

**Determinants of Simulcast Wagering:
The Demand for Harness and Thoroughbred Horse Races**

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The Thoroughbred horse racing industry has a long history in the United States. Since about 1875, betting on horse races has been conducted in the U.S. using a pari-mutuel system. Since its beginning, when, where and how pari-mutuel betting takes place has changed and expanded.

Technology plays an important role in changing the services Thoroughbred racetracks provide. Telephones, televisions, and computers allow the Thoroughbred racing industry to differentiate its product. Off-track betting (OTB) facilities allow bettors to consume racetrack services away from racetracks. Cable TV technology provides the opportunity to consume the same service OTB facilities provide at home. And telephones and the Internet have opened up opportunities for betting away from racetracks. Technological advances allow racetracks to separate the consumption and betting attributes of their service.

This study estimates the demand for simulcast betting services provided by a Thoroughbred racetrack. Simulcast bettors can go to a remote location to view and place bets on races. Simulcast bettors purchase the betting services of the track (just as live and account bettors do) as well as some, but not all, of the consumption benefits of viewing a live race.

The Literature

There is an extensive literature on pari-mutuel wagering on horse races. In a 1998 article in the *Journal of Economic Literature*, Sauer (1998) summarizes the literature on "The Economics of Wagering Markets." He found that "prices set in these markets, to a first approximation, are efficient forecasts of outcomes. Second, price changes in these markets are driven by an informed class of bettors and improve prediction." However, he concludes that studies have found departures from market efficiency due to diverse information, heterogeneous agents, and transaction costs.

Pari-mutuel horse racing is often used to study the efficiency of betting markets and the behavior of individual bettors. An edited volume by Hausch, Lo, and Ziemba (1994) includes 61 papers addressing the efficiency of betting markets. The papers look at psychological aspects of betting behavior (such as the "gambler's fallacy"), the characteristics of the racetrack bettor's utility function, and optimal handicapping and wagering systems. Papers on the efficiency of win and exotic wagering markets and the favorite-longshot bias are also included in the volume.

Swidler and Shaw (1995) studied market efficiency with "uninformed bettors" and found that the fast, repetitive feedback in horse racing facilitates learning and leads to an efficient win pool.

Chezum and Wimmer (2000) look at betting behavior with regard to "homebred" horses (horses owned and raced by their breeder). They determined that homebred horses are favored by bettors, since breeders are expected to keep their best horses for racing.

Studies of bettor behavior and betting market efficiency focus on race odds and betting pools. These studies do not include analyses of bettor behavior with regard to the size of the handle bet on individual races.

There have also been a number of studies of the demand and elasticity of demand for pari-mutuel horse racing. Thalheimer and Ali have studied the demand for racing focusing on telephone wagering (1992), intertrack wagering (1995), exotic betting opportunities (1995), transportation costs (1997), and video gaming (1998). They consider the demand for alternative racing products and find that intertrack wagering, telephone betting, and exotic wagering opportunities increase track handles. They find that track handle is sensitive to transportation (i.e. opportunity) costs and that the introduction of video gaming opportunities at a track decreases track racing handles.

Ray (1991) conducted a cross-sectional analysis of annual state horse racing handles and found that higher purses significantly affected state handle while substitute forms of gambling (dog racing and lotteries) decreased handles.

DeGennaro (1989) considered the effect of breeder subsidies on the demand for wagering and found little or no economic impact on the volume of wagering. Pescatrice (1980) and Morgan and Vasche (1982) studied "The Inelastic Demand for Wagering" at horse tracks. However, all of the studies of pari-mutuel horse racing demand to date have looked at *daily* track handles. There have been no studies that use race-by-race data to consider the attributes of individual races as they affect demand (handle).

The literature includes studies of a number of computer-based wagering systems and wagering experiments. Hausch, Lo, and Ziembe (1994) report on a variety of computer-based horse race handicapping and wagering systems. Wagering systems use a

variety of race and horse specific criteria for selecting bets. Pescatrice (1985) and Piron and Smith (1995) use experimental racetracks to study wagering and test efficiency hypotheses such as the favorite-longshot hypothesis.

Finally, Ray studies the demand for both live and account wagering for a Thoroughbred (2001) and a harness track (2002). She estimates separate models for live and account wagering in order to separate the demand for wagering from the demand for the consumption benefits of live racing. She also identifies differences between those betting on Thoroughbred races and those betting on harness races.

Background

Advances in technology have a dramatic impact on the pari-mutuel racing industry. Before telephones, televisions, and computers, bettors attended races and placed bets at a track. Live racing was the only option. Today, races are simulcast to different tracks and OTB facilities. Cable TV carries races into people's homes. And bets can be placed via the telephone or computer. Bettors can bet on races held all over the world and place their bets from any telephone or via the Internet.

Account betting systems separate the consumption benefits from attending a racetrack (the sights, sounds, excitement, social interaction, concessions, etc.) from the betting service. They serve consumers who are interested only in the gambling component of pari-mutuel horse racing. Therefore the demand for account betting services is somewhat different from the demand for live racing services since the bettors and their demand differ. Simulcast betting is similar to both live and account betting. As with live betting, bettors view races from a remote location, usually another track (horse or greyhound) or an off track betting facility. Bettors thus receive some of the

consumption (i.e. social) benefits from seeing the race happen live with a crowd.

However they are not present at the actual race. As with account betting, bettors can place bets on a race without attending the track at which the race is held. They have a variety of simulcast races from which to select.

Bettors will place a bet when the expected benefit of the bet exceeds the cost of placing the bet. The expected benefit of a bet is determined by the utility derived from betting, the probability of winning the bet, and its payoff. The cost of placing a bet includes the opportunity cost of gathering and analyzing information and placing the bet either at a track or through an account. Since live bettors also receive consumption benefits from attending races, they may place a bet with a lower expected return than an account bettor would require before placing the same bet. That is, for a live bettor, part of the total return from placing a bet comes in the form of consumption benefits. Live bettors receive benefits in addition to the payoff from a bet, from watching a race and cheering for "their" horse. Because account bettors and live bettors receive different benefits from placing bets, there will be differences in their choice of races to bet on (handicapping methods) and betting behavior. Simulcast bettors are expected to have some of the characteristics of live bettors and some of the characteristics of account bettors.

Handicapping is the attempt to predict the winner of a race on the basis of past performance, breeding, track conditions, etc. Bettors use many different types of information to select a horse on which to bet. Some bettors use very simple systems and others have very complicated methods for picking winners. The more complicated the system for selecting a bet, the higher will be the opportunity cost of a bet. Bettors

interested only in the gambling aspect of betting on a horse race will be willing to spend more time handicapping to increase the probability of winning a bet with a higher payoff.

Taking a lot of time to handicap races can decrease consumption benefits for a live bettor. When bettors receive consumption benefits, the expected payoff from a bet need not be as high. The opportunity cost of handicapping is lower when bettors place random bets, select bets from available "tip sheets", use simple handicapping systems and when information is more readily available. Bettors can bet on races that are easier to handicap to reduce their opportunity cost.

Race type is important because bettors feel more capable of handicapping races with certain characteristics. According to *The Complete Idiots Guide to Betting on Horses*, (Smith, 1998) Rule #1 of the Golden Rules of Racetrack Betting is "Don't bet every race." The Guide suggests *spot play*, that is, bet on races that fit certain characteristics and increase your confidence in handicapping the race. The need for bettors to select specific race characteristics for handicapping races is shown in the variety of wagering and handicapping systems. (Hausch, Lo, and Ziembe, 1994)

Thoroughbred races are held at various distances and on different surfaces. Thoroughbreds generally race between 6 furlongs (one furlong equals one eighth of a mile) and one and a half miles. A race under 1 mile is called a sprint. A race 1 mile or longer is called a route. Fewer races are routes, but they include some of the most prestigious races (e.g. the Triple Crown races). There are fewer horses bred for long distance races and therefore limited handicapping information for them.

Thoroughbreds race on either dirt or turf (grass) tracks. In the United States, turf races make up a small fraction of races. Most races are held on turf tracks in other

countries. Grass races "make up a disproportionate number of important stakes races...and you'll find very few races for sprinters or two-year-olds. American turf racing is mostly for mature, proven horses at middle distances or longer." (Smith, 1998, p. 146)

Races are often segregated by age, sex, and/or quality of horses. Age segregation is important at both ends of the spectrum. Two-year-old horses "can be erratic, physically and mentally" while older horses (6 years on) "should be worshipped as well as bet on." (Smith, 1998, p. 66)

Segregating races based on sex is important for predicting the outcome of races. Handicapping female horses can be difficult for biological reasons. Female horses can run or trot as fast as males, but their performance can be more difficult to predict. Hormones cause female horses to be less consistent than males. Also, wider hips make females more competitive with males running at shorter. (Smith, 1998) For Thoroughbred's, mixed sex races are much less common than races segregated by sex.

The quality of horses in a race is important to bettors. Bettors are more likely to bet on premium races, like Triple Crown or Breeder's Cup. A race's purse is an indication of the ability of the horses running in the race and therefore also determines bettor's interest in the race and ability to handicap the race (due to increased information about the horses).

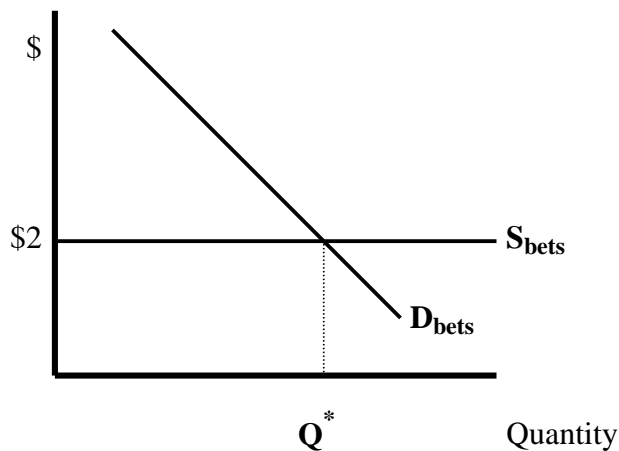
A variety of other, non race-specific, information is also used by bettors for handicapping. For example, there is a variety of horse-specific information that can lead a bettor to bet on a race. Horse-specific information affecting handicapping includes breeding, workout times, past performance information, medications or equipment, and a

horse's trainer or jockey. Chezum and Wimmer (2000) found that "homebred" horses are favored by bettors. Superstition, intuition, and "tips" (e.g. from trainers and jockeys) can also affect bettors' handicapping decisions. Bettors' handicapping of a race is encompassed in their bet selections and reflected in the odds on the horses in a race.

Many studies have found that betting markets are efficient and bettors, as a group, are generally able to handicap races well. However, some research has established a betting pattern, known as the Asch-Quandt betting hypothesis or the favorite-longshot phenomenon, found at most racetracks.

The Theoretical Model

For pari-mutuel racetracks, the quantity of bets demanded is measured by handle. Race handle is the total amount of money bet on a race. Since the payoff from a bet is reported for \$2 bets, handle/2 is the quantity of \$2 bets. The track can supply any number of \$2 bets, so the supply of bets is perfectly elastic and the level of demand determines the quantity of bets, as shown in the graph below.



The demand for a \$2 bet at a track is determined by the expected rate of return on the bet and by bettor tastes and preferences. The expected rate of return on a bet is influenced by the takeout rate (the combined profit of the track and the state that is deducted from the betting pool before its distribution to winners), the bettor's opportunity cost, the race odds, and the bettor's expectations about the performance of horses in a race.

Bettor expectations are based on a bettor's information and intuition about a race. In other words, bettors handicap races. Tastes and preferences are the factors that cause a bettor to prefer one type of horse, bet or race. For example, a bettor may prefer show bets (betting a horse will finish in the top three) to win bets (betting a horse will finish first) or races restricted to horses of a certain age or sex. Tastes and preferences also determine which type of betting service a bettor will use to place a bet, in this study the two types of services considered are live and account betting.

The demand for bets on a particular race (the handle for the race) is a function of the expected return to a bet and can be determined as follows:

$$\text{Handle} = f(\text{expected payoff, opportunity cost, race type, bet type})$$

The expected payoff of a bet is determined by race odds and the number of horses in the race. The number of starters in a race influences the expected payoff. Since favorites win about 30% of the and generally finish second or third if they don't win, the expected return on a show bet becomes low with a small field. While the probability of winning is high, after the takeout even a winning bet may not pay off. Takeout (the

percent of the handle that goes to the track and the state) will also influence the return to a bet, however the takeout rate at a track is the same across all races.

The return to a bet is also influenced by the opportunity cost of betting. Thalheimer and Ali (1997) showed that the demand for wagering is sensitive to the time it takes to travel to a track. Handicapping also takes time. Therefore, alternative uses for time will influence a bettor's decision to bet on a race. When and where betting takes place will affect bettors' opportunity costs. While at a track, the marginal cost of betting an additional race is relatively low, while the marginal benefit of betting an additional race includes consumption benefits.

Since live bettors are also receiving consumption benefits from their betting activities, and handicapping takes time away from non-betting activities, live bettors are expected to spend less time handicapping races and may rely more heavily on proxies, like race characteristics to determine their optimal bet.

Finally, the type of bets that can be placed on a race will affect the handle. The more different bets available, the more betting will take place, *ceteris paribus*, as bettors can choose from differentiated betting products. (Thalheimer and Ali, 1995)

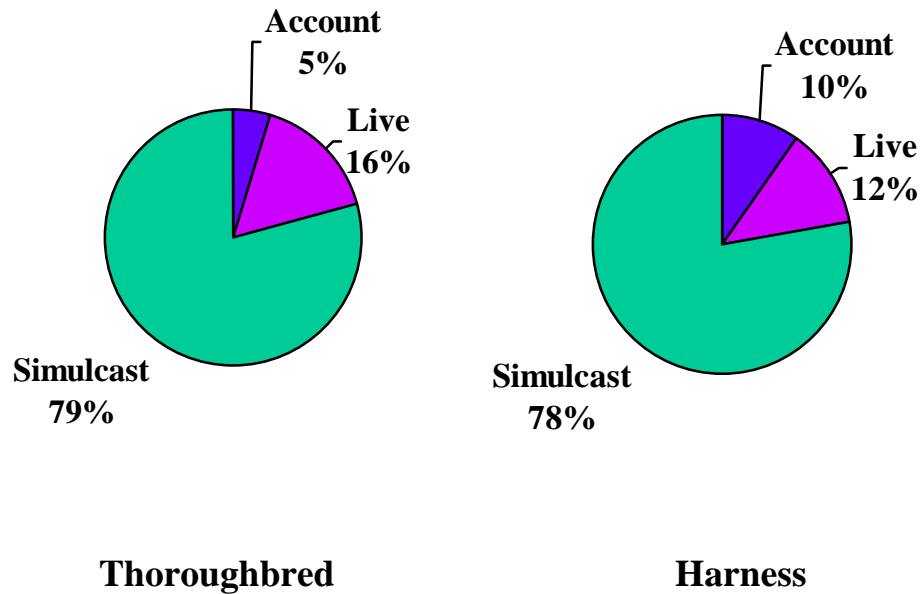
The Data

This study looks at the demand for bets on races simulcast from an individual Thoroughbred and an individual harness track, both in the United States. It is unique in that it uses race-by-race data to look at the demand for simulcast wagering. The data set contains information on 195 Thoroughbred races and 283 harness races held during July 2000. Simulcast handle data is proprietary information provided by the racetrack.

Simulcast handle makes up almost 80% of the total handle at both tracks (see Figure 1).

Other information about the races is from the United States Jockey Club, the organization that oversees Thoroughbred racing in the United States and the United States Trotting Association, the organization that oversees harness racing in the United States. Variables, like takeout rate, income, and population, that do not vary at a single track, during a single month are not included in this study. In addition, the temperature

Figure 1: Sources of Race Handle



during race times over the month studied did not vary significantly from a comfortable range around 70 degrees and therefore temperature is not included in this model. Studies of multiple tracks or over a longer time period would need to account for changes in other determinants of demand.

The Empirical Model

The simulcast demand function estimated is given below.

T-bred Handle = f (Index, #Starters, Holiday, Weekend, EarlyRace, LateRace, TrCond, Surf, Dist, FeRest, 2YO, Purse, DDouble, Super, Pick3, #buyers)

Harness Handle = f (Index, #Starters, Holiday, Weekend, EarlyRace, LateRace, Claiming, TrCond, Gait, FastClass, FeRest, 2YO, Purse, Stakes, Super, #buyers)

The definition of variables and expected signs are included in Table 1.

Table 1
Definition of Variables

Index (?)	Competition Index (see discussion in text)
#Starters (+)	Number of horses starting in the race
Holiday (+)	= 1 if 4 th of July, 0 otherwise
Weekend (+)	= 1 if Saturday or Sunday, 0 otherwise
EarlyRace (-)	= 1 for race 1- of the night, 0 otherwise
LateRace (-)	= 1 for races x and later, 0 otherwise
TrCond (+)	= 1 if dry track, = 0 if wet track
FillyRest (+)	= 1 if the race is restricted to fillies, 0 otherwise
2YO (-)	= 1 if the race is restricted to 2 year olds, = 0 otherwise
Purse (+)	The dollar value of the purse offered for the winners of the race
Super(+)	=1 if there is superfecta betting on a race, 0 otherwise
# Buyers	The number of sites that purchase the simulcast signal of the race

Thoroughbred Only Variables

Surface (+)	= 1 if the race is on turf, 0 otherwise
Dist (-)	= 1 if the race is a sprint, 0 otherwise
Ddouble	=1 if there is daily double betting included in the race handle, 0 otherwise
Pick3 (+)	=1 if there is Pick 3 betting on the race, 0 otherwise

Harness Only Variables

Gait (-)	= 1 if the race is for pacers, = 0 if the race is for trotters
FastClass (+)	= 1 if the race is invitational, preferred, or open, 0 otherwise
Stakes (+)	=1 if the race is a stakes race, 0 otherwise
Claiming (?)	=1 if the race is a claiming race, 0 otherwise

The competitiveness index and number of starters are included to measure the expected payoff of a bet. Characteristics of individual horses in a race and other factors (like bettor intuition and handicapping tips) are encompassed in the race odds. The competitiveness index is a measure of the spread of odds in a race. If bettors prefer more dispersed odds they will bet on races with horses with very high/very low odds, that is, a race with a strong favorite. If they prefer to bet on a race where the expected winner of the race is unclear, they will bet races with more concentrated odds. Details of the construction of the index are included in Appendix A.

Holiday (in this case, the 4th of July) and Weekend are included to measure the opportunity cost of betting, particularly the time it takes to attend live races. People have a lower opportunity cost of spending time at a track on holidays and weekends, since more people work during the week. Weather conditions, including temperature and precipitation will also affect the return to a bet for someone who gets consumption benefits from attending live races. If the weather is too hot or too cold or it is raining or snowing, utility from going to the track and placing live bets will be diminished. The TrCond variable measures track conditions (dry track or wet track) and is a proxy for weather conditions as well as race conditions. Live racing will be more appealing during good weather. The temperature during racing at this track in July 2000 did not vary significantly, so a temperature variable is not included.

EarlyRace and LateRace are included to account for the length of time it takes to run 9- 10 races each night. Individuals may come late to the track or they may leave early, but during the interim, their marginal opportunity cost of betting an additional race is low, while an additional bet brings additional consumption benefits. If you are at a

track to enjoy the races and betting on races brings added utility, why not bet each race? Therefore, the middle races of a race card should experience higher handles, *ceteris paribus*. Opportunity costs may be different for the first or last races of the night, if individuals must get to the track after work or are unwilling or unable to stay as late as the last races. However, Ali (1977) found that the last race of the day "offers a chance for losing bettors to 'get out'; i.e. to recoup their losses with a final wager." This may lead to a greater handle in later races from those bettors concerned with the gambling, rather than the consumption benefit from betting on races.

The track conditions for a race may also affect betting because of influences on handicapping. Different horses are affected differently by a wet racetrack, and these differences make handicapping more difficult.

Race characteristics can be used to provide information for handicapping. FillyRest is included to account for whether or not a race is for female horses. Handicappers must weigh the influence of the tendency of females to exhibit more erratic performance.

The age conditions of a race are measured by the 2YO variable. Races for two year-olds should be less appealing to bettors, *ceteris paribus*. Finally, the purse for a race will help to determine the quality of the horses racing. Higher purses lead to higher quality entries.

All racetracks allow win, place, show betting on all races. That is, betting that a horse will finish first, in the top two, or in the top three. In addition, there are a variety of "exotic" bets that can be placed on a race. "Exotic wagers have two things in common. They're difficult to figure out and they can pay extremely well when you do manage to

figure them correctly." (Smith, 1998, p. 199). At the Thoroughbred track, daily double, Pick 3, and superfecta, wagers are available on some races but not on others. A daily double wager requires selecting the winning horse in two consecutive races. A pick 3 wager requires selecting the winning horse in three consecutive races. A superfecta wager requires selecting the top four finishers in a race and a trifacta wager requires selecting the top three finishers in a race. At the harness track, superfecta betting was the only type not available on all races. The opportunity for additional types of betting should increase the handle on a race, *ceteris paribus*.

For Thoroughbred's, the Surf variable controls for the surface on which a race is run. If bettors prefer betting on races run on grass, the Surf variable will be positive. The Dist variable is a dummy variable for whether or not the race is a sprint race (7 furlongs or less). The sign on the Dist variable will indicate whether bettors prefer to bet on sprints or longer races (middle distance races or infrequent routes).

Race characteristics can be used to provide information for handicapping. When the data is for a harness track, the model controls for the two different gaits used in harness races. A harness race is held for either trotters or pacers. The handle for a race will vary depending on gait if bettors have a preference for betting on one or the other. There are generally more pacing races than trotting races at a harness track. Thus bettors have more experience betting pacers and handicapping pacing races entail a lower cost.

The FastTrack variable identifies races for successful, older harness horses (invitational, preferred, or open races are denoted as "FastClass"). These races should be more appealing for fans and/or bettors. Finally, stakes and claiming races help to

determine the quality of the horses racing. Stakes races may include higher quality entries and claiming races feature horses estimated to have the same value.

The means and standard deviations of the variables are reported in Table 2.

Table 2
Descriptive Statistics

<u>Dependent Variable</u>	<u>Mean</u>	<u>Standard Deviation</u>
Harness Handle	94826	49201
Thoroughbred Handle	27020	7991
<u>Thoroughbred Independent Variables</u>		
Index	.321	.092
#Starters	7.88	1.83
Holiday	.051	.221
Weekend	.487	.501
Earlyrace	.308	.463
LateRace	.282	.451
Surface	.200	.401
Dist	.431	.496
TrCond	.882	.323
FeRest	.446	.498
2YrOld	.036	.187
Purse	15507	16610
DD	.297	.458
Pick3	.103	.304
Superfecta	.097	.297
<u>Harness Independent Variables</u>		
Index	.	
#Starters	8.11	.954
Holiday	.053	.225
Weekend	.475	.500
Earlyrace	.284	.452
LateRace	.291	.455
TrCond	.848	.360
Gait	.362	.481
FillyRest	.220	.415
2YrOld	.131	.338

Purse	6403	7212
Stakes	.071	.257
FastClass	.078	.269
Claiming	.418	.494
Superfecta	.223	.417
#Buyers	24.5	1.5

The Results

The regression results for thoroughbred races are given in Table 3. Harness race results are given in Table 4, below. The F-statistics for both regressions show that the equations are significant. The R^2 indicates both equations have good explanatory power, especially for cross-sectional data of this type. The R^2 value is higher for the Thoroughbred equation.

Table 3
Thoroughbred Handle Equation

Variable	Coefficient	t-Statistic
Constant	-540667	1.76*
Index	-18817	-0.62
#Starters	6081	3.81***
Holiday	-6027	-0.46***
Weekend	-3882	-0.39
EarlyRace	-29530	-5.14***
LateRace	-27405	-3.76***
Surface	21534	3.27***
Dist	-1214	-0.26
TrCond	15843	2.24**
FillyRest	-12753	-2.74***
2YrOld	-2319	-0.16
Purse	0.58	3.73***
DD	2927	0.56
Pick3	-7368	-0.85
Superfecta	13103	1.40 ⁺
#Buyers	3712	6.03***

F-Statistic	19.65 ^{***}
R ²	.64
N	195

^{***} Significant at the .01 level

^{**} Significant at the .05 level

^{*} Significant at the .10 level

⁺ Significant at the .10 level, 1-tailed test

For the Thoroughbred equation, all of the variables have the expected sign and ten of the variables are significant.

Simulcast handle increased significantly with an increase in the number of starters. More horses in a race will increase the expected payoff from a winning bet, *ceteris paribus*. Simulcast bettors like larger fields, which is consistent with Ray's findings for live and account bettors. The holiday (which fell during the week in this sample) significantly increased Thoroughbred simulcast handle. Simulcast bettors were influenced to bet more on July fourth, but did not bet significantly more on weekends. It might be that simulcast bettors become live bettors on the weekend, when their opportunity cost declines, but the holiday did not have the same effect on the holiday.

The simulcast handle was significantly lower for late and early races (*ceteris paribus*). Most of the sites purchasing race signals were in the same time zone or one hour away. However, a few larger sites were located more than one hour away. Therefore it is difficult to tell whether the race time was significant because of its placement on the race card or the time of day adjusted for time zone differences.

While the race distance did not significantly affect race handle, simulcast bettors bet significantly more on turf races. This may be due to the fact that there are fewer turf

races so they are unique and often high quality races. This result is consistent with Ray's findings for live and account bettors.

The track conditions variable was negative and significant. With bad weather, simulcast handle increases significantly. This could be due to a preference for handicapping with a mud track or could be due to the fact that bettors travel to off track locations to bet when the weather is bad. Viewing a live race is less appealing in bad weather and off track locations may be closer.

Simulcast bettors bet significantly less on races restricted to fillies. Just as live and account bettors bet less on fillies, simulcast bettors are less interested in handicapping races for the more erratic female horses. Bettors bet significantly more, however, on the higher quality races that offer higher purses.

Superfecta betting was the only type of exotic wager that significantly affected simulcast handle. As expected, selling the simulcast signal to more locations significantly increased handle.

The harness race results are given in Table 4. For the harness equation, all of the variables have the expected sign and nine of the variables are significant.

The results for the number of starters, late races, track conditions, filly restricted races, purse, and number of signal buyers are the same as the Thoroughbred results.

The results for the index, holiday, and early races differ from the Thoroughbred results. For bettors betting on simulcast harness races, the index variable was negative and significant. Lower competition indices (races with are more evenly matched horses) led to significantly higher handles. This result is consistent with Ray's findings; index significantly affected harness bettors (live and account), but did not affect Thoroughbred

bettors (live and account). Races with overwhelming favorites (and hence higher competition indices) have smaller expected returns and attracted less simulcast betting. This result may come from the fact that harness races have a higher average competition index to begin with, so increases have an even stronger effect than for Thoroughbreds.

Table 4
Harness Handle Equation

Variable	Coefficient	t-Statistic
Constant	-9016	-1.01
Index	-435.3	-2.55**
#Starters	1798	3.05***
Holiday	-8369	-3.60***
Weekend	-821	-0.72
Earlyrace	3816	3.32***
Laterace	-1875	-1.65*
TrCond	-2895	-1.84*
Gait	204	0.18
FillyRest	-2743	-1.98**
2YO	1488	0.87
Purse	0.20	1.40 ⁺
Stakes	-2881	-0.66
FastClass	1914	0.94
Claiming	1447	1.28
Superfecta	67.49	0.06
#Buyers	837.50	2.36**
	F-Statistic	4.17***
	R ²	.63
	N	195

*** Significant at the .01 level

** Significant at the .05 level

* Significant at the .10 level

⁺ Significant at the .10 level, 1-tailed test

Simulcast handle significantly increased for early harness races (it significantly decreased for early Thoroughbred races). This may be due to the fact that all of the harness races were run at a later time in the day and the simulcast signal for harness races was purchased by more sites in time zones farther away. Early harness races may have fallen into a more appealing time slot relative to other racing options (e.g. live races in other time zones).

Simulcast handle was significantly lower for harness races on July 4th. This is the opposite of the Thoroughbred results. It may be that the races offered by the harness track on the fourth of July were less appealing than the alternatives (live races and other simulcast races). That is, the harness track may have lost the marketing contest for their holiday race card. They failed to take a larger (or even the same) share of the larger holiday pie!

There are several differences between these results and the results for live and account betting found by Ray. Live and account bettors (both harness and Thoroughbred) bet significantly more on weekends, when opportunity costs fall. Live and account bettors also bet less on races with two-year-olds while simulcast bettors did not. Each type of exotic wager increased handle for live and account bettors while Thoroughbred simulcast bettors only increased their bets significantly with superfecta betting. Finally, live and account harness bettors showed strong preferences for pacing races while gait did not significantly affect the handle of simulcast bettors.

Conclusions

The regression results for both the Thoroughbred and harness equations are summarized in Table 6.

Increasing the number of starters and increasing the number of site buying the simulcast signal significantly increase handles, ceteris paribus.

Harness race handle decreased significantly on the holiday, but neither Thoroughbred nor harness handle changed significantly on weekends. These results show that simulcast bettors do not change their betting behavior on the weekend in

Table 6
Regression Results Summary (significant variables)

<u>Thoroughbred Handle</u>	<u>Harness Handle</u>
#Starters(+)	Index (+) #Starters(+) Holiday (-)
EarlyRace(-) Laterace(-) Surface (+) TrCond (+) Filly Rest(-) Purse(+) Super(+) #Buyers(+)	EarlyRace (+) LateRace(-) TrCond(-) Filly Rest(-) Purse (+) Super (+) #Buyers(+)

response to reduced opportunity costs as live and account bettors have been found to do. However, harness bettors significantly decreased the amount bet on July 4th. This result may be due to differences in the specific events held at this track compared to other available races and activities. That is, the harness track may have lost handle to other racing and/or non-racing activities on the holiday.

Late races are less appealing to bettors, but the effect of being early on the race card differs for harness and Thoroughbred races, probably due to the time races are held at the two tracks and/or time zone differences between the track and simulcast sites.

Track conditions (i.e. wet weather) increased simulcast betting. This is consistent with a decrease in the consumption benefits of live betting when the weather is bad.

All other things equal, handles tend to be lower for races at the end of the race card. However, betting increased for early harness races while it decreased for early Thoroughbred races. This may be due to differences in race times and time zones for buyers of simulcast.

Simulcast bettors (both harness and Thoroughbred) bet less on races restricted to fillies. Thoroughbred bettors have a preference for turf races.

Bettors prefer betting on high purse races. The preference for high quality races may be due to the consumption benefit for live bettors and the type of information used for handicapping. The utility from attending races at a track may be higher for important, high quality races (e.g. turf races and stakes races), where the race is also a social event.

The availability of only one exotic wager on a race significantly increased race handle. For both harness and Thoroughbred races, superfecta wagering is found to increase race handle the most for both live and account betting.

These results confirm some of the same results found for live and account bettors. However, there are some ways in which simulcast bettors differ. For harness races, the results for simulcast bettors are more consistent with Ray's results for Thoroughbred live and account bettors than they are with other harness bettors. This indicates that simulcast harness races are being bet on by those who bet Thoroughbred races. This could be due to when or where the races are being broadcast. Since simulcast handle makes up close to 80% of the total handle (and this is consistent with the industry average), tracks need

to be aware of the race characteristics that generate significantly higher handles and hold and market the kind of races that appeal to simulcast bettors.

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Appendix A

Calculation of the Competitiveness Index

The competitiveness index is a measure of the allocation of money bet on a race and therefore the concentration or dispersion of the odds on horses in a race. This index is patterned after the Herfindahl Index, which uses sales percentages in an industry to measure market concentration.

The competitiveness index uses the same approach as the Herfindahl Index to evaluate the competitiveness of a race (as determined by bettors). It takes into account the distribution of bets placed on a race by squaring the percent bet on each horse to give greater weight to favorites.

The competitiveness index is given as;

$$C = \sum_{i=1}^m X_i^2$$

where each X_i is the percent of the total amount bet on a horse and m is the number of horses in a race. In a "perfectly competitive" race, with an infinite number of horses each with a small amount bet on them, the competition index would approach 0. A more realistic example is a race with 10 horses where 10% of the total amount bet is placed on each horse. In this example, the competition index equals .1. In a race where the outcome is certain (according to bettors), all money would be bet on the favorite horse and the index would equal 100^2 or 10,000. The competition index measures the

concentration/dispersion of odds on a race, which is part of the determination of the expected return on a bet (both the chances of winning and the payoff in the event of a winning bet). It can be useful in investigating betting behavior to determine how the level of competition affects the amount bettors are willing to bet on a given race. Do bettors look for a race where the horses are very competitive and it isn't clear which horse will win (a true "horse race") or do they look for strong favorites or long shots in a race?

A bettor can select from a range of different situation with regard to the level of competitiveness perceived by bettors as a whole. Bettors can select from high return/low probability or low return/high probability bets in a race with a high competition index (and a likely winner). Or they can choose to bet on a race with a low competition index and experience the excitement cheering for their selection in what is expected to be a close race. In reality, the takeout and breakage (rounding of payoff values) are subtracted from the pool before it is distributed to winners.

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