UNIVERSITY OF WARWICK

DEPARTMENT OF ECONOMICS

SPREADING YOUR BETS

Comparative Analysis of Gambling Product Consumption Offline and Online

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Abstract

From the first legalised betting shop in 1961, to the first National Lottery draw in 1994, gambling has long since been a part of British culture. In the last 10 years or so, the gambling industry has undergone some of its biggest changes, most notably the evolution into an online as well as offline activity. Despite its long history, gambling is an activity that splits opinion. At its core, gambling is a risk-seeking activity that promises likely losses for often meagre or highly improbable gains. This paper analyses the characteristics that determine the likelihood that a person will fall into the category of a 'gambler' or 'non-gambler'. The paper then compares this to online gambling activity, finding that the two groups present both similar and different characteristics. The analysis then extends to comparatively analyse how gamblers co-consume different gambling products offline and online, finding that on average the relative influence of online gambling products on each other are greater than the influence of offline products on each other.

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Introduction

In the last decade, the gambling industry has been subject to many changes. The UK has adopted one of most liberally regulated[1] stances in the developed world following the Gambling Act 2005, fixed-odds betting terminals have been introduced into almost all high-street bookmakers, and gambling has evolved into an online as well as physical activity. This paper is motivated by the increased visibility of gambling firms' behaviour, and a desire to understand the true nature of less visible individuals' behaviour. It is clear to see from the rise of gambling advertising and number of high-street bookmakers, that UK gambling firms have a very powerful presence. Ofcom (2013) showed that the number of gambling adverts on TV increased by over 1400% between 2005 and 2012[2], and deregulation has made it easier for firms to close out-of-town betting shops and move to busy places such as high-streets, making them much more visible (The Economist, 2014). All of these changes mean that consumers' access to gambling has been unequivocally heightened, but how are consumers actually behaving in this environment?

This paper defines gambling as monetary expenditure risked on the outcome of an uncertain event. The analysis starts by assessing the choice to gamble and to gamble online, which varies according to a range of demographic, socioeconomic and lifestyle characteristics. In the extended analysis, this paper argues that, in general, consumption of gambling product[3] 'X' *online* will greater influence the consumption of 'Y' online, compared to the relative influence of 'X' *offline* on 'Y' offline. For example X may be casino games and Y horse racing. This argument is based on the ability to make

[1] Not *unregulated*. Firms are licensed and monitored but enjoy relative freedom compared to other locales

[2] All advertising type spots on TV increased by 96%

[3] Gambling may also be referred to as a service. I make the distinction between the overall 'gambling service' a licensed firm provides, and the individual 'products' offered i.e. horse-betting

click-speed decisions online, the lower transportation costs of moving between products and targeted placement of different products online.

Literature Review and Theory

Behavioural Economics

Literature on gambling behaviour builds upon the wealth of behavioural economic theories that became prominent in the 20th century. Expected Utility Theory (von Nuemann and Morgenstern, 1947) extended the much earlier concepts of 'moral' and 'mathematical' expectation (Bernoulli, 1738). The theory lays out several axioms of rationality, describing the theory of choice under uncertainty via probabilistic weighting of outcomes and utility. Whilst this work was a cornerstone in utility theory, it is eminently clear that such rigorous probabilistic considerations are unlikely employed by gamblers. Expected utility theory was challenged by Tversky & Kahneman's development of Cumulative Prospect Theory[4] (1992), and provides more readily applicable insights into the theory of decision-making under uncertainty. The paper illustrates that individuals do not necessarily conform to the pre-supposed tenets of rationality. They suggest that people's utility of risk is concave over gains, and convex over losses with a kinked origin illustrating greater sensitivity to losses. Yet authors have struggled to assign gamblers beyond lottery players to a particular risk model. The skew of lottery gambles make the choice to purchase tickets easy to explain via prospect theory, but why would prospect theory agents who are more sensitive to losses repeatedly stake money on other gambles with modest potential gains?

[4] A development on Prospect Theory (Kahneman&Tversky, 1979)

Gambling behaviour

Recent attempts to answer this build upon the works of Friedman and Savage (1948) and Markowitz (1952) which analysed why individuals simultaneously purchase insurance (demonstrating risk-aversion) and lottery tickets (risk-seeking). These papers theorised that an individual's utility function could be both concave and convex over wealth. Conlisk (1993) attempts to answer the above question by rejecting standard economic theory, stipulating that gamblers' motives are not purely in wealth advancement. Conlisk presents a static model of a two-outcome prospect with expectation zero, and includes a separate 'utility of gambling' function. This is to encapsulate other motives for gambling discussed at length in previous literature (see bibliography 2.3) or feelings of "excitement and suspense" (Conlisk, 1993, p.261). Despite its frustrating immeasurability, at first this model seems a best-fit, however, Barberis (2012) offers a convincing rebuttal. In *A Model of Casino Gambling*, Barberis credibly explains aspects of the choice to gamble beyond lotteries via Prospect Theory. The paper illustrates that casino gambling is not an isolated activity that requires a unique explanation but in fact *can* be explained by probabilistic weightings. Barberis's models extend to show why prospect theory agents may choose gambles with both zero expectation games and negative expectation games.

Downes et al. (1976, p.195) explore the notion of gambling product co-consumption, by analysing to what extent gambling is a "composite rather than a discrete activity". However, the analysis does not extend much further from simply noting proportions of people who took part in one gambling activity with each other activity discussed. Additionally, Walker (2007) indirectly investigates this idea by analysing the 'linkage' between gambling industries. Using Seemingly Unrelated Regressions analysis, Walker concludes that certain industries, such as casinos and

lotteries 'cannibalise' each other, whilst others 'help' each other. But, there is a significant gap in the literature: those papers are motivated by US tax revenue analysis, rather than understanding consumer behaviour. The analysis in *this* paper extends upon those ideas, by analysing co-consumption of gambling products at an individual behavioural level. There are also gaps in economic literature on gambling behaviour online. Siemens and Kopp (2011) illustrated that the speed and amount of spending is increased in online environments, but this paper shows these environments also engender *broadened* risk-seeking behaviour.

Data

The dataset used is the "British Gambling Prevalence Survey 2010" (BGPS2010). This survey was commissioned by the UK Gambling Commission – an independent public body established under the Gambling Act 2005 to monitor and regulate commercial gambling. BGPS2010 is the third separate nationally representative survey on gambling participation in the UK; the others in 2000 and 2007. The latest 2010 survey is used for cross-sectional analysis. The dataset consists of 7,756 participants from 4,842 randomly sampled addresses in England, Scotland and Wales.

In choosing a dataset, there were two key requirements: detailed data on methods of gambling and an appropriately designed survey. BGPS2010 used computer-assisted self-interviewing (CASI), instead of the paper-based self-completion surveys used in 2000 and 2007, and as such was able to meet these requirements.

The survey design minimised social desirability bias, which is incredibly important given the social stigma that can be attached to gambling. Interviewers were present to familiarise participants with the survey programme on a provided laptop, but

then the survey would then be completed individually and anonymously. It is well reported that interviewer administrated surveys can cause bias in sensitive issues with respondents distorting the truth to engage in socially desirable responding. Further, initial contact to households confirmed the survey's confidentiality, and a neutral survey title, not explicitly mentioning the word gambling, was presented to minimise inaccuracies caused by survey titles (see Williams and Volberg, 2009).

A high depth of questioning was achieved through sophisticated CASI routing methods. For example, if a person stated that they didn't gamble at all in the last 12 months, then they wouldn't have to sift through pages of questions on gambling. However, if a person stated that they had gambled on football pools, they would be subsequently asked more thorough questions on their football gambling: methods, frequencies and expenditures. The result is a comprehensive dataset with 894 variables detailing individuals' gambling behaviour and demographic and socioeconomic characteristics. The depth of questioning made it preferable over the next best alternative, the Health Survey for England 2012. Despite being more recent, it only contained a very limited gambling module.

Examining the data, it was clearly suitable, but some deficiencies were also apparent. The data was cleansed of anomalous results, with examples including dropping an individual who claimed to have spent 4624 hours gambling last year (out of 5854 awake hours assuming 8 hours sleep) and individuals claiming to have drunk over 40 units (over 1L of Whiskey) in their heaviest day of drinking last week. The final number of observations fell from 7756 to 7668. Table 1 shows that 74% of individuals gambled in the past 12 months, and 14% gambled online.

Table1

Variable	Mean	Std.Dev.	Min-Max
gamble_12	0.74	0.44	0-1
online_12	0.14	0.35	0-1
age	47.77	18.41	16-97
pargam_yes	0.24	0.43	0-1
units	3.59	5.17	0-40
smoke	0.24	0.43	0-1

obvs=7668

Figure 1 graphs the mean proportion of gambling by age, with the lower distribution illustrating online gambling. The two follow fairly similar seemingly quadratic distributions, but we can see some heteroskedasticity for the oldest ages due to low numbers. For example, the data shows 33% of 94-year-olds gambled and 100% of 95-year-olds gambled, but there were only 3 and 1 individuals in these ages respectively. This is one source of bias in the data, albeit relatively small[5]. Figure 2 illustrates the proportion of gamblers in each income quintile, highest to lowest. Here we see very different distributions, with middle-income groups more likely to gamble compared to the highest and lowest but likelihood of online gambling increasing linearly by income quintile.

Figure1

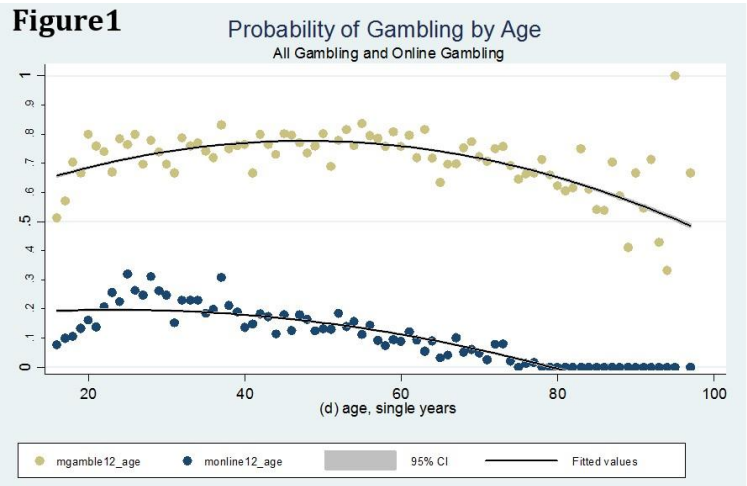
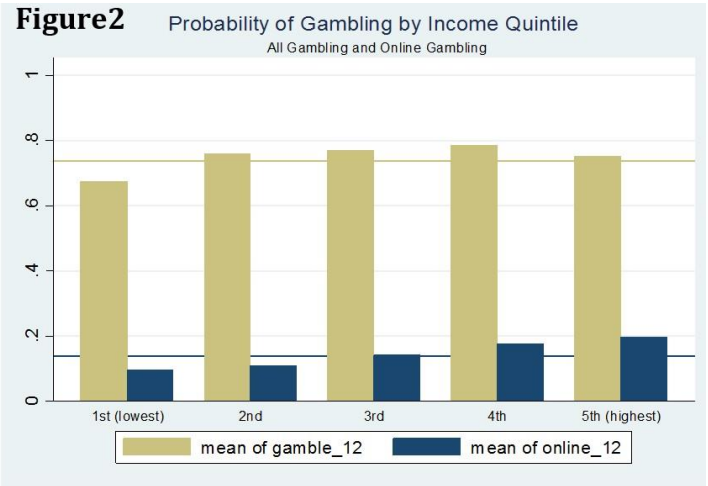


Figure2



[5] Other sources of bias and remedies discussed later

Methodology

The four regressions

Logistic regression analysis was used to construct four individual logit regressions. Regression 1 analyses how the choice to gamble varies according to a range of demographic, socioeconomic and lifestyle factors, whilst regression 2 focuses on the choice to gamble *online.* Regressions 3 and 4 are more focused regressions, analysing the choice to gamble on any of the products traditionally offered by high-street bookmakers in the last 12 months, in-person and online respectively. These products are sports, dog racing and horse racing. The four regressions are:

Table2

Regression/ Model Number	Binary Dependent Variable	Takes on the values 1 or 0, where:
(1)	$y_i = gamble\_12$	$y_i = \begin{cases} 1 \text{ Individual has spent money on any form of gambling in the past 12 months} \\ 0 \text{ Otherwise} \end{cases}$
(2)	$y_i = online\_12$	$y_i = \begin{cases} 1 \text{ Individual has spent money gambling online in the past 12 months} \\ 0 \text{ Otherwise} \end{cases}$
(3)	$y_i = sprc\_ip$	$y_i = \begin{cases} 1 \text{ Individual has spent money gambling on sports and/or races (horses or dogs)} \\ \text{in-person in the past 12 months} \\ 0 \text{ Otherwise} \end{cases}$
(4)	$y_i = sprc\_rem$	$y_i = \begin{cases} 1 \text{ Individual has spent money gambling on sports and/or races (horses or dogs)} \\ \text{remotely in the past 12 months} \\ 0 \text{ Otherwise} \end{cases}$

In regressions 3 and 4, sports and racing products were grouped for several reasons. Firstly, with limited numbers of individuals in each category, there is a need to group categories to avoid bias (discussed later). Secondly, I am particularly interested in understanding the consumer co-consumption of variable-odds[6] gambling products and fixed-odds gambling products. In the past, the two types of gambling product were very separated – consumers may have visited a casino for an array of fixed-odds gambles such as roulette, slots and cards, and the racetrack, pitch-side or bookmakers to gamble on variable-odds gambles. However, now the two broad types of product have a much closer interaction, online and offline. Fixed-odds betting terminals – electronic betting machines that offer fixed-odds games such as roulette – have now become commonplace in high-street bookmakers and elsewhere. Online, variable-odds gambles and casino style games are clicks away, and on many sites 'instant' fixed-odds games are on the side of every page. Gambling on these is encouraged without the need to navigate away from the page the individual originally came to. Further, there are stereotypical beliefs that the two types of gambles attract differently minded people: one group believing they possess better information than the bet-takers with variable-odds betting such as horse racing, and the other 'chancing their arm' on fixed-odds gambles such as slot machines. Do these stereotypes hold and does it mean these minded individuals do not cross-consume between the two types of gamble?

Within regressions 3 and 4 are independent variables for other gambling products, so one can see the influence that gambling on other products has on sports and races gambling – i.e. given that a person gambles on casino games relative to not, does this significantly increase or decrease the likelihood that a person gambles on sports and races?

[6] Variable by the estimations of each gambling firm

Logistic regression analysis

All four regressors are binary variables, taking the values 0 (no) or 1 (yes), so a suitable binary dependent variable model is needed. The Linear Probability Model is subject to several flaws, most notably non-normality and heteroscedasticity of the error term, and the possibility of $\hat{Y}_i$ lying outside of 0-1. With this data, the Logit and Probit models give qualitatively similar results. The Logit model is used for its comparative mathematical simplicity, and the ability to compare results with others authors'; notably Wardle et al's (2013) logistic model of machine gamblers. For the logit model, $F\left(x_i'\beta\right)$ is the cdf of the logistic distribution, where

$$P\left[Y_i = 1\right] = F\left(x_i'\beta\right) = \Lambda\left(x_i'\beta\right) = \frac{e^{x_i'\beta}}{1+e^{x_i'\beta}}$$

Survey weights

Weightings for individuals are included according to age, sex and region. Using the 'svyset' command and 'svy:logit' sub-commands, weighted estimations of the models were calculated. However, given the negligible differences (Appendix Table 8), for consistency and the ability to utilise a full-set of postestimation techniques, the results in the main body of this paper do not use weighted observations. .

Sources of bias

Sources of potential bias were clear before any logistic analysis was undertaken. First there are low numbers of individuals in certain categories, which is a particular issue for dependent variables. For example, with only 14% of individuals gambling online, the ability of model 2 to classify accurately will be biased; high specificity and low sensitivity is somewhat inevitable. Hence, this is why models 3 and 4 groups sports and races. Had the models been too narrow, for example analysing dog races

alone, high skew would have made meaningful interpretation difficult. Endogeneity in models 3 and 4 is another inevitable bias, with the error terms of the different gambling products undoubtedly correlated with the dependent variables. However, this is an unavoidable limitation of the model, given that suitable instrumental variables couldn't be used, for example in an ivprobit[7] model.

[7] Interestingly, however, STATA couldn't perform ivprobit on the model citing 'no endogenous variables'

Results – regressions 1 & 2

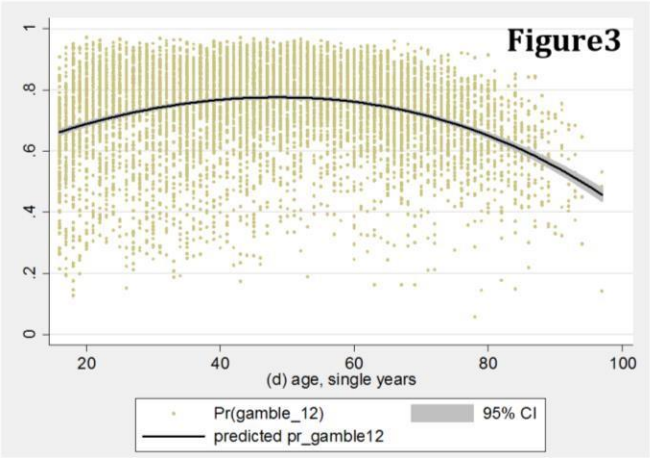
Table3	Dependent Variable:	(1)gamble_12		(2)online_12	
Independent Variable*(Default):*		Odds-Ratio	Std.err	Odds-Ratio	Std.err
Sex *(Female)*	Male	_	_	**1.2095****	(0.0906)
Age	Age	**1.0382*****	(0.0093)	**1.0518*****	(0.0167)
	Age^2	**0.9996*****	(0.0001)	**0.9990*****	(0.0002)
Ethnicity *(White)*	Non-white	**0.4282*****	(0.0423)	**0.7542***	(0.1081)
Qualifications *(Higher ed and above)*	Qualification below high	**1.4272*****	(0.0967)	**0.9472**	(0.0739)
	No qualifications	**1.5567*****	(0.1283)	**0.7687****	(0.0900)
Income *(2nd,3rd& 4th quintile)*	1st(lowest)quintile	**0.7477*****	(0.0639)	**0.7421****	(0.0920)
	5th(highest)quintile	**0.8501****	(0.0668)	**1.2396****	(0.1101)
	Refused	**0.6624*****	(0.0537)	**0.9440**	(0.1101)
Employment Status *(Paid employment)*	Unemployed	**0.6519*****	(0.0807)	**0.7154****	(0.1154)
	Housewife/husband	**0.7795****	(0.0824)	**0.8794**	(0.1248)
	Retired	**0.7895****	(0.0823)	**1.0068**	(0.1856)
	Full-time Education	**0.6499*****	(0.0882)	**0.5714****	(0.1015)
	Other economic-activity	**0.9465**	(0.1720)	**0.9794**	(0.2088)
Parental gambling *(Parents didn't gamble)*	Parents did gamble	**1.2220*****	(0.0830)	_	_
Parental gambling 2 *(Parents didn't gamble)*	Parents gambled and had problem	_	_	**1.5272****	(0.2587)
	Parents gambled, didn't have problem	_	_	**1.2261****	(0.1024)
Alcohol consumption *Units on heaviest day last week*	Units	**1.0714*****	(0.0127)	**1.0234****	(0.0130)
	Units^2	**0.9986****	(0.0006)	**0.9995**	(0.0005)
Smoking status *(Non-smoker)*	Smoker	**1.4570*****	(0.1066)	_	_
Number of children		**0.9066*****	(0.0306)	_	_
Attitude to gambling industry score		**1.0793*****	(0.0066)	**1.0599*****	(0.0087)
Region *(London)*	North	**1.5437*****	(0.1548)	**1.1730**	(0.1581)
	South exc.London	**1.1663**	(0.1164)	**1.3447****	(0.1808)
	East	**1.7108*****	(0.2111)	**1.5445*****	(0.2406)
	Midlands	**1.5619*****	(0.1675)	**1.3013***	(0.1830)
	Wales	**1.6467*****	(0.2385)	**1.1882**	(0.2315)
	Scotland	**1.3431****	(0.1629)	**1.1482**	(0.1847)
Cons		**0.1784*****	(0.0519)	**0.0295*****	(0.0118)
n=7668				***1% sig.level**5% sig.level*10% sig.level	

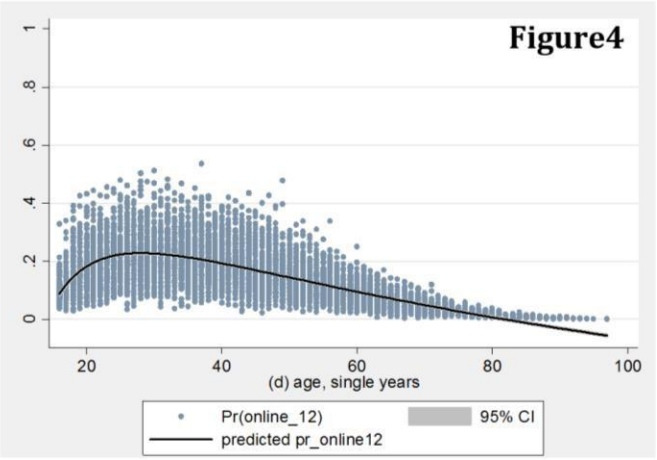
Interpretations[8] - regressions 1 & 2

The logistic regression output is an 'odds ratio'. The odds ratio shows the probability that an individual gambled divided by the probability that they didn't, evaluated at the different independent variables ceteris paribus. Therefore if the odds ratio for an independent variable exceeds one, then it is increasing the probability of gambling relative to not. If the odds ratio is less than one, then it's reducing the probability of gambling relative to not. The odds ratios also present the magnitude of these effects.

Demographic characteristics

There is a quadratic relationship in age for both regressions 1 and 2, with concavity clear in figures 3 and 4 respectively, but there are some key differences. The graphs show the predicted probability of gambling, and feature fitted curves.





The first clear difference is that the predicted probability of gambling online compared to model 1 is lower on average across all ages. Another interesting difference is that the peak is much earlier in online gambling: a person is most likely to gamble

[8] Due to word-count constraints, only the most important results discussed

online in their mid-twenties, compared to late-forties for all gambling. The drop is much sharper after the peak for online gambling too. These results were expected, given that computer and internet proficiency is subject to well-documented generational differences.

Interestingly, a gender effect was important in model 2, but insignificant in model 1. The regression 1 results support the work of Schubert et al. (1999) who discuss and subsequently refute the stereotypical view that women are more risk-averse in financial decision-making. Even when the regression is repeated excluding lottery players (as done in Wardle et al, 2013), males don't appear significantly more likely to gamble.

However, the odds that someone gambles *online* given that they are male is 1.21 times higher than the odds that someone gambles online given they are female. The explanation for different results in the models is not clear. The data on gambling motivations does not shed any light; with a higher proportion of females responding 'never' when asked if they gamble with friends and family, one might expect females to be just as likely to gamble online. To meaningfully explain the clear difference in results, further study would be needed; analysis of online peer network effects and response to online advertising may prove valuable.

The results for ethnicity are dramatic: non-whites are much less likely to gamble than whites, although this isn't as pronounced online. Minority ethnicities have been grouped given that they make up only 8.58% of the sample, and this small number is likely to bias the result somewhat. However, the results are consistent with Wardle et al's (2013) analysis of the odds being classified as a machine gambler. They find an odds ratio of 0.66 for non-whites, in-between the regression 1 and 2 results. Had there been

data on religion, and the extent to which individuals practice it, I believe some of the effect currently being portrayed as ethnicity would be diminished.

Socioeconomic status

Education, income[9] and employment status present some interesting findings. First, there are fundamental differences in the educational influence on all gambling and online gambling. Having qualifications below higher education or no qualifications significantly increases the probability that someone gambles in general: with odds ratios of 1.43 and 1.56 respectively. This concurs with the work of Wagenaar (1998) and Barberis (2012) which suggest the choice to gamble can involve being unaware of unfavourable odds; more educated people may better understand the weighted risks, hence why they are less likely to gamble.

However, in online gambling, the results are the opposite. Having no qualifications significantly decreases the probability that an individual gambles online, compared to those with higher education or above[10]. One might suggest that this is related to the likelihood that a highly educated person is better paid, and more likely to have access to computers and the internet – but income has been controlled for. Indeed the richest quintile *are* more likely to gamble online, whilst model 1 shows the richest and poorest quintiles are *less* likely to gamble compared to middle-income groups. Unsurprisingly all other economic groups are, on average less likely to gamble than those in paid employment[11].

[9] N.B. *pinc_refuse*, a dummy for refusal to state income is included to avoid dropping a large number of observations, but offers no meaningful interpretation
[10] The qualifications below higher variable proved insignificant, but is kept in for consistency
[11] Retired does show an odds ratio of 1.01 online, but this is insignificant and kept in for consistency.

Proxies for risk-seeking behaviour

Alcohol consumption and smoking status are widely accepted proxies in determining risk-seeking behaviour (see Weber et al., 2002). The odds that an individual gambles given that they smoke is 1.46 times higher than the odds that they gambled given that they don't. But smoking is insignificant in regression 2. I find this unusual, and was expecting similar results in both regressions given the research on smokers' higher propensity to take risks. In the past, one might have suggested non-smokers are deterred from gambling in in-person smoking environments, whilst both groups could comfortably gamble online, which could explain the results – but the 2007 smoking ban largely rules this out. Also, there is a clear negative correlation between age and likelihood of smoking (figure 9); younger people are more likely to smoke and more likely to gamble online, so one might even have expected a spurious connection to arise, but it didn't. For both regressions, alcohol consumption has a quadratic effect: alcohol consumption increases the likelihood a person gambles and gambles online, but there are diminishing marginal effects.

Parental risk-seeking behaviour is often discussed in literature, but seldom tested. The data shows that given an individuals' parents gambled, they too are more likely to gamble. An interesting distinction between the models, is that in online gambling, a greater effect is present given that an individuals' parents gambled *and* had a gambling problem.

Results – regressions 3 & 4

Table4 **Independent variable***(Default):*	**Dependent Variable:**	**(3)sprc_ip**		**(4)sprc_rem**	
		Odds-Ratio	Std.err	Odds-Ratio	Std.err
Sex *(Female)*	Male	**1.5527*****	(0.1109)	**2.3122*****	(0.3545)
Age	Age	**1.0385*****	(0.0112)	_	_
	Age^2	**0.9995*****	(0.0001)		
(Over45s)	16-24	_	_	**1.6942****	(0.3585)
	25-34	_	_	**2.3112*****	(0.4195)
	35-44	_	_	**1.8307*****	(0.3284)
Ethnicity *(White)*	Non-white	**0.5423*****	(0.0893)	**0.4584****	(0.1558)
Income *(1st to 4th quintile)*	5th (highest) quintile	**1.1883****	(0.1002)	_	_
	Refused	**0.9399**	(0.0983)	_	_
Parental gambling *(Parents didn't gamble)*	Parents gambled and had problem	**1.7688*****	(0.2800)	_	_
	Parents gambled, but didn't have problem	**1.3313*****	(0.1016)	_	_
Alcohol consumption *Units on heaviest day last week*	Units	**1.0906*****	(0.0133)	**1.0335*****	(0.0098)
	Units^2	**0.9975*****	(0.0005)		
Number of children		**0.9240***	(0.0382)	_	_
Other gambling products	Lottery– in-person	**2.4697*****	(0.2116)		
	Lottery– remote	**0.8299***	(0.0902)	**4.6123*****	(0.6858)
	Casino– in-person	**1.9850*****	(0.3023)	**1.9486*****	(0.4117)
	Casino games– remote	_	_	**4.5671*****	(1.0544)
	Bingo– in-person	**1.4892*****	(0.1665)	_	_
	Bingo– Remote	**0.6368***	(0.1482)	**1.7748***	(0.5496)
	Scratchcards	**1.5605*****	(0.1188)	_	_
	Fixed-odds betting terminal	**3.2858*****	(0.5045)	_	_
	Instant-game online	_	_	**1.7474****	(0.4259)
	Fruit-machines	**1.5768*****	(0.1439)		
Social - *Views gambling as sociable sometimes-always (comp.to never)*		_	_	**1.6774*****	(0.2370)
Attitude to gambling industry score		**1.0792*****	(0.0002)	**1.0999*****	(0.0003)
Cons		**0.0046*****	(0.0029)	**0.0007*****	(0.0006)
n=7668				***1%sig.level**5%sig.level*10%sig.level	

Interpretations - regressions 3 and 4

Gambling product co-consumption

Several interesting conclusions can be drawn on the co-consumption of different gambling products online and offline.

Fixed-odds betting terminals

Starting with in-person sports and races (sprc) gambling, we can see that fixed-odds betting terminals (FOBTs) have a very large effect. These are standout results in regression 3. The odds that an individual gambles on sprc in-person if they use FOBTs is 3.3 times higher than if they don't. We can therefore conclude that there is strong complementarity demand, but cannot comment on causality or its direction. As previously discussed, sports and races were grouped to assess the link between fixed-odds gambles and variable-odds gambles; this and following results clearly suggest that there *is* cross-influence between the two types of gambles.

Instant games and casino games

A comparable gambling product online is instant games. We can see from the odds ratio of 1.75 there is also a strongly significant link between online sprc gambling behaviour and instant online games. However, the magnitude is not as great as that of FOBTs on in-person gambling. There are other products that have much greater influence on sprc online gambling.

Compare casino games in the two regressions, starting with in-person casino gambling. In-person casino gambling does have a strong positive influence on in-person sprc gambling: an odds ratio of 1.99. In-person casino gambling is similarly influential in online sprc: an odds ratio of 1.95. R*emote* casino gambling proved insignificant in model

3, yet had a huge effect in regression 4 with an odds ratio of 4.57 – an overwhelmingly strong link. In isolation, this result supports the hypothesis that gambling product[12] 'X' *online* will greater influence the consumption of 'Y' online, compared to the relative influence of 'X' *offline* on 'Y' offline.

Bingo and Lottery

We see more support for this hypothesis in bingo and lottery gambling. Indeed, in-person bingo positively influences in-person sprc gambling, but remote bingo influences remote sprc gambling to a greater extent. Remote lottery has a strong and significant effect on remote sprc, whilst in-person lottery is insignificant despite the large numbers who play it.

It is shown that different gambling products clearly influence the consumption of sprc gambling, giving rise to the idea that a person is 'a gambler' i.e. if someone gambles at all they are likely to gamble on a variety of products. But, analysis of bingo and lottery gambling leads to a further interpretation: that a person is either 'an in-person gambler' or 'an online gambler'. There is little cross-influence between the two platforms; indeed, remote bingo and lottery appear to *negatively* affect in-person sprc gambling.

Network effects

Participants were asked if they viewed gambling as a sociable activity, inviting responses 'sometimes', 'often', 'always' or 'never'. Interestingly, those who responded positively to this question were more likely to gamble online in regression 4 compared those who responded 'never'. However, this didn't appear meaningful in regression 3. This may seem counter-intuitive, given that in-person gambling would appear by its

[12] Gambling may also be referred to as a service. I make the distinction between the overall 'gambling service' a licensed firm provides, and the individual 'products' offered i.e. horse-betting

nature more sociable. However, I believe that these findings point to the significant network effects in online gambling that are present through social features in gambling applications and greater peer influence through social media.

Postestimation and robustness checks

A range of postestimation and robustness checks for all four models, including classification and goodness-of-fit tests, are shown in the Appendix (Fig.5.1-8.3). The tests illustrated are subject to literature that both support and criticise their value. Therefore, these tests were not used in attempt to prove the models' respective merits, but as preventative checks to highlight any obvious flaws the tests could show.

Conclusions

Critique

There are several issues with this project that do not make the core of the analysis defunct, but in an ideal world would be different.

The analysis was somewhat restricted by the sample size. For models 1 and 2, a data-set comprised of over 7,500 gamblers and non-gamblers is ideal. However this is restrictive for models 3 and 4; narrower models of gamblers couldn't be constructed. I would have liked to have regressed FOBT gamblers, but with fewer than 5% of the sample partaking in it, this was too small to build a meaningful model. This too is a limitation of the interpretations of some independent variables within models 3 and 4, hence why the 95% confidence intervals are fairly broad. However, whilst the *exact* magnitude of effects may be imprecise, the directions of these effects are clear.

There is also an issue with data relevance. In a fast-evolving technological world, online gambling data from 2010 could be considered somewhat outdated. Gambling has since become even more accessible. Broadband subscriptions have risen from 71% in 2010 to 77% in 2014. More important, however, is the increase in smart-mobile phone ownership. In 2010, 23% of UK consumers accessed the internet via their mobile phone. Just four years later, this figure had jumped to 57%[13]. Gambling firms have responded to this consumer trend, by continually redeveloping mobile and tablet applications to provide existing and new gambling services. There is even a *direct* social media effect: Facebook launched games with real-money gambles in 2012. If more recent data were available, I would expect the results illustrated to be more pronounced.

Another issue is that the data cannot make the distinction between people that have the propensity to gamble in-person and online, but choose not to for other reasons than those discussed. For example, a person may attend horse racing in-person, but choose to gamble on their mobile phone in attendance, not for any reason of fundamental demographics or socioeconomic status, but to search odds online or avoid queuing.

Extensions

The most valuable consumer behaviour extension would be investigations into real-time gambling actions. If one were able to observe how much a person gambles, and what their 'next move' is, more interesting and accurate conclusions about sequential gambling behaviour could be made. Valuable extensions would answer questions such as "Given that a person wins £100 on football online, what do they do next? What if it was only £10? Or what if they lost £100?"

[13] Statistics: Ofcom Communications Market Report, 2010, 2014

Whilst this sounds difficult to achieve, it is possible for online analysis. Real-time data is not publicly available, but gambling firms hold a wealth of data on transactions carried out by individuals online, detailing in real-time to the second, details of amounts wagered, won or lost on different products. Doubtless gambling firms are already carrying out consumer behaviour research motivated by marketing potential; they have a unique platform to be able to entice consumers to bet on additional activities with well-targeted visual stimuli: pop-ups and instant mini-games. With access to the data, economists could gain a true understanding of risk-seeking behaviour in online gambling: how consumers choose between different types of gambles; the impacts of money lost and won; and time lags.

Concluding remarks

This paper has illustrated the various demographic, socioeconomic and lifestyle effects on the likelihood that a person will be classified as a gambler or an online gambler in models 1 and 2. Fundamental differences are present, such as a gender effect seen only in online gambling, and high-income only encouraging gambling online. The results provide both interesting complements and conflicts to existing literature.

In models 3 and 4, this paper illustrated that on average, other online activities, independent of the other demographic and socioeconomic factors shown, have a large influence on whether individuals also gamble on sports and races online. The argument that gambling on an online product will greater influence gambling on other products online, through the ability to make click-speed decisions, the lower transportation costs (especially time) of moving between products and targeted product-placement, has manifested itself in the results of this paper. Offline, however, we see that FOBM use is heavily influential to offline sports and races gambling. This too points to low

transportation costs between the two in betting shops. Further, there is evidence of little cross-influence between online and offline gambling, and the stereotypical view of a separation of fixed-odds and variable-odds gamblers was refuted.

It is important to remember that these conclusions are based on one subset of gambling products, and it would be imprudent to suggest these results are necessarily causal, or indicative of all gambling products.

Appendix

Table 5 – List of Important Variables

Variable name	Definition
gamble_12	Individual has spent money on any form of gambling in the past 12 months
online_12	Individual has spent money on online gambling in the past 12 months
sprc_ip	Individual has spent money on sports and/or races (dogs and horses) gambling in-person in the last 12 months
sprc_rem	Individual has spent money on sports and/or races (dogs and horses) gambling remotely in the past 12 months
male	Individual is male
age	Age, in single years, at time of survey
age2	Age variable squared
nonwhite	Individual's ethnicity is non-white
qualbelowhi	Individual holds qualifications below that of higher education
noqual	Individual holds no formal qualifications
pinc_1q	Individual is in the lowest personal income quintile
pinc_5q	Individual is in the highest personal income quintile
pinc_refuse	Individual refused to give their income
*unemp_*	Individual is unemployed or disabled unemployed
housewh	Individual is a 'housewife' or 'househusband'
retired	Individual is retired
fteduc	Individual is in full time education
ecact_other	Individual takes part in 'other' economic activity
pargam_yes	Individual's parents "regularly" gambled
pargam_prob	Individual's parents regularly gambled and had problems with their gambling
pargam_bnoprob	Individual's parents "regularly" gambled, but did not have problems with their gambling
units	Alcoholic units consumed on the heaviest day of drinking the week prior to the survey
units2	Units variable squared
smoke	Individual smokes
numchild	Number of children
gam_attscore	Attitude to gambling score. Based on 8 questions with 0-5 response. 0-19 =views harm of gambling industry as greater than benefits. 20 = neutral. 21-40 = benefits outweigh harm.
north	Individual lives in the North of England
south_exldn	Individual lives in the South of England (excluding London)
east	Individual lives in the East of England
midlands	Individual lives in the Midlands
wales	Individual lives in Wales
scot	Individual lives in Scotland
age_16t24	Individual is aged between 16 and 24 inclusive
age_25t34	Individual is aged between 25 and 34 inclusive
age_35t44	Individual is aged between 35 and 44 inclusive
lotto_ip	Individual spent money gambling on a lottery in-person in the past 12 months
lotto_rem	Individual spent money gambling on a lottery remotely in the past 12 months
cas_ip	Individual spent money gambling on a casino games (roulette, slots and cards) in a casino in the past 12 months
cas_rem	Individual spent money gambling on a casino games (roulette, slots and cards) remotely in the past 12 months
bingo_ip	Individual spent money gambling on bingo in-person in the past 12 months
bingo_rem	Individual spent money gambling on bingo remotely in the past 12 months
scratch12	Individual spent money gambling on scratchcards in-person in the past 12 months
fobm12	Individual spent money gambling on a fixed-odds betting machine in-person in the past 12 months
instantgame_online	Individual spent money gambling on an online afixed-odds instant game in the past 12 months
fruitslot12	Individual spent money gambling on fruit slot machine (outside of a casino) in-person in the past 12 months

Table 6 – Full regression results including confidence intervals, 1 and 2

				Number of obs	=7668	
				LR chi2(25)	=789.3	
				Prob > chi2	=0	
Log likelihood = -4025.8058				Pseudo R2	=0.089	
(1) gamble_12	Odds Ratio	Std. Err.	z	P>z	95% conf. interval	
age	1.0382	0.0093	4.16	0	1.0200	1.0566
age2	0.9996	0.0001	-4.72	0	0.9994	0.9997
nonwhite	0.4283	0.0412	-8.81	0	0.3547	0.5172
qualbelowhi	1.4273	0.0964	5.27	0	1.2504	1.6292
noqual	1.5567	0.1264	5.45	0	1.3277	1.8252
pinc_1q	0.7477	0.0638	-3.41	0.001	0.6326	0.8837
pinc_5q	0.8501	0.0670	-2.06	0.039	0.7285	0.9921
pinc_refuse	0.6624	0.0536	-5.09	0	0.5653	0.7761
unemp_	0.6519	0.0800	-3.49	0	0.5126	0.8291
housewh	0.7748	0.0816	-2.42	0.015	0.6302	0.9526
retired	0.7895	0.0820	-2.27	0.023	0.6441	0.9678
fteduc	0.6499	0.0881	-3.18	0.001	0.4982	0.8477
ecact_other	0.9465	0.1710	-0.3	0.761	0.6642	1.3488
pargam_yes	1.2220	0.0831	2.95	0.003	1.0694	1.3963
units	1.0714	0.0143	5.18	0	1.0438	1.0997
units2	0.9986	0.0006	-2.26	0.024	0.9974	0.9998
smoke	1.4570	0.1066	5.14	0	1.2624	1.6816
numchild	0.9066	0.0306	-2.91	0.004	0.8486	0.9685
gam_attscore	1.0793	0.0066	12.39	0	1.0663	1.0924
north	1.5438	0.1550	4.32	0	1.2680	1.8795
south_exldn	1.1663	0.1167	1.54	0.124	0.9586	1.4189
east	1.7109	0.2119	4.34	0	1.3421	2.1810
midlands	1.5619	0.1676	4.15	0	1.2656	1.9275
wales	1.6467	0.2383	3.45	0.001	1.2400	2.1868
scot	1.3431	0.1629	2.43	0.015	1.0591	1.7034
_cons	0.1794	0.0500	-6.17	0	0.1039	0.3097

				Number of obs	=7668	
				LR chi2(25)	=570.6	
				Prob > chi2	=0	
Log likelihood = -2800.7897				Pseudo R2	=0.093	
(2) online_12	Odds Ratio	Std. Err.	z	P>z	95% conf. interval	
male	1.210	0.091	2.53	0.011	1.0440	1.4013
age	1.052	0.017	3.18	0.001	1.0195	1.0850
age2	0.999	0.000	-5.14	0	0.9987	0.9994
nonwhite	0.754	0.107	-2	0.046	0.5718	0.9948
qualbelowhi	0.947	0.074	-0.7	0.486	0.8132	1.1034
noqual	0.769	0.089	-2.26	0.024	0.6120	0.9656
pinc_1q	0.742	0.092	-2.41	0.016	0.5821	0.9462
pinc_5q	1.240	0.110	2.41	0.016	1.0411	1.4760
pinc_refuse	0.944	0.110	-0.49	0.621	0.7514	1.1861
unemp_	0.715	0.115	-2.09	0.037	0.5222	0.9801
housewh	0.879	0.124	-0.91	0.363	0.6667	1.1601
retired	1.007	0.185	0.04	0.97	0.7020	1.4442
fteduc	0.571	0.101	-3.15	0.002	0.4035	0.8093
ecact_other	0.979	0.208	-0.1	0.922	0.6458	1.4854
pargam_prob	1.527	0.259	2.5	0.012	1.0959	2.1282
pargam_bnoprob	1.226	0.103	2.44	0.015	1.0408	1.4445
units	1.023	0.014	1.7	0.09	0.9964	1.0511
units2	1.000	0.001	-0.88	0.381	0.9984	1.0006
gam_attscore	1.060	0.009	7.12	0	1.0431	1.0770
north	1.173	0.158	1.18	0.238	0.9001	1.5287
south_exldn	1.345	0.181	2.2	0.028	1.0328	1.7508
east	1.545	0.241	2.79	0.005	1.1375	2.0973
midlands	1.301	0.183	1.87	0.062	0.9873	1.7152
wales	1.188	0.232	0.88	0.377	0.8106	1.7417
scot	1.148	0.185	0.86	0.391	0.8373	1.5747
_cons	0.030	0.012	-8.91	0	0.0136	0.0641

Table 7 – Full regression results including confidence intervals, 3 and 4

				Number of obs	=7668	
				LR chi2(20)	=1186.05	
				Prob > chi2	=0	
Log likelihood = -2999.9394				Pseudo R2	=0.1651	
(3) sprc_ip	Odds Ratio	Std. Err.	z	P>z	95% conf.	interval
male	1.5627	0.1116	6.25	0	1.3585	1.7976
age	1.0384	0.0112	3.5	0	1.0167	1.0605
age2	0.9995	0.0001	-4.22	0	0.9993	0.9997
nonwhite	0.5423	0.0882	-3.76	0	0.3942	0.7460
pinc_5q	1.1883	0.1003	2.04	0.041	1.0072	1.4021
pinc_refuse	0.9399	0.0980	-0.59	0.552	0.7661	1.1530
pargam_prob	1.7688	0.2820	3.58	0	1.2941	2.4177
pargam_bno~b	1.3313	0.1023	3.73	0	1.1453	1.5476
units	1.0906	0.0143	6.6	0	1.0629	1.1190
units2	0.9975	0.0005	-4.48	0	0.9965	0.9986
numchild	0.9240	0.0381	-1.91	0.056	0.8522	1.0019
lotto_ip	2.4697	0.2114	10.56	0	2.0883	2.9208
lotto_rem	0.8299	0.0905	-1.71	0.087	0.6702	1.0276
scratch12	1.5605	0.1188	5.84	0	1.3441	1.8117
fobm12	3.2858	0.5021	7.78	0	2.4354	4.4331
cas_ip	1.9851	0.3044	4.47	0	1.4698	2.6809
fruitslot12	1.5768	0.1444	4.97	0	1.3178	1.8867
bingo_ip	1.4892	0.1657	3.58	0	1.1974	1.8521
bingo_rem	0.6368	0.1472	-1.95	0.051	0.4048	1.0019
gam_attscore	1.0792	0.0087	9.44	0	1.0623	1.0965
_cons	0.0046	0.0014	-17.6	0	0.0025	0.0084

				Number of obs	=7668	
				LR chi2(13)	=572.53	
				Prob > chi2	=0	
Log likelihood = -931.6853				Pseudo R2	=0.2350	
(4) sprc_rem	Odds Ratio	Std. Err.	z	P>z	95% conf.	interval
male	2.3122	0.3556	5.45	0	1.7105	3.1256
age_16t24	1.6942	0.3562	2.51	0.012	1.1220	2.5582
age_25t34	2.3112	0.4179	4.63	0	1.6216	3.2940
age_35t44	1.8307	0.3279	3.38	0.001	1.2887	2.6006
units	1.0335	0.0099	3.43	0.001	1.0142	1.0531
nonwhite	0.4584	0.1561	-2.29	0.022	0.2352	0.8937
lotto_rem	4.6123	0.6858	10.28	0	3.4463	6.1728
cas_rem	4.5671	1.0581	6.56	0	2.9002	7.1919
cas_ip	1.9486	0.4138	3.14	0.002	1.2852	2.9545
bingo_rem	1.7747	0.5477	1.86	0.063	0.9692	3.2495
instantgameon	1.7474	0.4214	2.31	0.021	1.0892	2.8032
social	1.6774	0.2368	3.66	0	1.2721	2.2120
gam_attscore	1.0999	0.0182	5.77	0	1.0648	1.1360
_cons	0.0007	0.0003	-17.3	0	0.0003	0.0017

Postestimations

gamble_12 postestimations

Figure 5.1: Classification, sensitivity and specificity

	True classification		
Model prediction	D (gamble)	~D (not gamble)	Total
+ (gamble)	5423	1668	7091
- (not gamble)	226	351	577
Total	5649	2019	7668

Classified + if predicted Pr(D) >= .5

Sensitivity	Pr(+|D)	96.00%
Specificity	Pr(-|~D)	17.38%
Positive predictive value	Pr(D|+)	76.48%
Negative predictive value	Pr(~D|-)	60.83%
False + rate for true ~D	Pr(+|~D)	82.62%
False - rate for true D	Pr(-|D)	4.00%
False + rate for classified +	Pr(~D|+)	23.52%
False - rate for classified -	Pr(D|-)	39.17%
Correctly classified		75.30%

Figure 5.2: ROC curve, gamble_12

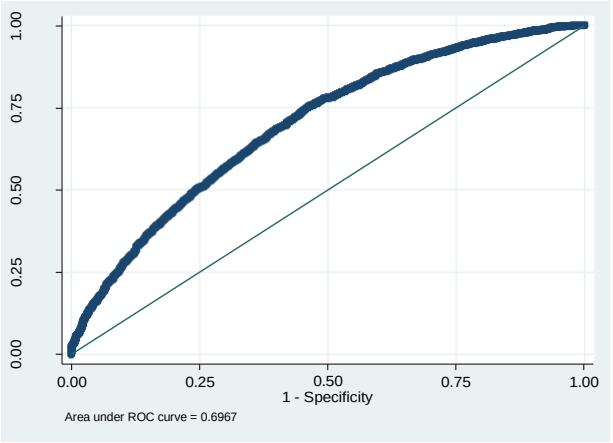


Figure 5.3: Goodness of fit test, gamble_12

Number of Observations	7668
Number of Covariate Patterns	7638
Pearson chi2(7612)	7650.78
Prob > chi2	0.3749

online_12 postestimations

Figure 6.1: Classification, sensitivity and specificity

	True classification		
Model prediction	D (gamble)	~D (not gamble)	Total
+ (gamble)	301	713	1014
- (not gamble)	762	5892	6654
Total	1063	6605	7668

Classified + if predicted Pr(D) >= .25

Sensitivity	Pr(+|D)	28.32%
Specificity	Pr(-|~D)	89.21%
Positive predictive value	Pr(D|+)	29.68%
Negative predictive value	Pr(~D|-)	88.55%
False + rate for true ~D	Pr(+|~D)	10.79%
False - rate for true D	Pr(-|D)	71.68%
False + rate for classified +	Pr(~D|+)	70.32%
False - rate for classified -	Pr(D|-)	11.45%
Correctly classified		80.76%

Figure 6.2: ROC curve, online_12

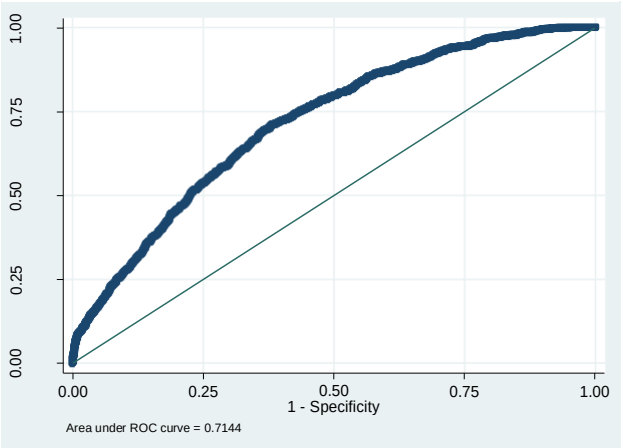


Figure 6.3: Goodness of fit test, online_12

Number of Observations	7668
Number of Covariate Patterns	7628
Pearson chi2(7602)	7500.14
Prob > chi2	0.7951

sprc_ip postestimations

Figure 7.1: Classification, sensitivity and specificity

	True classification		
Model prediction	D (gamble)	~D (not gamble)	Total
+ (gamble)	716	1015	1731
- (not gamble)	650	5287	5937
Total	1366	6302	7668

Classified + if predicted Pr(D) >= .25

Sensitivity	Pr(+|D)	52.42%
Specificity	Pr(-|~D)	83.89%
Positive predictive value	Pr(D|+)	41.36%
Negative predictive value	Pr(~D|-)	89.05%
False + rate for true ~D	Pr(+|~D)	16.11%
False - rate for true D	Pr(-|D)	47.58%
False + rate for classified +	Pr(~D|+)	58.64%
False - rate for classified -	Pr(D|-)	10.95%
Correctly classified		78.29%

Figure 7.2: ROC curve, sprc_ip

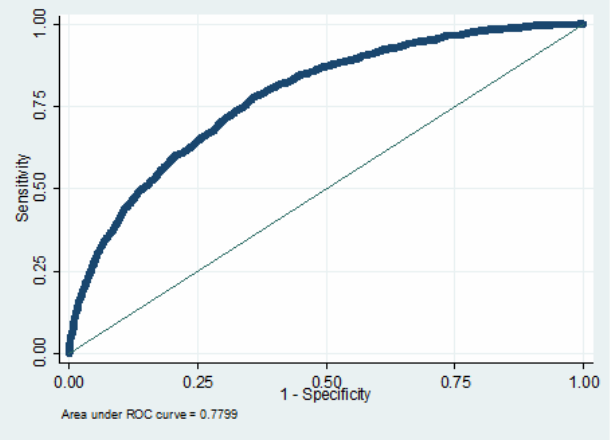


Figure 7.3: Goodness of fit test, sprc_ip

Number of Observations	7668
Number of Covariate Patterns	7540
Pearson chi2(7519)	7175.41
Prob > chi2	0.9977

sprc_rem postestimations

Figure 8.1: Classification, sensitivity and specificity

	True classification		
Model prediction	D (gamble)	~D (not gamble)	Total
+ (gamble)	93	135	228
- (not gamble)	192	7248	7440
Total	285	7383	7668

Classified + if predicted Pr(D) >= .2

Sensitivity	Pr(+|D)	32.63%
Specificity	Pr(-|~D)	98.17%
Positive predictive value	Pr(D|+)	40.79%
Negative predictive value	Pr(~D|-)	97.42%
False + rate for true ~D	Pr(+|~D)	1.83%
False - rate for true D	Pr(-|D)	67.37%
False + rate for classified +	Pr(~D|+)	59.21%
False - rate for classified -	Pr(D|-)	2.58%
Correctly classified		95.74%

Figure 8.2: ROC curve, sprc_rem

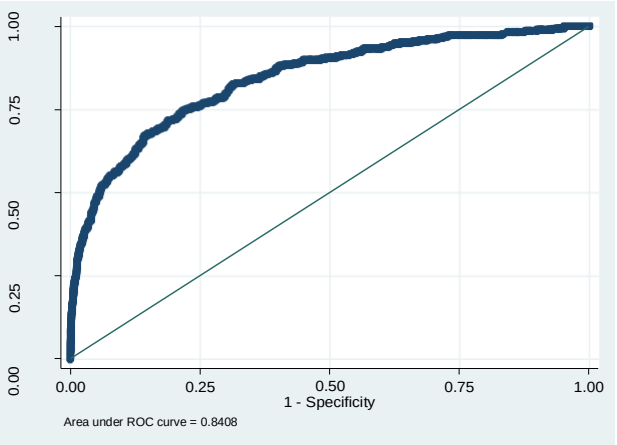


Figure 8.3: Goodness of fit test, sprc_rem

Number of Observations	7668
Number of Covariate Patterns	3254
Pearson chi2(3240)	3254.24
Prob > chi2	0.4266

Table 8 – highlighting negligible difference in results using survey weights

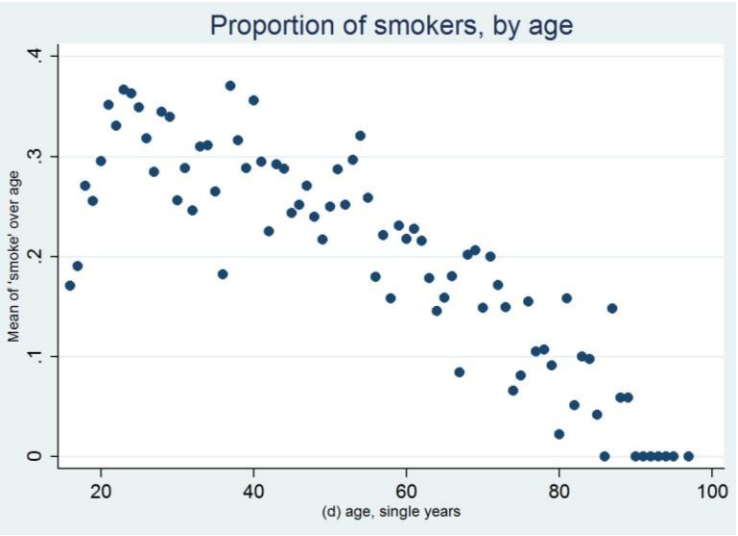
(1) gamble_12	Without survey weights	With survey weights
	Odds Ratio	
age	1.0382	1.0407
age2	0.9996	0.9996
nonwhite	0.4283	0.4549
qualbelowhi	1.4273	1.4239
noqual	1.5567	1.5065
pinc_1q	0.7477	0.7360
pinc_5q	0.8501	0.8829
pinc_refuse	0.6624	0.6777
unemp_	0.6519	0.6104
housewh	0.7748	0.7742
retired	0.7895	0.8020
fteduc	0.6499	0.6832
ecact_other	0.9465	0.9813
pargam_yes	1.2220	1.2374
units	1.0714	1.0713
units2	0.9986	0.9986
smoke	1.4570	1.5172
numchild	0.9066	0.9007
gam_attscore	1.0793	1.0779
north	1.5438	1.7185
south_exldn	1.1663	1.3593
east	1.7109	1.8744
midlands	1.5619	1.7092
wales	1.6467	1.7826
scot	1.3431	1.5191
_cons	0.1794	0.1504

(2) online_12	Without survey weights	With survey weights
	Odds Ratio	
male	1.2095	1.2287
age	1.0518	1.0535
age2	0.9990	0.9990
nonwhite	0.7542	0.7705
qualbelowhi	0.9473	0.9635
noqual	0.7687	0.7538
pinc_1q	0.7421	0.7837
pinc_5q	1.2396	1.2850
pinc_refuse	0.9440	0.9300
unemp_	0.7154	0.6860
housewh	0.8794	0.8858
retired	1.0069	1.0452
fteduc	0.5714	0.5353
ecact_other	0.9794	0.9179
pargam_prob	1.5272	1.5755
pargam_bnoprob	1.2261	1.2598
units	1.0234	1.0223
units2	0.9995	0.9995
gam_attscore	1.0599	1.0580
north	1.1730	1.1789
south_exldn	1.3447	1.4327
east	1.5445	1.6588
midlands	1.3013	1.3403
wales	1.1882	1.2448
scot	1.1483	1.2150
_cons	0.0295	0.0284

(3) sprc_ip	Without survey weights	With survey weights
	Odds Ratio	
male	1.5627	1.5948
age	1.0384	1.0408
age2	0.9995	0.9995
nonwhite	0.5423	0.5871
pinc_5q	1.1883	1.1992
pinc_refuse	0.9399	0.9759
pargam_prob	1.7688	1.6737
pargam_bnoprob	1.3313	1.3195
units	1.0906	1.0885
units2	0.9975	0.9976
numchild	0.9240	0.9446
lotto_ip	2.4697	2.4170
lotto_rem	0.8299	0.7980
scratch12	1.5605	1.5521
fobm12	3.2858	3.3464
cas_ip	1.9851	1.9400
fruitslot12	1.5768	1.5970
bingo_ip	1.4892	1.4693
bingo_rem	0.6368	0.6387
gam_attscore	1.0792	1.0764
_cons	0.0046	0.0047

(4) sprc_rem	Without survey weights	With survey weights
	Odds Ratio	
male	2.3122	2.2533
age_16t24	1.6942	1.5988
age_25t34	2.3112	2.2806
age_35t44	1.8307	1.7332
units	1.0335	1.0359
nonwhite	0.4584	0.4030
lotto_rem	4.6123	4.5551
cas_rem	4.5671	4.8214
cas_ip	1.9486	1.8436
bingo_rem	1.7747	1.5622
instantgame_rem	1.7474	1.8846
social	1.6774	1.7975
gam_attscore	1.0999	1.0953
_cons	0.0007	0.0008

Figure 9: Correlation between age and smoking



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