the men on the PGA tour was also supported by the results yielded in this analysis.

As for the all so important differences; first, the most controversial difference in these estimations is that of the most significant variable, PUTTPER. In Shmanske's model, PUTTPER was determined on a predicted value basis he called PUTTPRED. In this model we got lucky because both the LPGA and PGA tour kept full and accurate data for putting allowing for more legitimate results on putting. In the case of the LPGA, it almost did not matter due to the fact that we yielded the same result. On the PGA, putting did not show to be the most significant variable but was the most economically significant given the potential increase in earnings. Continuing, another noteworthy difference is in the results themselves. Many times Shmanske refers to putting and driving distance being the most significant, giving sand save shots almost no consideration. As stated earlier, SANDSAVE especially for the PGA, proved to be by far the most important aspect of a golfers game that he may want to consider improving. However, although statistically significant, when considering the actual impact of a sand bunker shot on earnings, the $63 change is minimalistic compared to other statistics such as PUTTPER, which yielded a $25,000 change. In the case of the PGA tour, he also referred to DRIVDIST having a major impact on earnings. We would have to agree but the significance level has decreased since he last ran his models and the $2,061 increase to earnings especially makes it more economically significant. One other difference that is notable is the actual dollar amount differences on the men and women's tours. A lot of which can be attributed to inflation seeing as in 1998 a PGA player would have only won $35,387 per tournament and an LPGA player would have only won $8,271. In the 14 years between the studies, it is still worth noting the averages of the dependent variable; the value of the WINPER variable has increased more than two times the amount since the 1998 study done by Shmanske (Tables 6 and 7).

Comparing the results of this replication to Shmanske's 2000 work, we find that a lot of the same variables are significant in increasing earnings for a professional golfer. The average earnings per tournament increased considerably for men from roughly $25,000 to nearly $75,000 and for women from nearly $6,000 to over $15,000. Additionally, the same skill factors that Shmankse (2000) found to be most important from the 1998 season seem to play in a player's chance of earning the most money today. The results of the idea of an existing gender bias on earnings are consistent with Shmanske's conclusions. As depicted with our second model, the FEMALE dummy variable came out negative leading us to believe that there may be inequality in earnings when accounting for skill differences. Consequently, the fact is that the -0.32 t-value of the variable shows that there is little significance to this variable, so we cannot reject our hypothesis that an inequality in earnings based on gender does not exist.

All in all, the results yielded show several areas of opportunity in improvements of skills for both men and women. The work done by Stephen Shmanske is still relevant in some ways but in many other ways, the world of golf has grown and changed dramatically making other aspects of playing the game more challenging and impactful to ones earnings. For men, to earn the most you must be flexible in all areas of golf with strong focus on saving incidental sand bunker shots, and be able to finesse your shots on the putting greens. Women need only keep a close eye on reaching greens in regulation and their putting skills while keeping all other skills equal.

Conclusion

This essay has used regression analysis to examine the effect of golfing skills on the earnings of professional golfers. We took estimations for the PGA Tour and the LPGA and ran them separately as well as combined. Obviously women earn less than men, but when their differing skill levels are taken into account, there is no clear evidence of a gender bias existing. The effects of skills on earnings confirm the earlier work done by Shmanske with a few noted differences. Putting has the largest impact for the men's earnings followed by, greens in regulation and driving distance. For the women the most significant aspect of the game came down to greens in regulation and putting.

Our analysis comes with two notable limitations. The study Shmanske did in 2008 using his own gathered micro data would have been a better way to analyze the problem. However, his analysis only included data from the PGA tour and since the PGA does not keep records of a player's performance for every hole in every event on every course, limited my analysis on that study. Also, given time constraints and limited resources to attend events and monitor how golfers play those courses, made it difficult to replicate that study. Our other limitation comes from the idea put forth by Gary Becker in 1971 of consumer discrimination. As stated previously, a portion of a players earnings are calculated using television broadcasts and fan attendance dollars. So, a consumer's decision to watch the PGA players over the LPGA players would play a role in their total earnings.

Comparing the one statistic that applies to both men and women, the percentage increases in earnings due to putting skills are about the same for men and women, but given that women earn less than men because of their lower achievement in other skills, the dollar payoff to improvement in one's putting skills is higher for men. This is not saying discrimination exists but it does raise the question, why are the men on the PGA tour better putters than the LPGA tour women? There is no real reason based on gender or physical attributes as to why they can't be just as good, or better given how heavily it weighs on their earnings.

In conclusion, perhaps none of these results are surprising. After all, it is the LPGA that discriminates by not allowing men rather than the PGA Tour, which has a nondiscrimination clause in its bylaws forbidding discrimination based on race, religion, sex, or national origin. Presumably, if a woman attempted to qualify for a PGA Tour event and succeeded, she would be allowed to play. Given the relative strength of the competition, the woman would probably be taking a pay cut to do so (Shmanske, 2000).

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Table 1: PGA and LPGA gameplay and earnings comparison

Comparison of PGA Tour vs. LPGA Tour, 2012		
Tour	*PGA*	*LPGA*
Events	49	28
With 2 rounds	0	1
With 3 Rounds	0	5
With 4 rounds	48	22
With 5+ rounds	1	0
Average Yardage	6,970	6,281
Longest Yardage	7,791	7,634
Shortest Yardage	6,841	6,108
Average Purse	$6,054,234	$1,746,428
Largest Purse	$9,000,000	$3,250,000
Smallest Purse	$1,057,500	$1,000,000

Table 2: Sources, data and results contributing

Author(s)	***Data Analyzed***	***Year Analyzed***	***Key Results***
Stephen Shmanske *Gender, Skill and Earnings in Professional Golf*	5 Skill factors: Driving Distance Driving Accuracy Greens in Regulation Sand Save shots Putting	1998 LPGA and PGA	Women are not underpaid compared to men and both are better off playing in their respected tours.
Stephen Shmanske *Golfonomics*	More in depth analysis of all factors contributing in golf. Such as weather, size of player, altitude of ball when hit, wind speed, speed of greens etc.	2004	Results were less conclusive as they were more descriptive and factual based.
Stephen Shamnske *Skills, Performance and Earnings in the Tournament Compensation Model: Evidence from PGA Tour Micro Data*	Micro level data for top 100 money earners and compares them to the tours averages.	2006 PGA	More conclusive evidence to support previous works. Micro level data concludes the effectiveness of skills on earnings.
Donald L. Alexander and William Kern *Drive for Show and Putt for Dough*	Driving Distance and Putting with minor reference on other skills and the changes over time.	1992-2001 PGA	Limited support but putting still remains the most important skill in determining earnings.
Kelsey L. Rinehart *The Economics of Golf: An Investigation of Returns to Skill of PGA tour Golfers*	Similar data as Alexander and Kerns. Returns to skill over time.	2002-2008 PGA	No significant results to support her hypothesis.
Andrew Peters *Determinants of Performance on the PGA tour*	Players experience on the tour and events played per year and the correlation to scoring averages and earnings.	2002-2005 PGA	Putting is the most important component in determining earnings. Driving distance, sand saves, and experience give some support in improving scoring averages.

Table 3: PGA Tour Regression results

Parameter Estimates					
Variable	DF	Parameter Estimate	Heteroscedasticity Consistent		
			Standard Error	t Value	Pr > |t|
Intercept	**1**	1162730	349996	3.32	0.0011
DRIVDIST	**1**	2061.06	739.01	2.79	0.006
DRIVACC	**1**	2880.49	1267.71	2.27	0.0246
GIR	**1**	4891.15	2055.20	2.38	0.0187
SANDSAVE	**1**	63.46	2.54	24.91	<.0001
PUTTPER	**1**	-1232155	172770	-7.13	<.0001

Number of Observations: 147
R^2=0.5406
Adjusted R^2=0.5243

Table 4: LPGA Tour Regression results

Parameter Estimates					
Variable	DF	Parameter Estimate	Heteroscedasticity Consistent		
			Standard Error	t Value	Pr > |t|
Intercept	**1**	206229	59106	3.49	0.0007
DRIVDIST	**1**	0.35	145.69	0.00	0.9981
DRIVACC	**1**	34.89	195.96	0.18	0.8590
GIR	**1**	1464.64	344	4.26	<.0001
SANDSAVE	**1**	-27.29	143.24	-0.19	0.8492
PUTTPER	**1**	-154091	31421	-4.90	<.0001

Number of Observations: 123
R^2=0.4494
Adjusted R^2= 0.4259

Table 5: PGA & LPGA Regression results

Parameter Estimates					
Variable	**DF**	**Parameter Estimate**	**Heteroscedasticity Consistent**		
			Standard Error	**t Value**	**Pr > |t|**
Intercept	**1**	250091	139790	1.79	0.0748
DRIVDIST	**1**	884.87	396.97	2.23	0.0267
DRIVACC	**1**	553.57	450.11	1.23	0.2199
GIR	**1**	1286.72	660.26	1.95	0.052
SANDSAVE	**1**	72.69	1.6787	43.3	<.0001
PUTTPER	**1**	-313420	579.73	-5.41	<.0001
FEMALE	**1**	-4855.98	15198	-0.32	.75

Number of Observations: 270
R^2= 0.5345
Adjusted R^2= 0.5239

Table 6: PGA Tour mean values of all variables in data collected.

Variable	**N**	**Mean**	**Std Dev**	**Minimum**	**Maximum**
DRIVDIST	147	290.81	8.90	258.3	315.5
DRIVACC	147	61.78	4.74	51.73	75.00
GIR	147	65.33	2.50	58.10	70.34
SANDSAVE	147	86.53	459.23	25.00	5616.00
SCOREAVG	147	70.65	0.60	68.87	72.0
PUTTPER	147	1.77	0.023	1.718	1.83
EVENTS12	147	24.34	4.04	15.00	32.00
EARN12	147	1681706.93	1254182.33	468298.0	8047953.00
WINPER	147	74845.18	67715.69	16148.21	502997.06
TOTTPUTT	147	1630.39	290.57	896	2438

Table 7: LPGA tour mean values of all variables in data collected

Variable	**N**	**Mean**	**Std Dev**	**Minimum**	**Maximum**
DRIVDIST	123	249.43	8.98	225.80	276.50
DRIVACC	123	68.53	7.66	43.00	85.00
GIR	123	65.65	5.17	49.00	82.00
SANDSAVE	123	46.39	10.51	14.00	78.00
SCOREAVG	123	72.65	1.52	69.60	79.00
TOTPUTT	123	1509.04	394.69	499.00	2288.00
PUTTPER	123	1.83	0.055	1.70	2.102
EVENTS12	123	19.34	4.81	9.00	27.00
EARN12	123	340403.36	430041.31	9978.00	2287080.00
WINPER	123	15534.99	18514.22	712.71	95295.00

Table 8: Description of all variables used and sources.

Variable	Definition	Source
DRIVDIST	Average driving distance per player, per tournament in yards.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>
DRIVACC	Percent of drives landing in fairway.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
GIR	Reaching the green in the appropriate amount of strokes. *Percentage	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>
SANDSAVE	Percent of shots landing in bunker, saved with only 1 stroke.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
SCOREAVG	Average score per round.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
TOTPUTT	Total putts taken throughout tournament year (2012)	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
PUTTPER	Putts taken per greens.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
EVENTS12	Number of official events available for a player to participate in.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
EARN12	Total earnings throughout tournament year (2012).	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
WINPER	Average earnings per event.	- PGA Tour 2012. http://www.pgatour.com/stats/stat.138.html - LPGA Tour 2012. <http://www.lpgatour.com/stats.html>.
FEMALE	Dummy variable for female players.	- LPGA tour. 2012. <http://www.lpgatour.com/stats.html>.