**Contests - affirmative action and sabotage. negative characteristics in contest design as observed in horse racing in the UK in the year 2019.**

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**Research Thesis**

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# Abstract

Affirmative action is a policy designed to balance the opening conditions on the competitive field. Although such policies usually aim to support certain demographic groups, commonly referred to as "minorities" or "weakened groups", of relatively low socio-economic status, this policy is also applied in sports, political campaigns, rent seeking contests and more. The goal of affirmative action is to improve the diversity of contest outcomes and to equalize opportunities between all levels of society. The literature shows that too much asymmetry among players causes incentive problems, resulting in reduced levels of the general effort due to the "despair effect", where weaker players have low expectations and no will to invest effort and stronger players feel no need to invest effort.

In these cases, a contest designer might consider implementing such a policy, whether by weakening the strong players (handicapping) or by strengthening the weakened players (head start). In this work, we examined whether a type of affirmative action, designed to reduce the gaps in the competitive world, may, in an attempt to encourage effort, motivate contestants into negative actions in the form of sabotage between the various contestants.

Using a natural experiment, observing horse racing in the UK in 2019, we have demonstrated how affirmative action in the form of handicapping favorite horses, does result in a more balanced playing field by allowing weaker horses higher winning probabilities. We have also demonstrated that cases of sabotage and negative behavior between riders, are more prevalent in such races. Sabotage is usually performed by the leading jockeys and improves their position by an average of 0.99 placings. We have also shown that stronger riders (the top 5 percent of UK jockeys), are in general 4.5 times more involved in cases of interference between riders than regular jockeys.

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# Introduction

A contest is a game in which the contestants invest high sunk costs, usually expressed as effort, while trying to win a prize. Examples of this type can be found in sports, economy, political campaigns, and almost countless other scenarios that meet the operating conditions of a contest.

CorchÛn and Serena (2018), say that contests are classified into two large families: those that occur naturally to resolve conflict (e.g. war) and those that are planned and organized by a contest designer in order to achieve a certain outcome. In this paper we will address the latter.

Runkel (2006) suggests considering a contest designer whose revenue increases in proportion to the size of the audience, inferring that the contest designer must address the desires of the audience, which often will be influenced and increasing in the contestant's performance. A contest in which the contestants perform well is more desirable to the public. In this case the variance in the abilities of contestants must be considered. The author shows that under certain assumptions, a marginal increase in prize may improve both performance and competitive closeness, which will lead to greater revenue for the designer due to both, i.e., good performance and competitive proximity.

In a close contest or in any market where the variance in the quality is low and there is low price elasticity, the prizes will be distributed based on relative and not absolute performance; in a structure in which there is only one winner, small differences in quality will be reflected in significant prize gaps. Loury and Fryer (2004).

A field of heterogeneous players might lead to undesirable results such as a low effort in performance, Chowdhury, Mukherjee and Gonzale (2019). The literature shows that too much asymmetry among players causes incentive problems that may reduce the overall level of effort. An uneven contest, where results are clear ex ante, might be less exciting to watch than a close contest.

This well-known problem has been addressed in many ways. Researchers offer diverse attempts to level the playing field, using polices such as affirmative action, known mostly for addressing ethical violations. This policy mainly supports weaker demographic groups and minorities.

Policies such as affirmative action can improve a contest by allowing equal probabilities to succeed ex ante, whether by weakening the strong players (handicapping) or by strengthening the weakened players (head start).

The purpose of affirmative action is to improve diversity in competition outcomes and allow equal opportunities between all parts of society. This policy is widely implemented around the world. However, its impact is still unclear, which undermines public support for this policy. (Chowdhury, .M Mukherjee, Gonzale 2019).

In this work we have endeavored to examine whether a type of affirmative action, designed to reduce the gaps in a competitive world, may, while in an attempt to encourage effort, also encourage sabotage between the various competitors.

In an attempt to implement affirmative action aimed at improving diversity, the contest designer should examine how to level the playing field by choosing the right design, taking into account other factors that may influence the success or failure of such goals. For example, there may be an incentive to sabotage opponents when implementing such a policy. Lazear, (1989); Chowdhury, and Brown (2014).

Observing the world of horse racing allows a natural experiment scene, which provides dozens of races a day. In the majority of these races corrective actions are taken, trying to allow equal probability for contestants competing to win. This equestrian scene offers a real measurement of sabotage actions followed by riders against each other, and hence, a possible search for the common denominator or the relationship between sabotage and the level of competitiveness.

The assumption is, that reducing the a priori differences between contestants, will encourage effort but will also encourage sabotage as a strategy, in a search for improving a competitor's position.

Studies on the subject have confirmed the hypothesis that a high level of competitiveness at the starting point, i.e. a low standard deviation of the implied win probabilities, may lead to intervention and sabotage between the various competitors and hence a possible decrease in general well-being. See (Brown and Chowdhury, 2014; Lazear, 1989; Konard, 2003).

In the following chapters, based on literature reviews, we will touch on some of the characteristics of a contest and the dilemmas facing a contest designer. Following this, through empirical evidence from horse racing competitions, we will test cases of sabotage in relation to affirmative action and competitive proximity.

# Considerations in a Contest Design

When preparing for a contest, a plan should be made, according to the purpose of the contest. Purposes can vary, e.g. making money by selling tickets, obtaining broadcasting rights, or perhaps increasing the bets in a gambling event. According to literature, a contest designer is often someone whose earnings depend on the size of the audience that comes to the event. A bigger audience will positively influence entrance fees and sponsorships. Therefore, the designer must relate to the level of the prize, the contest success function (CSF, the individual's probability of winning the prize as a function of his effort) and the structure of the contest. Most often it seems that the rewards for the contest designer will be directly related to the effort invested by contestants.

Brown (2011) showed that large differences in skill may reduce efforts, and an outstanding performer in a contest will decrease the level of performance, implying that Tiger Woods had earned millions more than he normally would have between 1999-2006, due to his opponents' weaker performance whenever he participated in an event. Lim (2010) showed that in some cases a contest designer should consider the number of winners in an event. Dealing with the question of how many winners and losers there should be in a contest, he showed that if competitors make social comparisons, more winners than losers can lead to a higher level of effort, giving as examples marketing executives who often use contests to motivate their sales forces, service workers and franchisees.

Szymanski (2003) shows how each contestant chooses an optimal effort for himself and all contestants invest some positive effort, the author demonstrates how an unequal contest can harm the overall effort and proposes to try and level the playing field. If it is not possible to identify the various competitors, then perhaps considering an optimal prize and charging an entry fee might ensure a high level of contesters. Thus, it seems common to note that sometimes, entries into races with large cash prizes, are

by prior arrangement and aimed at a select group of athletes. Using data from a prestigious tennis tournament, Sunde (2007), had also showed that greater heterogeneity among contestants affects incentives to exert effort, emphasizing the importance of finding strategies to identify and allow evaluation whether the intended incentives actually affect individual behavior

Runkel (2006), had suggested that competitive closeness has a significant impact on rewards and the variable he proposes as a measure of competitive closeness is the standard deviation of the implied win probabilities when the rationale that explains it, is that the closer the probabilities to win between contestants, the more uncertainty there is of the outcome of a game. It examines how the addition of the competitive closeness, influenced the contest designer in deciding the optimal prize. In addition, the distinction between effort costs among the various competitors should be examined. If the contest designer cannot distinguish between the different participants, and her rewards depend only on the quality of the performance then a uniform increase in effort costs cannot be optimal because it will harm the overall quality of the performance. However, the author also shows that when in situations where it is not possible to identify and discriminate between the various competitors, it is possible to raise the costs of effort in exchange for competitive closeness while certain performance impairment, e.g. ceiling in political campaigns, or maximum engine capacity in Formula One races. On the other hand, if the cost of discrimination between the various competitors is not high, and the designer is able to discriminate between the various contesters then imposing restrictions on strong players, (handicapping) may be optimal.

CorchÛn and Serena (2018) suggested that a designer could choose to maximize the sum of effort, by levelling the playing field perfectly i.e. by giving some advantage to weaker players as they are strategic complements. Raising the effort with one will encourage a rise in effort of the other.

# Contest Success Function and leveling the playing field.

In this paper there is no attempt to design an optimal contest but rather to empirically check for consequences that line up with some written design.

The sub chapter introducing the CSF, is based on a paper by CorchÛn and Serena (2018), and its purpose is include a theoretical view regarding the most popular CSF's used to meet the designer objectives by managing players incentives to invest effort. The axioms related to the CSF are, an independence from irrelevant alternatives, (e.g. the outcome of two player contests do not depend on the effort of players not participating in the contest). Winning probabilities depend on the ratio of the players efforts and winning probabilities depend on the deference in efforts. For more on the axiomatic approach see Skaperdas (1996).

In general, a contest can be considered as a game in which players compete with strategies that are expressed in terms of effort, prize, and payoffs (expected utility).

A group of players denoted as , and effort denoted as , prize as and payoffs as .

In addition, we assume a player is risk neutrality and has a linear cost function and that the marginal cost equals 1. Then the expected utility for a player i can be marked as follows: 

We follow the authors by presenting one of a common CSF, the All-Pay auction, (APA), introduced by Hillman and Riley, (1989), and takes the form of 

It is noticeable is that there is no equilibria in pure strategies, as long as a contester is not the winner she should decrease her efforts to 0. The highest effort considered by the winner should be a small epsilon more than the second highest effort. That small cost is always a reason to deviate.

The lottery CSF, introduced by Tullock (1980), takes the form of . This CSF is homogeneous of degree 0, where  is not sensitive to a specific unit measurement of effort.

Last and most common CSF used to justify leveling the playing field is the Logit CSF proposed by Dixit(1987):  where measures the impact of  in affecting the outcome of a contest.

( Mealem and Nitzan 2016; Chowdhury, Mukherjee and Gonzale 2019; Szymanski 2003), offer a description of an effort impact function, introduced by Tullock (1980) cornering the logit CSF that can take the form of  where  is the players budget, and is the impact function and reflects the effect of player i on a contest given his effort. The parameter  is interpreted as noise or a measure of the discriminatory power of the CSF and leads to an outcome of a contest that is completely random, the outcome takes the form of a lottery CSF, and the outcome takes a form of an All-pay auction respectively. Meaning, as  increases, the noise in the contest outcome decreases, leading to contest results that are clearer ex ante. It shows that under the logit CSF assuming the designer has the ability to choose , as  increases, a player spending more effort is increasing his probabilities of winning. Strong players are incentives to invest effort. Authors show that some positive amount of noise in the effort impact function is needed to maximize total effort and optimal levels of noise depends on the shape of the cost function.

(Chowdhury, Mukherjee and Gonzale 2019) detail one mechanism of leveling the playing field as the cost of effort, where altering costs can handicap the favorites or give a head start to weaker players, aiming to equalize winning probabilities of all players if they invest the same effort cost.

By implementing a multiplicative bias in the impact function, where all players receive equal treatment, and assuming that the cost of effort is linear and multiplied by the same alpha  compared with affirmative action where the weights attached to the players effort are in proportion to their marginal cost and under an n player contest , affirmative action will keep all players active in the game while, under equal treatment there is a positive probability that only part of the players will stay active incentivizing the strong players to invest more effort. This may result in higher total effort under equal treatment, though the authors suggest that when effort costs are not to heterogenous to begin with affirmative action as a policy, it is likely to deliver higher total effort.

CorchÛn and Serena (2018) offered to use the lottery CSF and by adding an- such as , there is a possibility to perfectly level the playing field by giving an advantage to weaker players and maximize the sum of efforts since this policy will encourage strong players to invest more effort as they are strategic complements.

In this paper we will show empirically that handicapping does indeed lead to a closer competition with uncertain outcomes, but it comes with a negative by product in the form of sabotage, as suggested by Lazear (1989), Brown and Chowdhury (2014). we use horseraces as a contest that supplies measurements of effort, probabilities to win, sabotage- as interference between riders and other measurements of prior abilities of contesters. A designer of a horserace would be the handicapper, which by definition tries to level the playing field by adding weight on strong horses and leveling to a degree, the winning probabilities at the beginning of a race. Will note that horseracing is designed in a way where horses compete against other horses from a similar level under a certain handicap range i.e. effort costs are not to heterogenous to begin with.

# Sabotage

Lazear (1989) shown that increasing rewards might lead to negative behavior, that reduces the output of a rival. It seems that when agent's erns, are based on relative performance, there are incentives to invest effort in making their opponent's fail, even when the total output reduces. Followed by Coral, Rodriguez, and Simmons (2010) who demonstrated how an increase in a point in the Spanish league per wining game, increased cases of red cards (sabotage punishable by a dismiss of a player) within teams in winning position. They also showed that there is a higher probability of receiving red cards towards the end of a much regardless to the position of the team.

Konrad, K. (2003) had demonstrated how do interest group which are lobbying for a discission that will benefit with their needs, and are competing with other groups on a particular matter, will invest effort, in what is considered in the literature as rent seeking contest, that will increase their probabilities for winning a prize and decrease the probabilities of their rivals.

This effort is considered as standard rent seeking effort. In addition, they may invest some negative effort (sabotage) which will decrease the probability of the group being sabotaged and increase the probabilities of all other groups.

This negative effort has been shown to decrease as the number of competing groups increases, as it is costly to perform and has benefits all other contestants. This assumption was followed by Grad, Lettl & Riedl (2020) who also demonstrated how strategic behavior does influence the outcomes of a contest, and that top contestants might be both, victims and culprits of sabotage.

Cases of sabotage appear at political events in marketing campaigns and sports and while it is known that investing effort will increase a contestant probability off winning a prize, it has been shown, Chowdhury., & A, Brown (2017), Lazear, E. (1989) that involving destructive behavior such as sabotage may also increase probabilities in favor of the saboteur.

Chowdhury, Gürtler (2015) described it as an invested cost that harms the opponent's probability of winning a prize. It seems that most sabotage cases are directed at the better opponent and, that it will indeed hurt the overall effort of the competitors. It may also reduce the effectiveness of the competition organizer policy.

The author's mention that while contestants will invest resources in order to win the prize, there are those who will also invest in the opponent not winning the same prize, giving as examples how do businesses harm competing businesses by hiring salespeople whose main job is to track competitors' salespeople and motivate potential buyers from realizing the deal with them, Friedman (1998). One other example examines how did Microsoft engineers hide information from each other in order to surpass fellow engineers in performance and evaluations received from the company (Oremus 2013).

Munster (2007) examined cases of sabotage in a selection of contests with heterogeneous participants and found that contestants can equal their probabilities at a contest, even if there are differences in the skills of the contestants. Furthermore the author showed that it might drive for the less talented contestants to compete, as incentives for the good contestants will decrease knowingly that the more talented they are the more they will experience cases of sabotage, hence using a tournament such as promotion contests , political, rental contests and contests of the kind, might lead to select a non-talented contestant.

In this study, observing horse racing, we will refer to any act of interference which was noticed by stewards and a riding offence was declared as an act of sabotage.

# Horseracing

A natural starting point regarding the analysis in this paper would be a small introduction to the equestrian world and horseracing in particular.

Most of horseracing in England are handicap racing, in such a race every horse gets added weight related to its abilities allowing equal probabilities to win ex ante.

The handicap ratings will dictate in which category the horse may compete. The categories are from A to G. A represents the best category and G represent the wicker one. Every horse gets a handicap rating straight after its third performance and from that point on its official rating will change in relation to its successes. Other factors related that are considered by handicappers may involve the ground the horse is running on, old injures and other factors that might influence the way the horse will perform at the day.

A high rated horse represents a good horse and therefore will carry more weight than a low rated horse. Each level is worth one pound to carry (0.45 kg).

For more information considering official handicap ratting please check the British horserace authority. <https://www.britishhorseracing.com>

The betting market is one of the main reasons for the popularity of a horseracing event. Until recently, gambling shops were the mainstay of horse racing gambling activity, Smith, Williams, Vaughan (2010). At the end of the 1960s, there were about 16,000 betting stores in England of the type that were most Owned by independent betting agents, later, in the coming years these shops are held by a small number off bookmarkers chains.

These agents offer prices or "odds" that dictate the conditions for betting on the event, usually based on a fraction, when the sum of the probabilities is usually higher than one. The surplus unit, mostly called the "over round", will embody within it the guaranteed return to the agent. The average size for 45,335 races in this study was 26.21% when there is an additional profit, (or loss), dividend on each horse resulting from the volume of bets on it.

These betting markets offer some assets that appear to be contradicting principles of efficiency and rationality, Sauer(1998) when they usually yield cumulative negative returns and moreover economists confirmed a longshot-favorite bias , In which better horses are underrated and horses with long odds are over rated and the "hot hand effect" where bettors overestimate positive performance.

In England, Australia, New Zealand, and other European countries such as France and Italy, the dominant betting method is a fixed odds system set by the betting agent. Ziemba, & Lo, Hausch (1994). The system works as follows: No bet can be made, until the bookmaker Post odds so that the initial odds do not depend on the market response. The bookmaker offers odds that can change during the betting period, but the gamblers are included in these odds, even if the odds change thereafter.

Under certain warnings, the odds set by the bookmakers, can be seen as a subjective probability forecast, but, a possible difficulty for this assumption is that the fixed odds of the betting agents are often inconsistent with the axioms of probability theory, for example, the total probability of wining horses are higher than one.

Although organized betting has a negative return for most players if not all, the odds offered by bookmakers must be tempting enough to attract bets, and the reasonable impact that competition has on this market cannot be ignored. Many agents operate so that unattractive bets will not be competitive in the market and as a result gambler miss opportunities for additional revenue. There is no doubt that psychological theories describing probabilistic biases are widely expressed in this market. Ayton (1997).

# Study Design, Materials, and Procedures

It has been shown by Brown and Chowdhury (2014) that reducing a priory differences between contestants by employing handicap will result with an equilibrium which is higher in effort, greater chances off weaker players to win and, higher levels of sabotage. The authors had first produced a model\*, a theoretical benchmark based on the model designed by Lazear (1989) and followed by an empirical review on horse racing in the UK. In this paper we will try to imitate these steps presenting new data and with some minor changes, such as the use of the actual distance of a jockey to the winning horse as a predictor of the independent variable," is the jockey a saboteur", showing that mostly competitive leading jockeys participate in negative actions of the kind.

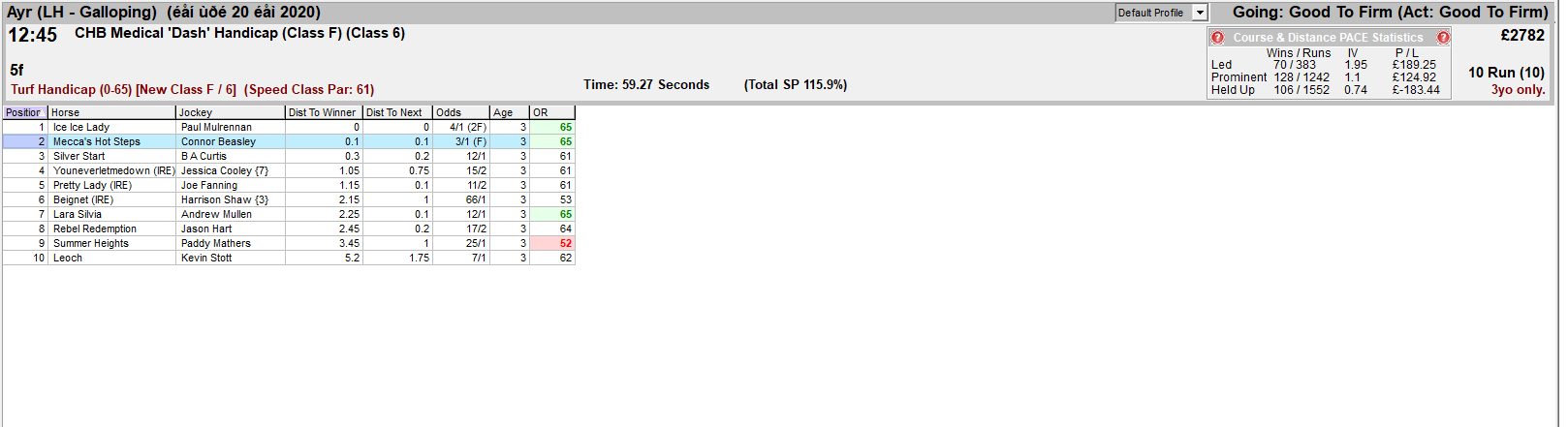
One other addition to the existing literature, we have added a certain character to the saboteur noticing that the top 5% of jockeys at 2019, are significantly more involved in cases off interference compared with the rest of competing jockeys, noticing it is not only the leading jockeys in a race, but rather the top jockeys of a hole year can be assumed to act more aggressively to wards competing colleagues.

Data:

Data on all horseracing in England is reachable at UK's horse racing website BHA (BRITISH HORSERACING AUTHORITY), where it is also possible to find each interference between riders under a category of Stewards reports: <https://www.britishhorseracing.com/racing/stewards-reports>.

Data regarding position on horse and rider, horses handicap ratings, distance between horses, betting odds, distance of a race and the prize money given in a race, I have collected from an English betting company, "Proform Racing", which required purchasing software that allows viewing historical data for the last 19 years. <https://www.proformracing.com>.

Below is an example of the output displayed from a Proform racing file.



The data I have collected came only from racetracks with at least one incident of interference during the year, making sure that I keep the same line of stewards and rules in order to avoid noisy data.

I have collected data on 1,619 horse races and 15,206 rides

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **Summary Statistics** |
| Flat(N=1,393) | Jump(N=226) | Non-Handicap(N=525) | Handicap(N=1,094) | All(N=1,619) | **Races** |
| 10.58186  (3.367939) | 11.1953  (6.577315) | 9.727881  (3.528647) | 11.05084  (4.031867) | 10.66  (3.93643) | No. of runners |
| 10353.31  (38390.95) | 27968.17  (75802.01) | 19462.62  (65989.2) | 9745.128  (32662.35) | 12609  (4.5336.66) | Prize money (GBP) |
| 1803.898  (612.8448) | 4521.857 (963.7516) | 2048.969  (1077.639) | 2197.779  (1147.009) | 2153.868  (1128.99) | Distance |
| Flat | Jump | Non-Handicap | Handicap | All | **Horses** |
| 4.410301  (1.894673) | 7.23773  (2.110073) | 3.781146  (1.89898) | 5.187704  (2.101953) | 4.772656  (2.1424) | Age |
| 18.52829  (24.65012) | 20.99674, (29.74687) | 26.86497  (36.9666) | 15.48574  (17.4128) | 18.84353  (25.37398) | Odds |

Summary statistics for 1619 horse race un the UK 2019. Top panel includes race statistics. Bottom panel includes individual horse statistics. Measures are means and standard deviation in parameters.

Analysis:

The first part of my Analysis was to confirm whether handicapping does its job in leveling the field prior to the beginning of the game, following a similar procedure taken from Brown and Chowdhury (2014).

H1: handicap racing will lead to more uncertainty in anticipating results and on results ex-post.

Testing this hypothesis, we run a regression on an indicator variable equaling 1 if the favorite wins the race, and 0 otherwise, on an indicator variable equaling 1 if the horse was running in a handicap race, and 0 otherwise, suggesting that if the favorite wins less in handicap racing, these events do not follow the odds as determined and expected by the bookkeeper.

The test resulted with significance, (, p < 0.00), a control variable was added in regression 2 (, p < 0.00).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 1.-Logistic regression Analyses-Dependent Variable: Favorite Wins=1 | | | | | | |  |
| Predictor |  |  |  | p | No. of obs |  |  |
| Handicap | -0.500990 | 0.1086681 | 0.6059303 | 0.000 | 1619 | 0.0099 |  |
| Table 2.-Logistic regression Analyses-Dependent Variable: Favorite Wins=1 | | | | | | |  |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| Handicap | -0.432545 | 0.1104948 | 0.6488554 | 0.000 | 1619 | 0.0165 | P=0.3420 |
| NUMBER of runners | -0.587502 | 0.0160185 | 0.9429423 | 0.000 |  |  |  |

For further investigating if handicapping does its job in getting a race closer together ex-ante and ex-post, I have used two dependent variables - the standard deviation of the odds and the standard deviation of the distance between the horses at the finishing line, respectively, as a way of measuring how even is the race.

H1: The standard deviation of the odds in handicap racing is smaller.

H2: The standard deviation of the distance between the horses at the finishing line, in handicap racing is smaller.

The negative coefficient of the handicap as a predictor, on both independent variables, indicate that handicap racing leads to a smaller spread in odds before the race, and horses are closer to each other at the end of a race, showing that handicap racing is more even than non-handicap racing. Both measures were significant (F(1,1617)=387.19, P=0.00), (F(1, 1608)=14.10, p=0.00) respectively. Control variables were added in regressions 5 and 6 and find results to be robust.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 3.- Dependent Variable: standart deviation odds | | | | | |
| Predictor |  |  | p | No. of obs |  |
| Handicap | -13.78322 | 0.7005478 | 0.000 | 1619 | 0.1932 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.- Dependent Variable: standart deviation odds | | | | | | | | | |
| Predictor | |  | |  | | p | No. of obs |  | |
| Handicap | | -16.70791 | | 0.6775615 | | 0.000 | 1619 | 0.3130 | |
| Win Prize Money | | -0.000208 | | 0.00001 | | 0.038 |  |  | |
| Number of runners | | 1.148823 | | 0.0926833 | | 0.000 |  |  | |
| class rate | | 2.105674 | | 0.2516379 | | 0.000 |  |  | |
| Distance | | 0.002193 | | 0.0004729 | | 0.000 |  |  | |
| Jump race | | -2.805747 | | 1.522723 | | 0.066 |  |  | |
| Table 5.- Dependent Variable: standard deviation of the distance between the horses at the finishing line | | | | | | | |
| Predictor |  |  | | p | No. of obs |  | |
| Handicap | -1.622607 | 0.427465 | | 0.000 | 1619 | 0.088 | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 6- Dependent Variable: standard deviation of the distance between the horses at the finishing line | | | | | |
| Predictor |  |  | p | No. of obs |  |
| Handicap | -3.032781 | 0. 3704592 | 0.000 | 1616 | 0.3229 |
| Win Prize Money | -0.000208 | 0.00001 | 0.007 |  |  |
| Number of runners | 0.4003202 | 0. 0506749 | 0.000 |  |  |
| class rate | 0. 4786002 | 0 .137584 | 0.001 |  |  |
| Distance | 0. 0037074 | 0. .0002586 | 0.000 |  |  |
| Jump race | 1.432244 | 0. 8325544 | 0.086 |  |  |

Following Brown and Chowdhury (2014) line of work, I continued by checking the correlation between the odds determined by the bookkeeper and the public as an indicator of expectations, as smaller odds represent expectations for a higher-ranking horse.

It seems that both handicapping and non-handicapping odds are correlated with the positioning of the horse. However, non-handicapping odds show a stronger relationship to results with a correlation of 0.444 compared with a correlation of 0.382 in handicap races, indicating more uncertain outcomes.

The second part of the analysis was to determine whether interference happens more in handicap than non-handicap racing.

H1: sabotage presented as cases of interference, is more present in handicap racing than in non-handicap racing.

An indicator equaling 1 if there was an interference by a jokey and 0 otherwise, was regressed against a variable equaling 1 if the race was a handicap race, 0 otherwise. As expected, the result shows a positive relationship (, p < 0.00).

In the following regression, control variables were included and revealed some negative relationship between the odds and the interference and as before, we find a positive eﬀect of handicapping on sabotage in a race (, p < 0.00).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 7.-Logistic regression Analyses-Dependent Variable: jockey is a sabotuer=1 | | | | | | |  |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| Handicap | **0. 4016528** | **0. 165933** | **1.494292** | **0.015** | **15206** | **0.0218** | **P=0.3283** |
| NUMBER of runners | **-0.0283804** | **0. 016984** | **0..9720185** | **0.095** |  |  |  |
| odds by number | **-0.0230714** | **0.005217** | **0.9771927** | **0.000** |  |  |  |
| official rating | **0.0035484** | **0.0020747** | **1.003555** | **0.087** |  |  |  |

As mentioned in previous work, the strong correlation between interference and handicap racing might give a wrong impression of causality, while an act of interference may derive from the tight racing that handicapping provides. Therefore, I will measure the effect of the closeness of the race, as well as handicap and non-handicap on interference, as it appears in horse racing in the UK.

H1: closer races both handicap and non-handicap have more cases of sabotage.

A variable I use to measure the closeness of the race is the standard deviation of the odds. In regression 1 I have regressed interference, on the standard deviation of the odds with an expected negative relation between tighter racing and interference (, p =0.0382).

In the following regressions I have separated handicap races from non-handicap races and the regression reported with significance (,p=0.0746) the negative coefficient of -0.17 reflects on the nature of the relationship between tightness of a race and interference.

I find a similar significant result in non-handicap racing with a negative coefficient of -0.2, (, p = 0.0216).

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| **Table 8.-Logistic regression Analyses-Dependent Variable: jockey is a saboteur=1 for all races** | | | | | | | |
| Predictor |  |  |  | P | No. of obs |  | Hosmer-Lemeshow |
| standard deviation odds | -0.0247344 | 0. 00575 | 1.494292 | 0.000 | 15206 | 0.0077 | P=0.6882 |
| **Table 9.-Logistic regression Analyses-Dependent Variable: jockey is a saboteur=1handicap racing** | | | | | | | |
| Predictor |  |  |  | P | No. of obs |  | Hosmer-Lemeshow |
| standard deviation odds | -0.0170738 | 0.0085468 | 1.494292 | 0.046 | 10719 | 0.0019 | P=0.7801 |
| **Table 10.-Logistic regression Analyses-Dependent Variable: jockey is a saboteur=non-handicap racing** | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| standard deviation odds | -0.0203092 | 0. 0094657 | 1.494292 | 0.032 | 4487 | 0.0089 | P=0.6913 |

As in previous research, these results leave us with a question regarding the incentive that Lazear's (1989) model suggests. Is the incentive the reason for interference, or is it just a thing jockeys do when a race provides them with a closer field?

On my journey to collect data, I could not miss some relationship between the saboteur (the jokey who interfered) to his position in the race.

In order to measure this, I have added a new independent variable: the distance to the winner.

H1: cases of sabotage appear more at the top of the race i.e. with the leading horses.

As expected, there is a strong negative relationship between interference and the distance to the winner in the race in general (, p =.00) handicap and non-handicap (, p = 0.000, p = 0.000) respectively.

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| Table 11.-Logistic regression Analyses-Dependent Variable: jockey is a sabotuer=1 | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| distance to the winner | -0.1266843 | 0. 0140731 | 0.8810118 | 0.000 | 14824 | 0.0514 | P=0.000 |
| Table 12.-Logistic regression Analyses-Dependent Variable: jockey is a sabotuer=1 | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| distance to the winner | -0.1155852 | 0.0154883 | 0.8908446 | 0.000 | 10440 | 0.0434 | P=0.000 |
| Table 13.-Logistic regression Analyses-Dependent Variable: jockey is a sabotuer=1 | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| distance to the winner | -0.1665207 | 0.0348909 | 0.8466053 | 0.000 | 4384 | 0.0767 | P=0.849 |

This suggests that more competitive jockeys participate in the act of interference. There may be a need to reconsider leveling the playing field as this may increase a destructive effort on the part of the players.

One question left open is, does interference help? Should the jockey interfere? The next hypothesis tested that.

H1: winning Jockeys will participate more in action of sabotage than regular jockeys.

A logit regression Using an indicator variable equaling 1 if the horse won the race, 0 otherwise, on an indicator equaling 1 if the jockey had interfered, 0 otherwise reported with significance ((, p = 0.000). The control variables: number of runners, the horses official rating and the dummy variable was it a handicap race, where added and find the results to be robust.( (, p = 0.000)

In order to investigate further and also to assure that my results are not influenced by the longshot bias, Griffith (1949), where better preforming

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| Table 14.-Logistic regression Analyses-Dependent Variable: jockey won the race=1 | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| jockey had interfered | 1.128535 | 0.135435 | 3.091124 | 0.000 | 15206 | 0.0056 | P=0.000 |
| Table 15.-Logistic regression Analyses-Dependent Variable: jockey won the race=1 | | | | | | | |
| Predictor |  |  |  | p | No. of obs |  | Hosmer-Lemeshow |
| jockey had interfered | 1.086553 | 0.1376304 | 2.964039 | 0.000 | 15206 | 0.0297 | P=0.4760 |
| Handicap | -0.2084771 | 0.0655103 | 0.8118196 | 0.001 |  |  |  |
| number of runners | -0.1127765 | 0.0083172 | 0.8933503 | 0.000 |  |  |  |
| official rating | 0.0043915 | 0.0008336 | 1.004401 | 0.000 |  |  |  |

horses are underrated and weaker horses are overrated, I have regressed a dependent variable: the performance of a horse against a dummy variable, had the jockey interfered.

For this hypothesis, I used a measure suggested again by Brown and Chowdhury (2014):

Performance= (The predicted finishing position - actual finishing position)/number of runners in class.

The predicted finishing position is a derivative of horse's odds in a race. Shorter odds indicate expectations for a higher-ranking horse. Horses with long odds are expected to finish last. This measure is by nature an order scale (shortest odds are predicted to finish first, second shortest to finish second and so forth). A positive performance signals a horse succeeding beyond the expectations while a negative result means the horse has underperformed.

Regression resulted with significance (F(1,15204)=28.37, p=0.00) meaning the jockey who interfered had improved his performance. Our average number of runners is 10.66 and the coefficient is .092 which means that an interferer had improved his position to expectations by .98 on average.

The odds of each jockey was added as a control variable in the following regression(F(2,15203)=30.88, p=0.000)

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| **Table 16.- Dependent Variable: Performance** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0.0920632 | 0. 017283 | 0.000 | 15206 | 0.0019 |
| **Table 16.- Dependent Variable: Performance** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0 .0877881 | 0. 0172812 | 0.000 | 15206 | 0.0040 |
| **Odds** | -0.0005406 | 0. 0000936 | 0.000 |  |  |

We measured changes in performance related to actions of sabotage also in handicap races only, (F(1,10717) =22.81,p=0.000) and adding a the odds as a control variable repeated with significance (F(2,10716)=28.66,p=0.000). followed by the same procedure for non- handicap racing, (F (1,4485) =

4.72, p=0.0299), F(2,4484) =7.73,p=0.000) respectively.

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| **Table 17.- Dependent Variable: Performance** **handicap racing** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0.0958935 | 0.0200783 | 0.000 | 15206 | 0.0021 |
| **Table 18.- Dependent Variable: Performance handicap racing** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0 .0877881 | 0. 0172812 | 0.000 | 10719 | 0.0053 |
| **Odds** | -0.0009962 | 0 .0001698 | 0.000 |  |  |

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| **Table 19.- Dependent Variable: Performance** **non-** **handicap racing** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0 .0761857 | 0 .0350693 | 0.030 | 4487 | 0.0299 |
| **Table 20- Dependent Variable: Performance handicap racing** | | | | | |
| Predictor |  |  | p | No. of obs |  |
| **jockey had interfered** | 0.0706668 | 0.0350718 | 0.044 | 4487 | 0.0034 |
| **Odds** | -0.0003421 | 0.0001044 | 0.001 |  |  |

According to the BHA there are in about 450 professional jockeys listed in the UK. Data describing top jockeys for 2019 UK, will offer as one more perspective, in addition to the existing literature, being able to count the times a top jockey will participate in an act of sabotage on average for a long period of time and, comparing it with regular jockeys.

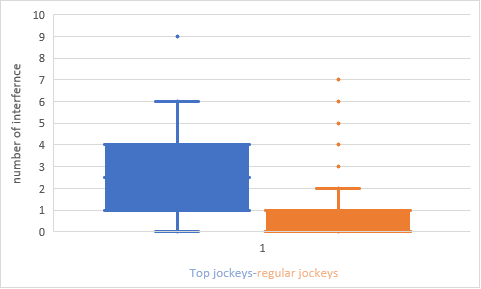
H1: top successful jockeys participate in destructive behavior i.e. sabotage more than regular jockeys.

A simple t test checking for the top 5% of professional flat jockeys in the UK revealed significant differences between the group of the top 5% and other jockeys.

The average amount of interference incidents for top flat jockeys between 01/01/2019-13/07/2019 was 2.86 times, 4.386 times more than rest of the jockeys who interfered in average 0.652.(t=7.1432, p=0.00).

Smaller differences were observed with the Jump Jockeys where the top 5% of jump Jockeys interfered 0.272 times on average in that time, and regular jump jockeys had interfered 0.144 times on average. The test had reported with weak significance (t=1.2942, p=0.0984).

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| **Table 21** | Top flat jockeys | Regular flat jockeys |
| Average number of interferences | 2.863636 | 0.6528662 |
| P-Value | 0.000 | |
|  | |  |
|  | Top flat jockeys | Regular flat jockeys |
| Average number of interferences | 0. 2727273 | 0. 1449275 |
| P-Value | 0.0984 | |



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# General discussion

Handicapping is a common tool used in contests, in the attempt to reduce a-priory differences between contestants and lead to an increase in aggregate effort. It has been shown in previous research as in this paper, that handicap policy does indeed allow an increase in winning probabilities for weaker contestants. Following the steps of Brown and Chowdhury (2014) we have also demonstrated how, the competitive closeness, is positively correlated with cases off sabotage. Using data on horseracing, it has been verified that the tighter the race, the more chances for interference between jockeys and, that cases of sabotage will usually occur at the top of a race between the leading jockeys.

One addition to the existing literature, in this paper, Is the ability to distinguish between the behavior of top contestants and regular contestants in respect to negative behavior and sabotage, using the top 5% of jockeys in the UK as a representative of superior sportsman, we have shown that the top 5% will participate in sabotage incidents 4.5 times more than regular contestants.

A question arises, is negative behavior a tactic to get to the top, or is it that successful contestants just participate more in cases of sabotage? This question is not answered in the limits of this paper though, it is worthwhile to consider, perhaps separating leading sportsman into a smaller group of contestants rather than handicapping them in the attempt to level their winning probabilities with weaker players. It is not to facilitate the importance of handicapping as a tool used by the contest designer, for the benefits it provides but rather to help understand and perhaps better deal with the weaknesses that come with.

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Regression 1



Regression 2



Regression 3



Regression 4





Table 2



Regression 5





Regression 6



Regression 9



Regression 10



Regression 11



Regression 12



Regression 13



Regression 14



Regression 15



Regression 16



Regression 17



Regression 18



Regression 19



Regression 20





