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The Ryder Cup is a biennial golf tournament in which teams USA and Europe compete against each other in a match play format. The course venue for the tournament is on a rotational basis between the United States and Europe, switching off every time the tournament takes place. Using the concept of the home advantage in accordance with human capital and production theory, it is expected that the hosting country will perform better than the visiting side and have a better chance of winning. Using OLS and logistic regression models, it was found that there is a significant advantage favoring the team playing in their home country. Team USA is found to have a 34.2% increase in their probability of winning, based solely on if they are playing on a course in the United States. Other non-measurable variables such as the crowd and behavioral states of the athlete's competing is found to have a positive effect on the home team winning.

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The Ryder Cup is a biennial golf tournament in which teams USA and Europe compete against each other in a match play format. The course venue for the tournament is on a rotational basis between the United States and Europe, switching off every time the tournament takes place. Using the concept of the home advantage in accordance with human capital and production theory, it is expected that the hosting country will perform better than the visiting side and have a better chance of winning. Using OLS and logistic regression models, it was found that there is a significant advantage favoring the team playing in their home country. Team USA is found to have a 34.2% increase in their probability of winning, based solely on if they are playing on a course in the United States. Other non-measurable variables such as the crowd and behavioral states of the athlete's competing is found to have a positive effect on the home team winning.

I. Introduction

The Ryder Cup is one of the most highly anticipated, competitive, and spectated tournaments in golf. Played between teams of the world's top golfers from the United States and European countries, this biennial tournament is played both on US and European soil, switching continental location every time the tournament takes place. The Ryder Cup is one of the only tournaments in the sport that does not feature a purse for the winner, the only thing these golfers are playing for are pride and bragging rights against their competitors. Historically, the team that hosted the tournament has won 64.7% of the time which is quite a substantial figure when it comes to a tournament that involves the highest quality golfers in the world. The high win percentage of the home team over the tournament's history makes it a reasonable assumption that there is some significant home advantage in effect for the hosting country during the Ryder Cup.

This doesn't just apply to golf either. Carron et al. (2005) finds that in every sport they had examined (baseball, soccer, ice hockey, football, and basketball) the teams have better results when they compete at home. This paper will attempt to answer the question of: why is there such a significant advantage for the home team in the Ryder Cup? This research will look into the different forms of the home advantage that the hosting country will benefit from, along with the effects of human capital which should positively impact a golfer's performance when it comes to producing a better score when playing on a course that is familiar to them. Using both ordinary least square and logistic regressions, we will be able to estimate the likelihood of a US win as a function of if the tournament is taking place on a US course, along with estimating the impact of a US win based off of several other golf course specific measurable variables included in the regression analysis.

Unlike other sports, there is no one uniform structure to a golf course. Basketball, football, and soccer are all examples of sports that have highly specific standards as to how the playing field should be set up. Golf courses on the other hand are designed over a unique piece of land, meaning that each golf course is different from any other. However, there are still some distinct geographical differences when looking at courses in the United States and Europe. These differences are found in the design of courses as well as the land on which the courses are played.

Golf courses in the United States are known for their length, manicured fairways and grass, and natural obstacles such as trees. On average, in the United States an 18-hole course will consist of 67% of its total acreage to be maintained turf (Lyman et al. 2007). These courses are lush and maintained nearly year-round to be kept in top condition for the course to play as it was intended to. Extensive care and inputs are required on these courses. The length of the courses can be quite substantial sometimes, with some courses nearing close to 8000 yards, which makes for quite the battle over 18 holes, even for professional golfers.

On the other hand, golf courses in Europe tend to be located near seas and shorelines. Being right next to a shoreline is significant as the winds and harsh conditions mean that the surrounding areas tend to create very firm turf. These are typically called a "links course." The firm ground and winds also are the reason for there being very few trees located on most European courses, as it is difficult for a tree to grow when there are such harsh winds coming off from the sea. The firmness of the turf in Europe requires much less maintenance compared to that of courses in the United States. Less maintenance means that the structure of the fairways and greens contain many hills and bumps that

golfers would not typically run into in America. The firmness also allows for the ball to run a lot longer along the fairway as the ground absorbs less of the impact of the ball, whereas in the United States the lush turf will absorb more of the ball so it will tend to sit. European courses are also home to the notorious 'pot bunker.' All golf courses contain bunkers (areas of sand as opposed to grass) but European courses have a special type of bunker that has a very high lip in order to get out, meaning they are much deeper than the bunkers you will encounter in America. These pot bunkers mean golfers need to possess the skill and ability in order to loft the ball high into the air just to get the ball out of the bunker area, let alone set themselves up for a shot which will benefit their score. In order to perform well on a course, European courses generally require more skill from the golfer than would a course in the United States.

In the following sections of the paper, I will review the literature in which the home advantage is defined and extensively reviewed as a major contributing factor for a home team to win their games/events that take place in a "home" environment for the competitors (Section II). I will then explain and apply human capital theory & production theory as it relates to my hypotheses of golfer's performances in the Ryder Cup (Section III). The next portion of the paper will consist of the empirical model used in order to predict the importance of a home advantage in the Ryder Cup along with a logistic model in order to predict the probability of a US win determinant on several measurable variables of a golf course (Section IV). I will give my conclusive thoughts on home course advantage in the Ryder Cup (Section VI).

II. Literature Review

There have been many new fields within economics that have developed throughout recent years, one of the most interesting being sports economics. Mainly based on microeconomic theory as teams and individuals are viewed as 'firms', this field of economics uses theoretical framework and empirical analysis to further our understanding of sports. The market for sports is a constantly growing and dynamic domain all over the world, so it was only a matter of time until an economic approach would be taken towards sports.

Home field advantage, or as it will be referred to interchangeably in this paper as "home course advantage," has been a well-developed theory within sports economics. Schwartz and Barsky (1977) find that "playing at home or away from home is as strong a correlate of a team's performance as is the average quality of its players," showcasing the importance of a home environment for a team's performance even compared to the quality of players, which is a factor that many consider to be the most important when it comes to the production of a win. Even before it had been researched and applied within the field of sports economics, the advantage of competing at home has always been a well-known and widely embraced phenomenon inside of the sports world. Teams playing at home, for reasons that will soon be discussed, hold a distinct advantage over their competitors. There is not just one reason for a home team holding an advantage over their competitor, the simple fact that they get to play on their home turf, but rather a multitude of aspects that all add up to the home team having quite some significant leverage over the visiting side. Carron et al. (2005) divide the causes of home advantage into multiple categories

including: game location factors, critical psychological and physiological states, and critical behavior states.

Game Location Factors

Carron et al. (2005) propose four main pillars that contribute to game location factors. Those four factors are the degree of crowd support, the need to travel, learned familiarity with the venue, and some rule advantages. The results from their studies have shown that crowd density is positively related to the home advantage, which supports the home team in the Ryder Cup as the crowds that go to the event are very heavily populated with home country fans. Salminen (1993) finds similar evidence for positive reinforcement from the fans. That being a supportive audience which encourages the home team to play up to their potential. Unfortunately, since golf is always played outdoors, there is less of an effect from the crowd when compared to teams that compete indoors (Schwartz and Barsky, 1977). This is because crowd noise is seen as the main factor for the home advantage (Smith, 2005 & Bourdreaux et al. 2015). In terms of traveling, it was found that distance and duration of travel does not necessarily mean the visiting team is at a disadvantage, but traveling across time zones is a disadvantage for the visiting team. Suggesting that when Team Europe makes their voyage over to the states, they undergo "jet lag" as they pass through many international time zones, leading to a disadvantage in performance. Home teams also experience an advantage over their competitors when it comes to the familiarity of the course that they play at. Research has shown that soccer teams who have a playing area larger or smaller than the league average experience home advantage, as well as baseball teams with artificial turf having a greater home advantage than those teams who don't have artificial turf. This can be applied to golf in terms of a

player becoming familiarized with the different firmness of turf that they are used to playing on (mentioned in Section I). Finally, there are sometimes a rules advantage that goes in favor of the home team; however this is not found in the Ryder Cup. The only rule advantage there is in this tournament is if there is an even score at the end (14 points - 14 points) the previous winners retain the cup, which is not always specifically the home team.

Critical Psychological and Physiological States

Carron et al. (2005) then looks at the mental states of athletes when playing at home. There is fairly consistent evidence that supports the notion that the psychological state of athletes is superior when playing at home. There is a greater personal confidence when playing at an athlete's home venue coupled with a superior emotional state as well. Anxiety, depression, tension, and anger are all found to be at a lower level prior to a home competition. The feeling of vulnerability is also impacted when an athlete is competing at their home venue. They possess a sense of serenity knowing that they will not have to deal with the taunting and heckling of away fans.

Critical Behavior States

The last portion of the conceptual framework provided by Carron et al. (2005) takes a look at behaviors of athletes when it comes to playing at home. Players have a sense of territoriality when they are playing at home, stemming from our genetic instinct to defend the geographical location in which we live. Strangely enough athletes also experience higher levels of testosterone prior to playing in home competitions. This gives the athlete a

physical advantage over his competitor. The home teams in this sense do not change their behavior in the sporting event in the same way that the visiting team would. More defensive tactics were used for visiting teams while more aggressive strategies were used by the home team. Kotecki (2014) had similar findings to this as he saw an increase in the performance of athletes playing on their home court in front of fans due to the fact that they feel obligated to step up and perform to their best ability whenever they're playing at home.

III. Theory

This paper will be primarily framed in human capital theory as well as production theory. Human capital in economics refers to the value that a person possesses due to their experience, knowledge, education, skills, health, etc. Lim et al. (2018) found that in countries where there is heavy investment by the government into areas of human capital, there will end up being higher rates of productivity within those countries. Investments in health and education are very positively correlated with returns of higher levels of output. Black and Lynch (1996) also find that when there is significant training involved in an individual's human capital there is a positive increase in the individual's productivity level. This means that the more time, energy, and money that is put into areas of an individual's human capital, the higher human capital that individual will have, and in turn, will possess higher levels of efficiency and productivity.

Higher levels of human capital are expected to yield higher levels of productivity in outcome. This is no different in the workplace as it is out on the golf course. It is what every coach preaches to any athlete, "the more you practice, the better you will become." This is

not just an old coach's tale as the time an athlete takes to perfect their craft has been studied and researched. McNamara et al. (2016) found that deliberate practice accounted for 18% of the variance in sports performance. However, this is only a measurement of non-elite level athletes, as the variance level drops to 1% when controlled for elite level athletes. This is helpful when considering the majority of an athlete's increase in skill level generally increases at a decreasing rate over the course of their lifetime. Skill sets are heavily influenced by the amount of practice they partake in during their youth. Becker (1962) saw that there are two different types of training, those being general and specific, and found that the specific style of training increases the marginal productivity of the trainee when compared to a more generalized approach. When thinking of these findings, it becomes apparent that the specific training a golfer receives in their youth impacts their skill set for who they later become as elite level athletes. This information is also in accordance with the "learned familiarity of venue" factor that was previously mentioned in Section II by Carron et al. (2005).

As golfers practice in their youth, they become familiarized with a specific style of golf course. The differences in American and European courses that have been stated in Section I describe the vast differences between the two courses. As young American golfers practice on courses within the United States, they become familiar with the differences and intricacies of that style of course. Their investment into their level of human capital will affect their production in a tournament. In other words, their time spent in specific, deliberate practice on their golf game will translate into their ability to perform well when it comes time to play in a tournament.

Based on these findings, I hypothesize that geographical differences in the US and Europe create distinctly identifiable courses when compared to one another. Furthermore, due to these differences in courses across continents, the growth of golfers will be impacted as they learn how to play on these specific courses and develop a skill-set more suited towards high performance on courses within their own country. Other non-measurable variables, such as crowd involvement and a golfer's psychological state among others, will further increase the advantage that a golfer will experience when playing on a course in their home country.

IV. Data & Empirical Model

As mentioned in the introduction, every golf course is unique and distinct in its own way. While this makes every round that is played interesting, it makes collecting numerical data on the course difficult. There are certain aspects of a course that just cannot be measured. However, the United States Golf Association (USGA) Course Rating and Slope Database provides all the possible measurables that can be found for the Ryder Cup courses in both the United States and Europe. Table 1 adequately describes the course descriptives on the USGA's database in order to give the reader a better understanding of what each variable means as they are not self-explanatory in some cases. In this empirical analysis I will focus specifically on the United States team in the Ryder Cup as it allows for the regression to have one constant home team, therefore the dummy variables will be US Win and US Course. For every US win the dummy variable will be given a value of 1, while for every US loss the value will be 0. Similarly, for every time the Ryder Cup takes place in

the United States the dummy variable US Course will be given a value of 1, while every time the Ryder Cup does not take place in the United States the dummy variable US Course will be given a value of 0.

Table 1: USGA Variables		
Variable	Description	Expected Sign
(Dependent Variable) US Win	Dependent dummy indicating a win for the US	
Independent Variables US Course	Independent dummy indicating if the Ryder Cup takes place in the US	+
Course Rating	Indicates the difficulty of a course in for a scratch golfer in relation to par	-
Slope Rating	Result of an equation used to measure the difficulty of a course for bogey golfers in relation to the course rating	+
Length	The total yardage of a course	+

The expected value of the rest of the variables are derived from the findings within Table 2, containing the MIN, MAX, and MEAN values for the non-dummy measures separated by the continent of the courses that have been played on in the Ryder Cup.

The US Course dummy variable is expected to be positive since this indicates the US team will have a home course advantage over the Europeans, based off of the home

advantage theory. It is also expected to have the highest correlation when it comes to the production of a US Win as stated from my hypothesis.

Course rating is expected to have a negative effect on U.S. Wins as European courses have a higher range of course rating values. European courses are also known for lying on pieces of land that involve more hills on fairways and greens, quicker turf speeds, deep pot bunkers, as well as fast winds that greatly impact the flight of the ball on every shot, making European courses challenging even for very skilled players.

Slope Rating is expected to have a positive effect on US Wins as the value for the slope rating on US courses is higher than the range? for Slope Rating on European Courses. The slope rating is a measurement of difficulty for bogey golfers in relation to the course rating. A bogey golfer is someone who shoots above par on most rounds that they play. While this may not occur often for golfers at the professional level, it is still an important metric that is found within the data set when considering the difficulty of a course. The mean value of the Slope Rating is also noticeably higher, 144, compared to the mean value of the Slope Rating on European courses, 138. This means that American players are typically playing on courses with a higher Slope Rating compared to Europeans playing on courses in their home country.

Length is also expected to have a positive value in all regressions as US courses are typically much longer than European courses. The range of length in US Ryder Cup courses is significantly longer than European Ryder Cup courses, with the mean value being close to 400 yards longer on average favoring the Americans. These longer courses encourage Americans to focus on hitting the ball far and straight.

Table 2: Descriptive Statistics of US vs European Courses		
	US Courses	EURO Courses
Course Rating	Min: 70.8 Mean: 76 Max: 79.1	Min: 72 Mean: 75 Max: 81.7
Slope Rating	Min: 128 Mean: 144 Max: 155	Min: 113 Mean: 138 Max: 155
Length (yards)	Min: 6703 Mean: 7283 Max: 7876	Min: 6130 Mean: 6887 Max: 7331

There will be four models presented in this study. All of which are significant in their own way when it comes to trying to prove the impact of home course advantage in the Ryder Cup. Model A is a simple ordinary least squares (OLS) regression model that looks at the relationship between a US Win and if the Ryder Cup has taken place on a US Course that year. Where the dependent dummy variable is a US Win and the only independent variable is a dummy US Course variable. Model B is another OLS regression model but with all the other measurable variables from the USGA database, where a US Win is again the dependent dummy variable measured in relation to the US Course dummy, Course Length, Course Rating, and Slope Rating are all acting as the independent variables. Model C is yet another OLS regression that still uses a US Win as the dependent variable, but the US Course dummy variable has been excluded from the independent variable portion, as it is expected that the US Course dummy is to have the highest correlation in respect to the production of a US Win. This allows for the model to predict which other variables are most

significant when looking at the production of a US Win. Model D is a logistic regression model which is used to estimate the probability of the occurrence of an event as it keeps the dependent variable between 0 and 1. This is unlike an OLS regression since OLS does not limit the predicted values to be ~~dependent variable to~~ between 0 and 1.

Model A: Simple Regression

$$US\_Win = \alpha_0 + \alpha_1(US\_Course)$$

Model B: Multivariate Regression

$$US\_Win = \beta_0 + \beta_1(US\_Course) + \beta_2(Length) + \beta_3(Course\_Rating) + \beta_4(Slope\_Rating)$$

Model C: Multivariate Regression w/o US Course

$$US\_Win = \beta_0 + \beta_1(Length) + \beta_2(Course\_Rating) + \beta_3(Slope\_Rating)$$

Model D: Logistic Regression

$$\ln\left(\frac{prob\ of\ US\ Win}{1 - prob\ of\ US\ Win}\right) = \theta_0 + \theta_1(US\_Course) + \theta_2(Length) + \theta_3(Course\_Rating) + \theta_4(Slope\_Rating) + e$$

When analyzing data from the Ryder Cup it is important to acknowledge the lack of data given the Ryder Cup has only taken place 43 times. Normally most tournaments take place once a year, every year since their conception, this is different however for the Ryder

Cup. Due to the magnitude of the event, it has only been played every other year since 1927. If it were played like a normal tournament, then we would have a much larger sample size of 94 observations, as it would take place every year since its inception. However, we are only able to look at 43 observations as that's how many times the Ryder Cup has taken place.

What this study lacks in sample size, it makes up for in the quality of data and the nature of which this study is conducted. The data that has been collected from the USGA is very accurate and helps describe certain courses that would otherwise not be able to be described given the nature of golf courses and their complexity. This study is also a natural experiment, meaning that the Ryder Cup possesses certain controls within the tournament that a researcher would not be able to control for in another tournament. Characteristics such as the quality of team, course location, and conditions the tournament is played in are all controlled for as both teams involved must deal with the same conditions. Quality of the team is controlled as a team of 12 world class golfers on each side possess an average level of skill that is comparable to both teams.

Since golf is a very dynamic game with minimal room for error, a normal PGA Tour event could not be effectively studied in the same way that this research is being conducted. A Tour event only focuses on the performance of a singular golfer over the course of four rounds, whereas the Ryder Cup focuses on the performance of two teams over the course of three days, and this is where the difference comes into play. Golf is a game with minimal room for error and also a game where players can go through horrible rough patches that significantly hurt their game. The team aspect of the Ryder Cup allows for relatively even control in terms of the golfer's level of ability. Team USA and Team

Europe both have captains who are able to select who is able to participate in the Ryder Cup, based off of recent performances and World Golf Rankings. Golfers who have not been playing well leading into the Ryder Cup will not be allowed to participate as they will be a detriment to the success of the team. Also, there is no home course for a golfer in a PGA Tour event, as the athletes are playing by themselves and the crowd is asked to be respectful towards all golfers. This is completely different in the Ryder Cup. Since the location of the course changes continents every time the tournament takes place, there is a clear home course feeling for the team that is hosting the tournament. The fans are also asked to be more involved in the action compared to a normal event on Tour.

V. Results

Table 3 shows the results for all four models that were mentioned in Section IV. Home course advantage is found in all models in which the US course variable is accounted for. Using Model A, we can look at the impact that playing on a US course would have on the outcome of a US win. Based on this factor alone, playing on a US course increases the probability of a US win by 34.2%, this is also statistically significant. When looking at Model B, all other measurable variables denoted in Table 2 are accounted for in this model. The importance of playing at home decreases slightly, that being by 4.4%, but remains statistically significant. Course rating is also found to be statistically significant, but has a negative effect on the outcome of a US win. Meaning that an increase of 1 in the course rating will decrease the chances of a US win by 13.2%. Model C then removes the US course variable in order to see what other variables will hold more significance on their own as the US course variable was found to have the most significant effect on a US win. The

coefficients of all variables are increased besides course rating. An increase in 1 of the course rating is now found to decrease the probability of a US win by 16%, a change of -2.9% from Model B to Model C. The course rating variable also becomes more statistically significant. Model D then finds the coefficients that are used in order to find the probabilities of each variable within the confines of a logistic regression.

Table 3: Results for Models A, B, C, D					
Variable	Model A	Model B	Model C	Model D	
	Coefficients				Std. Error
US Course	0.342**	0.298*		1.68	0.884
Length		0.0002	0.0004	0.0008	0.001
Course Rating		-0.131**	-0.160***	-0.885	0.575
Slope Rating		0.020	0.026	0.127	0.087
R^2 ($Adjusted\ R^2$)	0.129 (0.107)	0.194 (0.110)	0.119 (0.051)		
Sample Size = 43 observations					
Notes: *p<0.1; **p<0.05; ***p<0.01				Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1	

Table 4 only uses the coefficients found in the logistical model of Model D. The coefficients on their own do not hold any significance when it comes to predicting the probability of a US win. Using the mean and standard deviation values found in Table A1 of the Appendix, coupled with the coefficients from Model D, I am able to calculate the predicted probability

of a US win at various values of all the variables. These calculations are explained in Table A2 of the Appendix, with the most important results from those calculations being summarized in Table 4.

Table 4: Probability Results		
Variable	Model D Probability: 0.575	
	Probability	Change in Probability
US Course	0.758	0.183
Length	0.651	0.076
Course Rating	0.192	-0.383
Slope Rating	0.817	0.242

Model D finds that with all variables held at their mean value found in Table A1 of the Appendix, the probability of a US win in the Ryder Cup stands at 57.5%. The probability listed in the probability column comes from calculating the probability again except now the variable being referred to is increased by one standard deviation, that value being found in Table A1 of the Appendix. The change in probability just shows the difference between the probability of all variables held at mean value and the probability of each variable being increased by one standard deviation.

The US course dummy variable is the only variable in Model D that is found to have statistical significance. Increasing the US course variable by one standard deviation increases the probability of a US win by 18.3%. Increasing length by one standard deviation increases the probability of a US win by 7.6%. And increasing slope rating by one standard

deviation increases the probability of a US win by 24.2%. All of the variables mentioned here have a positive effect on the outcome of a US win.

The course rating variable shows the largest change in probability of a US win when increased by one standard deviation. Increasing slope rating by one standard deviation decreases the probability of a US win by 38.3%. This is the only negative value in Model D, and shows that a higher slope rating has a negative effect on the outcome of a US win.

VI. Conclusions

Home course advantage is a significant contributor to the home team winning the Ryder Cup. This was initially seen at the beginning of the paper in Section I as it was found that the host country has won the Ryder Cup 64.7% of the time, but the significance at which the hosting country playing on one of their home courses was not able to be measured prior to this research. The theory and established literature are consistent with my findings and results from this research. With the findings from Model A and B found in Table 3, it is clear that the team who is playing at home possesses a competitive edge over the visiting team, holding true with the idea of the home advantage described in Section II. The increase of a US win in the Ryder Cup of 34.2% based solely on the fact that the tournament is taking place on a US course is quite substantial and in alignment with established literature.

I expected the Length variable to hold more statistical significance in Models B, C, and D, but what I found was that the significance of length in a golf tournament can be found in the descriptive statistics of Table 2. The average length of a US course being almost 400 yards longer than the average length of a European course in the Ryder Cup

makes for a difference in how the golfers choose to play that course. The longer a golfer can hit the golf ball, the easier it will be for them to perform better on a longer course. A Tour player's average driving distance over the course of a PGA Tour season has been recorded since 1980 until 2021. Out of those 41 seasons that this metric has been recorded, there have been only 3 years in which an American did not lead the Tour in driving distance (ShotLink). This consistent dominance of driving distance by American golfers is a human capital variable that has come with the time that American golfers spend playing on longer courses. The investment of time and effort into their practice of hitting the golf ball far increases their productivity on a US course because that is a skill that is required in order to perform well.

The higher difficulty of European courses also has a significant impact on the skill development and human capital of European golfers. As European courses possess characteristics that increase the course rating (and thus difficulty of high performance/scoring under par), such as pot bunkers, fairways and greens with many hills, high wind speeds, and turf that causes the golf ball to roll a lot more than it would on an American golf course, European golfers have become familiar with all these characteristics as they play on these courses and develop their skill sets. This in turn causes European golfers to generally have a better ability to shape shots and deal with the harsh conditions that come with playing on a links course. Similar to a worker going through a training program to increase their human capital, athletes develop their own human capital through practicing in certain environments. Their capital comes in the form of their unique skill set and ability to produce at a higher level when playing in a familiar venue.

Other non-measurable factors were found in prior research to be impactful in increasing the advantage that the home team possesses over the visitors. The Ryder Cup is known for being one of the loudest, if not the loudest, tournaments in golf. The involvement of the fans is quite noticeable when watching the event and, in accordance with related literature (Carron et al., 2005), can often positively impact the performance of the home team golfers who are playing. Crowd involvement is not the only external factor that increases the performance of the home team. Jet lag decreases the performance of the visiting side while behavioral, psychological, and physiological states of the athletes are altered to increase the athlete's performance when playing at home.

Further research could include data pertaining to the attendance numbers of spectators at the Ryder Cup. Data on this was limited but it would be interesting to use attendance as an interaction variable with the US course dummy to see how much of an effect the crowd has using a statistic. The Ryder Cup is also one of the tournaments where ShotLink does not record the data of the players where they do for a typical PGA Tour event. Using data directly from the Ryder Cup could help answer a lot of questions about how individual golfers perform at home compared to when they are playing at an away course. For example, a statistic on Strokes Gained: Off the Tee and Strokes Gained: Putting would be insightful to how much better the team and individuals perform compared to the opposing side.

Appendix

Table A1 contains all the data that was collected from the USGA for the course the Ryder Cup was played on for that year. The mean values and standard deviations for each variable are also included.

Table A1: (Need a Title Here)

Year	US Win	US Course	Course Rating	Slope Rating	Course Length
1927	1	1	70.8	128	6750
1929	0	0	74.8	141	6130
1931	1	1	75.7	141	7140
1933	0	0	74.1	138	6396
1935	1	1	77.2	146	7190
1937	1	0	74.1	138	6396
1947	1	1	74.1	145	6703
1949	1	0	74.7	138	6134
1951	1	1	76.5	138	7588
1953	1	0	77.5	153	7284
1955	1	1	72.8	133	6815
1957	0	0	73.6	128	6503
1959	1	1	75.9	144	7285
1961	1	0	75.7	146	7118
1963	1	1	76.2	144	7346
1965	1	0	75.7	140	7156
1967	1	1	75.1	135	7301

1969	1	0	75.7	140	7156
1971	1	1	74.6	135	6946
1973	1	0	73.8	142	7245
1975	1	1	76.2	141	7154
1977	1	0	75.7	146	7118
1979	1	1	76	142	7286
1981	1	0	72.7	131	7026
1983	1	1	75.2	148	7048
1985	0	0	76.5	149	7253
1987	0	1	76.9	153	7392
1989	0	0	76.5	149	7253
1991	1	1	79.1	155	7876
1993	1	0	76.5	149	7253
1995	0	1	77.2	151	7360
1997	0	0	76.1	147	6390
1999	1	1	76.1	150	7033
2002	0	0	76.5	149	7253
2004	0	1	76.6	145	7445
2006	0	0	72	113	6992
2008	1	1	76.4	148	7458
2010	0	0	74.6	135	7030
2012	0	1	78.3	152	7657
2014	0	0	72	113	7320
2016	1	1	77.8	148	7674
2018	0	0	81.7	155	7331

2021	1	1	77.2	146	7790
AVG	0.65116279	0.51162791	75.6372	142.047	7115.67
STD DEV	0.476602361	0.49986477	1.957576	9.32851	401.3137

Table A2 shows the calculations and numbers that were used in order to complete Table 4. With the coefficients from Model D found in Table 3, those values are taken and multiplied by the mean of each corresponding variable in order to find the 'Average' value denoted in Table A2. With this new value established, the sum is then taken from all variables in the 'Average' column to find the Log Odds value. The value for Log Odds is then used in natural exponential function(e^x) where the Log Odds value is plugged in for value *x* in order to find the Odds Ratio. With the Odds Ratio that this function produces we are now able to calculate the probability of the logistic regression. Using the equation $\frac{Odds\ Ratio}{1+Odds\ Ratio}$ we are given the probability of a US win as a decimal value.

Table A2: Model D Probability Table

Variable	Average (Mean x Coeff)	Change US Course; Otherwise Average	Change Length; Otherwise Average	Change Course Rating; Otherwise Average	Change Slope Rating; Otherwise Average
US Course	0.85837	1.6993*	0.85837	0.85837	0.85837
Length	5.6925	5.6925	6.0136*	5.6925	5.6925
Course Rating	-66.9305	-66.9305	-66.9305	-68.6714*	-66.9305
Slope Rating	18.034	18.034	18.034	18.034	19.224*
Constant	42.649	42.649	42.649	42.649	42.649

Log Odds	0.30337	1.1443	0.62447	-1.43753	1.49337
Odds Ratio	1.3544155	3.1402424	1.867256	0.2375137	4.452074
Probability	0.575	0.758	0.651	0.192	0.817

Change in Prob		0.183	0.076	-0.383	0.242

*Denotes the increase of the variable by an additional one standard deviation

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