Do Financial Incentives Affect The Quality Of Expert Performance? Evidence From The Racetrack

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Abstract

Does the quality of performance by experts respond to financial incentives? I provide some new evidence on this question by examining the propensity of racehorse trainers to undertake effort-diverting actions. In a sample of 30426 horse races, I find that lower race stakes are strongly associated with more unexpected outcomes, consistent with more trainers exerting less-than-full effort in such races. These results continue to hold when low-information races are excluded from the sample, thereby ruling out the possibility that stake is simply a proxy for the level of information that is available to bettors. Moreover, in a sub-sample of 4416 races for which final odds data are available, the dispersion in odds is positively related to race stake, consistent with rational bettors recognising the incentives faced by trainers and incorporating this insight in their investments. As a group, horse trainers apparently tailor the quality of their services to the potential size of their remuneration from clients.

1 INTRODUCTION

Racetrack gambling data have been widely used to draw inferences about market efficiency and investor risk preferences; see for example Sauer (1998) and the collections of Hausch et al (1994) and Vaughan Williams (2003). In this paper, I suggest that such data can also be useful for shedding light on other aspects of agent behaviour. Specifically, I exploit a simple link between racehorse trainer effort and the predictability of race outcomes in order to shed light on the ability of financial incentives to motivate high quality performance.

The literature examining the relationship between financial incentives and performance has yielded mixed results. On the one hand, several recent studies document a strong output response to the provision of financial incentives for workers. For example, Lazear (2000), Paarsch and Shearer (2000), and Shearer (2004) all find that output is significantly greater when workers are paid piece rates rather than fixed wages. This evidence suggests that the potential for greater financial returns motivates greater effort and productivity, just as economic theory predicts. On the other hand, there is considerably more doubt about the sensitivity of performance *quality* to incentives - the extent to which greater payoffs motivate workers to produce better, as well as more, goods and services. This issue is particularly germane to the class of professional workers who use specialized knowledge, information and skills to provide quality-oriented expert services to clients. Because experts are typically members of a profession, they are likely to have high intrinsic motivation related to this membership; such "professional pride" considerations potentially dampen the impact of financial incentives on performance quality. Indeed, psychologists such as Kohn (1993a, 1993b) reject the idea that money can motivate quality-oriented tasks, a view generally supported by laboratory evidence: in a meta-analysis of 39 experiments undertaken between 1975 and 1996, Jenkins et al (1998) are unable to detect any significant relationship between financial incentives and the quality of performance. Away from the laboratory, some evidence for the view that financial incentives matter comes from standard agency settings: Levitt and Syverson (2005) and Rutherford et al (2005) find that real estate agents perform better when selling their own houses than when selling on behalf of clients, while Michaely and Womack (1999) and Barber et al (2007) report that the quality of stock analysis provided to clients is adversely affected by the existence of an investment banking relationship between the analyst's firm and the firm whose securities it is scrutinising.

The training of race horses provides an ideal setting for further examining the role of financial incentives in eliciting quality performance. Trainers are experts who prepare horses for racing on behalf of clients; the services they provide include not only physically working with the horses, but also the planning of training and racing schedules, engaging and instructing raceday drivers or jockeys, employing and assigning stablehands, choosing the appropriate racing equipment, and so on. In return, trainers receive daily fees plus a percentage of horse winnings (10% in the case analysed here). Because the latter component is not as valuable in low-stakes races, they stand to gain less from clients whose horses compete in such races. For such clients, exertion of "full effort" is less financially attractive, so the trainer may choose to pursue other objectives, e.g., additional leisure, devoting more attention to other stable horses, or maximising personal betting payoffs.[1] By contrast, such effort-diverting actions carry a greater opportunity cost in high-stakes races, suggesting that trainers are then more likely to exert full effort.

In this paper, I address the following question: do higher race stakes reduce the propensity for horse trainers to engage in effort-diverting activities? I do so by exploiting the simple intuition that the presence of less-than-full effort by trainers will be associated with more "unexpected" outcomes on average.[2] In handicapping any race, the betting public uses a vast array of information: expert opinion and advice, perceived horse quality based on prior performance, stable reputation, driver reputation, barrier draw, and so on. Most studies of racetrack betting conclude that markets are broadly efficient with respect to such publicly-available information (for an overview, see Sauer, 1998), but various anomalies suggest that private information may not be fully incorporated in odds (e.g., Crafts, 1985; Gabriel and Marsden, 1990; Shin, 1993). In this context, a particularly important piece of private information is the extent to which a horse's trainer exerts maximum effort in preparing it for that race, i.e., how hard is the stable trying to win? A trainer might, for example, decide to use the race primarily as a practice or experimental run and so under- or over-work a horse in the days leading up to the race; or, perhaps motivated by the betting considerations described above, he may entrust the horse's care to a junior stablehand, or issue the raceday driver or jockey with unhelpful instructions. In general, such "inside information" is unobservable to bettors, and so little of it is impounded in

[1]For example, the trainer may intend to bet on another trainer's horse in the same race and so maximises the probability of that bet succeeding by making his own horse less of a factor. Or he may hope to reap a large betting payoff on the horse in a future race by first improving its odds with a lacklustre performance in the current race. Shin (1992) cites an acknowledgement by United Kingdom racing officials of the prevalence of such practices.

[2]An alternative approach would be to use some direct measure of performance – such as the time taken to run a particular distance. However, the sensitivity of race times to weather, track surface and, particularly, race tactics, means that such an approach is unlikely to be useful.

betting odds.[3]

If the weaker financial incentives associated with low-stakes races result in trainers being more likely to choose less-than-full effort, then bettor odds will be a less reliable predictor of the outcomes of such races, since bettors are missing relevant information. By contrast, the greater opportunity cost of exerting less-than-full effort in high-stakes races means that private information about trainer effort should be less significant, hence ensuring a closer convergence between bettor odds and race outcomes. In short, race outcomes become more "predictable" to bettors (given the information they have available) as race stakes increase, and thus favoured horses – which offer smaller bettor payoffs – succeed more often.

This situation is depicted in Figure 1. The two circles represent the total amounts of information relevant to predicting the outcome of low- and high-stakes races respectively. In the low stakes race, some trainers exert less-than-full effort because of more attractive alternatives elsewhere (such as increased leisure or profitable betting activities), and so a relatively large proportion of the relevant information is unavailable to bettors. As a result, some horses will be over-bet and others under-bet, and unexpected outcomes (i.e., high payoffs to successful bettors) will be relatively common. But in the high-stakes race, most trainers do their best, so the quantity of private information is relatively small. Bettor odds thus reflect a greater proportion of the relevant information and unexpected race outcomes are less common.

To explore this idea, I test the following two hypotheses: if horse trainers respond to financial incentives by exerting less effort in races with low stakes, then (i) the average payoff (per unit of investment) received by successful bettors should decrease in race stakes, and (ii) the success rate of betting "favourites" (i.e., the horses with the most bettor money invested on them) should increase in race stakes. Put more succinctly, horses that are relatively heavily backed by bettors, and thus offer lower payoffs, should succeed more often in high-stakes races. Of course, such tests cannot identify differential effort by individual trainers, but they should reveal something about the propensities of trainers as a group.

[3] Of course, insiders (employees and other connections of the trainer's stable) will often have this information and can be expected to utilise it by exploiting any bet mis-pricing on the part of the public. If this information advantage were fully impounded in odds, then there would be no reason to suspect that race predictability would differ with race stake, and thus would be unable to shed any light on trainer incentives. However, such impounding is likely to be limited by insider capital constraints. Indeed, insider betting seems to typically constitute only a small proportion of the total amount bet - Shin (1993) and Coleman (2007) both arrive at estimates of approximately 2% - and, as previous studies indicate, does not seem to be sufficient to fully incorporate the information advantage in betting odds.

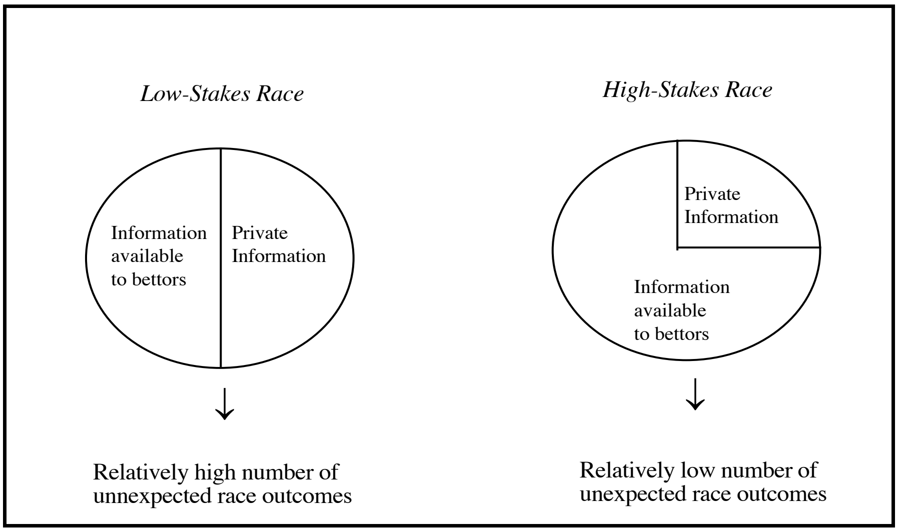

Figure 1: Proportion of Information Available to Bettors if Trainer Effort Depends on Race Stake.

In a sample of 30426 horse races, I detect a strong relationship between race stakes and payoffs to successful bettors: after controlling for other factors that systematically affect race outcomes, a doubling of the race stake is associated with a decrease in bettor payoffs of between 8% and 14%, depending on the betting pool. Similarly, the success rates of bettor-favourite horses increase significantly with the size of the race stake. Importantly, I obtain essentially the same results in sub-samples that exclude races about which bettors seem likely to have relatively little information, thereby suggesting that race stake is not simply proxying for the quantity and quality of information available to bettors.

Although this evidence is consistent with horse trainers tailoring the quality of their performance to the potential size of their remuneration from clients, it cannot rule out other possibilities. For example, race stake may be correlated with some unknown determinant of race outcomes, thereby rendering my results potentially spurious. In these circumstances, it is important to look for other evidence that is also consistent with stake-induced differential effort. One example of such evidence is the relationship between betting odds and race stake. If trainers are motivated by differential stake levels, then rational bettors will be aware of these incentives and hence respond by setting less dispersed odds in low-stakes races. In a sub-sample of races for which full-field odds data are available, I find that this is indeed the case: a 10% higher stake leads to a 10.3 point rise in the standard deviation of race odds. Moreover, the magnitude of this effect is the same across both low- and high-experience-horse races, so race stake is not acting as a proxy for the level of information bettors have about horse abilities.

In the next section, I describe the data used in this paper and undertake some preliminary analysis. Section 3 examines the relationship between stakes and race outcomes, and contains the results from a series of multiple regression models that are the paper's primary focus. Section 4 focuses on the relationship between stakes and final betting odds, while section 5 offers some concluding remarks.

2 DATA AND PRELIMINARY ANALYSIS

The data sample consists of 30426 standardbred (harness) races held in New Zealand between 1993 and 2006 for which full information is available.[4] These races were staged at 56 tracks spread across the entire country, although more than a third of them took place at the two major tracks located in Auckland and Christchurch. Since 1996, New Zealand has had both fixed-odds (bookmaker) and totalisator (pari-mutuel) betting options, but most investment takes place via the latter. Total betting on the races in my sample was approximately $3.5 billion.[5]

For each race, I recorded both the total prizemoney at stake and the payoffs to successful investors in three totalisator betting pools: win, quinella and trifecta. Moving from win to quinella to trifecta payoffs yields an increasingly broad measure of the extent to which a race corresponds to bettors' expectations. For example, a strongly favoured horse could win the race and yield a small win pool payoff - indicating that the result was highly predictable - but be followed home by two outsiders resulting in a large trifecta pool payoff - indicating that the result was unexpected. By using all three payoff measures, I am able to better assess whether the hypothesized relationship between betting payoffs and race stakes is robust. I also recorded the success of the betting favourite (i.e., the horse that attracted the most investment) in two pools: win and place. The win favourite was deemed to be successful if and only if it won; the place favourite was successful if and only if it finished in the first three.

Table 1 provides some summary statistics for the variables used in this study. Betting payoffs are expressed relative to a $1 unit of investment, i.e., a $10 payoff equals $1 return of investment plus $9 winnings. The

[4]These data were obtained from Harness Racing New Zealand, whose website (www.hrnz.co.nz) contains information on the outcome of every race held in New Zealand since 1985, including, since 1993, details of payoffs to winning bettors. A further 330 races had missing or non-existent data, and so were deleted from the sample.

[5]All monetary values are in New Zealand dollars.

Table 1: Summary Statistics

Variable	Mean (Standard Deviation)	Min	Median	Max
Race Stake ($)	8019 (15454)	1000	5000	750000
Win Payoff ($)	8.60 (9.71)	1.00	5.45	173.70
Quinella Payoff ($)	44.65 (72.89)	1.05	21.30	2103.35
Trifecta Payoff ($)	1055.00 (4023.36)	2.10	307.50	398606
Field Size	11.73 (2.32)	4	12	18
Unpredictability Index	0.672 (0.71)	0	1	3
Win Favourite Success Rate	0.335			
Place Favourite Success Rate	0.610			

three payoff variables display considerable dispersion, e.g., the mean trifecta payoff is $1055, but the sample contains payoffs ranging from $2.10 to almost $400,000. Race stakes are similarly variable: the mean stake is $8019, but individual stakes range from $1000 to $750,000. However, the difference between the 5th and 95th stake percentiles is only $16000, so the potential gains to trainers from stake-dependent effort are, across most races, quite small. All four variables exhibit significant skewness, with means that are considerably greater than medians.[6] Win favourites win approximately one third of all races, while place favourites successfully finish in the first three 61% of the time.

To investigate the relation between race stakes and betting payoffs (or favourite success rates), one variable that must be controlled for is the number of horses in the race, since a bigger field makes it less likely that any given horse – or combination of horses – will succeed. All else equal, bigger fields should lead to higher winning payoffs on average, particularly in the quinella and trifecta pools.

I also control for the inherent "unpredictability" of a race. Regardless of stake and field size, some races are simply more difficult to handicap than others, resulting in a greater number of unexpected outcomes that are associated with lower favourite success rates and higher betting payoffs. For standardbred horse races, three factors stand out. First, although most races in my sample are run on all-weather surfaces, a significant minority (approximately 12.5%) take place on grass. Grass track races are often more difficult

[6]In the case of the payoff variables, this is partly due to the Totalisator Agency Board (the sole legal outlet for betting on horse races in New Zealand) guaranteeing a minimum payoff of $1.

to handicap for several reasons: horses are less experienced at racing on grass, bettors have less information about horses' relative prowess on grass, and grass tracks offer a less homogeneous racing surface that may randomly affect some horses in any race. Second, approximately 10% of the races in the sample are run on rain-affected tracks. This affects different horses in different ways, but often tends to neutralise the advantages of high-speed horses, thus making the outcome more difficult for bettors to predict. Third, although the majority of races in my data begin from a mobile dispatch (where the horses are already moving at close to race speed at the point where the race starts), approximately 44% are standing start races (where the horses must stand quietly and begin from a stationary position). The latter feature introduces an additional random element because horses are more likely to deviate from the correct gait (i.e., racing action) when forced to begin quickly from a stationary position, potentially resulting in considerable loss of ground or disqualification.[7]

To quantify these features in a form amenable to empirical analysis, I construct an index that adds 1 for each of the above features that a race possesses. For example, a race that is run on a wet grass surface from a standing start has an index value of 3, while a race that is run on a dry grass surface from a mobile start is given an index value of 1. Races with none of these features have an index value of 0.[8]

Table 2 provides some preliminary analysis of the relation between race stakes and betting payoffs. I first split the sample into races above and below the median stake and calculate average betting payoffs and favourite success rates for each group. Average payoffs are higher, and favourite success rates are lower, in lower-stakes races, and these differences are strongly statistically significant (at the 0.1% level or better). Quantitatively, the differences are greatest in the more exotic bet pools - the average trifecta dividend in races with stakes above the sample median is only 82% of the average dividend in races with stakes below the sample median.

I also calculate the correlation between, on the one hand, the race stake, and on the other hand, the payoff and success rate variables. Partly to eliminate the skewness, and partly because any impact of stakes on betting payoff seems likely to be non-linear, I use the natural log of the race stake

[7]As pointed out by the referee, a further source of uncertainty potentially stems from the presence of previously high-quality horses appearing in low-stakes races, and the underlying reasons for their apparent form decline. However, the New Zealand harness handicapping system provides very few opportunities for horses to drop back in class; such horses are typically retired or sold to countries where a greater range of abilities is catered for.

[8]Models that include these three features as separate variables yield very similar overall results, so I report only the results from the more parsimonious index approach.

Table 2: PRELIMINARY ANALYSIS

	Above Median Race Stake	Below Median Race Stake	Difference	Correlation with Race Stake
Average Win Payoff ($)	8.28	8.93	−0.65	−0.25
Average Quinella Payoff ($)	42.13	47.15	−5.02	−0.27
Average Trifecta Payoff ($)	951.51	1157.92	−206.41	−0.31
Average Field Size	11.45	12.00	−0.55	−0.29
Unpredictability Index Average	0.619	0.725	−0.11	−0.26
Win Favourite Success Rate	0.347	0.322	0.025	0.13
Place Favourite Success Rate	0.625	0.596	0.029	0.13

Note: All estimates in the last two columns are significantly different from zero at the 0.1% level.

and bettor payoff variables for this purpose. As the last column of Table 2 reveals, race stakes are strongly negatively correlated with bettor payoffs and positively correlated with favourite success rates (again at the 0.1% level or better).

At the same time, however, both field size and race unpredictability are (i) greater on average in the low-stakes races, and (ii) negatively correlated with race stakes. Thus, although the above results yield the conclusion that betting payoffs are negatively related to race stakes, consistent with the view that bigger financial incentives induce greater effort and better performance from trainers, this relationship could be due to the negative relation between stakes and the two control variables. To disentangle these effects, I employ multivariate regressions that allow me to estimate the relation between race outcomes and stakes while controlling for these other factors.

3 STAKES AND RACE OUTCOMES

I estimate regression models of the general form

$$\begin{aligned} y &= \alpha_0 + \alpha_1(\ln \text{race stake}) + \alpha_2(\text{field size}) \\ &\quad + \alpha_3(\text{unpredictability index}) + \varepsilon \end{aligned} \quad (1)$$

In some specifications, the dependent variable y equals the natural log of one of the three betting payoff variables. In other specifications, y is an indicator variable: either (i) set equal to 1 if the win pool favourite wins and 0 otherwise, or (ii) set equal to 1 if the place pool favourite finishes in the first three and 0 otherwise. The first set of models are estimated by ordinary least squares with White (1980) heteroskedasticity-robust standard errors; the second set of models are estimated using maximum-likelihood logit regression.

I also estimate a version of (1) that incorporates fixed effects for each race track. Some tracks may be configured in such a way (e.g., smaller, with tighter and less contoured bends) that racing luck is more important at those venues, thereby resulting in a greater number of unexpected outcomes and higher average betting payoffs. To the extent that such a phenomenon is more likely to arise on tracks used by small racing clubs that primarily run low-stakes races, the estimated coefficient on race stake will be upwardly biased. To alleviate this problem, I include a dummy variable for each of the 26 tracks on which at least 150 races were held over the sample period.

3.1 Full-sample results

I initially estimate (1) using the full sample of 30426 races and present the results in Tables 3 and 4. Table 3 summarises the results of regressions that use one of the three betting payoff measures as the dependent variable, while Table 4 focuses on favourite success rates.

Table 3 shows that there is a strong negative relation between race stakes and bettor payoffs. On average, a doubling of the race stake is associated with an 8.2% decrease in the win payoff, a 9.9% decrease in the quinella payoff, and a 13.8% decrease in the trifecta payoff. Allowing for fixed-track effects reduces the magnitude of these relationships, but the change is minor (the stake elasticities in the models with fixed effects are approximately 90% of those described above). And regardless of model specification, the estimated relationship is statistically significant at the 0.1% level.

One way of assessing the economic significance of these results is to estimate the predicted dollar impact on bettor payoffs of going from a low-stakes to a high-stakes race, holding all else equal. Specifically, I set the control variables equal to their respective sample means and then allow the race stake to go from its 20th percentile value to its 80th (approximately a 90% rise in stake). As shown in the last row of Table 3, this lowers the predicted win payoff by \$0.35, the quinella payoff by \$1.45, and the trifecta payoff by \$29.05 (approximately 6%, 7% and 10% of their respective sample medians). Allowing for fixed-track effects results in slightly smaller impacts.

As expected, the control variables have a strongly positive impact on bettor payoffs, with all coefficients being significant at the 0.1% level. Reflecting the idiosyncratic nature of bets that rely on the success of a single horse, the explanatory power of the model is greater for the more exotic bets: the R^2 for the trifecta payoff is 0.22, but this falls to 0.07 for the win payoff.

Table 4 shows that there is also a significant positive relation be-

Table 3: Regressions of Betting Payoffs on Race Stakes: Full Sample

	Dependent Variable					
	Win Payoff	Win Payoff	Quinella Payoff	Quinella Payoff	Trifecta Payoff	Trifecta Payoff
Intercept	1.447	1.455	1.872	1.812	3.582	3.506
	(0.08)	(0.09)	(0.10)	(0.12)	(0.13)	(0.15)
Ln Race Stake	−0.082	−0.075	−0.099	−0.090	−0.138	−0.125
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Field Size	0.084	0.083	0.174	0.176	0.283	0.286
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Unpredictability Index	0.064	0.057	0.091	0.099	0.122	0.128
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R^2	0.07	0.07	0.15	0.15	0.22	0.22
Fixed-Track Effects	No	Yes	No	Yes	No	Yes
Quantitative Impact of Higher Race Stake	−\$0.35	−\$0.25	−\$1.45	−\$1.35	−\$29.05	−\$26.40

Notes: Heteroskedasticity-adjusted standard errors are in parentheses; all coefficient estimates are significantly different from zero at the 0.1% level. The final row calculates the predicted impact on betting payoffs of going from the 20th stake percentile to the 80th.

tween race stake and the probability of favoured-horse success: the win pool favourite has an approximately 5.5% greater chance of succeeding in a race in the 80th stake percentile than in a race in the 20th stake percentile; for the place pool favourite, the corresponding margin is approximately 2.5%. Again, these estimated relationships are statistically significant at the 0.1% level, with and without track fixed effects.

One possible concern with these results is that race stake is simply acting as a proxy for race prestige. That is, any differential effort on the part of trainers is motivated not by financial incentives but instead by the desire to achieve the fame and peer recognition associated with training the winner of a major race. Like most developed racing industries, NZ harness racing awards 'Group' status to its feature races, with Group 1 being the most important. Thus, to check the robustness of the stake effect, I create a dummy variable set equal to 1 if and only if the race is a Group 1 event and include this both directly and as an interaction with the stake variable in the above models. Because of the similarity of these results to those appearing in Tables 3 and 4, I do not provide them in tabulated form. In summary, although Group 1 races do tend to be more predictable, this effect is insignificant at conventional levels. Moreover, controlling for high-prestige races has essentially no effect on the other coefficients, including, most importantly, those for the race stake variable.

Table 4: Regressions of Betting-Favourite Success Rates on Race Stakes: Full Sample

	Dependent Variable			
	Win Favourite Success	Win Favourite Success	Place Favourite Success	Place Favourite Success
Intercept	−0.806 (0.20)	−0.905 (0.22)	1.038 (0.20)	1.100 (0.22))
Ln Race Stake	0.131 (0.02)	0.119 (0.02)	0.100 (0.02)	0.090 (0.02)
Field Size	−0.080 (0.01)	−0.077 (0.01)	−0.116 (0.01)	−0.117 (0.01)
Unpredictability Index	−0.132 (0.02)	−0.100 (0.02)	−0.137 (0.02)	−0.140 (0.02)
PseudoR^2	0.01	0.01	0.02	0.02
Fixed-Track Effects	No	Yes	No	Yes
Quantitative Impact of Higher Race Stake	5.80%	5.31%	2.55%	2.30%

Notes: Heteroskedasticity-adjusted standard errors are in parentheses; all coefficient estimates are significantly different from zero at the 0.1% level. The final row calculates the predicted impact on the probability of the favourite succeeding of going from the 20th stake percentile to the 80th.

3.2 Do high-stakes races induce more effort from trainers, or do they just provide more information for bettors?

The results in Tables 3 and 4 are consistent with the view that financial incentives matter for experts such as horse trainers: a low race stake induces more trainers to exert less-than-full effort in preparing their horses, thereby making the information possessed by bettors less useful in handicapping the race, and hence, all else equal, making it less likely that bettor-favoured horses will succeed. However, there is an obvious alternative explanation for the results: a race with a low stake may be one in which bettors have less information about the abilities of the horses involved, and hence they are less able to handicap such a race. According to this view, races with the lowest stakes are those in which bettors are least informed, so any relation between race stakes and the success of bettor-favoured horses may simply reflect this information effect, and have nothing to do with trainer responses to financial incentives.

Bettors may have more and better information in high-stakes races for at least two reasons. First, such races are typically restricted to more experienced horses (since qualification requires some minimum level of prior performance) who have a longer racing history and hence offer more information about their abilities to bettors. Second, racing media coverage is often greater for higher-stakes races, particularly when these are held in major population centres.

I attempt to control for bettor information effects by re-estimating equation (1) using sub-samples that increasingly eliminate low-information races. First, all races that were restricted to, or were primarily designed for, horses that had previously won no more than one race are excluded from the sample. This reduces the sample to 8133 races. Second, all races that were restricted to two year old horses and those that were held outside the two principal race tracks in Auckland and Christchurch are also excluded.[9] This results in a total of 3368 races. In this way, I restrict the sample to just those races involving experienced horses at meetings receiving the most extensive media coverage. Variation in the amount of information available to bettors should be minor in these races.

Tables 5 and 6 contain the results from estimating (1) using these sub-samples. If anything, the relationship between race stake and realised bettor payoffs (Table 5) is even stronger than in the full sample: for example, a doubling of the race stake is now associated with a 19% decrease in the trifecta payoff, compared with 14% in the full sample.[10] The relation between race stakes and bettor-favourite success (Table 6) is similarly affected: the estimated coefficients are all 50-100% greater than in the full-sample results of Table 4. And although the standard errors are also larger, all coefficient estimates for the stake variable remain significant at the 0.1% level. Thus, it seems unlikely that my earlier results are due to unobserved differences in the information available to bettors.

The results in Tables 5 and 6 also provide some reassurance about a potential endogoneity problem. Suppose there are actually two types of trainer: those who rarely exert less-than-full effort ("good"), and those who often do so ("bad"). If, as seems plausible, the former are also higher-quality trainers on average (i.e., have the greatest skills, knowledge etc), then they are most likely to be entrusted with clients' best horses, which subsequently race primarily in high-stakes races. In this case, the results in Tables 3 and 4 could simply indicate that low- and high-stakes races are dominated by different trainer types, not that individual trainers respond to the financial incentives offered by different stakes. However, restricting the sample to races

[9]Since these two tracks are all-weather – and hence not grass – the maximum value of the Unpredictability Index in this analysis is 2.

[10]One possible reason for this is that the excluded races are likely to have lower betting turnover on average. As a result, betting by informed insiders is a greater proportion of the betting pool, thus weakening the relationship between race stake and the propensity for surprise outcomes. Another possibility is that such races are dominated by trainers who specialise in - and exert maximum effort in - low-stakes races.

Table 5: Regressions of Betting Payoffs on Race Stakes: Sub-samples

	Sub-sample A ($n = 8132$)			Sub-sample B ($n = 3368$)		
	Dependent Variable					
	Win Payoff	Quinella Payoff	Trifecta Payoff	Win Payoff	Quinella Payoff	Trifecta Payoff
Intercept	1.576	2.144	3.820	1.721	2.032	3.948
	(0.14)	(0.18)	(0.23)	(0.21)	(0.27)	(0.32)
Ln Race Stake	−0.107	−0.141	−0.191	−0.118	−0.122	−0.192
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Field Size	0.095	0.188	0.311	0.091	0.181	0.301
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Unpredictability Index	0.078	0.113	0.140	*0.068*	0.154	0.159
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
R^2	0.09	0.18	0.28	0.07	0.15	0.24

Notes: Sub-sample A excludes all races restricted to horses that have previously won no more than one race; sub-sample B also excludes all races for two year-old horses and all races conducted outside the two major metropolitan tracks located in Auckland and Christchurch. Heteroskedasticity-adjusted standard errors are in parentheses; all coefficient estimates are significantly different from zero at the 0.1% level.

Table 6: Regressions of Betting-Favourite Success Rates on Race Stakes: Sub-samples

	Sub-sample A ($n = 8132$)		Sub-sample B ($n = 3368$)	
	Dependent Variable			
	Win Favourite Success	Win Favourite Success	Place Favourite Success	Place Favourite Success
Intercept	−1.086	*0.389*	*-1.225*	*-0.143*
	(0.35)	(0.36)	(0.50)	(0.52)
Ln Race Stake	0.183	0.185	0.168	0.216
	(0.04)	(0.04)	(0.05)	(0.06)
Field Size	−0.100	−0.129	−0.078	−0.106
	(0.01)	(0.01)	(0.02)	(0.02)
Unpredictability Index	−0.150	−0.175	*-0.086*	−0.237
	(0.04)	(0.04)	(0.06)	(0.06)
PseudoR^2	0.02	0.02	0.01	0.02

Note: See Table 5.

involving experienced horses at major tracks eliminates most "bad" trainer entries, since the low-quality horses prepared by these trainers will not be eligible to appear in such races. If there is something to the trainer-type story, then the results from such a restricted sample should be considerably different to those generated by the full sample. The absence of any such difference suggests that trainer-type effects are unlikely to be driving the relationship between race stake and the propensity for surprise outcomes.

4 STAKES AND RACE ODDS

The results of section 3 are what one would expect to find if trainer effort, and hence the quality of performance, responds to variation in stake levels. However, other explanations may also be possible, so additional evidence is desirable. One possible source of such evidence is the setting of odds by bettors.

Suppose that trainers do indeed provide better quality services to clients whose horses race in high-stakes races that offer greater potential trainer remuneration. Then, as discussed in previous sections, the propensity for "unexpected" outcomes should be greater in low-stakes races because such races are more strongly associated with variation in trainer effort that is unobservable to bettors. But rational bettors will be aware of this problem, and hence adjust their odds accordingly. In particular, the risk of observed differences in horse ability being offset by unobserved differences in trainer effort should cause bettors in low-stakes races to be relatively wary of favourites and to "keep safe" longshots. That is, although a horse in a low-stakes race may look clearly superior to its rivals, bettors will keep in mind the possibility that the trainer may be exerting less-than-full effort in this particular race and hence allow the horse to start at more generous odds than they otherwise would. Similarly, a horse that, on past performance, looks clearly inferior may nevertheless attract relatively strong bettor interest because bettors cannot discount the possibility that the trainer has prepared the horse more carefully for this race than for its predecessors. By contrast, in high-stakes races where all trainers are likely to exert maximum effort, these risks are less of an issue for bettors, who can thus be more certain in their odds setting.

This suggests an additional test of the proposition that trainers respond to the financial incentives associated with variation in race stakes: if the quality of trainer service increases with race stake, then the dispersion of race odds should be higher in high-stakes races than in low-stakes races. In low-stakes races, the risk of a surprise outcome due to unobservable variation in trainer effort results in "even" betting where many horses offer relatively similar odds. By contrast, the greater certainty of high-stakes races encourages bettors to set odds that better reflect the range of horse abilities.

Investigation of this idea requires odds data for every horse (or combination of horses) in the betting pools run on each race, information which is not recorded in the Harness Racing New Zealand database. However, a private, hand-collected, dataset covering 4416 races held between December

Table 7: Summary Statistics for Measures of Odds Dispersion

Variable	Mean (Standard Deviation)	Min	Median	Max
Volatility ($)	24.26 (10.19)	3.63	23.25	79.45
Range ($)	76.36 (33.30)	10.05	72.35	232.25
Proportion of Races with Strong Favourite	0.193			

2004 and November 2006 is available for this purpose.[11] For each race, this dataset contains the final win pool odds of every horse who competed in that race.[12]

Utilising these data, I calculate three measures of odds dispersion. First, the standard deviation of odds. Second, the difference between the highest odds and the lowest odds.[13] Third, a binary variable set equal to 1 if there is a "strong favourite" in the race (i.e., a horse offering even odds or less) and 0 otherwise.

As Table 7 shows, approximately 19% of races have a strong favourite, while the average race has an odds standard deviation of $24.30 and an odds range of $76.40. However, there is considerable variation around these average values. To investigate whether this variation is related to differences in race stake, I again use multiple regressions that include the field size and unpredictability index control variables (since a large number of competitors increases the potential range of odds on offer while high unpredictability makes it more likely that betting will be evenly spread) and report the results in Table 8.

As would be expected if higher stakes motivate uniformly higher effort amongst trainers, bettors set more dispersed odds in high-stakes races. On average, a 10% higher stake leads to a 10.3 point rise in the standard deviation of race odds, a 28 point increase in the odds range, and a 6.6% increase in the likelihood of there being a strong favourite, all of which are statistically significant at the 1% level.

Although these results are consistent with bettors recognising the greater risk of less-than-full trainer effort in low-stakes races, there is another possible interpretation: that high-stakes races primarily contain experienced horses whose abilities have been more fully revealed to bettors, thereby providing

[11] I am grateful to Phil O'Connor for providing me with these data.

[12] Horse odds are equal to the promised payoff minus one, e.g., a horse offering a $50 payoff for a $1 bet is at odds of $49-to-1.

[13] For example, if the favourite horse in a race is at odds of 2-to-1 while the rank outsider is offering 100-to-1, then the odds range is 98.

Table 8: Regressions of Betting Odds on Race Stakes

	Dependent Variable					
	Volatility	Volatility	Range	Range	Strong Favourite	Strong Favourite
Intercept	−7.918 (2.64)	−11.148 (3.65)	−38.319 (8.25)	−47.896 (9.84)	−1.813 (0.58)	*−1.232* (0.77)
Ln Race Stake	1.030 (0.28)		2.802 (0.87)		0.424 (0.06)	
Ln Race Stake – High Experience		1.375 (0.39)		3.824 (1.21)		0.362 (0.08)
Ln Race Stake – Low Experience		1.444 (0.42)		4.031 (1.32)		0.347 (0.09)
Field Size	2.070 (0.06)	2.054 (0.06)	7.930 (0.19)	7.882 (0.19)	−0.269 (0.02)	−0.265 (0.02)
Unpredictability Index	−2.881 (0.20)	−2.865 (0.20)	−8.426 (0.64)	−8.378 (0.64)	−0.638 (0.07)	−0.641 (0.07)
R^2	0.19	0.19	0.25	0.25	$0.09^{\dagger}$	$0.09^{\dagger}$

Notes: Heteroskedasticity-adjusted standard errors are in parentheses; all coefficient estimates except those in italics are significantly different from zero at the 1% level. † denotes a Pseudo–R^2

the latter with greater confidence about their ability to assess the field. In low-stakes races by contrast, the true ability of the majority of horses is more uncertain, so bettors are more cautious about letting any horse pay too little or too much. To check that this is not driving the results, I designate each race in the sample as catering either for experienced horses or for inexperienced horses and then repeat the above regression models estimating separate stake coefficients for each group.[14] The results of these specifications also appear in Table 8 and reveal that the estimated coefficients for Ln Race Stake are essentially the same regardless of the experience levels of horses in a race. Stronger priors about variation in horse ability do not seem to be the source of the relationship between odds dispersion and race stake.

5 CONCLUDING REMARKS

On the one hand, experts can be expected to advance their own financial interests by, for example, favouring their most profitable clients. On the other hand, experts are more likely than other workers to be subject to professional pride considerations that motivate them to treat all clients equally. However, very little is known about the way in which experts respond to these

[14]The results appearing in Table 8 are based on the criterion used to generate subsample A of Section 3.2. Adopting the more restrictive sub-sample B criteria yields similar findings.

competing incentives. In this paper, I show that even though the potential financial gain is relatively small, racehorse trainers appear to favour clients whose horses compete in higher-stakes races: such races are characterised by lower average returns to successful bettors, and higher favourite-success rates, than are low-stakes races, consistent with more trainers exerting full effort in the former than in the latter. Moreover, odds dispersion is greater in high-stakes races, consistent with rational bettors recognising the incentives faced by trainers and incorporating this insight in race odds.

A likely objection to this conclusion is that low-stakes races simply offer less information to bettors, which leads directly to less predictable outcomes regardless of any trainer incentive effects. Against this, I offer a crucial piece of counter-evidence: eliminating races that involve only the most inexperienced horses leaves the above results unaffected. Nevertheless, information effects may vary with race stake in a manner not captured by this process, so some caution is advisable.

One possible implication of these results is that the agency conflict between owners and trainers is at least partly resolved by higher trainer returns to performance – above some critical stake level, the expected payoff to the trainer outweighs the potential gains from effort-diverting activities. Nor is it necessarily replaced by a more severe conflict between trainers and the owners of horses that race for low stakes: such clients may, at least in some cases, be willing to tolerate a lower level of service today in the expectation that they will be favoured when and if they come to own a horse that races for high stakes.

Finally, the results of this paper may also have implications for the literature on the efficiency of horse race betting markets. In a study of United Kingdom thoroughbred racing, Vaughan Williams and Paton (1997) find little evidence of betting inefficiency in high-quality races – which presumably offer relatively high stakes – but stronger evidence in other races. Similarly, Weisbach and Paul (2008) report that the favourite-longshot bias is a feature of United States greyhound races for maiden dogs, but not otherwise. Both sets of authors argue that these differences may be due to the provision of greater information and media coverage in higher-quality races, but my results suggest another possibility: that higher-quality races are less susceptible to bettor error caused by unobservable variation in trainer effort.

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