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In the Money: Gender and Jockey Success on the Thoroughbred Racetrack

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Abstract

This paper examines the relative performance and access to mounts of female jockeys in American horseracing, the only major professional sport where female and male athletes directly compete on a regular basis. We modeled the determinants of the probability for a jockey finishing a race "in-the-money"—placing first, second, or third, and the determinants for receiving mounts. Among other findings, the results indicated that the probability for female jockeys finishing a race in the money was not significantly different from male jockeys, *ceteris paribus*, yet female jockeys continue to receive fewer mounts after controlling for other relevant, observable factors.

Keywords

jockeys, horseracing, gender, discrimination, probit

Introduction

With roots extending back to colonial times, horseracing is the oldest spectator sport in the United States. Throughout most of its history, the human athletes in American

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horseracing were exclusively male. Jockeys, those who ride the horses during a race, were traditionally young men of small stature but with great strength and dexterity. The maleness of the jockey profession was manifest in unwritten traditions and through enforced regulations. It took court interventions[1] for the gender barrier to be broken in early 1969 when Diane Crump rode at Hialeah Park Race Track in Florida (McKenzie, 2012). Today, women routinely ride in horse races at all levels of competition; however, in the intervening 50 years since Crump's ride, the desegregation of the industry has been slow. Currently only about 12% of all jockeys riding on pari-mutuel Thoroughbred tracks are women. A number of factors underlie this outcome, including deep-seated traditions in training and hiring practices, and a commonly-held view that female jockeys,[2] on average, do not have the physical athletic characteristics equivalent to their male counterparts. Horseracing is the only major sport in the US, and in many other countries, where men and women compete head-to-head on a consistent basis.[3] Thus, the contention that the requisite athletic talents and skills differ across the sexes can be empirically tested. That is the primary purpose of the research presented here.

Employing three calendar years of data, drawn from racetracks nation-wide, we analyzed the outcomes of nearly a million jockey rides and over 2,000 jockeys. A model was constructed and estimated using probit analysis to examine the factors assumed to influence whether a jockey finished "in the money"—placing first, second, or third in a race. Along with each jockey's sex, our model controlled for other jockey-specific personal characteristics, horse and trainer characteristics, and race-specific environmental variables. The model was estimated for all races and across several subsamples broken out by race classification. In addition, several specifications of the model which allowed for independent variable interactions were also estimated. Though higher percentages of male jockeys win and finish in the money, the results of our model indicate that the probability of a female jockey finishing in the money was not significantly different from that of male jockeys, *ceteris paribus*, and only a few interactions were significant dependent on the class of race.

A second model was then constructed using the same data reorganized by jockey and estimating the factors that influence the number of mounts a jockey receives in a calendar year using linear regression analysis. This mounts model was estimated by year for all 3 years in the sample and for subsamples of apprentice jockeys and the top journeyman jockeys. The estimated equations controlled for metrics of jockey success, the quality of mounts, the jockey's ability and willingness to ride on multiple tracks, and the jockey's sex. Results indicate that female jockeys receive fewer mounts than their male counterparts, all else equal, despite the apparent lack of significant productivity differences found in our probit model of racing success.

In the following section we provide a brief overview of the American horseracing industry and review the limited research literature to set the context of our study. Next, we describe and discuss the racing data used to analyze the effect of sex on jockey success. This is followed by the presentation of our model of jockey success

and the empirical results. We conclude the paper with a review of the major results and suggestions for further research.

The Institutional Context and Academic Literature

Jockeys in the American Horseracing Industry

Prior to the ascendance of baseball and other professional team sports, horseracing was the most popular spectator sport in the US during the 19th and early 20th centuries (Robertson, 1964). Over the past several decades, the appeal of horseracing to the American sports fan has significantly declined to the point where polls show that it is now tied with men's tennis and women's basketball in overall popularity (Baynham, 2017). There are many underlying reasons for the decline in relative popularity (Levin, 2017, 2019), but regardless of the changes in tastes and preferences of sports fans over time, horseracing remains a major industry by all standard economic measures. Today, Thoroughbreds and Quarter Horses compete in tens-of-thousands of races annually spread across more than 100 tracks nationwide, with total purses (prizes paid to winning participants) paying more than $1.2 billion (American Horse Council Foundation, 2018). Pari-mutuel gambling on race outcomes remains a primary attraction for a vast majority of racing fans (Riess, 2014). In 2018, more than $11.2 billion was wagered at tracks and at off-site betting facilities and casinos (Jockey Club, 2019). The most recent comprehensive economic impact study of the overall horse industry estimates that the racing sector employs nearly one-quarter million workers and generates a $21 billion direct impact on the American economy (America Horse Council Foundation, 2018).

Of all major spectator sports, professional horseracing is the most strictly regulated (Busch, 2016).[4] Oversight is maintained through partnerships of state racing commissions, local race associations, and the national Jockey Club. In general, state racing commissions have the authority to grant racetrack operating licenses, set the number of racing days, oversee the pari-mutuel betting operations, and license all racing participants—including owners, trainers, horses, and jockeys. Local race associations are comprised of racetrack operators who cooperate in scheduling and promoting races. The private Jockey Club is the national horse breed registry that strictly regulates the production of Thoroughbred race horses and also established the historic "Rules of Racing"[5] (1905) that set the standards adopted by the state racing commissions. Collectively, the state racing commissions, the local race associations, and the Jockey Club appoint stewards who are responsible for enforcing the rules and regulations at each racetrack. In addition, the National Association of State Racing Commissioners ensures full reciprocity of rules enforcement across state lines to maintain a homogeneous racing experience for participants and fans. Finally, international agreements between regulatory bodies are in place to harmonize the rules for high stakes races which attract entries from other countries.

Jockeys are licensed private contractors who are hired by horse owners and trainers to race. To obtain a racing license, jockeys must first serve an apprenticeship, usually after entering the profession through work as a stable groom or exercise walker. Throughout the apprenticeship period, horse trainers control which mounts a jockey will ride as well as many other aspects of the jockey's daily life. A jockey's apprenticeship is a classic case of general on-the-job-training whereby the employer will attempt to recover their education provision costs through low wages and long work hours. Apprentice jockeys are often responsible for much of the manual labor necessary to maintain and operate a racing stable (McHale, 2015).

Racing rules encourage owners and trainers to continually hire apprentice jockeys by providing them with a weight advantage during races. The amount of the weight advantage is determined by the jockey's race record and years of experience. An apprenticeship is completed only when a jockey loses their weight advantage. Within this system, new jockeys are dependent upon trainers and owners who are willing to give them a chance to demonstrate their riding skills. Once they lose their weight allowance, the number of rides on high quality horses tends to dry up, and it is the top riders who are able to advance beyond the apprenticeship to become journeyman jockeys.

As private contractors, jockeys are free to contract, usually through an agent, with any horse trainer. Jockeys are paid a fixed mount fee per race plus a percentage of the prize money won. Both racing tradition and modern rules dictate that a winning jockey will receive ten percent of the purse won with second and third places taking five percent each. Losing jockeys generally only receive the fixed mount fee which may be less than one hundred dollars per race. The "Rules of Racing" institutionalized these significant differences in jockey compensation between those that finish in the money and those who do not. The continuing practice incentivizes maximum effort for each jockey and the tying of remuneration to performance is endorsed by the labor union that represents riders, the Jockey's Guild.[6] To maximize income, journeyman jockeys strive to ride in as many races as possible. According to *Forbes*, the top five jockeys gross[7] between $1.4 and $2.3 million per year but typically need to race in more than 1,000 events to do so (McGrath, 2016).

The Experience of Female Jockeys

Given the deep-seated, centuries-old, traditions in a profession dominated by men, it is not surprising that women continue to face significant barriers as professional jockeys. The institutional structure of the racing industry characterized by contractual apprenticeships and compensation tied directly to performance provide owners and trainers with monopsonistic market powers that allow for discretionary personnel actions not possible in more traditional employment settings. Many accounts indicate that over the past 50 years female jockeys have faced both overt and implicit forms of hiring discrimination.[8] Thirty years after the gender barrier was broken, Davidson and Anthony (1999) reported on the experiences of ten pioneering female

jockeys, all of whom recounted personal incidences of discriminatory actions by owners, trainers, and others that limited their opportunities to compete. (Several women even raced under their initials instead of their full names in order to avoid attention and stereotyped reactions by those in the industry.) Economic theory suggests that in the absence of discriminatory barriers that limit access to the market, competition between trainers would result in the best riders being hired regardless of sex. The continuing under-representation of women on the racetrack today raises the question of whether discrimination remains entrenched, or if inherent differences in athletic abilities associated with gender result in the observed proportions of male and female jockeys on the racetrack. Surprisingly, economists and other social scientists have devoted little attention to this question.

To date, most of the academic work on female jockeys has been conducted by sociologists studying racing in the United Kingdom. Given that the American horseracing industry can trace its historical roots to England, and that the modern employment structures, regulatory regimes, and cultures are similar, the UK experience is relevant to the US experience. Using a qualitative approach, Velija and Flynn (2010) found that women are perceived by the public, and perceive themselves, as "outsiders" in the UK racing industry. Furthermore, they reported that female jockeys are often seen as "weaker and less capable than male jockeys." Butler and Charles (2012) reported that while a majority of the young people entering racing industry apprenticeships are women, the majority of those eventually receiving a jockey license are men. They attribute the significant attrition of women to societal "hostility and harassment" toward what is appropriate work for female bodies. This conclusion is refined through Butler's later works (2013, 2014) examining the role of masculinity and gender identity in the UK horseracing industry. Through a series of interviews, Roberts and MacLean (2012) reported that female jockeys face discrimination due to perceptions of physical strength, body shape, and historical tradition. This conclusion is reinforced by Williams and Hall (2018) who found that "ingrained patterns of sexism, chauvinism and paternalism" reinforce traditionally held views of appropriate male and female roles within the industry.

Economists Brown and Yang (2015) conducted an empirical study of the relative performance of female jockeys in the UK and Ireland. Using 10 years of wagering data, they found that female jockeys won flat races 0.3 percent more often than the betting market predicted. Larger underestimations of female performance were found in steeplechases and hurdle races. Brown and Yang suggest their results may be due to "mistake-based discrimination" whereby ingrained beliefs influence decision-making.

In addition to studies based on the British horseracing industry, the academic literature also includes work on female jockeys in Brazil (Adelman & Azeredo Moraes, 2008), Australia, and New Zealand (Tolich, 1996). In these cases, the theme of barriers imposed by a tradition-bound, male-dominated, industry remain. However, in the case of New Zealand, Tolich reported that by the mid-1990s women composed nearly half of the apprentice jockeys racing in the country. Interestingly,

he concludes that this resulted from the decline in importance of the New Zealand racing industry which led to the inability of the industry "to retain or attract male jockeys" who migrated to Australia. Thus, while appearing more successful at breaking the gender barrier, Tolich sees female jockeys in New Zealand as being trapped in a secondary labor market.

Studies using data drawn from the American horseracing industry have tended to focus on contest design and incentive structures (see, e.g., Brown & Yang, 2017; Coffey & Maloney, 2010) or the financial return to owning a racehorse (see, e.g., DeGennaro, 2003; Gamrat & Sauer, 2000; Ray, 2001). Only two studies have explicitly addressed the relative performance outcomes of female jockeys within the context of the US market. Using cross-sectional data on the top one hundred jockeys in 1988, Ray and Grimes (1993) estimated a two-equation recursive model that controlled for personal characteristics and observed performance. The results revealed that female jockeys secured significantly fewer mounts from trainers during the year, which in turn resulted in significantly lower earnings relative to their male counterparts. Grimes and Ray (1995) extended this analysis using *career* data for the top one hundred jockeys in 1993 with similar results being found. Furthermore, the model predicted that if the number and quality of mounts were held constant across gender, a significant positive annual winnings differential would exist for female riders. These findings were interpreted as empirical evidence of the discriminatory barriers often described by female jockeys.

The most recent analysis of gender issues in US horseracing was conducted by von Hippel et al. (2017), public health scientists, who examined the distribution of body mass index characteristics between top jockeys and the general population. Their work focused on the jockey weight requirements that are imposed by industry standards. von Hippel, Rutherford, and Keys found that among adults light enough to satisfy the weight restrictions, women outnumber men by a factor of seven to one and that women were only half as likely to be underweight. Given the significant under-representation of women in the profession, this is additional evidence of either unobserved differences between the sexes in career decision-making, discriminatory access to work, or inherent differences in athletic ability.

With respect to athletic ability, McCombs and Sommers (1983) found that female equestrians outperformed their male counterparts in Grand Prix Jumping in terms of both points and prize money earned. While von Hippel et al. (2017) had noted that females seemed to have an advantage in meeting weight restrictions compared to males, they also noted that there were a number of factors which could contribute to jockey success, including reaction time and strength, which tend to favor male jockeys. Still, the literature is not consistent regarding whether one sex possesses a significant physical advantage over the other in the relevant skills necessary to be a successful jockey. Recent analyses also suggest that modern racing postures require greater bodily flexibilities which favor female jockeys (Pfau et al., 2009). Within the context of this academic literature, we turn our attention to examining the empirical question regarding gender differences in the observed success, and therefore, athletic

skills, of professional jockeys as well as their access to mounts on Thoroughbred racetracks.

The Data

The data used in this study consist of the records for 121,548 Thoroughbred horse races during the calendar years 2016-2018 provided by Handicapper's Data Warehouse (HDW). HDW compiles and composites primary racing data collected by Equibase, the Thoroughbred racing industry's most comprehensive source for data, news, and information (Equibase, 2019). The HDW data is normally sold by subscription to gamblers to handicap races, and includes proprietary indices and measures of jockey, horse, and trainer performance.[9] Our database was constructed such that each observation represents a particular jockey-horse combination, or "jockey ride" within a race. There were 935,350 complete jockey ride observations in our 3-year sample representing 2,147 jockeys riding 85,684 unique horses.[10] These jockeys and horses ran for 6,962 different trainers on a set of 105 racetracks across North America.[11]

For each jockey ride, the database includes specific information about the horse and the race, including, but not limited to: track surface type and condition, size of the field, post position of the horse, age and sex of the horse, weight assignment for the horse, various velocity measures, recent racing success measures, relative position within the race, and a number of performance ratings developed by the handicappers at Handicapping Technology and Research (Massa, 2017). Jockey career length was obtained from Equibase to supplement the HDW data. While the HDW data reflect a number of personal characteristics for each jockey, the database is missing a variable for jockey sex. Therefore, each individual jockey's sex was identified and confirmed using a variety of sources, including Equibase, FemaleJockeys.com, Horseranker.com, personal websites, news reports, and personal correspondence.[12]

Table 1 provides the definition and descriptive statistics for each of the variables used in our analysis. As constructed, the data include virtually all Thoroughbred races for 3 full years and, therefore, is representative of the industry. Of the 2,036 jockeys with complete records in the sample, only 250, or 12.28%, were women. Furthermore, female jockeys, on average, rode fewer races during the sample period than male jockeys as just 6.08% of all rides within the sample were by female jockeys. This is consistent with prior studies that indicate female jockeys receive fewer mounts than their male counterparts (Ray & Grimes, 1993; Grimes & Ray, 1995). At the highest levels of Thoroughbred racing—stakes races—female jockeys rode the horse in only 3.28% of the observations. The overall breakdown of female jockey participation across race types is reported in Table 2 as well as other statistics for comparison. As seen in the table, female jockeys are more prevalent in the lower tier claims and maiden races compared to the higher tier allowance and stakes races.

Table 1. Summary Statistics for the Jockey Ride Data.

Variable	Description	Mean	SD	Minimum	Maximum
Dependent Variable					
InTheMoney	Finished in the top 3 (yes = 1, otherwise = 0)	0.390	0.488	0.0	1.0
Race Environment					
Distance	Length of race in furlongs	6.726	1.338	1.0	20.0
FieldSize	Number of horses competing in the race	8.156	1.919	1.0	20.0
FieldRating	Proprietary rating estimating the strength of the field	94.990	5.351	80.0	115.0
PostPosition	Starting position relative to the post	4.578	2.586	1.0	20.0
MaleHorse	Horse is male (yes = 1, otherwise = 0)	0.572	0.495	0.0	1.0
FastDirt	Track type classified as "Fast Dirt" (yes = 1, otherwise = 0)	0.593	0.491	0.0	1.0
WetDirt	Track type classified as "Wet Dirt" (yes = 1, otherwise = 0)	0.133	0.339	0.0	1.0
Turf	Track type classified as "Turf" (yes = 1, otherwise = 0)	0.184	0.388	0.0	1.0
Horse and Trainer Characteristics					
LayoffDays	Number of days since last start	40.676	64.265	0.0	999.0
HorseAge	Age of horse in years	4.361	1.678	2.0	13.0
HorseRating	Rating estimating the quality of the horse	94.032	12.225	50.0	115.5
PedigreeRating	Rating estimating the quality of the horse's pedigree	373.247	115.237	50.0	990.0
TrainerRating	Rating estimating the quality of the trainer	240.649	93.388	50.0	500.0
Trainer+HorseStarts	Number of races the horse has run with the trainer	7.605	9.378	0.0	117.0
Jockey Characteristics					
FemaleJockey	Jockey is female (yes = 1, otherwise = 0)	0.061	0.239	0.0	1.0
JockeyRating	Rating estimating the quality of the jockey	252.015	75.041	50.0	500.0

(continued)

Table 1. (continued)

Variable	Description	Mean	SD	Minimum	Maximum
Jockey+HorseStarts	Number of races the horse has run with the jockey	1.948	3.400	0.0	97.0
CareerLength	Number of years since first ride as a jockey	12.566	9.809	0.0	42.0
WeightAllowance5	Apprentice allowance of 5lbs (yes = 1, otherwise = 0)	0.035	0.184	0.0	1.0
WeightAllowance7	Apprentice allowance of 7lbs (yes = 1, otherwise = 0)	0.029	0.167	0.0	1.0
WeightAllowance10	Apprentice allowance of 10lbs (yes = 1, otherwise = 0)	0.007	0.081	0.0	1.0

This is suggestive of potential barriers for female jockeys in the ability to move up the hierarchy of races.

Similar to the data reported by Grimes and Ray (1995), male jockeys displayed significantly higher percentages of wins and in the money finishes compared to female jockeys. Without controlling for any other relevant factors, our sample indicated male jockeys finished in the money 39.24 percent and won 13.14 percent of their opportunities while female jockeys finished in the money 34.71 percent and won 10.66 percent of their opportunities. Female jockeys also rode lower-rated horses on average, had lower average ratings, and shorter careers than male jockeys. The first model of the current study seeks to isolate the effect of sex by controlling for all the relevant and observable factors that affect the outcome of a race.

The jockey ride data is then reconstructed into a data base where each observation is a single individual jockey found within our sample of races. These data were split into three annual subsets to better capture the skill or experience of the jockey, which vary over the course of the 3 years in the sample, at the time of the mount. For each jockey, this database contains information such as their win percentage, in the money percentage, average jockey rating, career length, the percentage of their races riding a favorite, the number of mounts in graded stakes races, and their sex, among other factors. Table 3 provides the definition and descriptive statistics for each of the variables used in our mounts model. A comparison of the statistics by the sex of the jockey is displayed in Table 4.

Without controlling for any other factors, the data in Table 4 reveal female jockeys receive noticeably fewer mounts, have shorter careers than male jockeys, and win and finish in the money at a lower rate on average.

Table 2. Comparison of Female and Male Jockeys in the Jockey Ride Data.

Variable	Mean	Female	%	Male	%
Horse Rating	94.03	91.391		94.20	
Jockey Rating	252.02	220.000		254.00	
Career Length	12.57	7.760		12.88	
Race Class	Total				
Stakes	47,488	1,559	3.28%	45,929	96.72%
Allowance	140,592	6,627	4.71%	133,965	95.29%
Claims and Maiden	747,270	48,693	6.52%	698,577	93.48%
Total	935,350	56,879	6.08%	878,471	93.92%
Success	Total				
In the Money	364,437	19,744	34.71%	344,693	39.24%
Win	121,502	6,062	10.66%	115,440	13.14%

Empirical Analysis

The Models

The primary purposes of our two models are to examine the effect of a jockey's sex on racing performance outcomes and their relative access to mounts to investigate the possibility of discrimination. Though the relative advantages male jockeys may have over female jockeys and vice versa are unclear in the sport of horse racing, men have fewer apparent physical advantages than they would in other professional sports. A jockey's sex is, of course, not the only, nor is the most significant potential factor, affecting a horse racing performance. Many other factors, including aspects of the race environment, physical characteristics of the horse, trainer practices, and the skill characteristics of the jockey may impact horse performance and race outcomes.

If female jockeys do not perform relatively worse than their male counterparts, *ceteris paribus*, then there is no productivity basis for trainers or owners to discriminate against women in granting them mounts. In order to be awarded mounts, jockeys must foster relationships with trainers and prove their value with success on the track. Jockey success and opportunity are measurable and can be accounted for using several variables available in the data. Ability to network and foster relationships with trainers is much more difficult to quantify and is largely unobservable. To assess the relative impact of a jockey's sex on the performance of the horse and controlling for all other relevant and observable factors, we estimated the probability of a horse finishing a race in the top three, or in racing parlance, finishing "in the money." The linear form of our model takes the following specification:

$$InTheMoney_{it} = \alpha + X_{it} + \delta_{it} + \gamma_{it} + \varepsilon_{it}. \quad (1)$$

Table 3. Summary Statistics for the Jockey Data.

Variable	Description	Mean	SD	Minimum	Maximum
Dependent Variable					
NonGradedStakesMounts	Number of non-graded-stakes mounts	453.48	689.27	0	4,167
Independent Variables					
MeanJockeyRating	Average jockey rating across each mount	209.56	64.44	50.0	483.0
%Win	Percent of mounts the jockey won	1.06	5.23	0.0	100.0
%InTheMoney	Percent of mounts the jockey finished in the top three	3.40	11.74	0.0	100.0
CareerLength	Number of years since first ride as a jockey	10.53	10.51	0.0	42.0
GradedStakesMounts	Number of graded stakes mounts	6.05	34.56	0.0	524.0
%Favorites	Percent of mounts jockey was the favorite	13.90	13.62	0.0	100.0
Tracks	Average number of tracks the jockey rode annually	5.17	4.72	0.0	32.0
MeanWinPrice	Average return on $2 bet for jockey's horse to win	1.16	1.87	0.0	37.6
FemaleJockey	Jockey is female (yes = 1, otherwise = 0)	0.12	0.33	0.0	1.0

For horse, i, in race t, X_{it} is a set of race environment factors including length of the race, size of the field, track surface type and condition, quality of the field, and post position; δ_{it} is a set of horse and trainer characteristics including sex of the horse, age of the horse, quality of the horse, quality of the horse's pedigree, skill quality of the trainer, and the number of races the horse has started with that trainer; γ_{it} is a set of jockey characteristics including the sex of the jockey, the skill quality of the jockey, the number of starts the jockey has with that horse, the weight assigned to the horse (by rule determined according to the jockey's experience), the number of career starts, and the amount of career winnings.

Since the dependent variable is a dichotomous response variable, traditional linear regression techniques cannot be used to estimate the relative impact of the independent variables on the jockey's ride outcome. Instead, we employed a

Table 4. Comparison of Female and Male Jockey Means in the Jockey Data.

	2016			2017			2018			Total		
Variable	All	Female	Male	All	Female	Male	All	Female	Male	All	Female	Male
NonGradedStakesMounts	210.74	117.75	222.53	206.99	121.69	218.02	211.91	113.04	223.03	453.48	227.04	485.18
MeanJockeyRating	209.22	204.75	209.78	213.79	201.04	215.44	214.70	200.08	216.34	209.56	202.10	210.61
%Win	9.30	8.98	9.34	8.88	8.47	8.93	9.29	8.66	9.36	8.62	8.66	8.62
%InTheMoney	30.07	28.71	30.24	30.31	28.03	30.61	30.25	29.84	30.29	29.06	27.65	29.26
CareerLength	11.41	7.64	11.89	11.34	7.67	11.81	11.37	8.37	11.71	10.53	6.70	11.07
GradedStakesMounts	2.74	0.36	3.04	2.76	0.29	3.08	2.91	0.27	3.20	6.05	0.59	6.81
%Favorites	13.79	15.61	13.56	13.76	12.41	13.94	13.36	12.88	13.41	13.90	13.78	13.91
Tracks	4.08	3.53	4.15	4.00	3.47	4.07	4.01	3.42	4.07	5.17	4.40	5.28
MeanWinPrice	1.33	1.88	1.26	1.17	1.15	1.18	1.20	1.13	1.20	1.16	1.31	1.14

binomial probit model of the following general specification:

$$Pr(Y = 1|X) = \Phi(X^T\beta). \quad (2)$$

The binomial probit estimates the probability of a horse finishing in the money given the vector of regressors, X, which include the aforementioned race environment factors, horse and trainer characteristics, and jockey characteristics. The cumulative distribution function of the standard normal distribution, Φ, is the link function used in a probit model and the parameters, β, are estimated using maximum likelihood estimation.[13]

Due to the need for lighter and smaller jockeys, the overall physical differences between male and female competitors are minor in Thoroughbred horseracing relative to other sports, however; there are still potential differences, such as aggression level or style of racing that may vary across sexes. Separate model specifications were estimated interacting the female jockey categorical variable with race distance, size of field, track surface type, and horse rating were performed to test for these possibilities. The chosen variable interactions indicate if horses with female jockeys perform differently with regard to these race environment and horse characteristics.[14]

To assess a jockey's access to mounts, we estimated the number of non-graded-stakes mounts as a function of the jockey's performance, experience, opportunity, and sex using a linear regression following the model specification adopted by Grimes and Ray (1995). The model specification takes the form:

$$Annual\ NonGradedStakesMounts_i = \alpha + X_i + \varepsilon_i. \quad (3)$$

The number of mounts received during the year by jockey, i, is estimated to be a function of independent variables, X_i, including the jockey's average rating, their win percentage and in the money percentage, length of career in years, number of graded stakes mounts received that year, the percentage of favorites they rode, their mean win price, the number of tracks on which they competed that year, and their sex. The first three variables capture the success of the jockey and are expected to be positively correlated with the number of mounts received. The length of the jockey's career estimates the effect of the jockey's experience on the number of mounts received and is expected to be positive; however, confounding factors such as novice riders receiving more mounts due to apprentice status, or journeyman jockeys receiving fewer mounts due to declining skills are present.

Graded stakes mounts, percentage riding the favorite, and mean win price are included in the model to capture the effects of the quality of mounts received and the jockey's performance on those mounts on the total number of mounts for which the jockey is hired. Jockeys with higher quality mounts and better performance on those mounts are expected to receive more total mounts. The number of tracks is included to account for "ad hoc" or local jockeys who ride only at certain tracks rather than competing on a wider circuit. Of course, jockeys who compete on more tracks may do so because of invitations by trainers and therefore reflects both the willingness

and ability of the jockey to gain mounts. An interaction term between jockey sex and the percentage in the money is included as an alternative specification to test for different treatment of female jockey success by owners and trainers. Thus, the model aims to estimate the impact of the jockey's sex on the number of mounts received holding all other relevant and observable factors constant.

The Results

The probit regression results for our base model and the specifications containing the interacted variables estimated over the entire sample are shown in Table 5. Marginal effects and robust standard errors clustered by jockey are displayed. Across all specifications, many of the estimates are statistically significant, indicating a close relationship between the independent variables and the probability of a jockey's ride finishing in the money. However, and most notably, the FemaleJockey dummy variable is not statistically significant in our base model (Column (1)) for the entire sample of races. Thus, we find no observable relationship between a jockey's sex and the probability of finishing in the money, *ceteris paribus*. This means that when hiring a jockey, horse owners and trainers have no productivity basis upon which to choose a jockey of a particular sex.

The interaction model specifications (Columns (2) through (7) in Table 5) indicate that female jockeys are less likely to finish in the money in longer races, holding all else constant, but have no other significant interaction effects.

One confounding issue with estimating the model over the entire sample is the problem of trainer intent. The sample contains an array of races of widely differing quality levels, including stakes races, allowance races, maiden races, and claims races.[15] Trainers may not always run a horse with the intent to win, which may impact jockey selection. For example, a trainer may enter a horse in a race to gain experience (maiden races) or expose a horse to potential buyers (claims races). Likewise, owners and trainers may hire a jockey in lower tier races to evaluate his or her racing skills. The intent of trainers is unobservable but clearly impacts the probability of a jockey finishing in the money. To control for the trainer intent problem, the sample was split first into three sub-samples: stakes races, allowance races, and claims and maiden races.

Model estimates for stakes races, the highest-rated races with the largest purses, where trainer intent is less likely to be a problem, are reported in Table 6. The weight allowance variables were omitted in these estimations because apprentice jockeys are not granted a weight allowance in stakes races. The coefficients for the variables of most interest, FemaleJockey and each of its interactions, are insignificant in all model runs. Again, these findings suggest no productivity difference between male and female jockeys, *ceteris paribus*.

Table 7 reports the marginal effects for allowance races—mid-tier races where each horse is assigned to carry a specific weight according to age, past-performance, or other characteristic. Though FemaleJockey remains insignificant, the interaction

Table 5. Binary Probit Regression Marginal Effects Estimates of Finishing in the Money for All Observations.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Race Environment							
Distance	0.00205***	0.0023***	0.00205***	0.00205***	0.00205***	0.00205***	0.00205***
	(0.00051)	(0.00053)	(0.00051)	(0.00051)	(0.00051)	(0.00051)	(0.00051)
FieldSize	−0.01574***	−0.01574***	−0.01573***	−0.01574***	−0.01574***	−0.01574***	−0.01574***
	(0.00042)	(0.00042)	(0.00044)	(0.00042)	(0.00042)	(0.00042)	(0.00042)
FieldRating	−0.0027***	−0.0027***	−0.0027***	−0.0027***	−0.0027***	−0.0027***	−0.0027***
	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)
PostPosition	−0.00371***	−0.00371***	−0.00371***	−0.00371***	−0.00371***	−0.00371***	−0.00371***
	(0.00033)	(0.00033)	(0.00033)	(0.00033)	(0.00033)	(0.00033)	(0.00033)
RaceMaleHorse	0.00822***	0.00822***	0.00822***	0.00822***	0.00822***	0.00822***	0.00823***
	(0.00126)	(0.00126)	(0.00126)	(0.00126)	(0.00126)	(0.00126)	(0.00126)
FastDirt	−0.00523	−0.00528	−0.00524	−0.00523	−0.00524	−0.00523	−0.00519
	(0.0036)	(0.0036)	(0.00359)	(0.00363)	(0.0036)	(0.0036)	(0.0036)
WetDirt	0.00654*	0.0065*	0.00653*	0.00654*	0.0063*	0.00654*	0.00659*
	(0.0039)	(0.0039)	(0.0039)	(0.00391)	(0.00393)	(0.0039)	(0.0039)
Turf	0.00792**	0.00782**	0.00791**	0.00792**	0.0079**	0.00788**	0.00796**
	(0.00398)	(0.00398)	(0.00398)	(0.00399)	(0.00398)	(0.00405)	(0.00398)
Horse and Trainer Characteristics							
LayoffDays	−0.00019***	−0.0002***	−0.00019***	−0.00019***	−0.00019***	−0.00019***	−0.00019***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
HorseAge	−0.00244***	−0.00244***	−0.00244***	−0.00244***	−0.00244***	−0.00244***	−0.00244***
	(0.00047)	(0.00047)	(0.00047)	(0.00047)	(0.00047)	(0.00047)	(0.00047)
HorseRating	0.01673***	0.01673***	0.01673***	0.01673***	0.01673***	0.01673***	0.01675***
	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)
PedigreeRating	0.00014***	0.00014***	0.00014***	0.00014***	0.00014***	0.00014***	0.00014***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
TrainerRating	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Trainer+HorseStarts	0.0005***	0.0005***	0.0005***	0.0005***	0.0005***	0.0005***	0.0005***
	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)

(continued)

Table 5. (continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Jockey Characteristics							
FemaleJockey	−0.00285	0.02488*	−0.0014	−0.00284	−0.00339	−0.00297	0.03656
	(0.00386)	(0.01374)	(0.01049)	(0.00619)	(0.00399)	(0.00397)	(0.0303)
JockeyRating	0.00036***	0.00036***	0.00036***	0.00036***	0.00036***	0.00036***	0.00036***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Jockey+HorseStarts	0.00183***	0.00183***	0.00183***	0.00183***	0.00183***	0.00183***	0.00183***
	(0.00023)	(0.00023)	(0.00023)	(0.00023)	(0.00023)	(0.00023)	(0.00023)
CareerLength	−0.00014	−0.00014	−0.00014	−0.00014	−0.00014	−0.00014	−0.00014
	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)
WeightAllowance5	0.0073*	0.0072*	0.00729*	0.0073*	0.0073*	0.0073*	0.00724*
	(0.00425)	(0.00426)	(0.00425)	(0.00425)	(0.00425)	(0.00425)	(0.00426)
WeightAllowance7	0.01102**	0.01092**	0.01101**	0.01102**	0.01101**	0.01103**	0.01094**
	(0.00479)	(0.00479)	(0.00479)	(0.00479)	(0.00479)	(0.00479)	(0.00479)
WeightAllowance10	0.01539*	0.01532*	0.01538*	0.01539*	0.0154*	0.0154*	0.01495*
	(0.00866)	(0.00866)	(0.00866)	(0.00866)	(0.00866)	(0.00866)	(0.00865)
Interactions							
DistanceFemaleJockey		−0.00418**					
		(0.00208)					
FieldFemaleJockey			−0.00018				
			(0.00137)				
FastDirtFemaleJockey				−0.00003			
				(0.00709)			
WetDirtFemaleJockey					0.00379		
					(0.00794)		
TurfFemaleJockey						0.00085	
						(0.00825)	
HorseRatingFemaleJockey							−0.00041
							(0.0003)
Likelihood Ratio χ^2	157,993.1***	157,999.1***	157,993.1***	157,993.1***	157,993.4***	157,993.1***	157,996.8***

Notes: () Robust clustered standard errors N = 935,350 *p < .1, **p < .05, ***p < .01.

Table 6. Binary Probit Regression Marginal Effects Estimates of Finishing in the Money for Stakes Races.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Race Environment							
Distance	−0.00088	−0.00089	−0.00088	−0.00089	−0.00088	−0.0009	−0.00088
	(0.00153)	(0.00155)	(0.00153)	(0.00153)	(0.00153)	(0.00153)	(0.00153)
FieldSize	−0.01716***	−0.01716***	−0.01706***	−0.01716***	−0.01716***	−0.01717***	−0.01716***
	(0.00142)	(0.00142)	(0.00144)	(0.00142)	(0.00142)	(0.00142)	(0.00142)
FieldRating	−0.00115**	−0.00115**	−0.00114**	−0.00116**	−0.00115**	−0.00116**	−0.00115**
	(0.00057)	(0.00057)	(0.00057)	(0.00057)	(0.00057)	(0.00057)	(0.00057)
PostPosition	−0.00234**	−0.00234**	−0.00235**	−0.00234**	−0.00234**	−0.00234**	−0.00234**
	(0.00106)	(0.00106)	(0.00106)	(0.00106)	(0.00106)	(0.00106)	(0.00106)
RaceMaleHorse	0.003	0.003	0.00298	0.00301	0.003	0.00304	0.003
	(0.00495)	(0.00495)	(0.00495)	(0.00495)	(0.00495)	(0.00495)	(0.00495)
FastDirt	−0.01134	−0.01134	−0.01134	−0.01021	−0.01128	−0.01162	−0.01134
	(0.01223)	(0.01224)	(0.01223)	(0.01231)	(0.01223)	(0.01227)	(0.01223)
WetDirt	0.00553	0.00554	0.00553	0.0059	0.00607	0.00528	0.00553
	(0.014)	(0.014)	(0.014)	(0.01397)	(0.0141)	(0.01403)	(0.014)
Turf	−0.00006	−0.00005	−0.00008	0.00051	0.00002	−0.00115	−0.00006
	(0.0128)	(0.01281)	(0.01281)	(0.01279)	(0.0128)	(0.01284)	(0.0128)
Horse and Trainer Characteristics							
LayoffDays	−0.00022***	−0.00022***	−0.00022***	−0.00022***	−0.00022***	−0.00022***	−0.00022***
	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00005)
HorseAge	−0.00569***	−0.00569***	−0.00568***	−0.00565***	−0.00569***	−0.00568***	−0.00569***
	(0.00182)	(0.00182)	(0.00182)	(0.00182)	(0.00182)	(0.00182)	(0.00182)
HorseRating	0.01562***	0.01562***	0.01561***	0.01562***	0.01562***	0.01562***	0.01562***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
PedigreeRating	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
TrainerRating	−0.00012***	−0.00012***	−0.00012***	−0.00012***	−0.00012***	−0.00012***	−0.00012***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Trainer+HorseStarts	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	(0.00036)	(0.00036)	(0.00036)	(0.00036)	(0.00036)	(0.00036)	(0.00036)

(continued)

Table 6. (continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Jockey Characteristics							
FemaleJockey	−0.01525	−0.01844	0.01652	−0.00245	−0.0135	−0.02277	−0.01576
	(0.01487)	(0.05665)	(0.05905)	(0.01851)	(0.01489)	(0.01815)	(0.14262)
JockeyRating	0.00046***	0.00046***	0.00046***	0.00046***	0.00046***	0.00046***	0.00046***
	(0.00004)	(0.00004)	(0.00004)	(0.00005)	(0.00004)	(0.00004)	(0.00004)
Jockey+HorseStarts	0.00423***	0.00423***	0.00422***	0.00422***	0.00423***	0.00424***	0.00423***
	(0.00077)	(0.00077)	(0.00077)	(0.00077)	(0.00077)	(0.00077)	(0.00077)
CareerLength	0.00036	0.00036	0.00036	0.00036	0.00036	0.00037	0.00036
	(0.00029)	(0.00029)	(0.00029)	(0.00029)	(0.00029)	(0.00029)	(0.00029)
Interactions							
DistanceFemaleJockey		0.00045					
		(0.00756)					
FieldFemaleJockey			−0.00404				
			(0.00698)				
FastDirtFemaleJockey				−0.02318			
				(0.02348)			
WetDirtFemaleJockey					−0.01407		
					(0.03991)		
TurfFemaleJockey						0.03908	
						(0.03868)	
HorseRatingFemaleJockey							0.00001
							(0.00152)
Likelihood Ratio χ^2	8,710.3***	8,710.3***	8,710.6***	8,711.0***	8,710.4***	8,711.5***	8,710.3***

Notes: () Robust clustered standard errors N = 47,488 *p < .1, **p < .05, ***p < .01

Table 7. Binary Probit Regression Marginal Effects Estimates of Finishing in the Money for Allowance Races.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Race Environment							
Distance	−0.00106	−0.00078	−0.00106	−0.00106	−0.00106	−0.00106	−0.00107
	(0.00128)	(0.00132)	(0.00128)	(0.00128)	(0.00128)	(0.00128)	(0.00128)
FieldSize	−0.01945***	−0.01945***	−0.01957***	−0.01945***	−0.01945***	−0.01945***	−0.01945***
	(0.001)	(0.001)	(0.00101)	(0.001)	(0.001)	(0.001)	(0.001)
FieldRating	−0.0009**	−0.0009**	−0.0009**	−0.0009**	−0.0009**	−0.0009**	−0.00091**
	(0.00043)	(0.00043)	(0.00043)	(0.00043)	(0.00043)	(0.00043)	(0.00043)
PostPosition	−0.0037***	−0.0037***	−0.0037***	−0.00369***	−0.00369***	−0.0037***	−0.00369***
	(0.00066)	(0.00066)	(0.00066)	(0.00066)	(0.00066)	(0.00066)	(0.00066)
RaceMaleHorse	0.00427	0.00425	0.00428	0.00425	0.00428	0.00427	0.00427
	(0.00302)	(0.00302)	(0.00302)	(0.00302)	(0.00302)	(0.00302)	(0.00302)
FastDirt	−0.00352	−0.00359	−0.00349	−0.00438	−0.00336	−0.00351	−0.00344
	(0.00652)	(0.00653)	(0.00651)	(0.00653)	(0.00651)	(0.00652)	(0.00652)
WetDirt	0.01226*	0.01218*	0.01228*	0.01204*	0.01414	0.01227*	0.01235*
	(0.00742)	(0.00742)	(0.00741)	(0.00741)	(0.00742)	(0.00742)	(0.00742)
Turf	0.01286*	0.01273*	0.01289*	0.01256*	0.01305*	0.01289*	0.01295*
	(0.00677)	(0.00678)	(0.00676)	(0.00676)	(0.00676)	(0.00685)	(0.00677)
Horse and Trainer Characteristics							
LayoffDays	−0.00027***	−0.00027***	−0.00027***	−0.00027***	−0.00027***	−0.00027***	−0.00027***
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
HorseAge	−0.00952***	−0.00952***	−0.00952***	−0.00952***	−0.00952***	−0.00952***	−0.00952***
	(0.00123)	(0.00123)	(0.00123)	(0.00123)	(0.00123)	(0.00123)	(0.00123)
HorseRating	0.0169***	0.0169***	0.0169***	0.0169***	0.0169***	0.0169***	0.01697***
	(0.00021)	(0.00021)	(0.00021)	(0.00021)	(0.00021)	(0.00021)	(0.00021)
PedigreeRating	0.00011***	0.00011***	0.00011***	0.00011***	0.00011***	0.00011***	0.00011***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
TrainerRating	−0.00006***	−0.00006***	−0.00006***	−0.00006***	−0.00006***	−0.00006***	−0.00006***
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Trainer+HorseStarts	0.00043**	0.00043**	0.00043**	0.00043**	0.00043**	0.00043**	0.00043**
	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)

(continued)

Table 7. (continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Jockey Characteristics							
FemaleJockey	0.00092	0.04208	−0.01952	−0.00662	0.00587	0.00109	0.12728
	(0.00916)	(0.03499)	(0.0358)	(0.01319)	(0.00879)	(0.01074)	(0.08305)
JockeyRating	0.00037***	0.00037***	0.00037***	0.00037***	0.00037***	0.00037***	0.00037***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Jockey+HorseStarts	0.00201***	0.00201***	0.00201***	0.00201***	0.00201***	0.00201***	0.002***
	(0.00045)	(0.00045)	(0.00045)	(0.00045)	(0.00045)	(0.00045)	(0.00045)
CareerLength	−0.00014***	−0.00014***	−0.00014***	−0.00014***	−0.00013***	−0.00014***	−0.00014***
	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)	(0.00019)
WeightAllowance5	−0.00898	−0.00909	−0.00886	−0.00935	−0.009	−0.00899	−0.00901
	(0.01015)	(0.01015)	(0.01013)	(0.01015)	(0.01013)	(0.01015)	(0.01017)
WeightAllowance7	−0.01155	−0.01162	−0.01153	−0.01178	−0.01151	−0.01155	−0.01195
	(0.01205)	(0.01205)	(0.01203)	(0.01204)	(0.01206)	(0.01205)	(0.01205)
WeightAllowance10	−0.0044	−0.0038	−0.00481	−0.0044	−0.00482	−0.00438	−0.00645
	(0.02823)	(0.02828)	(0.02818)	(0.02832)	(0.02824)	(0.02823)	(0.02798)
Interactions							
DistanceFemaleJockey		−0.00603					
		(0.00516)					
FieldFemaleJockey			0.00272				
			(0.00491)				
FastDirtFemaleJockey				0.01428			
				(0.01491)			
WetDirtFemaleJockey					−0.03734**		
					(0.01812)		
TurfFemaleJockey						−0.00079	
						(0.01626)	
HorseRatingFemaleJockey							−0.00129
							(0.00083)
Likelihood Ratio χ^2	21,504.9***	21,506.4***	21,505.5***	21,506.1***	21,508.7***	21,504.9***	21,508.8***

Notes: () Robust clustered standard errors N = 140,592 *p < .1, **p < .05, ***p < .01

with WetDirt is negative and significant for allowance races, indicating female jockeys do not perform as well on the wet dirt surface condition.

Table 8 displays the results for the claims and maiden races sub-sample which contains 747,270 of the 935,350 total observations, leading to results very similar to the overall sample. For this division of the data, the results again indicate no difference between female and male jockeys when interactions are not present in the model. The interaction term between FemaleJockey and Distance is negative and statistically significant (Column 2) suggesting that horses running longer distances while being ridden by female jockeys are less likely to finish in the money at the conclusion of claims and maiden races.

The effects of field size, layoff days, horse rating, pedigree rating, trainer rating, and jockey rating remained remarkably consistent through each of the sub-samples. It makes sense that the proprietary ratings, included to control for the quality of each of the variables being rated, would be consistent given that performance directly impacts the rating.

It is unclear why female jockeys were found to perform relatively worse over longer distances especially in the lower tier races and on the wet dirt surface condition in allowance races. Additional research will be needed to explore this interesting result and the motivations of owners and trainers with respect to assignment of jockeys to horses in different classes of races.

Because winning comes with a higher premium than merely finishing in the money, each model and sub-sample were also estimated with a binary dependent variable for winning the race. Using this narrower definition of success produced mostly similar results including the general insignificance of the jockey's sex on the outcome of the race in most situations. However, there were a couple of differences including one rather significant difference. Female jockeys were 1.5% less likely to win in stakes races than male jockeys, but also to perform relatively better than male jockeys on the turf surface type. Full results, including the marginal effects for each "win" model specification across all sub-samples are available upon request.

Selecting a jockey to ride in most types and classes of horseracing, solely on the basis of sex is not justified by the results presented here. To the extent that winning is a more important consideration than merely finishing in the money, trainers do have a productivity basis to choose male jockeys in stakes races. However, it is unclear if the female jockey underperformance in stakes races is due to innate differences between men and women or due to some other factor such as lack of access to mounts at lower levels of races where no productivity differences were found. Given that female jockeys comprised over 12% of total jockeys, but only 6.08% of all horses ridden, the results could reflect the presence of discrimination in the form of access to mounts to which we now turn.

The linear regression results of our mounts model for the entire sample of jockeys broken out by year are shown in Table 9. A second specification (Model 2 in Table 9) includes an interaction to test for differential treatment toward female jockey success. An alternative specification (Model 3 in Table 9) was also run to account for

Table 8. Binary Probit Regression Marginal Effects Estimates of Finishing in the Money for Claims and Maiden Races.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Race Environment							
Distance	0.00274***	0.00303***	0.00274***	0.00274***	0.00274***	0.00274***	0.00273***
	(0.00057)	(0.00059)	(0.00057)	(0.00057)	(0.00057)	(0.00057)	(0.00057)
FieldSize	−0.01544***	−0.01544***	−0.01541***	−0.01544***	−0.01544***	−0.01544***	−0.01544***
	(0.00044)	(0.00044)	(0.00046)	(0.00044)	(0.00044)	(0.00044)	(0.00044)
FieldRating	−0.00278***	−0.00278***	−0.00278***	−0.00278***	−0.00278***	−0.00278***	−0.00278***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
PostPosition	−0.00379***	−0.00379***	−0.00379***	−0.00379***	−0.00379***	−0.00379***	−0.00379***
	(0.00035)	(0.00035)	(0.00035)	(0.00035)	(0.00035)	(0.00035)	(0.00035)
RaceMaleHorse	0.00835***	0.00835***	0.00835***	0.00836***	0.00835***	0.00835***	0.00837***
	(0.00143)	(0.00143)	(0.00143)	(0.00143)	(0.00143)	(0.00143)	(0.00143)
FastDirt	−0.00458	−0.00462	−0.0046	−0.00448	−0.00461	−0.00458	−0.00455
	(0.00355)	(0.00355)	(0.00355)	(0.0036)	(0.00355)	(0.00355)	(0.00355)
WetDirt	0.00618	0.00615	0.00617	0.00619	0.00553	0.00618	0.00623
	(0.00386)	(0.00386)	(0.00386)	(0.00387)	(0.00389)	(0.00386)	(0.00386)
Turf	0.0097**	0.0096**	0.00968**	0.00973**	0.00967**	0.00974**	0.00975**
	(0.004)	(0.004)	(0.00401)	(0.00402)	(0.004)	(0.00409)	(0.00401)
Horse and Trainer Characteristics							
LayoffDays	−0.00017***	−0.00017***	−0.00017***	−0.00017***	−0.00017***	−0.00017***	−0.00017***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
HorseAge	−0.00153***	−0.00153***	−0.00153***	−0.00153***	−0.00153***	−0.00153***	−0.00153***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
HorseRating	0.01676***	0.01676***	0.01676***	0.01676***	0.01676***	0.01676***	0.01679***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
PedigreeRating	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***	0.00015***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
TrainerRating	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***	−0.00007***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Trainer+HorseStarts	0.00055***	0.00055***	0.00055***	0.00055***	0.00055***	0.00055***	0.00055***
	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00008)

(continued)

Table 8. (continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Jockey Characteristics							
FemaleJockey	−0.00293	0.02519*	0.00043	−0.00204	−0.00432	−0.00284	0.03112
	(0.00372)	(0.01418)	(0.01097)	(0.00604)	(0.00388)	(0.00389)	(0.02925)
JockeyRating	0.00035***	0.00035***	0.00035***	0.00035***	0.00035***	0.00035***	0.00035***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Jockey+HorseStarts	0.00163***	0.00163***	0.00163***	0.00163***	0.00163***	0.00163***	0.00163***
	(0.00026)	(0.00026)	(0.00026)	(0.00026)	(0.00026)	(0.00026)	(0.00026)
CareerLength	−0.00017	−0.00017	−0.00017	−0.00017	−0.00017	−0.00017	−0.00017
	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)	(0.00011)
WeightAllowance5	0.00823*	0.00813*	0.00822*	0.00825*	0.00824*	0.00822*	0.00817*
	(0.00429)	(0.0043)	(0.00429)	(0.0043)	(0.0043)	(0.00429)	(0.0043)
WeightAllowance7	0.01164**	0.01155**	0.01162**	0.01167**	0.01161**	0.01164**	0.01158**
	(0.00492)	(0.00493)	(0.00492)	(0.00492)	(0.00492)	(0.00492)	(0.00492)
WeightAllowance10	0.01465*	0.01459*	0.01463*	0.01465*	0.01467*	0.01464*	0.01428*
	(0.0087)	(0.00869)	(0.0087)	(0.0087)	(0.0087)	(0.0087)	(0.00869)
Interactions							
DistanceFemaleJockey		−0.00426**					
		(0.00213)					
FieldFemaleJockey			−0.00042				
			(0.00138)				
FastDirtFemaleJockey				−0.00146			
				(0.00728)			
WetDirtFemaleJockey					0.00974		
					(0.00841)		
TurfFemaleJockey						−0.00074	
						(0.00978)	
HorseRatingFemaleJockey							−0.00036
							(0.00029)
Likelihood Ratio χ^2	127,739.6***	127,744.8***	127,739.7***	127,739.7***	127,741.5***	127,739.6***	127,742.0***

Notes: () Robust clustered standard errors N = 747,270 *p < .1, **p < .05, ***p < .01

Table 9. Linear Regression Estimates of Non-Graded-Stakes Mounts for All Jockeys.

	Model 1			Model 2			Model 3		
Variable	2016	2017	2018	2016	2017	2018	2016	2017	2018
Intercept	−184.081***	−198.957***	−191.388***	−189.215***	−202.172***	−196.879***	−191.656***	−209.201***	−198.285***
	(17.737)	(18.323)	(18.930)	(17.800)	(18.389)	(18.954)	(17.117)	(17.216)	(18.139)
MeanJockeyRating	0.836***	0.840***	0.806***	0.830***	0.830***	0.797***	0.836***	0.853***	0.808***
	(0.079)	(0.079)	(0.082)	(0.079)	(0.080)	(0.082)	(0.077)	(0.076)	(0.079)
Win%	0.400	0.699	0.374	0.307	0.771	0.439			
	(0.708)	(0.769)	(0.790)	(0.707)	(0.770)	(0.788)			
InTheMoney%	1.143***	0.866***	1.098***	1.431***	1.029***	1.438***	1.526***	1.188***	1.504***
	(0.344)	(0.308)	(0.355)	(0.359)	(0.320)	(0.371)	(0.306)	(0.285)	(0.326)
CareerLength	5.267***	4.856***	6.019***	5.234***	4.804***	5.838***	5.261***	4.869***	5.796***
	(1.485)	(1.436)	(1.508)	(1.482)	(1.435)	(1.504)	(1.479)	(1.432)	(1.502)
CareerLength^2	−0.157***	−0.141***	−0.177***	−0.158***	−0.140***	−0.174***	−0.158***	−0.142***	−0.173***
	(0.042)	(0.041)	(0.042)	(0.042)	(0.041)	(0.042)	(0.042)	(0.041)	(0.042)
GradedStakesMounts	1.965***	0.796**	1.248***	1.937***	0.778**	1.238***	1.938***	0.774**	1.242***
	(0.426)	(0.393)	(0.410)	(0.425)	(0.392)	(0.409)	(0.425)	(0.392)	(0.409)
Favorite%	−0.062	−0.180	−0.003	−0.160	−0.160	−0.007	−0.169	−0.152	−0.023
	(0.353)	(0.362)	(0.414)	(0.354)	(0.362)	(0.412)	(0.352)	(0.361)	(0.411)
Tracks	40.567***	44.258***	42.073***	40.462***	44.197***	41.710***	40.471***	44.328***	41.728***
	(1.755)	(1.668)	(1.865)	(1.751)	(1.667)	(1.863)	(1.750)	(1.661)	(1.861)
MeanWinPrice	−2.343	0.883	1.079	−1.608	1.147	0.442	−1.025	3.389	1.877
	(2.135)	(3.723)	(4.162)	(2.148)	(3.722)	(4.154)	(1.716)	(3.033)	(3.283)
FemaleJockey	−63.095***	−48.191***	−60.354***	−6.849	−11.010	7.512			
	(15.268)	(14.674)	(16.528)	(25.702)	(24.759)	(27.349)			
FemaleJockey*ITM				−1.966***	−1.322*	−2.293***	−2.132***	−1.553***	−2.127***
				(0.723)	(0.709)	(0.738)	(0.428)	(0.419)	(0.444)
Adj. R-squared	0.517	0.540	0.509	0.519	0.541	0.512	0.519	0.541	0.513
F-statistic	161.040***	175.639***	146.794***	147.700***	160.255***	135.157***	180.706***	195.834***	165.342***
N	1,496	1,488	1,404	1,496	1,488	1,404	1,496	1,488	1,404

collinearity between win percentage and in the money percentage and between female and its interaction with in the money present in some years and subsets of the data.

An adjusted R-squared above 0.50 and significant F-statistics in the base model for each year (Model 1 in Table 9) indicates the independent variables are a good fit and explain much of the variation in mounts received by jockeys. Metrics of jockey success show a clear, positive relationship with the number of mounts they receive, though perhaps surprisingly winning percentage does not. This could be due to a close relationship between win percentage and in the money percentage, though correlation statistics did not indicate the presence of multi-collinearity. As expected, career length has a positive impact on mounts received that erodes over time. Percentage riding the favorite and mean win price had no significant relationship on the number of mounts. The number of tracks on which jockeys rode was also significantly and positively related to mounts received with each additional track yielding over 40 mounts.

Of most interest, female jockeys received far fewer mounts after controlling for other factors that affect the number of mounts. Furthermore, the interaction with in the money indicates that female jockeys do not receive similar treatment as male jockeys for on-track success. Finishing in the money correlates with fewer mounts for female jockeys, a result that contradicts the findings of Grimes and Ray (1995) which found that female jockeys received relatively more mounts for finishing in the money. The disagreement may be due to the differences in samples as theirs consisted of the top 100 jockeys and not the entire sample of jockeys.

Because journeyman jockeys and apprentice jockeys may be selected for mounts on different bases, we split the sample of jockeys into two sub-samples to check for differences. Table 10 displays results for all the jockeys with apprentice status at any point during the year and Table 11 displays results for the top half of jockeys by total mounts received.

The sample of apprentice jockeys is much smaller and yields some notably different results. Metrics of jockey success and career length are not as closely related to the number of mounts received, which makes sense given that apprentice jockeys are early in their careers and need mount opportunities to hone their craft and eventually find success. However, female jockeys continue to gain access to fewer mounts at the apprentice level and their success is not rewarded with mounts at the same rate as male jockeys. The model for the top jockeys does not explain as much of the variation in mounts as it does for the entire sample or for apprentice jockeys, but the negative relationship between mounts and female jockeys is still present.

Each model specification and sample consistently indicate that female jockeys, *ceteris paribus*, do not have the same opportunities as male jockeys despite the lack of productivity difference found in the probit model. Female jockeys are not as likely to win in stakes races and that could be part of the driving force behind their lack of opportunities, even at the lower levels. However, our results also imply that if female

Table 10. Linear Regression Estimates of Non-Graded-Stakes Mounts for Apprentice Jockeys.

	Model 1			Model 2			Model 3		
Variable	2016	2017	2018	2016	2017	2018	2016	2017	2018
Intercept	−57.688	−130.426***	−96.496**	−68.659*	−143.144***	−115.035**	−71.608*	−185.030***	−117.038**
	(37.997)	(41.577)	(46.575)	(38.948)	(42.399)	(48.784)	(37.063)	(37.662)	(42.759)
MeanJockeyRating	0.177	0.417**	0.307	0.212	0.403**	0.332	0.233	0.594***	0.365*
	(0.180)	(0.194)	(0.227)	(0.182)	(0.194)	(0.228)	(0.176)	(0.179)	(0.204)
Win%	2.219	7.425**	1.225	1.541	8.042**	1.449			
	(2.423)	(3.287)	(3.578)	(2.480)	(3.306)	(3.576)			
InTheMoney%	0.845	1.843*	2.074*	1.191	2.284**	2.461**	1.304*	3.662***	2.558**
	(0.765)	(0.994)	(1.164)	(0.813)	(1.038)	(1.202)	(0.735)	(0.808)	(1.072)
CareerLength	−0.596	−6.797	−7.109	−1.093	−5.897	−6.460	−1.438	−4.866	−6.354
	(5.756)	(6.556)	(7.749)	(5.761)	(6.568)	(7.753)	(5.688)	(6.622)	(7.708)
CareerLength^2	0.122	−0.094	0.249	0.129	−0.143	0.238	0.146	−0.283	0.238
	(0.192)	(0.372)	(0.345)	(0.192)	(0.373)	(0.345)	(0.189)	(0.372)	(0.343)
GradedStakesMounts	24.886***	29.491***	36.295***	24.454***	28.217***	35.594***	24.261***	30.758***	35.606***
	(6.754)	(7.642)	(7.200)	(6.752)	(7.672)	(7.209)	(6.713)	(7.674)	(7.168)
Favorite%	0.009	0.717	−0.147	−0.352	0.776	0.050	−0.335	0.773	−0.071
	(0.828)	(1.090)	(1.279)	(0.876)	(1.087)	(1.286)	(0.825)	(1.099)	(1.255)
Tracks	36.697***	40.261***	37.298***	37.095***	39.630***	36.950***	37.181***	42.232***	37.031***
	(3.739)	(3.548)	(4.402)	(3.746)	(3.565)	(4.403)	(3.711)	(3.433)	(4.374)
MeanWinPrice	3.237	−15.257**	13.661	7.579	−13.531*	14.183	14.173	−1.989	19.743
	(14.771)	(7.493)	(19.977)	(15.155)	(7.568)	(19.948)	(10.469)	(5.811)	(14.074)
FemaleJockey	−50.396**	−35.373*	−42.632	8.151	8.146	14.292			
	(22.302)	(19.939)	(26.630)	(52.037)	(36.301)	(52.543)			
FemaleJockey*ITM				−2.211	−1.859	−2.366	−2.040***	−1.404**	−1.919**
				(1.776)	(1.297)	(1.884)	(0.747)	(0.713)	(0.948)
Adj. R-squared	0.476	0.644	0.509	0.477	0.646	0.510	0.482	0.639	0.515
F-statistic	17.883***	36.303***	19.952***	16.449***	33.377***	18.342***	20.230***	39.308***	22.624***
N	186	195	183	186	195	183	186	195	183

Table 11. Linear Regression Estimates of Non-Graded-Stakes Mounts for Top Half of Jockeys.

	Model 1			Model 2			Model 3		
Variable	2016	2017	2018	2016	2017	2018	2016	2017	2018
Intercept	−42.659	−47.579	−31.662	−64.112	−54.391	−40.449	−96.895*	−75.436	−79.815
	(66.365)	(64.764)	(71.283)	(66.483)	(66.085)	(71.355)	(57.029)	(58.627)	(63.091)
MeanJockeyRating	0.110	0.611**	0.071	0.106	0.613**	0.092	0.272	0.681***	0.243
	(0.288)	(0.270)	(0.299)	(0.287)	(0.271)	(0.299)	(0.266)	(0.251)	(0.273)
Win%	6.108	3.189	6.554	5.745	2.972	5.913			
	(4.177)	(4.388)	(4.646)	(4.159)	(4.409)	(4.654)			
InTheMoney%	6.609***	4.252*	5.795**	7.549***	4.454**	6.331***	8.561***	5.312***	7.731***
	(2.293)	(2.197)	(2.347)	(2.306)	(2.231)	(2.363)	(1.991)	(1.859)	(1.992)
CareerLength	4.189*	2.201	2.313	4.119*	2.218	2.561	4.254*	2.315	2.378
	(2.461)	(2.486)	(2.595)	(2.449)	(2.487)	(2.595)	(2.450)	(2.481)	(2.591)
CareerLength^2	−0.174**	−0.118*	−0.108	−0.175**	−0.118*	−0.114	−0.176**	−0.120*	−0.108
	(0.069)	(0.068)	(0.071)	(0.069)	(0.068)	(0.071)	(0.069)	(0.068)	(0.071)
GradedStakesMounts	2.300***	1.426***	2.144***	2.248***	1.416***	2.106***	2.289***	1.417***	2.134***
	(0.489)	(0.462)	(0.482)	(0.487)	(0.462)	(0.482)	(0.487)	(0.461)	(0.482)
Favorite%	−1.164	−2.488	−1.340	−1.396	−2.427	−2.134	−0.843	−2.555	−1.831
	(3.550)	(3.371)	(3.707)	(3.534)	(3.375)	(3.729)	(3.527)	(3.359)	(3.698)
Tracks	23.644***	25.769***	19.732***	23.455***	25.755***	19.731***	23.741***	25.926***	20.012***
	(2.445)	(2.423)	(2.706)	(2.434)	(2.424)	(2.702)	(2.434)	(2.406)	(2.696)
MeanWinPrice	−18.643	−6.729	14.339	−19.893	−6.195	14.889	−9.874	−0.288	27.123
	(17.863)	(19.767)	(21.499)	(17.784)	(19.803)	(21.469)	(16.597)	(17.790)	(19.342)
FemaleJockey	−102.804***	−74.870***	−88.738***	163.375*	−24.084	95.641			
	(26.165)	(26.213)	(30.556)	(97.361)	(100.318)	(109.824)			
FemaleJockey*ITM				−7.692***	−1.492	−5.418*	−3.292***	−2.181***	−2.855***
				(2.711)	(2.844)	(3.100)	(0.726)	(0.741)	(0.861)
Adj. R-squared	0.417	0.410	0.370	0.423	0.409	0.371	0.420	0.411	0.371
F-statistic	54.683***	52.913***	42.162***	50.917***	48.081***	38.720***	61.447***	58.831***	47.004***
N	750	747	702	750	747	702	750	747	702

jockeys had the same opportunities as male jockeys at the lower levels and their success evaluated on similar terms, they may better be able to ascend to the highest levels of racing and erode the productivity difference in stakes races that is not found at any other level. The results presented in this paper are therefore consistent with the possibility of discrimination and certainly align with the sociological studies discussed above, but other interpretations are possible. For example, the observed difference between male and female jockeys may be due to unobserved differences in motivation or abilities in networking; or, women may receive fewer mounts, not because of direct gender discrimination, but because of a higher preference for inter-temporal flexibility such as that necessary to bear children that may interrupt and shorten a career in horseracing. It is important to note that both of these alternative possibilities may also involve discriminatory action through societal norms or employer behavior. Additional research is necessary to explore these possibilities and others to more fully understand the dynamics at play in a trainer's choice of a jockey and the role a jockey's sex plays in that choice.

Conclusions

For more than 50 years, women and men have competed against each other as jockeys in Thoroughbred racing. Personal testimonies and a few previous empirical studies suggest that female jockeys face employment bias that limit their access to mounts, particularly in high quality races with large purses. Whether there are biological or psychological advantages to either male or female jockeys remains open to debate, but it seems clear that female jockeys early in their career may have trouble being awarded equal opportunities to demonstrate skills at winning races. Without opportunities to win races in the beginning, female jockeys cannot easily access the incentive system and professional networks which reward jockey success with opportunities for more success. This study analyzed how a jockey's sex influenced the probability of a horse finishing a race in the money holding observable race environment variables, horse characteristics, trainer characteristics, and jockey attributes constant and how a jockey's sex influenced the number of mounts received controlling for other relevant, observable factors. Using a database of nearly a million jockey rides and over 2,000 jockeys over a 3-year period, we estimated various specifications of a probit model for the entire sample of Thoroughbred races and stratified across different race categories to examine the factors, including jockey sex, that influence racing success. We also estimated a linear model for the entire sample of jockeys and sub-samples of jockeys by apprentice or journeyman status to examine the effect on jockey sex on annual mounts received.

The results indicate that a jockey's sex does not significantly influence the probability of a horse crossing the finish line in the money, *ceteris paribus,* but does influence the likelihood of a horse winning in stakes races, the highest tier of Thoroughbred horseracing. Thus, from this perspective, there is no apparent

productivity differences between male and female jockeys that can explain the persistent claims of employer gender bias within the industry and the lack of access to mounts at lower levels observed in the descriptive data and found in the results of our mounts model which controls for other relevant factors.

Our results also suggest, dependent upon the class of race, that a jockey's sex may interact with very few other variables that influence a race's outcome, including distance, track condition, and the quality rating of the horse. Employer biases on lower tier racetracks where apprentice jockeys hone their skills may limit the advancement to journeyman status and further access to mounts in high tier stakes races.[16] Additional research is needed to understand these findings and to clearly identify their source.

While horseracing is an industry awash in statistics, to date economists have not exploited these data to the extent that the industry is as well-understood as professional team sports. More work is needed to understand the forces which may allow implicit bias to influence hiring in a market where returns to investment are directly linked to employee productivity. We leave this and other interesting questions implied by the results presented here for future researchers to consider.

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Notes

1. The racing commissions of various states and jockey union contracts prohibited women from riding in professional horse races prior to court rulings in 1968 which allowed former Olympic rider Kathy Kusner to obtain a racing license in Maryland. Kusner broke her leg preventing her from being the first professional female jockey (Haney, 1973).

Penny Ann Early and Barbara Jo Rubin subsequently received jockey licenses from Kentucky and Florida respectively but were not allowed to race due to boycotts, with minor violence, by male jockeys who refused to race against them (*Newsweek*, 1968). The gender barrier was finally broken on February 7, 1969 when Crump raced at Hialeah. A year later she became the first woman to compete in the Kentucky Derby.

2. Though we recognize use of gender-specific terms are part of an on-going public debate, throughout this paper we use the word "female" as an adjective and the words "woman" and "women" as nouns (Norris, 2019). This is in accordance with long-standing conventions of English grammar. Furthermore, our choice aligns with the way female jockeys refer to themselves (see, https://FemaleJockeys.com). Likewise, we attempt to use the word "sex" when referencing the physical distinctions between women and men and the word "gender" when reference is made to social norms, roles, and expectations for behavior. To our knowledge, there are no transgender jockeys currently competing in North America. See Elder (2018) for information about Victoria Smith the first transgender jockey who rides in the UK.
3. Female drivers in NASCAR and other auto-based racing remain a relatively rare exception. In 2019, no female drivers routinely raced in the top Cup Circuit and only three women are currently racing in the truck division. See "What Happened to All the Women in NASCAR?" (Caldwell, 2019).
4. The extent of regulation in the horseracing industry is primarily motivated and determined by the gambling activities which are permitted both on and off-site. However, uniform horse safety and health regulations are lacking and recent rashes of racing accidents resulting in the death of horses has generated calls for additional regulations.
5. Printed versions of the "Rules of Racing" appeared as early as 1836 (see the archives of the New York Public Library) and have been revised and expanded many times over the years. By the early 20th Century, the Jockey Club's rules had evolved to form the primary basis of regulation in the states that allowed horseracing.
6. The Jockey's Guild (2019) has traditionally concentrated its efforts on providing access to insurance and other non-wage benefits to its members. See, https://www.jockeysguild.com/history
7. Journeyman jockeys must typically spend 25 to 30 percent of race earnings on agent and valet fees.
8. The website FemaleJockeys.com (2019) provides the transcripts of several hundred interviews with female riders who chronicle their first-hand experiences with trainers and owners, their interactions with male jockeys, and the difficulties they faced in securing mounts. A review of the transcripts reveals widespread perceptions of discriminatory actions in both historical and contemporary contexts. See, http://femalejockeys.com/interviews.htm
9. Additional information about the data and services provided by the Handicapper's Data Warehouse can be found on their website: http://www.horsedata.com/?q=content/welcome-handicappers-data-warehouse
10. The HDW database consisted of 936,276 total jockey rides and 2,147 jockeys, but some of the jockeys were not included in the Equibase database or their gender could not be

verified and were dropped from the dataset used to run the probit analysis. The HDW database also failed to identify the jockey in 279 jockey rides. The dropped observations amounted to less than 0.01% of total observations, and just 2.1% of jockeys.

11. The HDW database includes races from eleven racetracks located in Canada where US-based horses and jockeys compete.
12. The sex of only a limited number of jockeys in the sample could not be verified. For each of these, the jockey had ridden in only one or two races during the 3-year sample period. Due to ambiguity, these few observations were dropped from the final sample.
13. All statistical analyses were conducted using SPSS.
14. Numerous variations of the model's specification were conducted to test and ensure the stability of the empirical results presented here. In addition, the model was also estimated using a logit technique with similar results found for all variables of interest.
15. Thoroughbred horseraces may be classified and labeled in several ways depending on a number of factors. For our purposes, the relevant classifications include stakes, allowance, maiden, and claiming races. In a stakes race, entry fees are pooled to form the winning purse (additional monies may be added by the track or race sponsors). An allowance race requires horses to carry certain amount of weight or be allowed to carry less weight based on prescribed factors such as the number of prior starts or amount of prior winnings. Purses for allowance races are significantly less than stakes races. Lower tier non-stakes-and-non-allowance races may include maiden races for horses who have not won a previous race, and claiming races where every horse is for sale.
16. Employer bias at the lower levels of a job hierarchy limit the ability to advance beyond the "glass ceiling" to the highest ranks. For female jockeys, this situation may be similar to that which black coaches face in some team sports where they appear to be relegated to assistant and support roles that do not often result in opportunities for advancement (e.g., see Bozeman & Fay, 2013; Day, 2015). As in coaching, in Thoroughbred horseracing this phenomenon is likely reinforced by "good old boy" networks of established owners and trainers.

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