Contracts, Pay and Performance in the Sport of Kings:
Evidence from Horse Racing

ABSTRACT

A considerable body of evidence shows that performance-related pay schemes can raise worker productivity with much of this increase due to worker sorting. However, variations in the power of performance-related pay contracts are rarely observed. The thoroughbred horse racing industry offers such an opportunity. Contrary to earlier research, we find no evidence of worker shirking when the power of incentive contracts is reduced through jockeys switching from complete performance-related pay scheme into a salaried (retainer) contract. Moreover, salary contracts result in legacy effects with superior performance continuing for elite jockeys even after their salary agreements have expired. We argue this is due to a reduction in monitoring costs.

Keywords: Contracts, incentives, horse racing.

1. INTRODUCTION

Linking performance to pay is a standard mechanism to ensure goal congruency between owners (principals) and workers (agents) in settings of imperfect monitoring where moral hazard possibilities arise. A significant body of research now exists examining the impact of performance-related pay schemes on worker productivity. Many studies show that the introduction of a performance-related pay scheme can increase worker effort and worker productivity (e.g. Gielen et al., 2010). The underlying theory has the cost of effort as convex in effort with rising marginal cost of effort. In Lazear's seminal (2000) study of windscreen fitters at the Safelite company, worker productivity improved when the option of a piece-rate payment system was introduced alongside straight salary payment. Moreover, Lazear found that around one-half of worker productivity increase was due to worker sorting. The piece-rate payment method attracted more skilled and motivated workers who were confident of securing increased earnings under the piece-rate system.

Identifying labour markets such as this, where incentive mechanisms are amenable to empirical analysis, is a challenging task. In this paper, we turn to the horseracing industry, a sport with ample data on worker pay and performance. We aim to test for the effects of variations in power of incentive contracts on a specific group of workers, horserace jockeys participating in the British thoroughbred racing industry. In particular, our data set presents a unique opportunity to consider variations in power of incentive contracts in two directions. Unusually, several of the jockeys we consider switched into a risk-free salaried contract whilst keeping an incentive component of pay linked to prize money earned from successful racing. This had the effect of diluting the power of the performance-related incentive contract. Some jockeys also switched in the reverse direction, losing their annual salaried status and reverting to performance-related pay, where pay is determined by appearances (riding fees) and prize money. For these jockeys,

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the power of incentive contracts was enhanced. To our knowledge, empirical evidence on performance-related pay effects on worker productivity has not thus far considered two-sided switching into and out of a performance-related pay scheme.

Why is the horseracing industry appropriate to investigate performance-related pay? First, it offers a reasonably controlled environment where there is an unambiguous principal-agent relationship. This environment contains both occupational risk (through jockey injury and loss of selection to ride horses) and moral hazard possibilities as jockey and horse performances are hard to separate. Second, the jockey labour market adopts clear mechanisms to improve incentive compatibility between owners and jockeys. The payment system to *freelance* jockeys includes only a fixed remuneration unrelated to performance (riding fee), and a variable remuneration (prize money), linking payment to performance. This exists on a decreasing scale from winning a race through to being placed second, third, fourth, and occasionally lower ranked positions. Additionally, a limited number of jockeys are paid a substantial annual salary (a '*retainer*') by an elite owner. This enhances the fixed riding fee and any potential share of prize-money for the jockey but gives owners/trainers exclusive rights over a jockey's services for a set period. Importantly, retained jockeys still earn shares of prize money generated, similar to freelance jockeys, so the fixed retainer salary is over and above the variable component of salary generated by rides and prize money. Since prize money is inherently uncertain for jockey and owner, the retainer salary offers risk-free income to the jockey and a retainer salary will be preferred by a jockey who is risk-averse over income.

The paper proceeds as follows. The next section reports some empirical evidence on the effects of performance-related pay schemes in various settings. Section 3 provides the context to the horseracing industry in Great Britain and shows how jockey contracts are typically structured.

Section 4 outlines the data used to examine the empirical question and describes our model used for the empirical tests. Section 5 presents the results. Section 6 discusses the results and concludes the paper.

2. BACKGROUND AND PREVIOUS RESEARCH

There is a considerable body of evidence demonstrating the effectiveness of performance related payment schemes in a wide range of settings. In addition to Lazear (2000), studies include Banker et al. (1996) on US manufacturing workers, Paarsch and Shearer (1999) on Canadian tree planters, Bandiera et al. (2005) on UK fruit pickers, Gielen et al. (2010) on Dutch manufacturing workers, Heywood et al. (2011) on Chinese academics and Bun and Huberts (2018) on Dutch sales workers. In addition to Lazear (2000), sorting effects on worker productivity and earnings have been demonstrated by Cadsby et al. (2007), Lemieux et al. (2009), Dohmen and Falk (2011) and Shaw (2015).

However, there is also a literature pointing to unintended consequences of piece-rate and other performance-pay schemes. According to recent research, performance-related pay does not necessarily deliver 'true' increases in productivity and may generate worker absences in a team context (Frick et al., 2013). Group bonuses and profit-sharing schemes are fraught with free-riding problems (Bogaard and Svejnar, 2018; Delahaie and Duhautois, 2019). Unintended consequences of performance-related pay include worker injuries (Bender et al., 2012) and increased use of harmful substances (Artz et al., 2020). Moreover, in the United Kingdom performance-related pay schemes are not as prevalent as theory might suggest and are located primarily in the financial services sector (Bryson et al., 2017). Performance-related pay schemes may be costly to enact. Freeman and Kleiner (2005) found that shoemakers in the United States delivered lower productivity when a piece-rate pay scheme

was abandoned in favour of fixed salary. However, company profitability increased due to the higher incentive-related costs of implementing the previous piece-rate pay scheme.

Agency theory has been applied to sports data in the past, to examine decision making by sports administrators (Mason, Thibault and Misener, 2006) and sports referees (Sutter and Kocker, 2004; Dohmen and Sauermann, 2016; Butler and Butler, 2017). However, despite anecdotal evidence of principal-agent problems in sport, limited attention has been paid to the area. This is largely due to the absence of contract data in the public domain and difficulties in quantifying individual performance, particularly in team sports, where a group of players contributes to outcomes.

A number of notable exceptions to this exist for professional football. Bryson, Buraimo and Simmons (2011) examined football referees and find that a treatment group of salaried referees delivered improved performance compared to a control group of referees still on match fees. This suggests that a well-judged salary payment scheme, with appropriate worker selection, can deliver benefits over a scheme based on appearance fees. Miklos and Ullrich (2016) find shirking to be a problem amongst Bundesliga players prior to the 2008 UEFA European Championship Finals, with players regularly picked to represent their national team reducing effort levels, possibly to avoid injury or fatigue. However, the opposite effect is found when the chance of selection for the national team is not guaranteed. These intermediate players were found to exert higher levels of effort in order to gain selection to the national team squad for Euro 2008. Recently, using distance run as a proxy for effort, Weimar and Scharfenkamp (2019) report a reduction in player exertion once a contract has been agreed with an outside agent. While this effect does not spread to the team, the authors argue for more nuanced

contract design so that incentive mechanisms can be employed as a contract runs out in order to maximise player effort.

In a precursor to our study, Fernie and Metcalf (1999) argue that horse racing offers an extreme example of an occupation where there is an incentive to shirk. Although jockeys are required by rule to race horses to the best of their abilities, jockeys can blame poor race outcomes on horse and track conditions and horse attitude (Coffey and Maloney, 2010). Favoured industry phrases are 'the horse did not like the trip' or 'the going (track conditions) did not suit the horse'. Fernie and Metcalf (1999) demonstrate how a variable payment scheme delivered alignment of incentives between jockeys and their employers in Great Britain, where jockey performance is isolated in a particular metric (that we also use). The formula for payment is fixed riding fee per race (appearance money) plus a given proportion of prize money where winning carries a higher weight than finishing in a designated place behind the winner. Incentive payments, in the form of share of prize money, have facilitated the crucial alignment of performance-related bonuses and jockey effort.

Fernie and Metcalf (1999) used descriptive evidence to argue that jockeys who switched from the variable payment scheme to fixed salary delivered inferior performances. Coffey and Maloney (2010) corroborate the incentive element of Fernie and Metcalf (1999), using American horse racing and comparing this with greyhound racing without jockeys. They argue that jockeys increase effort levels when the returns to success are greater.

For many employers, technology has dramatically reduced monitoring costs in recent decades. The horse racing industry provides a microcosm for this. Recording and broadcasting of racing gradually increased in the 1980s with terrestrial channels broadcasting a selection of races each

Saturday. However, relatively few races were televised. Monitoring costs for owners (employers of both trainers and jockeys) fell around the turn of the millennium with the advent of satellite channels such as *Racing UK* and *Attheraces*. Today every race run in Great Britain is available to watch live on either free-to-air television or subscription channels *Racing TV* or *Sky Sports Racing*. All stakeholders can watch the evolution of each race, the performance of horses, and importantly, judge the effort exerted by jockeys.[1]

Fernie and Metcalf (1999) document the entry into the UK horse racing industry of a group of wealthy Arab racehorse owners in the 1990s. Over time, these owners developed a complex network of stables, trainers and jockeys. Employed racing executives, responsible for hiring and firing trainers and jockeys, practised increased monitoring at low cost given the wide availability of video playbacks. Elite jockeys were offered fixed salary contracts (retainers) as owners wanted exclusive access to their services. The authors attributed their observation of poorer performance of retained jockeys to moral hazard and shirking effects due to the fixed salary contract. However, over time it appears that the new Arab owners did devote resources to increased monitoring through data-driven performance evaluation of jockeys, trainers and horses. This mirrors the general growth of sport analytics in the 2000s, largely stimulated by the best-selling book on Major League Baseball, *Moneyball*, by Michael Lewis (2004). Two decades on from Fernie and Metcalf's original study, it is worth revisiting jockey pay and performance data to test whether salaried contracts really do detract from jockey performance.

3. THE HORSE RACING INDUSTRY IN GREAT BRITAIN

The British Horseracing Authority (BHA) administers horse racing in Great Britain. This body is "*responsible for the governance, administration and regulation of horseracing and the wider horseracing industry in Britain*" (BHA, 2020a). The three main stakeholders in any horse are

the owner, trainer and jockey. According to the BHA (2018a), this tri-party relationship extended to approximately 14,000 registered owners, 600 licensed trainers and 450 licensed jockeys, as well as 300 amateur riders, in Britain in 2017. Given the complexities involved in this arrangement, a variety of different incentive mechanisms are used in order to elicit maximum performance from jockeys. These include both fixed and variable payment systems, with the latter dependent upon performance, and long-term retainer contracts for elite jockeys. The varying schemes trigger differing labour supply responses from individual jockeys.

In 2019 there were 916 flat race meetings scheduled throughout England, Scotland and Wales with 562 ran on turf and 354 ran on all-weather tracks (BHA, 2020). Flat turf attracts the most expensive yearlings and involves racing over distances ranging from five furlongs to around two miles, normally between March and October. Flat all weather involves running on a synthetic surface over similar distances and the same calendar months.

A registered owner in Great Britain today has between one, and in some cases, hundreds of horses in training at any time. Aside from the thrill of winning, and the potential residual breeding value of stallions and mares once retired, prize money principally drives the motivation for principals running horses in races on offer.[2] This is a considerable sum of money, and in 2018 across all racing codes in Great Britain was in excess of £166 million. Both the total prize money and average prize money per race have risen year-on-year since 2014. Evidence of this is presented in Table 1.

In order to be permitted to ride at British racecourses, all jockeys are required to hold a riding licence. Those that do acquire a licence become apprentice or conditional jockeys. An apprentice is used to describe flat jockeys (turf and all weather) that are under 26 years of age

and have ridden less than 95 winners on-course. A conditional jockey rides in National Hunt races and is under 26, having ridden fewer than 75 winners. Due to their inexperience, these jockeys are supported by the handicapping system. This system attempts to improve competitive balance by allowing inexperienced jockeys to carry lower weight within races. There is very little churn in the profile of the top 50 jockeys in both flat and National Hunt racing, and jockeys have considerable longevity, with many riding into their 40's or 50's at an elite level. As suggested above, professional jockeys earn income from direct race activities in three main ways: fixed riding fees, share of prize money and retainer contracts.

TABLE 1 - TOTAL AND AVERAGE PRIZE MONEY AT BRITISH RACECOURSES 2014 – 2019

The Professional Jockeys Association (PJA) collectively represents jockeys. One of the primary functions of the PJA is the negotiation of fixed riding fees with races authorities. Table 2 presents the fixed fee payment to professional flat jockeys from 2008 to 2018. If a jockey rode in seven races at a typical flat race meeting, during the 2018 season, they would accumulate £844.62 in gross income. This does not include performance-related pay in the form of prize money, of which professional jockeys are entitled to 6.9 per cent, when winning a race, and 3.5 per cent for a place (2nd to potentially 4th).

TABLE 2 - PROFESSIONAL FLAT JOCKEYS RIDING FEE 2000 – 2019

The final source of income for professional jockeys is a retainer contract. Retained jockeys are considered as the elite performers in the sport and are selected by owners, racing managers and trainers based on past performance. Retainer contracts are agreements between jockeys and

either trainers or owners, the details of which remain private. It is unheard of that a jockey would turn down the offer of a retaining contract from an elite trainer or owner. This is simply because the guaranteed income of a retainer contract (six-figure sums, sometimes exceeding £1 million per season), will surpass any income that could be earned as a freelance jockey (Racing Post, 2018a; The Telegraph, 2012). The key feature of these contracts, and the reason some run into millions of pounds per season, stipulates that an elite jockey commits to riding for the paying retainer in all races where they have a runner. This does not prevent jockeys from riding for other owners and trainers when the retaining party does not have a runner in a particular race.

Retainer contracts are renewable and always subject to performance review. Several jockeys have managed to sustain retainer contract status over long periods (see Table 4). When these contracts do cease it is normally by mutual consent of all parties: the jockey, trainer and owner.[3] Furthermore, once the contract is terminated, the jockey is free to ride for any owner or trainer. Such jockeys are known as *freelance* and make up the overwhelming bulk of professional jockeys riding in Britain. The group of freelance jockeys is therefore a combination of inexperienced or less successful jockeys (the vast majority of the group) and a selection of older, elite jockeys that previously held retainer agreements. Given the large degree of uncertainty surrounding retainer contracts, the often short-term nature of these agreements and the removal of riding options for elite jockeys who miss out on riding elite horses as they are tied to a single owner, the expected value of these agreements does not dramatically exceed that of freelance jockeys. For example, signing a retainer contract, which then last just one year, will impose a cost on the returning freelance jockey as they may have missed out on winning rides that they would otherwise have taken had they not been retained.

With more than 450 professional jockeys riding in Great Britain at any one time (Racing Post, 2018a), this industry has many agents that can be observed. These agents work for hundreds of different principals (owners and trainers) over their careers. Given the large sums of prize money on offer during the racing season, elite jockeys can earn in excess of half a million pounds per year should they be successful in major races. However, the bulk of professional jockeys win very little prize money, and can report annual incomes as low as £30,000 to £35,000. This substantial income inequality is illustrated by the notably bowed Lorenz curve seen in Figure 1.

FIGURE 1 - LORENZ CURVE - FLAT JOCKEY EARNINGS 2000-2015

This shows the cumulative earnings of 454 flat jockeys in Britain over a recent fifteen-year period (Gini coefficient 0.898). The difference between elite jockeys and those at the bottom of the earnings distribution is driven almost entirely by prize money payments – successfully winning races or finishing in runner-up positions (places as determined by the number of entrants). As such, one would expect to observe greater levels of motivation, towards accessing potential bonus mechanisms, given the relative importance of prize money in determining annual income. For a typical freelance jockey in our sample, prize money income forms around 60 per cent of total pay.

4. DATA AND METHOD

We examine the relationships between jockey pay, contractual status and performance for Flat racing in the Great Britain from 2000 to 2019. Flat racing is chosen given the availability of jockey performance data. Our analysis considers the performance of 227 jockeys over 20 seasons. 26 jockeys are identified as being on retainer contracts allowing for comparison with

freelance riders. All observations for individual jockeys are seasonal. It is not possible to employ jockey-race observations. However, these form part of the overall performance measure. In total, this allows for the consideration of jockey performance, both across races and within races, and results in more than 2 million jockey-horse combinations. Jockey pay is calculated using data from the *Racing Post*. Jockey performance is measured using data from *Racing Research* following the approach taken by Fernie and Metcalf (1999) and described in detail below.

4.1 *Racing Research* and Jockey Performance

Racing Research is an independent source that has analysed each race run at a British racecourse since 1983 for flat racing. *Racing Research* form ratings require an extensive data collection process and are implemented by a custom-designed mathematical model acting on a results database which essentially captures the career record and performances of each horse, the associated conditions under which each horse has run and the multiple connections each has with all other horses it has raced against.

On completion of a race, the *Racing Research* algorithm assesses the performance of both horses and jockeys, with computation of ratings a daily exercise. Each horse gets a rating based upon their performance within the race (direct comparison) and past performance competing against horses in other races (indirect comparisons), allowing for the calibration of multiple horse performances, over the course of a season. Ratings in previous races can be revised upwards or downwards once new information becomes available. Revisions on can be made as far back as six years for races run today. For example, a race run in 2018 (last year considered in the data) could effect a rating assigned as early as 2012. This can affect by direct and indirect comparisons and allows for improve the performance of horses that were otherwise

not captured by the original application of the algorithm. As a very small proportion of flat horses in Great Britain run for more than six seasons, this allows for changes to be made cover the entire racing career of most horses. The entire set of ratings on the database is recomputed occasionally for the purposes of consistency.

Importantly for the purposes of this research, the algorithm then calculates jockey contribution to horse performance within a race. This is largely unobservable and dependent upon many exogenous factors outside of the jockey's control such as the quality of opposing horses and jockeys, horse odds, previous form, ground conditions, horse draw[4] and in-race incidents. Jockey tactics which result in slower run races, undermine the accuracy of time ratings as an alternative performance metric. When reported time rates fall well below expected times, it is often the case that this was a result of how the race was run (slower pace) rather than the ability of the horses of jockeys, and enabled weaker horses to stay in the race longer. As a consequence time ratings are not as reliable and can under or over-representative the real ability of a horse, and by extension jockey, on a race day. Form ratings overcome this problem and provide a far more accurate assessment of both horse and jockey performance.

Using the form ratings, it is possible to assign a value to the performance of each jockey. This performance measure does not consider prize money awarded in any given race and as such should be considered as a measure of *form* rather than monetary returns. A jockey might win no prize money for an owner yet considerably overperform on their respective horse. As a result, their form rating would be much higher than expected. For example, *Racing Research* considers the performance of a horse, under 'jockey X', relative to other jockeys riding the same horse. This is calibrated so the performance measure for each jockey has mean value of 10 lbs. Over a distance of 5 furlongs – the shortest run race – one length corresponds to a

difference of 3 lbs. Over a distance of 2 miles, one length between horse is the equivalent of 1 lbs in weight. Importantly, the rating system controls for race-related effects such as distance, going and horse betting odds (probability of success). The value of this measure is that it covers thousands of rides each year to "expose what the rider is really contributing to his mount's performance" (Whitley, 1992). Effectively, *Racing Research* strips out the marginal productivity of each jockey, in each race, for tens of thousands of races each year in Great Britain, by separating the performance of the horse from the jockey and the contribution of each actor to the race outcome. Summary statistics for the past ten years of this baseline measure of jockey performance are presented in Table 3. The mean value of 10 lbs applies to all years.

TABLE 3 - SUMMARY STATISTICS OF RACING RESEARCH

JOCKEY PERFORMANCE

The benefit of using the *Racing Research* indicator is that it continually measures the performance of jockeys, and retrospectively calculates their contribution to past success, given the most current information of horse performance. Although many elite horse run a limited number of times per season (approximately 4-5 races), lower grade horses could run between 10 and 20 times over the course of a calendar year. Frequent running often results in recurrent jockey changes. Therefore, controlling for the many race-related conditions, *Racing Research* can repeatedly measure the performance of the same horse with different jockeys. This analysis removes much of the subjectivity of assessing combined jockey and horse performance by instead relying on an algorithm constantly seeking to recalibrate past and present performance (Racing Research, 2019). To summarise, the advantage of the *Racing Research* measure is that it allows for the extraction of jockey performance from the myriad of potential factors affecting race outcomes.

4.2 Retained Jockey and Owners

Retained jockeys do not work under the same incentive mechanisms as freelance jockeys since a large element of their pay (fixed salary) is independent of performance in the short run. In order to be considered a retaining owner, we assume the following criteria must be fulfilled. First, horses must be stabled with a British or Irish based trainer, over our sample period. Second, the retaining owner had to appear in the top ten of the Racing Post Total Earnings for Great British flat and all-weather racing at least three times between 2000 and 2018. Third, the owner must have accrued more than £1 million in prize money on average, for at least three seasons between 2000 and 2019. These criteria capture owners that consistently maintain a high a volume of horses in Great Britain and Ireland and experience considerable success on a consistent basis. We identify seven retaining owners: Al Shaqab Racing, Ballydoyle Racing, Godolphin, Shadwell Racing, Khalid Abdullah, Qatar Racing and Sheikh Hamdan bin Mohammed Al Maktoum.[5] Given our criteria, it can be reasonably concluded that this list consists of the elite owners racing horses in Great Britain.

From these owners, 26 retained jockeys are identified as having signed retainer contracts with at least one owner between 2000 and 2019. Table 4 displays the retainer principal-agent relationships in our sample. For estimation, we observe 17 retained jockeys with matching *Racing Research* performance measures. Over the past twenty years, retained jockeys have tended to be well-established in the sport. The mean age for the sample considered is 30.5 years, with a standard deviation of 7.68 and median age of 29.5 years.

TABLE 4 - RETAINER OWNER AND JOCKEY COMBINATION

4.3 Empirical Model

To examine pay and performance under different contractual agreements, we estimate the following set of jockey fixed-effects regressions:

$$y_{i,t} = \alpha_1 + \beta_1 X_{i,t} + u_{i,t} \tag{1}$$

$$w_{i,t} = \alpha_2 + \beta_2 X_{i,t} + u_{i,t} \tag{2}$$

$$v_{i,t} = \alpha_3 + \beta_3 X_{i,t} + u_{i,t} \tag{3}$$

where: $y_{i,t}$ measures log total variable pay for jockey i in time period t.
$w_{i,t}$ measures log riding fees for jockey i in time period t.
$v_{i,t}$ measures log prize money for jockey i in time period t.
$X_{i,t}$ contains a vector of dummy variables to denote contractual status and a control variable for performance using *Racing Research*.
$u_{i,t}$ is the error term.

Jockey pay $y_{i,t}$ includes prize money accrued from wins and places during the season, where jockey prize money shares were fixed throughout our sample period (6.9 percent for wins), and the number of fixed-fee riding payments received. $w_{i,t}$ and $v_{i,t}$ are components of the total variable pay for jockey. Jockey pay excludes retainer contracts, which are additional to riding and prize money payments. Hence, jockey pay, riding fees and prize money each refer to incomes that *all* jockeys receive, regardless of contract type.

The dummy variables, $X_{i,t}$, for contractual status comprise *Retainer* (1 = any year in which a given jockey has a retainer contract), *Before Retainer* (1 = any retained jockey in each of three seasons prior to achieving retainer status) and *After Retainer* (1 = any season where a jockey has freelance status having been previously retained). The numbers of observations where these dummy variables were equal to one were 66, 48 and 51 respectively out of 1,283. 17 retained jockeys were observed before reaching their salaried contracts while nine retained jockeys were observed after leaving retainer contracts.

The three season threshold for assessing retained jockeys prior to their salaried contracts is arbitrary and will be modified below. Extending *Before Retainer* to all observed seasons gives 132 observations where the dummy is coded as one. The purpose of the *Before Retainer* dummy is to assess whether jockeys who gain retainer status had higher total variable pay, riding fees and prize money in a given period prior to being selected.

Next, we produce further estimations for jockey performances. We hypothesise that the owner's utility is a function of wins and prize money earned (DeGennaro, 2003; Gamrat and Sauer, 2000). Owners enjoy visits to the winner's enclosure and receiving any associated trophies. They also enjoy the pecuniary benefits of prize money although we should note that only a small number of racehorse owners make sustained positive returns from racing given the high costs of owning, maintaining and training racehorses (Butler, 2018). On this basis, our additional dependent variables are number of wins and strike rate of jockeys (wins per ride). Again, the independent variables comprise dummy variables for contractual status and the *Racing Research* performance measure, identical to those used in the jockey regressions.

Table 4 presents an overview of the retained jockey performance. While the list of jockeys presented in Table 4 identifies 26 in total, six of these did not ride enough times during the period of their retainer contracts to be assigned a performance measure by *Racing Research*. The algorithm requires jockeys to ride in Great Britain a certain number of times in order for comparisons to be made both between jockeys on the same horse and on different horses. A lower number of observations would potentially bias the Racing Research metric and result in the reporting of possible over/under performance of a jockey. This would depend on the performance of the jockey in the limited number of rides within that particular season. In order to avoid this, jockeys with a limited number of racing observations are dropped from the Racing

Research comparison tool. However, our results are qualitatively the same if the *Racing Research* performance measure is excluded and the omitted jockeys brought back into the sample.

For the estimations, jockey fixed effects are included to capture unobserved jockey-specific characteristics. Regression models use the raw measure of *Racing Research* performance as a control covariate. Performance is measured in three ways in the descriptive Table 5. First, we employ the *Racing Post* ordinal ranking in the two years prior to retainer status (2YBR), during retainer contract and two years post retainer status (2YPR).[6] The Champion Jockey[7] of flat racing in Great Britain each season obtains a rank of 1, with the second best jockey receiving a rank of 2, and so on. The *Racing Post* lists these jockeys, with the number of race wins the primary ranking criteria. Given the number of professional jockeys riding in Great Britain each season, the highest ordinary rank value will exceed 450. Second, we use the deviation from the 10 lbs *Research Racing* mean for before, during and after retainer status. Raw values of *Racing Research* are used in regressions. Third, prize money won for the three time periods is listed.

TABLE 5 - SELECTED RETAINED JOCKEY PERFORMANCE 2008 TO 2018

5. RESULTS

Tables 6 to 8 present results for estimation of pay component models for all 227 jockeys from 2000 to 2019 for which performance data were available. Recall that *Fixed riding payments* and *prize money* are the component parts of *total variable pay*. Retainer payments are excluded from this category. Results include jockey fixed effects and are presented with robust standard errors, clustered by jockey. Year dummies are included to control for nominal increases in prize money over the sample period.

TABLE 6 - DETERMINANTS OF LOG TOTAL VARIABLE PAY

TABLE 7 - DETERMINANTS OF LOG RIDING FEES

TABLE 8 - DETERMINANTS OF LOG PRIZE MONEY

Racing Research has positive and significant coefficients in all three payment models from column (1) in Tables 6 to 8. The performance elasticities of total pay, riding fees and prize money are estimated at means as 0.46, 0.32 and 0.68, respectively. The higher elasticity for prize money received is to be expected. From column (1), freelance jockeys earn £1,939 more in riding fees alone for each 1lb they are above the 10 lbs mean. Better performing jockeys are rewarded by being booked by owners and trainers more frequently to ride horses.

Column (2) of Tables 6 to 8 adds the *Retainer* dummy. The size of retainer income is unknown and our estimates show retained jockeys' earnings as the variable component of their salary comprising riding fees and prize money. There is no significant difference in riding fees between retained and non-retained jockeys, suggesting they ride a similar number of horses. This is to be expected. Freelance jockeys are just as likely to book rides as retained jockeys, there is a limited number of retained jockeys, and the excess supply of horses in flat racing means freelance jockeys have no shortage of riding opportunities.[8]

We find that retained jockeys earned more prize money for owners and themselves and received more total variable pay than non-retained jockeys. This finding contradicts the earlier descriptive analysis of Fernie and Metcalf (1999) who argued that retained jockeys delivered lower prize money than their freelance counterparts.

Column (3) adds the *Before Retainer* dummy. This has insignificant coefficients in all three payment regressions presented in Tables 6 to 8. However, the models in Column (3) are incomplete as they do not include the *After Retainer* dummy variable. Jockeys who switch out of salaried contracts might exhibit different variable income, riding fees and prize money compared to jockeys who never achieve retainer status. When *After Retainer* is added to the regressions in Tables 6 to 8 (Column (4)) we find that *Before Retainer* has positive and significant coefficients in each regression.

In Table 7 estimates of *Log Riding Fees*, the coefficient on *After Retainer* is not significant. After losing retainer status, the numbers of rides between previously retained and ordinarily freelance jockeys are not significantly different. From column (4), jockeys that lose retained status deliver significantly higher prize money (Table 8) than their freelance counterparts. The positive coefficient on *After Retainer* is imprecisely estimated in the variable pay regression due to the inclusion of riding fees.

If jockeys were shirking during their retainer contracts, we would expect them to earn higher prize money when they revert to the performance-pay formula. An F-test shows no significant difference in prize money earned after losing retainer status compared to the prize money generated while under retainer contracts (F = 0.93, p = 0.34). This contradicts the Fernie and Metcalf (1999) hypothesis of shirking while earning a fixed retainer salary.

Tables 9 and 10 introduce estimations for two variables of interest to jockeys and racehorse owners: *log wins* and *strike rate* defined as wins per ride. Of these, we consider strike rate to be a preferable measure of jockey performance since more rides simply offers more opportunities to win races. The columns are as specified for the jockey variables. Without

contract status dummies, the performance elasticities of wins and strike rate from column (1) are 1.19 and 0.47 respectively. Each is statistically significant.

TABLE 9 - DETERMINANTS OF LOG WINS

TABLE 10 - DETERMINANTS OF LOG STRIKE RATES

When the *Retainer* dummy is added in column (2), we find positive and significant coefficients of *Retainer* in the strike rate model (Table 10) but not the wins model (Table 9). From the results so far for strike rate and prize money, we conclude that retainer contracts do not act as a disincentive for jockeys to perform and win races and hence generate prize money for owners. This finding is again in contrast to Fernie and Metcalf (1999). Evidence of shirking by retained jockeys is not apparent from our estimates of strike rate and prize money.

Column (3) in Tables 9 and 10 adds the *Before Retainer* dummy. The coefficient on this dummy variable is positive and significant for both wins and strike rate (Tables 9 and 10). Hence, before reaching retainer status, the selected jockeys had already produced more wins (Table 9), higher strike rate (Table 10) and more prize money earnings (Table 8) for their owners than non-selected, freelance jockeys. The hiring process appears to be broadly efficient in terms of selecting the best performing jockeys for retainer contracts.

Adding *After Retainer* in column (4) of Tables 9 and 10 shows that jockeys returning to freelance contracts also produce higher strike rates than never-retained jockeys. The effect of *After Retainer* is imprecisely estimated in the wins model in Table 9. There appears to be a 'legacy effect' where jockeys who switch from retainer to freelance contracts continue to deliver higher strike rates (Table 9) and prize money (Table 8) for owners. We conjecture that

the network relationships between jockeys, trainers and owners forged during retainer contracts persist even when these jockeys switch out of retainer contract. Some previously retained jockeys depart by mutual consent with the understanding that they continue to ride for previous employers but on a freelance basis. Naturally, their original selection as a retained jockey, for a leading owner, was due to perceived enhanced ability relative to all other jockeys. It can be interpreted that their continued overperformance is also a consequence of them simply being better jockeys which is further exploited by the relationships and networks that have been developed whilst working as a retainer.

Tables 11 and 12 present results of F-tests for coefficient equality for our contractual status dummies from our jockey prize money and strike rate models. We test whether the *Retainer* effect is greater than *Before Retainer* and *After Retainer*. For completeness, we test whether the *After Retainer* effect is larger than the *Before Retainer* effect. Tables 11 and 12 also report robustness checks on the measure of *Before Retainer*. Thus far, we have confined the pre-retainer period to three years. We modify this to show results for i) all years before retainer ii) four years before and iii) two years before.

The only systematically significant F-tests for differences in contractual status coefficients come from the *Log Prize Money* regressions where *Retainer* has a significantly greater coefficient than *Before Retainer*, regardless of choice of period for *Before Retainer*. The tests essentially show step changes in jockey and owner prize money, from non-retained through to the period before a jockey is hired on retainer, and a further uplift when elite jockeys achieve salaried status. This highlights the effectiveness of the owners' selection process where candidates for retainer contracts are already delivering greater prize money for owners prior to retained employment.

TABLE 11 - DETERMINANTS OF LOG PRIZE MONEY WITH ALTERNATIVES FOR

BEFORE RETAINER

TABLE 12 – STRIKE RATE WITH ALTERNATIVES FOR BEFORE RETAINER

The robustness checks suggest some nuanced contract status effects. In particular, the effect of *Before Retainer* on jockey prize money is statistically significant for two and three years but not for four years or all years. In the strike rate model, *Before Retainer* has a conventionally significant coefficient over two, three and four years but not for all years. We suspect that this discrepancy is due to promising young jockeys delivering high strike rates four years before they obtain retainer contracts but these strike rates tend to be associated with lower prize money compared to when these jockeys reach retainer status. Basically, early career jockeys tend to ride more at lower grade race tracks where less prize money is on offer. In the period five years or more before retainer status is achieved, jockeys are very recently licensed professionals and show no discernible variation in strike rate or prize money relative to more experienced freelance jockeys.

6. DISCUSSION

Our data set facilitates an analysis of sorting effects when workers switch out of performance-related pay into a salaried contract and subsequently switch in the reverse direction. In personnel economics, such a data set is novel. Our results strengthen the predictable conclusion that, regardless of payment scheme, performance matters for worker and employer returns. More productive jockeys get a higher number of mounts, achieve higher strike rates, win more prize money and earn more overall. When measuring performance using *Racing Research*, jockeys outperforming the mean earn significantly more across all payment categories.

In a finding that appears at first surprising, elite retained jockeys significantly outperform freelance riders in wins, strike rates and prize money generated suggesting a degree of sorting. We find no systematic significant differences in the strike rate between jockeys, either before a retainer contract is agreed, during the retainer contract, or once the jockey's agreement with an owner has lapsed. Therefore, there is no evidence that jockeys shirk when on retainer contracts. Furthermore, prize money won by retained jockeys for themselves and owners is significantly greater than prize money earned by the same jockeys up to three years before a retainer contract. This suggests that owners broadly hire the best jockeys on retainer contracts and the selection process is about more than luck.

Upon leaving a retainer contract, the elite group of jockeys continue to earn significantly more prize money than other freelancers. One interpretation of this result is that the high-profile nature of retainer agreements adds value for the jockey even after termination, with elite jockeys continuing to get the best rides on average. This would suggest that these agreements end, not because of underperformance, but instead naturally run their course with both parties content to end the retainer contract. Being previously retained as jockey with an elite trainer also carries a signalling quality for future jockey-trainer relationships. The exposure a jockey gets when retained for an elite trainer adds value and facilitates a better quality rides per season and hence significantly more earnings, even after their retainer agreement has ended. This may explain why we find no significant difference between prize money won by jockeys during tenure of retainer contracts and after retainer contracts have expired.

A second possible interpretation is that jockeys, by virtue of their contact with leading stables and elite riding experiences, develop tacit skills and further hone their talent. Owners and trainers hiring jockeys, ex-post, could well benefit from a positive externality associated with

the period where a jockey was incubated in a retainer contract. This interpretation implies that unobservable learning during the retainer could explain the greater level of prize money earned rather than a pure 'exposure' effect. Of course, these two interpretations are not mutually exclusive.

There are numerous possible explanations why our results differ substantially from Fernie and Metcalf (1999) two decades on. Improvements in technology, specifically the universal recording of all British racing, have dramatically reduced the monitoring cost of agents. This has allowed owners to monitor jockey performance far more readily than during the 1980s and early 1990s. As agents are aware that performance is always closely watched, this may act as a stimulus to exert maximum effort. A corollary to this is that owners can terminate retainer contracts if repeated underperformance from jockeys is evident. This is also true of the individuals they select as trainers. Both jockeys and trainers therefore have an incentive to continually perform when monitoring costs are low, even in races that are a much lower grade class. Moreover, it is clear that owners have invested resources in scientific and statistical performance evaluation of jockeys, trainers, horses and stables. This is all part of a learning process from previous mistakes in the hiring process for retained jockeys.

We should point out that underperforming jockeys, or dissatisfied retaining owners, are not the only plausible reasons for the end of a retainer contract. Elite jockeys can choose to end these contractual agreements voluntarily. Having enhanced their reputations from high profile agreements, many jockeys have a standing within the sport that allows them to return to freelance riding. The switch to freelance riding could be motivated by several factors. First, the commitments involved for retained jockeys can be exhausting. This includes a binding commitment to daily travel and repeated rides, some of which have very limited chance of

success. In contrast, freelancers have the option to avoid onerous travel commitments and can strategically book rides. Second, high profile freelance jockeys occasionally have an option to select which horse they wish to ride in elite races. This is not the case when one is tied to a contractual arrangement with an owner. Third, many jockeys that choose to exit these contracts do so when they are moving to a mature stage of their careers. It may be that other commitments, such as family life, take precedence. The flexibility of freelance riding could be a more attractive proposition. Having built substantial reputations, many former retained jockeys continue riding, confident in the knowledge that they can still get the best rides and earn significant income. Furthermore, as international travel has become easier in recent decades these jockeys can ride regularly in other locations such as Ireland, France, the Middle East, Asia and Australia.

Our findings on the positive relationship between retainer status and worker performance are in line with those of Bryson et al. (2011) on football referees. If workers are appropriately matched and selected, then salaried contracts can boost owner returns. Our results are also in line with the sports literature on assortative matching where the best players gravitate to the best teams (Drut and Duhautois, 2017; Filippin and van Ours, 2015; Gandelman, 2008). In horse racing the best jockeys develop both formal and informal employment relationships with the best owners and trainers. Further research could usefully test for assortative matching in horse racing.

At a more general level our findings are important. The conditions required for the effectiveness of performance-related pay schemes, to raise worker productivity and output, are actually very strong. These conditions include measurability of worker productivity, a limited role for luck in variations of worker rewards and the absence of team production where co-

worker effects such as free-riding might become important. Not surprisingly, empirical studies of performance-related pay have tended to focus on very precise production settings where these conditions are broadly fulfilled e.g. tree planters and windscreen fitters.

Once settings such as ours are considered, with highly skilled workers and specialised tasks, models of the effects of performance-related pay need to come to terms with sorting of workers into pay schemes in a different sense. The sorting that we observe in our study is actually employer selection where the employer offers a limited number of salaried contracts to strongly performing candidates. Employer selection then has implications for workers' future earnings. This shifts the focus of analysis to career concerns which are generally absent in studies of performance-related pay in manufacturing sectors. We suggest that future studies of impacts of performance-related pay schemes should address employer selection and potential career concerns as factors in the analysis.

7. CONCLUSION

Variations in power of performance-related pay contracts are rarely observed. The thoroughbred horse racing industry offers such an opportunity as elite jockeys are paid by annual salary (retainer) as well as receiving a share of prize money earned in races. We find a positive relationship between jockey pay and performance in this industry. However, contrary to earlier research, we find no evidence of worker shirking when the power of incentive contracts is reduced through switching into retainer contracts. Retained jockeys deliver greater prize money for owners and themselves compared with freelance jockeys.

Our results show that jockeys about to be hired under retainer contracts are already outperforming other jockeys in wins and prize money even before they sign their contracts.

This suggests that owners are well informed about jockey ability and performances before retainer contracts are signed – in recent times their screening practices have borne fruit.

Moreover, retainer contracts result in legacy effects with superior performance, in wins and prize money, continuing for elite jockeys even after their retainer agreements have expired. We suggest that this is due to a reduction in monitoring costs in recent decades and enhanced opportunities for previously retained jockeys to make use of network contacts to ride successfully for large-scale racehorse owners in big races. This effect is worth further analysis in other settings. For example, a switch from employed contract to self-employment might raise an individual's earnings, albeit with greater risk, as reputation and network effects are carried over into self-employment.

ENDNOTES

1. Historically, while trainers were almost always on-course, the same was and is not true of owners. This can largely be explained by two factors. Firstly, the trainer (or a member of the stable) is an essential element of race day. The horse needs to be transported, saddled up, walked to the paddock, collected after the race, etc. Secondly, the volume of racing in the UK means that most racing takes place during the week. Racing owners are typically engaged in other activities during the week. Unlike the trainer, owners are non-essential, and their presence at the race course is not required for the horse to run. The same is true of racing managers hired by distant owners. Many owners and managers are therefore not present at races, particularly at lower graded races, run from Monday and Friday. Prior to the advent of satellite channels such as Racing UK and Attheraces this would have meant been unable to watch a race live – unless present on-course – and difficulty obtaining a recoding, if such a race was filmed.

2. See Gamrat and Sauer (2000), Ray (2001) and DeGennaro (2003) for a debate relating to owner motivations to maximise utility viz-a-viz profit.

3. Cessation tends to be the exception rather than the rule. Rare examples include Godolphin's decision not to retain Frankie Dettori for the 2013 calendar year and Davy Russell's release at the end of 2013 by influential Irish owners Gigginstown.

4. A draw refers to a horse's starting stall. Given the heterogeneity of racecourses in Great Britain, the stall a horse is drawn from can dramatically affect their chances of winning. A wide draw (high number stall) at a racecourse with sharp bends can result in horses running considerably further than those with a low draw.

5. Cheveley Park Stud also meet the criteria for a retaining owner but are excluded because they did not employee a designated retaining jockey for the period under examination. Rather the owners use a combination of trainers and the stable jockeys used by each.

6. In order to be assigned a value in 2YPR a selected jockey must have left their retainer no later than 2017 and remained a freelance jockey.

7. The Champion Jockey of flat racing in Great Britain is the jockey who has ridden the most winning horses during a season.

8. According to the BHA (2017), the average field size of a flat race in Great Britain has ranged between 8.22 and 10.56, over a ten-year period from 2007 to 2016. Further information on this can be found at https://www.britishhorseracing.com/wp-content/uploads/2017/07/10-Year-Stat-Pack.pdf

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TABLES

Table 1: Total and Average Prize money at British Racecourses 2014 – 2019

	2014	2015	2016	2017	2018	2019
Flat (Turf)						
Total Prizemoney	£68,361,000	£73,640,000	£74,383	£77,160,000	£86,617,000	£84,635,000
Prizemoney per Race	£17,180	£18,682	£19,088	£19,227	£22,064	£22,254
Flat (All-Weather)						
Total Prizemoney	£14,019,000	£16,096,000	£17,971,000	£18,242,000	£25,487,000	£23,911,000
Prizemoney per Race	£6,020	£6,973	£7,547	£7,656	£9,549	£9,329
National Hunt						
Total Prizemoney	£40,609,000	£42,416,000	£45,224,000	£47,137,000	£54,515,000	£52,518,000
Prizemoney per Race	£10,695	£11,237	£12,102	£12,178	£14,302	£14,121
Total						
Total Prizemoney	£122,989,000	£132,152,000	£63,269,383	£142,539,000	£166,619,000	£161,064,000
Prizemoney per Race	£12,171	£13,183	£13,736	£13,881	£16,009	£15,970

Source: BHA (2018b) and BHA (2020b)

Table 2: Professional Flat Jockeys Riding Fee 2000-2019

Year	Riding Fee	Year	Riding Fee
2000	£68.17	2010	£106.55
2001	£70.55	2011	£109.10
2002	£73.40	2012	£112.37
2003	£75.60	2013	£115.52
2004	£80.55	2014	£118.29
2005	£87.56	2015	£118.29
2006	£92.65	2016	£118.29
2007	£96.35	2017	£120.66
2008	£100.44	2018	£124.40
2009	£103.45	2019	£127.14

Source: Professional Jockeys Association

Table 3: Summary Statistics of *Racing Research* Jockey Performance

Year	Mean	Median	St. Dev	Min	Max
2000	10	10.0	1.60	6.0	13.8
2001	10	10.3	1.56	6.5	13.1
2002	10	10.3	1.55	5.9	13.0
2003	10	10.0	1.43	7.0	12.8
2004	10	10.5	1.42	6.9	12.9
2005	10	10.2	1.63	4.1	12.6
2006	10	10.4	1.32	6.6	11.9
2007	10	10.1	1.31	6.3	12.4
2008	10	10.1	1.33	6.8	13.4
2009	10	10.1	1.32	6.7	13.1
2010	10	10.1	1.30	7.3	12.6
2011	10	10.2	1.13	6.5	12.2
2012	10	10.1	1.05	7.3	12.1
2013	10	10.3	1.18	6.0	11.9
2014	10	9.9	1.17	7.5	12.8
2015	10	10.0	1.02	7.8	12.2
2016	10	10.3	1.01	7.2	12.0
2017	10	10.1	0.83	8.4	11.7
2018	10	10.0	1.10	6.9	12.0
2019	10	10.1	1.15	6.3	11.8
All Years	10	10.1	1.14	6.0	13.4

Source: Racing Research

Table 4: Retainer Owner and Jockey Combinations

Retaining Owner	Retained Jockey	Contract Duration	Age When Retained	Active Years Post Retainer
Al Shaqab Racing	Lanfranco Dettori	2013 to present	44	-
Coolmore	Michael Kinane	1999-2003	40	0*
	Jamie Spencer	2004	24	16
	Kieran Fallon	2005-2007	40	9*
	Johnny Murtagh	2008-2010	38	4*
	Joseph O'Brien	2011-2014	18	2*
	Ryan Moore	2015 to present	32	-
Godolphin	Lanfranco Dettori	1994-2013	25	7
	Mickael Barzalona	2013	22	7
	Silvestre de Sousa	2013-2014	33	6
	Adam Kirby	2014	26	6
	James Doyle	2015 to present	27	-
	Wiliam Buick	2015 to present	27	-
Shadwell Racing	Richard Hills	1997-2012	34	0*
	Paul Hanagan	2013 -2016	33	4
	Dane O'Neill	2013 to present	38	-
	Jim Crowley	2017 to present	31	-
Khalid Abdullah	Richard Hughes	2001-2007	28	7*
	Tom Queally	2009-2012	25	8
	James Doyle	2013-2014	25	6
Qatar Racing	Jamie Spencer	2013-2014	33	6
	Harry Bentley	2013-2014	21	6
	Andre Atzeni	2015	24	5
	Oisin Murphy	2015 to present	20	-
Sheikh Hamdan bin Mohammed Al Maktoum	Joe Fanning	2013 to present	43	-
	Franny Norton	2013 to present	43	-

Note: Observations must have signed a retainer agreement no later than the start of the 2019 racing season. "To present" refers to the end of the 2020 racing season. Ceiran Fallon was retained by Qatar Racing for the 2020 season, but because he did not ride as a retained jockey in 2019 or earlier, is not included in the table.

* Jockey now retired.

** Tom Queally, although not officially retained by Khalid Abdullah, was a de facto retained jockey, riding star horse Frankel in all of his 14 starts and multiple Midday in 18 of her 19 races between April 2009 and November 2011.

Table 5: Selected Retained Jockey Performance: 10 Year Period – 2008 to 2018

Jockey	Retaining Owner	Years Retained	Rank 2YBR	No. of Years		Average Ordinal performance (rank, 1 = top)			Average Cardinal performance: Deviation (lb) from mean of 10 lb			Average Prize money won (£m)		
				Retained	Not Retained	2YBR	Retained	2YPR	2YBR	Retained	2YPR	Pre-Retainer	Retained	Post-Retainer
L Dettori	Al Shaqab Racing	2013-2018	24, 42	6	5	33	45	-	0.8	-	-	2.07	4.66	-
S De Sousa	Godolphin	2013-2014	2, 5	2	8	4	10	33	0.7	1.1	1.3	0.91	2.16	2.22
A Kirby	Godolphin	2014	8, 3	1	9	6	1	4	1.1	0.7	0.2	0.86	2.02	2.11
J Doyle	Godolphin	2015-2018	19, 10	4	7	15	10	-	0.9	0.2	-	1.14	2.92	-
W Buick	Godolphin	2015-2018	10, 8	4	7	9	17	-	-0.4	N/A	-	2.14	3.01	-
L Dettori	Godolphin	2008-2012	-	5	5	-	23	-	-	-	-	-	2.37	-
P Hanagan	Hamdan Al Maktoum	2013-2016	1, 7	4	6	4	14	15	-0.2	-0.4	-0.1	1.48	2.40	1.52
D O'Neill	Hamdan Al Maktoum	2013-2018	20, 13	6	5	17	39	-	1.8	0.1	-	0.74	0.76	-
J Crowley	Hamdan Al Maktoum	2017-2018	8, 1	2	9	5	3	-	0.6	0.6	-	1.33	5.24	-
R Hills	Hamdan Al Maktoum	2008-2012	-	5	5	-	32	-	-	-	-	-	1.6	-
J Spencer	Qatar Racing	2013-2014	6, 11	2	8	9	19	16	0.5	0.2	-0.1	1.71	1.76	1.88
A Atzeni	Qatar Racing	2015	9, 9	1	9	9	25	10	0.9	1.1	0.7	0.93	3.39	3.36
O Murphy	Qatar Racing	2015-2018	53, 23	4	7	38	11	-	-1.2	0.3	-	0.73	1.83	-
T Queally	Khalid Abdullah	2009-2012	15, 10	4	6	13	13	21	0.2	0.5	-0.2	2.72	2.21	0.85
R Moore	Coolmore	2015-2018	2, 5	4	7	4	14	-	1.7	0	-	5.57	2.91	-
F Norton	Hamdan bin Mohammed Al Maktoum	2013-2018	48, 18	6	5	33	26	-	1.1	1	-	0.57	0.81	-
J Fanning	Hamdan bin Mohammed Al Maktoum	2013-2018	9, 1	6	5	5	5	-	0.8	0.3	-	0.91	1.54	-

Source: Racing Post (2018b) and Racing Research (2019)

Table 6: Determinants of Log Total Variable Pay

Dependent Variable:
Log Total Variable Pay

Variable	(1)	(2)	(3)	(4)
Racing Research	0.046***	0.046***	0.045***	0.046***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer		0.117***	0.133***	0.185***
		(0.010)	(0.007)	(0.001)
Before Retainer			0.055	0.095**
			(0.142)	(0.011)
After Retainer				0.127*
				(0.055)
R^2 (within)	0.27	0.29	0.29	0.30
R^2 (overall)	0.30	0.35	0.37	0.43
N	1283	1283	1283	1283
N jockeys	222	222	222	222

Note: In all regression tables, statistical significance is denoted by ***at 1% level; **at 5% level; *at 10% level. Robust p values, with standard errors clustered by jockeys, are in parentheses.

Table 7: Determinants of Log Riding Fees

Dependent Variable:
Log Riding Fees

Variable	(1)	(2)	(3)	(4)
Racing Research	0.032***	0.032***	0.031***	0.032***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer		-0.014	-0.006	0.009
		(0.604)	(0.832)	(0.794)
Before Retainer			0.030	0.041
			(0.220)	(0.117)
After Retainer				0.037
				(0.278)
R^2 (within)	0.30	0.30	0.30	0.31
R^2 (overall)	0.36	0.36	0.37	0.37
N	1283	1283	1283	1283

Table 8: Determinants of Log Prize Money

Dependent Variable:
Log Prize Money

Variable	(1)	(2)	(3)	(4)
Racing Research	0.068***	0.069***	0.068***	0.070***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer		0.217***	0.237***	0.337***
		(0.008)	(0.006)	(0.000)
Before Retainer			0.070	0.148***
			(0.173)	(0.008)
After Retainer				0.243**
				(0.014)
R^2 (within)	0.24	0.26	0.27	0.28
R^2 (overall)	0.24	0.32	0.34	0.43
N	1283	1283	1283	1283

Table 9: Determinants of Log Wins

Dependent Variable:
Log Wins

Variable	(1)	(2)	(3)	(4)
Racing Research	0.119***	0.119***	0.116***	0.118***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer		0.112	0.161*	0.265***
		(0.153)	(0.058)	(0.009)
Before Retainer			0.172**	0.252***
			(0.041)	(0.004)
After Retainer				0.251*
				(0.061)
R^2 (within)	0.11	0.11	0.12	0.12
R^2 (overall)	0.26	0.28	0.30	0.34
N	1283	1283	1283	697

Table 10: Determinants of Strike Rate

Dependent Variable: Strike Rate

Variable	(1)	(2)	(3)	(4)
Racing Research	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer		0.019**	0.023**	0.034***
		(0.022)	(0.014)	(0.000)
Before Retainer			0.014**	0.023***
			(0.019)	(0.000)
After Retainer				0.026***
				(0.009)
R^2 (within)	0.15	0.18	0.18	0.20
R^2 (overall)	0.21	0.32	0.32	0.41
N	1283	1283	1283	1283

Table 11: Determinants of Log Prize Money with Alternatives for Before Retainer

Dependent Variable: Log Prize Money

Variable	All Years Before	4 Years	3 Years	2 Years
Racing Research	0.071***	0.070***	0.070***	0.070***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer	0.406**	0.320***	0.337***	0.331***
	(0.016)	(0.001)	(0.000)	(0.001)
Before Retainer	0.138	0.094	0.148***	0.192***
	(0.350)	(0.153)	(0.008)	(0.002)
After Retainer	0.297**	0.227**	0.243**	0.235**
	(0.046)	(0.016)	(0.014)	(0.019)
F Retainer = After Retainer	1.22	0.92	0.93	0.96
F After Retainer = Before Retainer	2.80	1.81	1.04	0.23
F Retainer = Before Retainer	10.11***	5.76**	4.83**	3.16*
R^2 (within)	0.27	0.27	0.28	0.29
R^2 (overall)	0.45	0.45	0.43	0.42
N	1283	1283	1283	1283

Table 12: Strike Rate with Alternatives for Before Retainer

Dependent Variable: Strike Rate

Variable	All Years Before	4 Years	3 Years	2 Years
Racing Research	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Retainer	0.042***	0.036***	0.034***	0.032***
	(0.010)	(0.000)	(0.000)	(0.016)
Before Retainer	0.018	0.022***	0.023***	0.024***
	(0.153)	(0.000)	(0.000)	(0.000)
After Retainer	0.032**	0.029***	0.026***	0.024**
	(0.018)	(0.003)	(0.009)	(0.022)
F Retainer = After Retainer	0.70	0.36	0.46	0.50
F After Retainer = Before Retainer	1.70	0.38	0.12	0.00
F Retainer = Before Retainer	9.17***	2.38	1.98	0.95
R^2 (within)	0.18	0.20	0.20	0.20
R^2 (overall)	0.41	0.41	0.41	0.40
N	1283	1283	1283	697