

How Much on that Doggie at the Window? An Analysis of the Decline in Greyhound Racing Handle

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Abstract: In recent years, considerable attention has been given to the role of legalized gambling in regional economic development. Evidence of the effectiveness of legalized gambling activities in causing economic growth has led to its expansion in the United States. This paper looks at the greyhound pari-mutuel racing industry to determine the factors affecting the handle (total amount of money bet legally at pari-mutuel tracks) on greyhound races (live and off-track/intertrack). Identifying these factors is necessary for the industry and public policy makers to address the decline in greyhound racing wagering throughout the 1990s and the associated reversal in economic growth.

I. INTRODUCTION

In recent years, considerable attention has been given to the role of legalized gambling in regional economic development. Evidence of the effectiveness of gambling activities in causing economic growth, along with other factors, has led to an expansion of legalized gambling in the United States. Pari-mutuel racing, including greyhound racing, expanded dramatically in the 1970s. The number of state-sanctioned lotteries increased through the 1980s, and in the 1990s casino gambling became newly legal and popular in many states.

However, there is evidence to suggest that the economic development impact of pari-mutuel gambling is diminishing. This may be attributed to the substitution of new types of gambling activities for pari-mutuel gambling. This paper looks at the greyhound pari-mutuel racing industry to determine the factors that affect the handle (total amount of money bet legally at pari-mutuel tracks) on greyhound races (both live and off-track/intertrack). Identifying these factors is necessary for the industry and public policy makers to address the decline in greyhound racing wagering and the associated reversal in economic growth.

II. BACKGROUND

Greyhound racing has been legal in some form, in some states, since the 1930s. Other states have legalized greyhound racing as recently as the 1980s. Currently, 15 states sanction and offer live greyhound pari-mutuel racing.¹ Data from the Association of Racing Commissioners International, Inc., show an increase in

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¹The states with live greyhound racing in 1998 were Alabama, Massachusetts, Arizona, New Hampshire, Arkansas, Oregon, Colorado, Rhode Island, Connecticut, Texas, Florida, West Virginia, Iowa, Wisconsin, and Kansas.

nominal greyhound racing handle and a fairly steady real greyhound racing handle between 1974 (the first year for which complete data is available) and 1991. However, both nominal and real racing handle fell steadily between 1991 and 1998 (see Figure 1). Greyhound racing revenue to government increased each year from almost \$19.5 million in 1959 to \$239 million in 1989, but then fell each year up to 1998, when it was \$109 million. These statistics show the clear decline the industry has experienced through the 1990s.

FIGURE 1



The decline in the pari-mutuel industry has not been felt evenly across states and regions. According to the *International Gaming and Wagering Business* web site², the percentage change in pari-mutuel handle between 1996 and 1997 ranged from -11.4 percent in Kansas to +11.3 percent in Iowa.

During the 1974-1998 period, additional types of substitute gambling activities were legalized and introduced (e.g., lotteries and casino gambling). Also during this time, live greyhound racing saw an increase in intertrack and off-track/telephone betting, which rose from about 0.6 percent of total handle to almost 50 percent of total handle. Differences between states with regard to their policies on alternative forms of gambling have led to different rates of change in handle over time.

New technology and the outcomes of legal debates may lead to a further expansion of non-live betting on greyhound racing (for example, cable TV and Internet betting). These changes in the structure and conduct of the greyhound racing industry make it essential for industry participants and public policy makers to understand the factors that affect wagering on greyhound racing.

III. LITERATURE

There is an extensive literature regarding legalized gambling in the U.S. (for reviews of the literature on legalized gambling in the U.S., see Christiansen 1998 and Goodman 1994, 1995). However, while there are a large number of studies of horse racing, lotteries, and casinos, there are very few studies of greyhound racing.

²Available at www.gemcommunications.com/publications/igwb.htm.

Several articles have looked at the demand for pari-mutuel racing and government revenues from racing in general (including horse racing) and at the greyhound industry in particular. Studies of horse racing handle and the demand for pari-mutuel horse racing include: Pescatrice (1980a), Ray (1991), Thalheimer (1998), and Thalheimer and Ali (1995a, 1995b, 1997). Studies of government revenue from pari-mutuel racing include: Pescatrice (1979, 1980b) and Guthrie (1981). Simmons and Sharp (1987) and Mobilia (1992) look at the relationship between pari-mutuel gambling and the institution of state lotteries. Studies of the greyhound industry include: Mobilia (1992), Walker (1998), and Walker and Jackson (1998).

Ray (1991) investigated the extent to which states considering legalization of pari-mutuel horse wagering could expect to experience economic development as a result. She used data from flat horse racing and found that state income and the quality of racing were important for racing in a state to create economic growth. In addition, she found flat horse racing, greyhound racing, and harness racing to be close substitutes. Other studies look at the demand for alternative forms of pari-mutuel wagering (e.g., intertrack wagering, exotic betting, telephone betting) and seek to determine the factors affecting the demand for different betting opportunities.

Studies of government revenue generated as a result of pari-mutuel racing investigate alternative pari-mutuel taxation schemes. In 1998, the effective pari-mutuel tax rate on greyhound racing ranged from 2.02 percent (Arizona) to 5.64 percent (Alabama). Ultimately, however, the amount of government revenue generated depends on the demand for wagering (i.e., the industry handle).

A specific question that has been studied in the literature is the effect on the pari-mutuel industry of instituting a state lottery. Both Mobilia (1992) and Simmons and Sharp (1987) find that gamblers (most often those wagering small amounts) substitute lottery gambling for pari-mutuel gambling. Mobilia (1992) also notes that increasing the takeout rate (the percentage taken out of the betting pool before distribution as winnings—the profit of the track and of the state comes from the takeout) decreases the average handle per attendee. However, her study combines data for horse and greyhound racing and she suggests looking at each industry separately.

Finally, Walker and Jackson (1998) look closely at whether greyhound racing causes increases in per capita income and whether the export of gambling activities is necessary for greyhound racing to cause economic growth in a state. They find that greyhound racing does, in fact, Granger cause increases in state per capita income (and not vice versa). They also conclude that export of the gambling activity is sufficient, but not necessary, for greyhound racing to Granger cause economic growth in a state. Walker (1998) also finds that lotteries do not cause increases in state income. Rather, he finds that higher state income leads to increased lottery sales.

Evidence in the literature clearly suggests that the greyhound racing industry contributes to economic growth in states that sanction pari-mutuel greyhound racing. While greyhound racing is found to spur economic growth, it is the least likely of gambling activities (e.g., pari-mutuel racing, lotteries, casinos) to export its product and there is a higher degree of import substitution associated with greyhound tracks (Walker 1998). Greyhound tracks tend to locate in smaller communities where they make up a larger part of the local economy. Thus, while the success or failure of the greyhound industry will indeed have an impact on the state economy, it will also have a profound impact on local economies where tracks are located.

Data for the 1990s show that the industry is clearly experiencing a decline in handle. Thus, changes in the greyhound racing industry will have an effect on the industry, the states that sanction greyhound racing, and especially the regions where racetracks are located. This paper investigates differences in state greyhound racing handle to determine what factors affect the amount of wagering on greyhound racing.

IV. THE MODEL

The model used to estimate greyhound handle is based largely on Ray's (1991) model used to estimate state horse racing handle. It also includes the take-out rate for greyhound racing, found to be significant in Mobilia's (1992) model.

From the perspective of both the state and the greyhound industry, success depends directly on the track handle. For a track, the handle is equivalent to total revenue from betting. For the state, the track handle is the base used to calculate the government's tax share. For all, it is an indication of the economic activity associated with tracks.

The takeout rate is a measure of the product price. Bettors' expectations as to the return on a bet, which involves the probability of winning the bet and the estimated size of return on a bet, also affect the demand for bets. The higher the return a bettor expects, the higher will be the demand for bets.

In this model, the tastes and preferences of bettors are measured by the number of races held, the size of the purses distributed, and the year in which racing was instituted. As the number of races held increases, the opportunity to bet, as well as the variety of types of race on which to bet, increases. The size of the purse offered for a race affects the quality of the competition competing in the race. Higher purses attract higher-quality greyhounds. If bettors prefer betting on higher-quality races, then this will positively affect the handle on a race.

Greyhound racing was instituted in different states at different times. States introduced their current system of greyhound racing as early as 1975 and as late as 1990. The number of years greyhound races have been run in a state is an indication of the extent to which it is part of the history and culture of a region. But more years of greyhound racing may also lead to "greyhound fatigue" in the same way "lottery fatigue" has been discussed. Lottery fatigue is said to decrease

participation in lotteries as people tire of playing (or perhaps become more accurate in estimating their chances of winning).

The demographic variables race, age, and population per mile are included to account for possible differences in the propensity of the state population to bet on greyhound races. The race and age variables will determine if minorities or an older population have greater or lesser propensities to bet on greyhounds. Population per mile measures population density and controls for differences in the degree of urbanization and distance of the population from tracks.

Income per capita, poverty, and unemployment are included to measure the economic conditions in the state. More income per person should increase the demand for bets, if betting is a normal good. Since income per capita is held constant, poverty measures the distribution of income in the state. For a given level of income per capita, higher poverty rates mean that there are more people at both the high- and low-income levels (i.e., a more unequal distribution of income). Unemployment is a measure of opportunity cost. Higher unemployment (given the level of income) gives people a lower opportunity cost of spending time at the track.

The availability of substitute forms of gambling should decrease the demand for greyhound betting. Horse racing is the closest substitute for greyhound racing. Lotteries have also been shown to act as a substitute for pari-mutuel gambling. In addition, casino gambling has expanded in recent years and may now compete with greyhound racing for gambling dollars. However, in some cases, casino-style gambling (for example, slot machines or card rooms) was introduced at tracks and may act as a compliment to pari-mutuel racing. A positive effect of casino gambling implies that it is a compliment for greyhound racing, while a negative effect indicates that they are substitutes.

The demand for greyhound bets is determined as follows:

- (1) $\text{Handle} = f(\text{TO Rate, \#Races, Purse, Race, Age, Pop/mi, Poverty, Unemployment, Inc/Pop, YrsSince, Horse?, Lottery?, Casino?})$

The definitions of the variables and their means and standard deviations are given in Tables 1 and 2.

V. THE DATA

The data are a pooled cross section of annual state data for states with live greyhound racing from 1991 to 1998. The greyhound industry data used for estimating the model come from the 1991-1998 Statistical Summaries of Pari-Mutuel Racing prepared by the Association of Racing Commissioners International, Inc. Data for the other income demographic variables come from the U.S. Census Bureau. Information on the existence of alternative forms of gambling comes from the regulatory agencies of individual states.

TABLE 1
Definitions of Variables

Variable (expected sign)	Definition
TORate (-)	percent of the betting pool withheld before distribution as winnings
#Races (+)	number of live greyhound races held in the state during the year
Purse (+)	total amount of prize money distributed to winners of greyhound races
Race (?)	percent of the population that is white
Age (+)	percent of the population over 65
Pop/mi (?)	state population density
Unemployment (?)	state unemployment rate
Inc/Pop (+)	state real personal income per capita
Poverty (?)	state poverty rate
Yrs Since (?)	number of years pari-mutual greyhound racing (in its modern form) has existed in the state
Horse? (-)	dummy variable for the existence of pari-mutuel horse racing in a state; 0 = no horse racing, 1 = horse racing
Lottery? (-)	dummy variable for existence of a state lottery; 0 = no lottery, 1 = lottery
Casino? (?)	dummy variable for the existence of casinos in a state; 0 = no casinos, 1 = casinos

TABLE 2
Means and Standard Deviations of Variables

Variable	Mean	Standard Deviation
Live Handle	142,874,088	162,040,830
OTB/ITW Handle	47,121,828	62,223,933
TORate	21.26	1.92
#Races	14,485	13,745
Purse	7,646,763	6,737,250
Yrs Since	11.04	6.07
Race	89.64	6.33
Age	13.65	2.03
Pop/mi	222.44	300.00
Inc/Pop	20,394	3,453
Poverty	12.46	4.16
Unemployment	5.47	1.09
Horse?	0.80	0.40
Lottery	0.74	0.44
Casino?	0.31	0.46

VI. RESULTS

The model was estimated for the total state greyhound handle, the total live state greyhound handle, and the non-live (off-track, telephone, and intertrack) handle. The means and standard deviations of the variables are given in Table 2. The results for each equation are reported in separate sections below. For each equation, the F-statistic is significant at above the 99% confidence level. The R^2 values range from .81 to .92, which indicate a very good fit of the equation, particularly for a cross-sectional model. Since the estimation uses state data, the residual values from the equations were plotted and indicated no problem with heteroscedasticity.

Live Racing Handle

The results of the live racing equation are given in Table 3. In the live racing equation, the takeout rate, number of races, years since, race, poverty, unemployment, and dummy variables for the existence of casino gambling and horse racing were significant. The takeout rate was negative, as expected. More races increased the handle for greyhound races in the state. More experience with greyhound racing in a state was associated with lower live racing handles, which may indicate the equivalent of "lottery fatigue" for those going to bet live at a track. A higher percentage of nonwhite population in the state was positively associated with higher handles.

TABLE 3
Total Revenue Equation
(Dependent Variable = Live State Handle)

Variable	Coefficient	t-Statistic
Constant	1,194,054,113	4.60***
TORate	-12,448,007	-2.96***
#Races	8,910.44	7.98***
Purse	0.77	0.40
Yrs Since	-5,555,832	-4.07***
Race	-8,099,271	-3.64***
Age	3,892,186	0.82
Pop/mi	10,381.45	0.21
Inc/Pop	-3,529.76	-0.98
Poverty	-3,528,708	-3.43***
Unemployment	20,324,728	-2.19*
Horse?	-46,691,076	-2.66***
Lottery?	-13,996,693	-0.84
Casino?	-26,729,761	-2.00**
F-Statistic	102.73***	
R ²	0.92	
N	120	

***Significant at the .01 level.

** Significant at the .05 level.

* Significant at the .10 level.

Higher unemployment led to higher live handles. Unemployment indicates a lower opportunity cost for individuals to attend a track for the day. Higher poverty is associated with lower live handles. More people below the poverty line means a less equal income distribution and is associated with less live betting.

The Horse? and Casino? dummy variables were negative and significant, indicating that the existence of horse racing or casino gambling in the state decreases the live greyhound racing handle. Lotteries were not found to significantly reduce live greyhound racing handles. Since betting on live races has entertainment value, as well as providing a gambling opportunity, it may be that bettors preferring to attend racetracks are looking for an activity in addition to a bet. Casinos and horse races provide an entertainment activity while lotteries do not.

OTW/ITW Handle

The results of the OTW/ITW equation are given in Table 4. The OTW/ITW handle equation includes bets placed from a location other than the track where the race is run. OTW is off-track wagering, which includes bets placed at off-track betting facilities and via telephone. ITW is intertrack wagering. This includes bets placed at tracks other than the track where the race is run. For example, a track may simulcast a race from another track and take bets on the simulcast race. These bets can be viewed as having different utility than a bet on a live race. For these bets, bettors do not receive the utility of seeing the greyhounds "in person" or experiencing the entertainment of a live race. Bettors betting on other than live racing place emphasis on a different set of the product characteristics than someone experiencing live racing.

TABLE 4
Total Revenue Equation
(Dependent Variable = OTW/ITW Handle)

Variable	Coefficient	t-Statistic
Constant	-449,727,472	-3.90***
TORate	-6,834,319	-3.68***
#Races	1,566.06	3.13***
Purse	4.36	5.29***
Yrs Since	3,720,922	6.10***
Race	3,302,977	3.38***
Age	142,363	0.06
Pop/mi	-362,135	-0.96
Inc/Pop	10,111.9	3.68***
Poverty	11,719,240	6.56***
Unemployment	-23,649,877	-5.61***
Horse?	-4,548,701	-0.47
Lottery?	-23,406,725	-2.45*
Casino?	-3,118,376	-0.37
F-Statistic	34.51***	
Adj R ²	.81	
N	105	

***Significant at the .01 level.

** Significant at the .05 level.

* Significant at the .10 level.

In the OTW/ITW equation, the racing variables TORate, #Races, Purse and Yrs Since were significant. TORate and #Races had the same sign as in the live handle equation. In this equation, higher purses led to increased handles. More established racing in a state led to increased handles, an indication that more familiarity with greyhound racing in a state increases the gambling demand (as opposed to the entertainment demand) for greyhound racing. Over time people may become bored with racing as entertainment, but they become more proficient at betting. These variables indicate that quality and experience are important for bettors more concerned with rates of return than entertainment experiences.

A higher percentage of white population in a state is associated with increased OTW/ITW handle. There seems to be a clear association between race

and the type of betting preferred. Higher income per capita and a more unequal distribution of income are associated with higher OTW/ITW handle. This type of betting appears to be dominated by the wealthy. Unemployment is negatively associated with handle in this equation. Unemployment reduces OTW/ITW wagering, which has a much lower opportunity cost than spending a day attending races at a track.

Lotteries are found to be a significant substitute for the gambling aspect of greyhound racing. People betting on races (without attending the track) found lotteries to be a substitute for placing bets on greyhounds.

Total Handle

The results of the equation for total state handle are given in Table 5. For the total handle equation, TORate, #Races, Purse, Race, Horse?, and Casino? are significant. Each of the variables has the expected sign.

TABLE 5
Total Revenue Equation
(Dependent Variable = Total State Handle)

Variable	Coefficient	t-Statistic
Constant	779,819,572	3.63***
TO Rate	-17,025,963	-4.90***
#Races	11,304.96	12.24***
Purse	4.11	2.60***
Yrs Since	-1,654,096	-1.47
Race	-3,932,806	-2.14**
Age	863,683	0.22
Pop/mi	46,581	1.16
Inc/Pop	-3,529.76	-0.98
Poverty	-3,528,708	-1.08
Unemployment	-681,682	-0.09
Horse?	-46,691,076	-2.66***
Lottery?	-13,996,693	-0.84
Casino?	-26,729,761	-1.75*
F-Statistic	102.73***	
R ²	0.92	
N	120	

***Significant at the .01 level.

** Significant at the .05 level.

* Significant at the .10 level.

A higher takeout rate reduces total handle. Holding more races, *ceteris paribus*, increases the greyhound handle in a state. As purses are increased, the handle for greyhound races increases in a state. This is an indication that bettors bet more on higher-quality races. This result is consistent with Ray's (1991) findings for thoroughbred racing handles. A higher minority population is associated with higher total state handle, indicating an important demographic characteristic of greyhound bettors. Finally, the existence of horse racing and casino gambling significantly reduces greyhound handle in a state. These two forms of gambling entertainment are found to be substitutes for greyhound racing.

VII. CONCLUSIONS

The results of the regression equations using the dependent variables live, non-live, and total handle are summarized in Table 6. These results concur with Moblia's (1992) findings with regard to takeout rates and Ray's (1991) conclusion about pari-mutuel horse racing with regard to the number of races and quality of racing. Both the total handle equation and the OTW/ITW handle equation show a significant positive relationship between the number of races and the size of purses offered and the handle. However, purse did not significantly affect the live racing handle for greyhound racing. OTW/ITW bettors are able to choose the races on which they bet, thus their choices are influenced by the quality of a race. Live bettors must bet on the races offered at the track they choose to attend (or not bet at all), regardless of the purse size.

TABLE 6
Summary of Regression Equation Results

Total Handle Equation	Significant Independent Variables	
	Live Handle Equation	OTW/ITW Handle Equation
TORate	TORate	TORate
#Races	#Races	#Races
Purse	Yrs Since (-)	Purse
Race	Race	Yrs Since (+)
Horse?	Poverty (-)	Race
Casino?	Unemployment (+)	Inc/pop
	Horse?	Poverty (+)
	Casino?	Unemployment (-)
		Lottery?

The year in which racing was established in a state affects both the live and OTW/ITW handle. Increased experience with greyhound racing and pari-mutuel wagering on greyhounds leads to a larger OTW/ITW handle. However, history and experience significantly decrease the live racing handle in a state. This may be explained by the difference in the type of bettor who bets on live races versus they type who uses OTW/ITW. The former tends to wager smaller amounts and to gain more utility from the entertainment aspect of racing and may experience "racing fatigue." The latter is more interested in the betting opportunity and tends to bet larger amounts. Experience seems to increase the handle from those bettors who focus on the gambling aspect of greyhound racing. Since OTW/ITW handle is becoming a much more significant part of the total greyhound racing handle, this result should be carefully reviewed by states considering opening new greyhound tracks.

The results indicate a significant difference between the demographic characteristics of bettors at tracks and off track. States with a high nonminority population and high incomes (and more unequal income distributions) had higher off-track handles. Minority population and unemployment (low opportunity cost) were associated with higher live handle in a state.

The availability of substitute pari-mutuel racing (i.e., horse racing) or casinos had a significant negative effect on live handle. When live horse racing is available in a state, it acts as a substitute for greyhound racing for those interested in attending live racing. Bettors may choose to attend either the horse or dog track. But this only affects state handle when bettors want to have the entertainment experience and bet at a track. The existence of horse racing does not affect the selective betting of OTW/ITW bettors, who have a range of all types of races on which to bet. Casinos also seem to provide an alternative gambling entertainment experience, while lotteries act as a substitute for bets placed off the track.

These results, and the differences between the live and OTW/ITW handle equations, have important implications for the greyhound industry and states with greyhound racing. The decline in total greyhound pari-mutuel handle has been shown to negatively impact economic growth in a state. In addition, local areas surrounding tracks often rely heavily on greyhound racing for income and tax revenues. Policy makers and those involved in the industry should consider these results and impending changes in the legal and technological environment of the industry in order to reduce the decline in the greyhound racing industry and accompanying negative economic impact.

States and tracks should consider the elasticity of demand when setting takeout rates. Where tracks have high attendance, are not located near other tracks (either horse or greyhound), and have a high percent of total handle from live racing, the results indicate the focus should be on the number of races offered and the entertainment experience at the track. They should also consider the demographic makeup of their customers in marketing live racing.

Tracks with a high percentage of their total handle from OTW/ITW should focus on increasing the quality of racing through increased purses. Simulcasting, and new technologies that are being debated in legal and political arenas, provide the potential for increasing OTW/ITW handle by targeting the demographic groups associated with off-track betting and reducing the opportunity cost of placing bets. The greyhound industry can capitalize on the use of technology (e.g., Internet and cable TV betting) by providing quality greyhound racing via these technologies as early as possible. Creating bettor experience using these technologies and competing with horse racing will be crucial to maintaining or increasing non-live greyhound handle in the future.

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