**Does the offline environment matter in online horse race betting engagement?**

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**ABSTRACT**

While the viability of many racing industries depends crucially on the sport attracting online bettors, relatively little is known about the role the local offline environment and fan interest plays in consumers’ online gambling. Using Finland as a data source, this paper investigates how off-track betting opportunities and the level of interest in horses in a local environment are associated with online horse race betting engagement. Whilst previous research has usually relied on self-reported surveys, we use objective data extracted from consumers’ online horse race betting accounts and data sources covering the horse race betting environment, equine statistics and socio-demographic statistics of Finnish municipalities. Our findings suggest that the off-track betting environment and the level of interest in horses in a municipality appear to be predictors of online horse race betting engagement as measured by betting volume and the number of bettors.

**Keywords**: Internet gambling, environmental effects, betting, horse racing, gambling consumption

**JEL Codes**: L83, Z21

**INTRODUCTION**

Nearly all racing industries are dependent on revenue claimed from betting activity (Forrest & Simmons, 2003). Increasingly, this activity is online making the viability of existing racing industries depend crucially on the sport attracting online bettors. The purpose of this paper is to investigate how the offline gambling environment and interest in horses (‘equine interest’), as a special case of ‘sports interest’ (see Nelson et al. 2007), are associated with online betting activity. Compared to other betting activities, such as sports betting, a connection between betting and the institutional attributes of the horse race industry is, perhaps, stronger for two reasons. First, the prizes of horse races are at least in part paid from the betting revenues. Second, trainers, drivers, breeders and bettors are tightly networked with each another in the trot racing industry (Binde, 2011; Kruse, 2016). It is therefore worthwhile to examine who bets online and whether the revenue tapped is from existing horse enthusiasts or from a different audience.

While previous studies have established motives and personal traits which are associated with the gambling habits of land-based gamblers (e.g., Welte et al., 2004; Lam, 2007; Fang & Mowen, 2009; Lloyd et al., 2010), recent accounts have examined the socio-demographic composition of online gamblers (e.g., Wood & Williams, 2007; Humphreys & Perez, 2012). Online gamblers tend to participate in multiple gambling activities, such as horse race betting and poker and casino games (Gainsbury et al., 2015a). Further, they appear to be disproportionately male, unmarried, and better educated with higher incomes (Wood & Williams, 2011; Gainsbury et al., 2012). However, other attributes may also influence gambling engagement and expenditure on gambling. In particular, how a local environment (Nelson et al., 2007; Marshall, 2009) and personal interests (Nelson et al., 2007) are associated with online gambling is a relatively unexplored subject in the literature. Gambling can be regarded as a complementary good to sport with indirect and direct monetary benefits accruing to the organizer of a sports event (Forrest & Simmons, 2003). For instance, individuals who are interested in sports or participate in physical activities regularly appear to be more willing to engage in sports betting (e.g., LaBrie et al., 2003; Nelson et al., 2007; Wann et al., 2015; Gassman et al., 2017). In a study of gambling participation among college students, Nelson et al (2007) found that athletes and fans reported more sports-related gambling than other students. In addition, they found that students in schools with a higher share of sports fans were more likely to gamble. Further, Paul and Weinbach (2010) find that fan behaviour rather than investment behaviour appears to predict consumption of sports betting. These findings suggest that personal interests and the surrounding environment could affect consumers’ gambling decisions and expenditures on gambling.

In this paper, we examine empirical relations between online betting activity and bettors’ offline attributes using a data set from Finland. One element of data was extracted from the Finnish horse race betting monopoly’s online betting accounts. Other data are related to the offline betting environment, socio-economic, demographic and equine statistics. Our data set has some advantages compared to those used in previous studies. Most studies in this domain of gambling research are based on consumer surveys (e.g,. Castrén et al., 2018), which are prone to biases induced by self-selection, self-reporting and small scale, limiting the validity of their results (Gainsbury et al. 2012; Gainsbury et al., 2015b). By contrast, our sample covers the whole country though the data are aggregated to the level of a municipality in statistical analyses. Further, compared to survey-based studies, our data are based on objective measurements. In regard to recent studies which use information on actual bets extracted from online gambling accounts but have limited or missing information on bettors (e.g., Kainulainen 2019; Suhonen et al. 2018; Suhonen & Saastamoinen 2018), our data provide a rich set of background variables, which can be used as controls in statistical analyses. The main disadvantage of our data is that the unit of measurement is the level of a municipality. Thus, strong conclusions cannot be drawn regarding betting behaviour at the individual level.

This study contributes to the literature in various ways. First, our paper suggests that, despite the wealth of gambling opportunities provided by the online gambling environment, the local offline gambling environment still plays a role in gambling decisions. Second, so far as we know, this is the first study to report an association between a general interest in horses and online horse race betting activity. Similar findings have been reported before in other forms of sports betting (e.g., Paul & Weinbach, 2010). Thus, our paper also contributes to the nascent literature which links sports interest with sports betting. This is important because revenues of racing industries are particularly dependent on betting interest (Forrest & Simmons, 2003). As betting activity is increasingly online, the viability of existing horserace industries depends crucially on the sport attracting online bettors. Finally, this paper uses archival demographic data and actual betting data from all residents in a country. Thus, the validity of the results obtained from consumer surveys can be assessed against our findings, which are based on objective measures, albeit the measures used in this study are taken at the level of a municipality.

This paper is organized as follows. In Section 2, we introduce the horse race betting environment in Finland. Section 3 describes the data and the measures used in statistical analyses. Results are presented in Section 4. Section 5 discusses the results, and Section 6 concludes the paper.

**THE HORSE RACE BETTING ENVIRONMENT IN FINLAND**

By European standards, Finland is a medium-sized trotting country behind the leading trotting countries of France, Sweden and Italy (Raento & Härmälä, 2014). Special distinguishing features of Finnish (harness) horse racing are the high number of racetracks and the substantial share of amateur-licensed and owner-licensed drivers in horse races. In relative terms, the number of racetracks is the second highest in Europe, while the numbers of amateur-licensed and owner-licensed drivers are the highest and second highest, respectively (UET Annual Report, 2017). In comparable European countries, both the numbers of professional drivers and professional trainers are higher (UET Annual Report, 2017). Consequently, horse racing in Finland appears to be driven by equine enthusiasts who train and race their own horses. Further, an extensive network of racetracks provides ample opportunities to participate in race meetings.

The Finnish horse race betting market is dominated by the government-owned gambling monopoly operator Veikkaus (formerly Fintoto Ltd which had a monopoly on horse race betting). The revenues of the horse race betting monopoly are used for ‘the public good’: the main recipient of the gross gaming revenue (i.e. player losses) from horse race betting is “horse breeding and equestrian sports”. In 2016, for instance, 33 million euros were raised for the purpose corresponding to 51.5% of the annual gross gaming revenue, which is equal to total stakes less winnings paid back to bettors (Suomen Hippos, 2017). 90% of these funds were allocated to racetracks to subsidize race meetings and prizes paid at the racetracks (Suomen Hippos, 2017).

Although trot racing is one of the most popular spectator sports in Finland, on-track attendance has declined over the past decades. In 1990, nearly 1.5 million spectators visited racetracks (Mahlamäki, 2003). By 1996, however, these numbers nearly halved to 800,000 (Suomen Hippos, 2010). Nowadays racetracks still attract almost 635,000 spectators annually (Suomen Hippos, 2017). One reason for this development is the evolution of gambling services with the introduction of track-to-track betting in 1992, off-track betting in establishments such as restaurants and cafés in 1995 and Internet gambling in 2002 (Raento, 2014). It appears that these innovations have had an impact on the number of spectators because the total turnover from horse race betting steadily increased from 124 million euros in the mid-1990’s (Suomen Hippos, 2015) to 256 million euros in 2009, since when the betting volume has declined slightly to 231 million euros in 2015 (Suomen Hippos, 2017). Today, online bets account for almost 60 % of total revenue (Suomen Hippos, 2017).

**DATA AND METHODS**

**Sample**

This study combines archival data extracted from online horse race betting accounts, socio-demographic statistics, equine statistics and data on the off-line horse race betting environment.

*Online horse race betting account data.* Individual-level online betting account data provided by Fintoto include 18,641 bettors and all their race-level bets made at the company’s online betting platform between August 1st and August 30th, 2012. The bet types include Quinella (the first two horses in either order), Trifecta (the first three horses in the correct order), Win Bet (the winner of a race), Quinella (the two horses that finish first irrespective of their order) and Place (the chosen horse finishes first, second or third). Information on multiple race bet types, such as Double (the winners of two consecutive races), was not available for analysis. The information on players is limited to a bettor’s age, gender and postal code of residence. However, the postal code provides access to socio-demographic characteristics of a bettor’s place of residence. Consequently, we collapsed the gambling data to the level of a municipality by aggregating the number of players and other betting-related variables for each municipality.

*Socio-demographic data*. Data on the socio-demographic characteristics of Finnish municipalities were extracted from Statistics Finland’s official StatFin database. It provides comprehensive statistical information on municipalities and their residents, such as education levels, income levels and unemployment rates by age-group.

*Offline betting environment.* Data on the location of race tracks, the number of off-track betting venues in a municipality and the number of horse race meetings in each municipality in August 2012 was extracted from the websites of Veikkaus and Suomen Hippos (The Finnish Trotting and Breeding Association).

*Equine environment.* Suomen Hippos has data on registered horses. Data for 2013 were used because year 2012 was not available. However, we do not believe that using the horse statistics from 2013 as a proxy for 2012 is a cause for concern: aggregate statistics suggest that the level of horse ownership and the number of horses remain relatively stable over time (see Hevostalous lukuina “horse industry in figures” 2014 (2015); Hevostalous lukuina 2015 (2016)). Moreover, the figures for 2013 were recorded in June 2013, which results in a gap of less than a year between the equine statistics and our observation period of betting data.

**Variables**

*Betting engagement.* Two variables were used to measure different aspects of betting engagement. The total number of bettors in each municipality is an indicator of participation in horse race betting. The total bet amount in each municipality measures betting volumes in euros on horse race betting. These variables are dependent variables in the regression analyses applied in this study. They are deflated by the population residing in a municipality and transformed into the number of bettors per 1,000 inhabitants and the betting volume in euros per 1,000 inhabitants.

*Betting environment variables*. We are interested in how online horse race betting activity is related to the land-based betting environment in a municipality. A variable which records the number of horse race meetings in a municipality with a racetrack during the observation period, is a measure for the access to local horse racing events. Moreover, Ali and Thalheimer (1997) find that the demand for horse wagering has an inverse relationship with distance to the closest racetrack. We control for the proximity of a racetrack by assigning a dummy variable to municipalities with a racetrack and a separate dummy variable to municipalities which are adjacent to a municipality with a racetrack. In addition, the betting company is likely to be aware of how much local demand there is for off-track horse race betting venues, and this is likely to vary between municipalities. We model this effect by including a variable which measures the number of off-track betting venues in a municipality.

*Equine variables.* Research into sports betting suggest that sports interest predicts engagement in sports betting (LaBrie et al., 2003). This finding may extend to horse betting. Consequently, we introduce three variables as proxies for equine interest. The number of horse owners per 1,000 inhabitants in a municipality is an indicator for the general level of interest in horses. Since the equine data set also contains information on specific horse types, we use two variables for different horse types. The number of warmblood horses per 1,000 inhabitants, which are typically trotting horses, is a proxy for an interest in horse racing in a municipality. Riding horses, on the other hand, are not generally used for horse racing. For this reason, we use their number per 1,000 inhabitants in a municipality as a proxy for another kind of interest in horses, which may also be correlated with consumer preferences for horse race betting.

*Socio-demographic variables.* This study employs several socio-demographic variables suggested by previous studies. First, online gamblers tend to be younger than land-based gamblers (Wood & Williams, 2011; Gainsbury et al., 2015a; Edgren et al., 2017). We use the average age of the residents living in a municipality as an explanatory variable influencing engagement in online horse betting. Second, gambling expenditures tend to increase with disposable income (Abdel-Ghany & Sharpe, 2001; Tan et al., 2010), and online gamblers tend to earn more than traditional gamblers (Gainsbury et al., 2012). We use the average annual net income in a municipality as a regressor. Third, although education has been associated with lower expenditures on gambling (Forrest and Gulley, 2009), online gamblers appear to be better educated than their land-based counterparts (Wood & Williams, 2011; Gainsbury et al., 2012). Thus, we employ an education index, which measures the number of years of post-15 formal education in the municipality divided by population, as a proxy for the average education level of residents aged 20 years and older in a municipality. In the education index, one hundred points corresponds to an extra year of education beyond the elementary level. Finally, we control for the unemployment rate in a municipality because online gamblers tend more often to be employed than offline gamblers (Gainsbury et al., 2012).

In addition to the socio-demographic characteristics highlighted in the literature, our study also controls for three attributes which are more specific to the Finnish context. First, Swedish-speakers constitute the largest minority group in Finland. While they do not differ from Finnish-speakers in a cultural sense, their socio-economic status tends to be somewhat higher than the rest of the population. For instance, they have a longer live expectancy (Hyyppä & Mäki, 2001), are in better (self-reported) health (Hyyppä & Mäki, 2002), are less likely to be unemployed (Saarela & Finnäs, 2003) and use less alcohol (Paljärvi et al., 2009). The share of the Swedish-speakers in a municipality is accounted for by their percentage share of the residents in a municipality. Second, a typical assumption is that horse race bettors are often from rural areas (Raento & Härmälä, 2014). For this reason, we use a dummy variable for a municipality classified as a city, which is a proxy for urban areas. Finally, there is a persistent trend of migration from rural to urban areas with a tendency for migrants to be younger and better educated than those who stay behind (Pekkala, 2003). Thus, we control for the potential effect inter-municipal migration exerts on betting engagement in a municipality by including a variable for net migration computed as the difference between inward and outward migration.

**Methods**

We use descriptive statistics and a geographical visualization to illustrate the data. Associations between the dependent and independent variables are analysed using Ordinary Least Squares (OLS) regression analysis. Due to heteroscedasticity indicated by White’s test, we report robust standard errors in results from regression models.

**RESULTS**

**Descriptive statistics**

The descriptive statistics are reported in Table 1. The socio-demographic statistics show that the average age of the adult population in a municipality was nearly 45 years. The average municipality had almost 14,000 adult residents though size exhibits great variation, from less than one hundred to more than half a million. The average education level corresponds to roughly 3 years of secondary and higher level education. The average municipality unemployment rate was approximately 9%. Although the inter-municipal net migration cancels out on average, there are municipalities which attract population and those that lose residents. A third of the municipalities were classified as cities. The proportion of residents identifying themselves as Swedish-speaking was almost 10% on average, but the range was wide from zero to almost exclusively Swedish-speaking municipalities.

Regarding the offline betting environment variables, there were 42 racetracks in the country. 13% of municipalities had a racetrack, of which 28 hosted a horse race meeting in August 2012. Further, 43% of municipalities were adjacent to a municipality with a racetrack. The frequency of horse race meetings at a racetrack ranged between 0 and 4, corresponding to an average of 0.17 meetings per racetrack during the observation period. As for off-track betting, there were 0.20 off-track betting venues per 1,000 inhabitants. However, there were no such venues in 96 municipalities.

The equine variables were intended to capture interest in horses. On average, there were 18 horse owners per 1,000 inhabitants in a municipality and at least one horse owner in almost every municipality (318 out of 320). It should be noted that a horse can have more than one owner, one owner can own several horses, and owners do not necessarily live in the same municipality as their horses. By their composition, there were 11 warmblood horses as opposed to 3,5 riding horses per 1,000 inhabitants in an average municipality. The online horse race betting statistics show that the average number of bettors per 1,000 inhabitants in a municipality was 4.8, while their average expenditure on horse race betting totalled nearly 1,319 euros per 1,000 inhabitants in that month.

[Table 1.HERE]

The geographical origin of bets is illustrated in Figure 1. The total amount bet in the month in a municipality has been deflated by the adult population residing in the municipality resulting in a measure of stakes per adult. While the mean value of bets placed per adult in the month was approximately 1.40 euros, the expenditure was below this in two thirds of the municipalities. Further, the highest stakes per adult were 14.3 euros, but there were also a few municipalities where no online horse race bets were placed during the observation period (14 out of 320 municipalities.). In the figure, the shading from white to dark blue indicates increasing per adult betting volumes, and a triangle marks a municipality with a racetrack. The figure suggests that there may be a positive relation between the physical proximity of a racetrack and wagering on horse races online because the municipalities which have or are located close to racetracks tend to exhibit a darker hue implying higher betting volume per capita.

[Figure 1. HERE]

**Regression results**

Regression results for the number of online bettors and betting volume are reported in Table 2. Both regression models include the same set of covariates. Regression coefficients are interpreted assuming *ceteris paribus*. We tested for multicollinearity by computing the variance inflation factors (VIFs) for the covariates. The maximum VIF at 7.51 and the mean at 2.94 suggest that multicollinearity is at a tolerable level.

[Table 2. HERE]

*The number of online bettors*. All variables measuring equine interest are statistically significant. The coefficient estimate on the number of horse owners implies that each additional horse owner adds 0.11 online bettors. That is, ten additional horse owners are associated with an increase of one additional gambler in a municipality, on average. However, the types of horses owned exhibit divergent results: a one unit increase in the number of warmblood horses is associated with a 0.11 increase in the number of online bettors, whereas a similar change in the number of riding horses has the opposite effect with a magnitude of 0.09.

All measures of the off-track betting environment are statistically significant and point to their importance to betting engagement. The number of horse race meetings in the local racetrack suggests that each local race meeting adds 0.42 bettors per 1,000 inhabitants to the ranks of online bettors. Furthermore, a racetrack in a neighbouring municipality is associated with an increase of 0.85 bettors per 1,000 inhabitants. Interestingly, there is some indication that the number of off-track betting venues could make a relatively large contribution to the number of online bettors because each additional off-track betting establishment is associated with an increase in their number by 1.7 bettors. This is consistent with the presumption that the betting company knows the local demand for off-track horse race betting venues, which is also an indicator of local interest in betting and is likely to vary between municipalities.

As for the socio-demographic characteristics, the estimated coefficients are mostly statistically insignificant. There are two exceptions, however. A city as opposed to a rural municipality is associated with a 0.59 increase in the number of online bettors per 1,000 inhabitants. As a result, online betting appears to be more prevalent in cities. The results also suggest that the share of Swedish-speakers is associated with a lower level of online betting engagement: a one percentage point increase in the share of those identifying themselves as Swedish-speaking decreases the number of online bettors by 0.035 bettors per 1,000 inhabitants.

*Betting volume*. Regarding betting volume, two equine interest variables are statistically significant. Each additional horse owner is associated with 47.7 euro increase in betting volume per 1,000 inhabitants. By contrast, the number of riding horses pulls in the opposite direction, implying that a one unit increase in the number of riding horses lowers the volume by 53.48 euros.

As was the case with the equine variables, there are two statistically significant variables relating to the off-track betting environment. An additional horse race meeting at the local racetrack is associated with a 298.39 euro increase in the betting volume per 1,000 inhabitants. The estimates also suggest that a racetrack in a neighbouring municipality is associated with an increase of 354.27 euros in the betting volume per 1,000 inhabitants.

The estimates for socio-demographic characteristics follow a pattern established in the previous model. A city adds 331.52 euros to the betting volume per 1,000 inhabitants. By contrast, a percentage point increase in the share of Swedish-speakers reduces the betting pool per 1,000 inhabitants by 12.70 euros.

**DISCUSSION**

**Offline betting environment**

Our results point to offline elements still being pivotal in online horse race betting. Our findings suggest that the location of an event translates into an increase in online horse race betting engagement. Most importantly, we found that local race meetings are positively associated with online betting revenue and the number of bettors. While it is possible that bettors at the racetrack bet using the online platform, it is also possible that they stay home and bet online. We believe in the latter explanation because in Finland, the first mobile application for horse race betting was launched only in 2013, postdating our data set, which is from 2012. Nowadays, however, many bettors at the racetrack use the mobile application for convenience. Further support to our conclusion is provided by the finding that a racetrack in a neighbouring municipality is positively associated with betting activity.

Furthermore, the number of off-track betting venues appear to increase the number of online bettors but not their betting expenditures. This finding is in concordance with Gainsbury et al. (2015b) who report a substantial share of bettors using land-based venues for horse and dog race betting. It is also in line with Ali and Thalheimer (1997) who find that the demand for horse wagering is negatively associated with the traveling distance to the racetrack. Further, they argue that increasing off-track betting opportunities as well as the frequency of races at a venue could boost demand for wagering, which is also consistent with our results.

**Equine interest**

Our results suggest that equine interest is associated with online horse race wagering. In particular, we found that horse ownership predicts betting activity. Interestingly, the types of horses registered in a municipality are related to online horse race betting. The number of warmblood horses, which are commonly used for racing, appear to increase the number of online bettors but not the volume. To some extent, these results are consistent with Nelson et al. (2007) who find that sports fans and athletes tend to wager more if they do bet, though in our case this tendency appears to be associated with an increased participation rate not volume. Also, our findings provide some empirical support for the argument that the members of the race horse industry in Finland are tightly networked (Binde, 2011; Raento & Härmälä, 2014) in the sense that race horse owners are also more likely to engage in horse race betting. However, the number of riding horses points in the opposite direction. This suggests that the number of riding horses as an indicator of interest in equestrianism in a municipality correlates with a lower level of engagement in horse betting. In contrast, the number of harness horses in a municipality is an indicator of an interest in horse betting. This divergence may result from differences in the demographic profile of the two groups as riding horse enthusiasts tend to be predominantly female and under 18-year old (see e.g., Hevostalous lukuina 2015 (2016)), whereas a typical horse race bettor in our data is a 50–year-old male.

**Socio-demographics**

The socio-demographic variables in this study were used to control for the effects established in previous research. Our results differ from their findings because we do not detect any associations with betting engagement and age, income, education or employment status (e.g., Woolley, 2003; Wood & Williams, 2011; Gainsbury et al., 2012; Edgren et al. 2017). These discrepancies may be attributable to differences in research methodologies in that we were constrained to model at the level of the municipality rather than the individual or to the context specificity arising from our focus on online horse race betting and data from a single country.

However, some of our results regarding the socio-demographic controls are more relevant when assessed within the Finnish context. We found a robust negative association between the share of Swedish speakers and betting activity in a municipality. The gambling habits of this linguistic minority group in Finland has been previously studied by Nordmyr et al. (2014) who did not find any differences in the prevalence of gambling problems between the Swedish-speaking minority and the Finnish-speaking majority in Western Finland. An explanation for this discrepancy between our and their results could be that we focused on horse race betting whereas their study addressed gambling activity and gambling problems in particular, which were unobservable in our data. Moreover, our results do not point to horse race betting, or at least its online format, being more of a ‘rural’ as opposed to ‘urban’ sport. While previous research has concluded that a typical offline horse race bettor comes from a rural area (Raento & Härmälä, 2014), online bettors in our data appear to be city-dwellers. We found that, if a municipality is classified as a city, it tends to be associated with higher levels of betting engagement even after controlling for factors associated with cities, such as higher incomes, better education, a younger composition of population and inter-municipal migration (Pekkala 2003). This suggests that there are subtle differences in the consumer types using these two gambling platforms.

**Limitations and future research**

This study comes with some limitations. First, although the data used in this study eliminates the bias induced by self-reporting in surveys, the main disadvantage of our data is collapsing individual-level data to the aggregate level of a municipality. Estimated coefficients reported in this study reflect interests in betting and equine sports on an aggregate level (i.e., municipality level in our case) and are descriptive of individual preferences only under restrictive assumptions. This means that individual-level information, which would lend itself to a more precise analysis, is lost. However, since we are interested in how much the average attributes that characterize a municipality’s horse betting environment and socio-economic composition predict aggregate engagement in horse betting on a municipal level, we do not regard this as a major problem. Second, our data only include race-level betting types, whereas the information on multiple race betting types is missing. This may provide an incomplete picture of the municipality level betting attributes. In addition, the missing data may bias the result since those who consider themselves very well informed (perhaps even with insider information) are likely to bet at the individual race level. Third, although all bettors who bet during the observation period of 30 days are included, the data set is relatively limited in a temporal sense. Finally, our study concerned Finland, and thus, the results may not be generalizable. Therefore, the results of our study should be interpreted with caution.

This study opens up several avenues for future research. Using individual-level data on consumers’ socio-demographic characteristics from official databases would improve our understanding of how they are associated with gambling activity. Another way would be to collect data with a survey questionnaire and combine them with actual betting records and/or official statistics to provide a more complete picture on consumers’ gambling activity. Future studies could also investigate how consumers’ actual risk taking in gambling is related to their socio-demographic characteristics and other environmental factors.

**CONCLUDING REMARKS**

In this study, we examined how elements of the off-track betting environment and equine interest are related to online horse race betting engagement at the municipal level. We also controlled for socio-economic background factors associated with online gambling participation. To do this, we combined data from individual level online bets on harness horse racing, municipality-level socio-demographic data from the official national statistics database and horse race betting environment data from the horse race betting monopoly operator. The advantage of this data set is that statistical modelling does not rely on self-reported data which has often had to be used in previous studies.

To summarise our findings, we can make two concluding remarks. First, our results suggest that the off-track betting environment in a municipality appears to be an important predictor of online betting engagement. Indeed, online betting has gradually become the dominant platform for horse race betting, which may have changed consumers’ gambling habits: many consumers who used to wager at the racetrack or placed their bets in off-track betting shops now place their bets at home while following races on television or on the Internet. Loosely speaking, this assumption is supported by the fact that, while on-track attendance has gone down over the past two decades, the share of online bets has increased and overall betting revenues have remained rather stable over the period. Second, our study points to interest in horses, and race horses in particular, stimulating online betting engagement. This indicates that a level of interest in a sport tends to translate into gambling activity in that sport.

Although our results concern the Finnish horse race betting market, they may hold relevance to other markets as well. Because online horse race betting has taken off rapidly in Finland, similar developments may take place in other countries. Hence, we believe that these results shed some new light on how consumer habits and the environments in which they live in are associated with the current changes in online gambling markets.

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**TABLES**

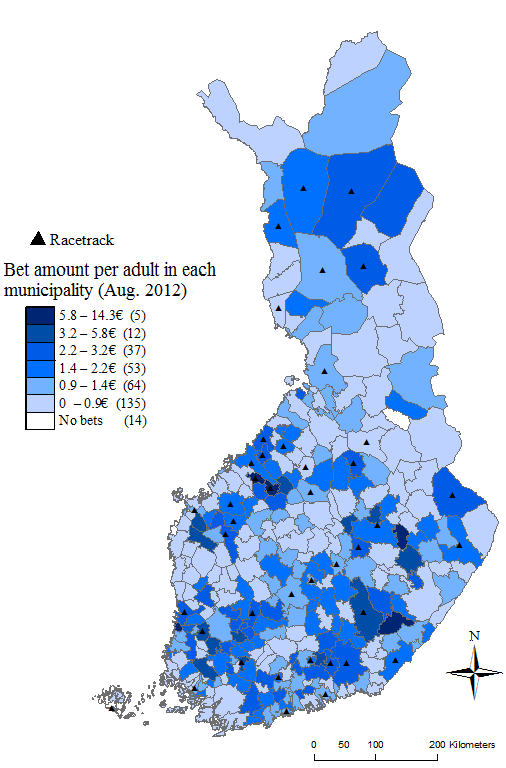
**Table 1.** Descriptive statistics.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Socio-demographic statistics | | | | |
|  | Obs. | Mean | S.D. | Min. | Max. |
| Average age (years) | 315 | 44.59 | 4.07 | 30.40 | 54.60 |
| Population (persons 18 years and older) | 315 | 13,789.78 | 37,002.12 | 92 | 505,439 |
| Education index | 315 | 282.09 | 49.14 | 194 | 573 |
| Average net income (1,000 euros) per capita | 315 | 19.77 | 2.47 | 15.49 | 38.57 |
| Unemployment rate (percentage points) | 315 | 8.84 | 3.34 | 0 | 18.40 |
| Share of Swedish speakers (percentage points) | 317 | 9.61 | 25.16 | 0 | 93.43 |
| City (= 1 if classified as a city) | 315 | 0.34 | 0.47 | 0 | 1 |
| Inter-municipal net migration (persons) per 1,000 inhabitants | 315 | -5.29 | 11.06 | -76.67 | 25.33 |
|  |  | Betting environment statistics | | | |
|  | Obs. | Mean | S.D. | Min. | Max. |
| Racetrack (= 1 if in a municipality) | 315 | 0.13 | 0.34 | 0 | 1 |
| Adjacent to racetrack (= 1 if a racetrack located in a neighbouring municipality) | 315 | 0.43 | 0.50 | 0 | 1 |
| Horse race meetings at the local track in a month | 315 | 0.18 | 0.67 | 0 | 5 |
| Off-track betting venues per 1,000 inhabitants | 315 | 0.20 | 0.17 | 0 | 0.93 |
| Distance to the closest racetrack (kilometres) | 315 | 36.22 | 28.57 | 0 | 264.70 |
|  |  | Online betting statistics | | | |
|  | Obs. | Mean | S.D. | Min. | Max. |
| Number of online bettors per 1,000 inhabitants | 315 | 4.80 | 3.25 | 0 | 31.56 |
| Betting volume (euros) per 1,000 inhabitants | 315 | 1,318.99 | 1,483.15 | 0 | 14,326.43 |
|  |  | Equine statistics | | | |
|  | Obs. | Mean | S.D. | Min. | Max. |
| Number of warmblood horses per 1,000 inhabitants | 315 | 11.15 | 10.50 | 0 | 90.73 |
| Number of riding horses per 1,000 inhabitants | 315 | 3.49 | 5.91 | 0 | 93.17 |
| Number of horse owners per 1,000 inhabitants | 315 | 18.13 | 11.12 | 0 | 124.39 |
| Notes: Socio-demographic, betting environment and online betting statistics from 2012. Equine statistics from 2013. There were five missing values in the municipality data and two missing in the equine data. | | | | | |

**Table 2.** OLS regression results for the number of online bettors and online betting volume.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Number of online bettors per  1,000 inhabitants | | Online betting volume (euros) per 1,000 inhabitants | |
| Dependent variable |
| Independent variables | Coef. | S.E. | Coef. | S.E. |
| Offline betting environment | | | | |
| Race meetings at the local racetrack in a month | 0.422\*\* | 0.176 | 298.387\*\* | 122.258 |
| Racetrack in a neighbouring municipality ( = 1) | 0.851\*\*\* | 0.255 | 354.274\*\* | 146.409 |
| Off-track betting venues per 1,000 inhabitants | 1.707\* | 0.929 | 194.479 | 639.131 |
| Equine interest | | | | |
| Horse owners per 1,000 inhabitants | 0.113\*\*\* | 0.032 | 47.698\*\* | 22.304 |
| Warmblood horses per 1,000 inhabitants | 0.107\*\* | 0.052 | 30.020 | 29.077 |
| Riding horses per 1,000 inhabitants | -0.086\*\* | 0.034 | -53.475\*\* | 24.001 |
| Socio-demographic variables | | | | |
| Average age (years) | -0.062 | 0.042 | 47.136 | 32.763 |
| Average net income (1,000 euros) per capita | -0.063 | 0.104 | 49.910 | 62.338 |
| Education index | 0.008 | 0.005 | 4.470 | 2.922 |
| Unemployment rate (percentage points) | 0.013 | 0.058 | -26.011 | 26.179 |
| Share of Swedish speakers (percentage points) | -0.035\*\*\* | 0.006 | -12.702\*\*\* | 3.009 |
| City ( = 1) | 0.585\*\* | 0.269 | 331.516\*\* | 136.746 |
| Inter-municipal net migration per 1,000 inhabitants | -0.016 | 0.014 | 4.042 | 7.350 |
| Constant | 2.860 | 3.653 | -4038.490 | 2562.151 |
| Obs. | 315 | | 315 | |
| F-statistic | 18.08\*\*\* | | 7.97\*\*\* | |
| R2 | 0.583 | | 0.296 | |
| VIF range (mean) | 1.16 -7.48 (2.96) | | 1.16 -7.48 (2.96) | |
| *Notes: Robust standard errors applied due to heteroskedasticity. Statistical significance: \*\*\* p-value < 0.01; \*\* p-value < 0.05.* | | | | |

**Figures**



**Figure 1.** Average wagering in each municipality in August 2012.