

## **Abstract**

Gambling has been around for a very long time. Recently however, there has been much more attention to the addictive side of gambling. Therefore, this paper will discuss several ways of thinking and attributes of people, and how they are related to gambling addiction. It uses several logit regressions to find answers on whether, and if so to what extent, these ways of thinking and attributes may influence gambling addiction. Although significant relationships were found, there are problems with the data which cause it not to be deemed a causal relationship. Therefore, this paper suggests further research into this topic and the creation of a more efficient dataset to get a real answer as to what causes gambling addiction.

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# Introduction

Over the last couple of years, the issue of gambling has become a very contentious one in the Netherlands, especially since its legalization took place in October 2021. Ever since online gambling was legalized for private parties, Dutch television has been flooded with gambling advertisements, leading to concerns of increases in gambling addiction. According to van der Pal (2022), there is already a noticeable rise in gambling addicts entering rehab clinics. In fact, in some clinics there has been an incredible 50% increase in under a year's time. Experts warn that addictions generally take a while to develop, so a much larger increase can be expected within the next couple of years. To counter this, the Dutch government is already working on a ban, or at least severe restrictions, on gambling advertisements. There is one type of gambling that has been legal for a long time, and which advertisements may not even be noticed as gambling advertisements by the average viewer. This is, of course, the lottery. Even though it does not get as much attention as casinos and online sports gambling, in 2017 47% of all the money Dutch people lost, not just spent, on gambling, or around 1.19 billion euros, was lost in lottery games<sup>1</sup>. Lottery organizers are multi-million euro organizations, as for example the PostcodeLoterij has an annual revenue of over 900 million euros<sup>2</sup>. Some may believe lotteries are not as addictive as online or casino gambling as the gambling participant usually has to wait, sometimes for several days, after buying the lottery ticket to see whether they have won a prize, whereas other forms of gambling such as slot machines can provide an instant hit of excitement. However, articles such as Guryan & Kearney (2010) provide evidence that gambling is addictive, by doing an experiment in which they give out a winning lottery ticket in a certain zip code, and then look at lottery ticket sales in stores which are local to that zip code. Guryan & Kearney (2010) show that in the long-run sales are consistently higher in stores near that zip code, which, according to the authors, is evidence of addiction. One big reason why people get addicted to the lottery is because our brains are not wired to understand the numbers or odds of lottery games. In the UK for example, 32 million people play the lottery every week, even though there is a winning chance of only one in fourteen

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<sup>1</sup> <https://casinovergelijker.net/nederlanders-vergokken-253-miljard-euro-per-jaar/>

<sup>2</sup> <https://view.publitas.com/npl/npl-jaarverslag-2016/page/71>

million (Woollaston, 2013). Robert Williams, a professor of health sciences from the University of Lethbridge, explains that our brains were never evolved to understand these enormous numbers, and that our decision making on these odds has 'less to do with outcomes than with how much hope or fear we are feeling when we make a decision' (Piore, 2013). This perfectly shows that it is really all about being hopeful, about emotions, and not about making a rational financial decision for lottery players, even if the players may not be consciously aware of this. Piore (2013) continues to explain that for a relatively small fee a customer can spend the next couple days after buying a lottery ticket, but before the outcome of the lottery, dreaming about what they would do with their jackpot earnings. Would they move to a bigger home? Go on a vacation across the world? The possibilities that can be imagined are endless, which is what makes the lottery so fun and addictive. In fact, according to Woollaston (2013) similar parts in the brain are activated by the imagination of winning the lottery as are activated when someone actually wins the lottery. This also explains why it is most often poorer people, who really cannot afford to waste away any money on a lottery which they are most likely to never win, who gamble away a lot of money on lottery tickets, as it is a little bit of money every time, with the promise of a lot of money possibly coming in every time. It is reasonable to assume that the marginal value of money increases as income decreases, because money is more important to someone who does not have a lot of it.. Therefore, for poorer people, the possibility of a jackpot win in a lottery is worth more than it is worth to relatively more rich people. Furthermore, an experiment by Haisley, Mostafa & Loewenstein (2008) showed that people who believe themselves to be poorer are more likely to gamble their money away. This could lead to a vicious cycle in which people gamble their money away, become poorer, and become more likely to buy another lottery ticket. This paper will look at the effect of certain physical and mental attributes on someone's likelihood to become an addict to lottery games. It will look at attributes such as their results in former lotteries, people's reasons behind participating in the lottery, their income, and how satisfied they are with their life. Specifically, this paper will look at the relationship between these independent variables and whether people who have been given a lottery ticket for free in an experiment decide to purchase another ticket. It would seem logical if people who are less satisfied and participate in the lottery as an escape, or people who struggle to accurately judge their own odds and play the lottery to win money are the most

likely to keep playing, and to become addicted. The dataset that is used for this paper comes from the Centerpanel, a well-known panel in the Netherlands. This is very useful because the Centerpanel is known to be representative of the whole population in the Netherlands. The dataset from this panel comes from three questionnaires. One questionnaire from before any lottery tickets were given out, another questionnaire was sent out after the tickets were given out, but before the results were known, and finally a third questionnaire was released after the results of the lottery were released. The questionnaires were sent out in 2015, so before the legalization of other forms of gambling in the Netherlands. This paper will use a dummy logit regression to find the answers as to the relationship of the aforementioned independent variables with the odds of buying another lottery ticket. It finds that income and the extent to which people gamble to become rich are the most important factors in deciding whether people will buy another lottery ticket. Satisfaction in life and whether people gamble to alleviate boredom are not significant in the analyses performed in this paper. This paper adds a different way to determine the factors that decide whether someone is more likely to become a gambling addict, and if future research could improve on this paper to find real causal results, it could help policy makers decide on how to regulate the gambling industry as effectively as possible.

## Literature review

This thesis will discuss, and attempt to identify, some of the characteristics of potential problem gamblers. Therefore, this thesis will discuss the relationship between many variables and the likelihood of someone to buy a lottery ticket quickly after the last lottery participation. Fortunately, this is not the first paper to discuss risk factors for gambling addiction, as many economists, psychologists, and sociologists have looked at this topic before. For instance, Hing et. al (2015) discusses possible risk factors for gambling by gender. It finds that there are some relevant differences in the risk factors for gambling between males and females. One important example

is that in men, being low educated is a major risk factor for problem gambling, whereas this is not shown to be the case for women. Many other risk factors are also shared. Firstly, the age at which the risk is highest is 18-24 in both genders, problem gamblers are most likely to live in a group household, and they are likely to be unemployed or outside the workforce. Furthermore, problem gamblers are less likely to gamble for social reasons, and are more so trying to win money, or entertain themselves by gambling. As it is known that in most, if not all cases, the gambler loses money in the long run, it is not surprising that those who play to win money end up with a gambling problem, as they are likely to keep playing no matter how much money they lose in an attempt to turn their fortunes around. Another paper, Welte et al (2004), discusses what types of gambling are most likely to lead to problem gambling. In this paper, casino gambling is the most dangerous form of gambling, with lotteries being the second dangerous. This shows that relative to other forms of gambling, the lottery is one of the more addictive ones. This is relevant, because this paper will obviously exclusively discuss lottery gambling addiction and abuse, so it is important to know that lottery games are major drivers in gambling addiction. Furthermore, Emond & Marmurek (2010) find that more heavy gamblers are less likely to think rationally, and more likely to think experientially. The lack of rational thinking relates back to some of the variables in the questionnaire that this paper uses. For example, the questionnaire asks the respondents whether they feel that they are lucky people. In answering this question, a rational thinker would most likely understand that there is no such thing as a lucky person within a lottery, while an experiential thinker may make the association that because they won a large lottery prize in the past, they are more likely to win a lottery again in the future. The aforementioned Hing et al (2016) also discusses some possible characteristics of gambling addicts as those who try to earn back their losses. This also relates back to the issue of thinking rationally during a gambling session, as those who are trying to win back their losses are likely to think irrationally, and fall into many rational fallacies, such as the gambler's fallacy. After a certain amount of losses gamblers may believe that the probability of a win is higher than it was before those losses, which is not the case. Additionally, problem gamblers often 'include gambling to escape from a dysphoric state.' To study this effect in this paper's dataset, the variable for happiness could be used to see if there is a negative relationship between those who choose to buy another lottery ticket and happiness. Another

independent variable this paper will look at is the reason people have for enjoying gambling. According to Wood & Griffiths (2010), a big reason for problem gamblers to gamble is to alter their mood. This could go both ways, some problem gamblers are looking for stimulation and excitement, others gamble to relax. Another reason for problem gambling according to the study was to win back any lost money, which seems to be a common theme in most of the literature on problem gambling. Other causes given in Wood & Griffiths (2010) are believing themselves to be lucky, or at least capable of making consistent profit, trying to forget about problems in life, and boredom. The issue with Wood & Griffiths (2010) is the fact that it is a research paper with very little explanatory power, as it just interviews 50 people who have signed themselves up as problem gamblers. This paper can check the anecdotal evidence that Wood & Griffiths provide with an actual dataset and can show whether the claims made in the paper hold up in any way. Turner, Zangeneh & Littman-Sharp (2007) compares casual gamblers to problem gamblers, and finds one very interesting result. Aside from the fact that problem gamblers have more stress in their life, are more likely to be depressed, and are using gambling as a coping mechanism, problem gamblers on average also experienced more big wins early on in their gambling career. This shows that aside from the fact that problem gamblers tend to keep gambling to win back their losses, they will also keep gambling because they have the memory of a great gambling session when they just started out, and try to get the feeling of that first big win back. This phenomenon, where addicts chase an amazing feeling from one of the first times they gambled at all, is common in all substance abuse addictions. As the brain gets more used to doing something heavily addictive, it will start to take more and more of that substance to satisfy the craving. Furthermore, it is shown that the risk of gambling addiction is lower when the chance of winning is lower. This would indicate that lottery games are not as addictive as, for instance, blackjack or roulette, as the odds of a positive result from a lottery game is extremely low, and it is very unlikely that someone has a big money win with lottery games early on in their gambling career. It is entirely possible however that lottery games are addictive in a different way than other casino games. Additionally, the hypothesis that big early wins have a causal relationship with gambling addiction is heavily disputed. Weatherly, Sauter & King (2004) do a laboratory experiment in which four mostly similar groups play slot machines. One group is given a big win very early on, another group is only given small wins early

on, a third group gets a big win on the 5th attempt, and the fourth group does not win anything. Interestingly, the group with a big early win quit playing the soonest, followed by the group that did not win anything. After this comes the group with only small wins, and finally the group that had a big win on the 5th attempt played the longest. Although this is only very limited evidence, it is at least an indication that the relationship between an early win and getting addicted is not as strong as Turner, Zangeneh & Littman-Sharp (2007) showed.

All in all, previous literature has given many perspectives on the causes for people to become problem gamblers. Some of the more physical attributes correlated with gambling addiction such as age and gender have been established, whilst, more importantly, the way certain mindsets can be linked to gambling is also discussed. For instance, the fact that possible problem gamblers tend to try to win back their lost money in gambling, and often irrationally believe themselves to be lucky people, and capable of beating the odds and winning money. Furthermore, according to the discussed literature gambling is viewed as an escape from a life which provides one with little happiness or excitement. Aside from showcasing many different possible attributes of a problem gambler, this paper has also shown that buying lottery tickets, which is the type of gambling that will be discussed in this paper, is one of the more addictive types of gambling, and lends itself perfectly for the topic that this paper aims to discuss. Although lotteries have shown to be an addictive form of gambling, it is not clear yet from the earlier literature whether the characteristics of problematic lottery players are very different from, for instance, sports gambling players. In this aspect, this paper can improve on the existing literature by focussing specifically on the characteristics and ways of thinking that lottery players hold, instead of the general view on gambling addicts that is used in most of the current papers.

## Setting & Data

Now let us look at the setting and data of this paper. The data that will be used in this paper comes from, as has been discussed earlier, three surveys by the Centerpanel. The Centerpanel is a panel of Dutch people which was founded in 1991. Its

members are picked by address based sampling, and it is impossible for someone to sign up without being chosen based on this method of sampling. This makes sure the panel is as representative as possible for the entire Dutch population. The surveys were all conducted in close proximity to each other, as they were all conducted in May 2015. Although this is relatively recent, a lot has changed in the Dutch gambling landscape since this time, as the legalization of other forms of gambling may reduce the interest in lottery games of the respondents in the survey, as there are other options out there. Therefore, the time at which the survey was made may reduce the external validity of this paper. The dataset this paper will use was originally created for a paper on how lottery play can make people happy (Burger et al, 2020). Burger et al (2020) did an experiment where some people in the center panel were given a lottery ticket, and others were not given this ticket. Accompanying this field experiment three questionnaires were sent out: one questionnaire before the tickets were given out, one questionnaire after they were given out, but before the respondents knew whether they had won, and a final questionnaire after the lottery's results were published. For their research paper, they mostly focused on the happiness variable that they measured, to see whether getting a lottery ticket increases happiness, and how happiness is then impacted by the outcome of the lottery ticket. In their research, they found that having a lottery ticket has utility and in and of itself, separate from the potential financial utility that a lottery ticket provides. This is a very interesting study that Burger et al did, however this paper will use other variables. Mostly the variables that it will use include, as a dependent variable, whether the respondent will be participating in another lottery this week. This is a dummy variable, meant to show whether the respondent is at a higher risk for becoming addicted to gambling. As independent variables, many different ones will be used to get, as much as possible, a complete view of the risk attributes of problem gamblers. The first independent variable that will be used is whether a respondent got the free lottery ticket or not, which is also a dummy variable. Doing this analysis is important, because it shows whether those who just got to participate in a free lottery are more likely to keep buying lottery tickets afterwards, which would show a strongly addictive effect. It is important to note here that the lottery tickets were assigned randomly, and therefore any difference between the two groups is likely to be caused by the lottery ticket that was given out. After this analysis is done, the dependent variable will be altered to only include the

respondents who got the lottery ticket. This is done because this research is only about the people who got the lottery ticket and whether they will keep playing the lottery, so the group of people that did not play has become irrelevant to this paper.

The most important independent variables are the ones that actually discuss people's ways of thinking and their former experiences in gambling, as the point of this paper is to find the ways of thinking that are actually likely to cause one to have a gambling problem. Firstly, this paper will discuss the effect of the respondents' reason for participating on their likelihood to keep gamble more. Specifically, to what extent respondents consider lottery gambling a real opportunity to get rich, and to what extent respondents consider lottery gambling to be a method to avoid boredom. These two possible reasons were chosen because they are the most likely indicators for addiction, as has been shown in the literature review already. These variables, just like the earlier mentioned independent variable, are categorical ordinal variables. In this case, it means respondents can answer to what extent boredom and wanting to get rich play a role in their enjoyment of the lottery by giving a number on a scale of one to seven, with one being equal to complete disagreement, and seven meaning to fully agree with the statement. When someone believes lottery gambling is a real chance to get rich, this is likely because they are overconfident about their odds, as many people tend to be when it comes to lotteries, as discussed in the introduction, for this reason, it may lead to problem gambling as one believes their winning chances to be something entirely different from what they actually are. In terms of boredom, it may be a dangerous path towards problem gambling when someone uses gambling to fill up a hole in their life, as it could quickly start to become compulsive, or one may get addicted to the excitement gambling brings. Important to mention is that the two last mentioned independent variables are from the second questionnaire, which means the respondents explained their reasons for gambling prior to receiving the results of the lottery they got to participate in for the experiment. Another independent variable that will be used is how satisfied respondents are with their life. The literature review already showed that people who are less satisfied with their life are more likely to fall into problem gambling, and this is also known to be the case with all kinds of addiction in general, such as internet addiction (Alhassan et al., 2018), and drug addiction (Rounsaville et al., 2018). In the dataset that is used for this paper, the respondents' satisfaction with their life is an

ordinal categorical variable, which goes from one to ten, with one being the absolute lowest score, whereas ten is the highest possible score for life satisfaction. In addition, this paper will also discuss the effect of net income on buying more lottery tickets. This is an interesting independent variable to use because there are two opposing mechanisms that seem theoretically logical. As has been discussed in the introduction, poorer people are often more likely to get a gambling problem because the promise of getting rich is worth much more to poor people than it is to rich people. On the other hand however, for people with a higher income losing the money for a lottery ticket is a much smaller deal, and winning millions of euros will often still have a significant effect on their way of life. The income variable is, once again, a categorical ordinal variable, with four possible values. These are: earning less than 1150 euros per month, earning between 1151 and 1800 euros per month, earning between 1801 and 2600 euros per month, and earning more than 2600 euros per month. Furthermore, for all of these separate regressions, gender and age will be added as control variables, and gender will also be added as an interaction term. This is because men and women may significantly differ in their ways of thinking, and men are known to be more likely to develop a gambling problem. Additionally, age may be a significant factor in gambling addiction, as young adolescents whose brains are not fully developed are more susceptible to addiction of any kind, including gambling.

Let us now move on to discussing some descriptive data. This is important to do because it gives a better insight into the nature of the dataset, and helps us understand it as well as possible. First of all, let us discuss the variables that are relevant prior to all the regressions this paper will do. These variables are, as discussed, whether someone has received a lottery ticket and whether someone has bought another lottery ticket for the same lottery game. Looking at these two variables is important to do because it shows whether the excitement of receiving a lottery ticket already creates a reason for someone to want to buy more of them, thus showing a correlation with addictive tendencies. Due to the nature of this dataset, it is not possible to compare the tendency to buy more lottery tickets with just one variable. The reason for this is that the questionnaire separately asked the ones with and without a free lottery ticket whether they had bought another one. However, it is

luckily still possible to look at the difference between the two by using descriptive data. Obviously, no causal relationships can be established by this data, however it is interesting to look at in order to understand this dataset. Somewhat unexpectedly, out of those that have received a free lottery ticket only 20.17 percent bought another lottery ticket, whereas amongst those who had not received a free lottery ticket, 64.08% decided to buy a ticket. There are several possible explanations for this. The first explanation is that lottery gambling is not addictive in high amounts, as one lottery ticket could be enough for a life-winning prize, there may not be an increased amount of excitement for the lottery by getting more tickets for the same one. In addition, the earlier dataset on lottery gambling might have intrigued many respondents, and made them want to buy a lottery ticket. Whereas the urge for those that got a free lottery ticket was obviously fulfilled, it was not for those who did not get a free lottery ticket. One of the shortcomings of this dataset, that will be discussed in more detail in the discussion part, is the fact that this variable on whether the respondent has bought more lottery tickets, does not go further in time than this current week. That allows for what I have discussed to be a very real possibility, and therefore in this particular comparison it is impossible for a causal relationship to be established. It seems theoretically plausible that if there was a long-term variable instead of the extremely short-term one that has to be used here, those that had received the free lottery ticket would be the ones that had bought more lottery tickets over a few years time.

This paper uses only one dependent variable for all regressions. That variable determines whether someone who was given a free lottery ticket will buy another one. It is originally a categorical variable which can take on three values: zero if the respondent has not bought an extra lottery ticket, one if they haven't done so yet but are planning to buy another lottery ticket, and two if they have bought another lottery ticket. For the sake of creating a regression which results can be interpreted well, for this paper this dependent variable has been turned into a dummy, valued at zero if the respondent has not, and is not planning to, buy another lottery ticket, and valued at one, if they are planning to buy another lottery ticket or have already bought one.

Moving on, let us have a look at the independent variables for the main regressions. These are: Whether a respondent uses lottery gambling to get away from boredom, which from here on out will be described as “boredom”; to what extent the respondents refer to gambling as a chance to get rich, which from here on out will be described as “getting rich”; the satisfaction of the respondents’ with their life, which from here on out will be described as “satisfaction”; and the income of the respondent, which will from now on be referred to as “income”. First of all, let us discuss boredom. Interestingly, not a lot of people view boredom as an important reason for playing the lottery. In fact, 56.94% of all respondents say that boredom is not a relevant reason for playing the lottery at all. Another 21.79% of all respondents gave the second lowest value after not finding it a relevant reason at all, and only 0.61% gave a six or seven score, indicating that only 0.61% of this dataset views lottery games as a method to fight boredom. The reasons that this result is quite low while in earlier literature, boredom was shown to be a common reason for gambling is not quite clear, and it is indeed very surprising that this is the case. One possible explanation is that there simply are no current gambling addicts in this dataset, and that people will only need gambling to get rid of their boredom once they are already quite deep into their addiction to gambling. Unfortunately though, this is merely speculation and cannot be verified.

For the variable getting rich, it is a much different story. 50% of the respondents chose one of the bottom three options for getting rich, which means they do not enjoy the lottery due to the chance to get rich at all, or only see it as a very minor part of their rationale for playing the lottery. The other 50% chose the value four, five, six or seven, which means that this half either believes it to be a very major part behind their reasoning for playing the lottery, or at least they say it plays a sizable role. In addition to this, only 20.57% of the respondents say the opportunity to get rich plays no part at all, and 7.38% says it plays a massive part. This is relevant, as it shows that the respondents clearly think more about getting rich when they play the lottery than about alleviating boredom. It makes sense that this is a very important reason to play the lottery because it is the main selling point of lotteries. If there was no opportunity to get rich from the lottery there would barely be a reason left to play.

Continuing to the next independent variable, let us look at some descriptive data relating to satisfaction. Less relevant information can be gotten from this variable, so this variable will be discussed a bit shorter. The people in this dataset are mostly reasonably satisfied with their life, as only 4.85% of the respondents gave a five or lower out of 10. Furthermore, 62.62% of all respondents judge their life satisfaction at an eight out of ten or higher, showing that relatively even six or seven is quite a low score.

Finally, let us discuss the independent variable income. In this dataset, only 8.39% of the respondents earn 1150 euros or less. Furthermore, only 15.9% of the respondents earn between 1150 and 1800 euros, and 27.67% of them earn between 1800 and 2600 euros per month. That leaves 0.74% of the observations, which was answered “unknown”, and another 47.29% of the respondents who earn a net income of 2600 euros per month or higher. This shows that the average net income is relatively high in this dataset, as the median monthly net income in the Netherlands at that time was only 1968 euros<sup>3</sup>. This shows that the dataset is not fully representative for the entire population, although it is most likely only a small discrepancy it is something to worry about in terms of external validity.

Now, let us move on to some tables that further illustrate the past four independent variables. These tables will provide the mean and number of observations for all the main independent variables, by gender. This gives further illustration of the nature of these variables, and gives insight into the effect gender has on their value.

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<https://www.gemiddeld-inkomen.nl/modaal-inkomen-2015/#:~:text=Het%20modaal%20inkomen%202015%20volgens%20het%20CPB%20is%20%E2%82%AC%2035.500.inkomen%20het%20meest%20voorkomende%20inkomen.>

**Table 1***Descriptive variables of all relevant variables based on firm type*

	<i>Male</i>		<i>Female</i>	
	<i>N</i>	<i>Mean</i>	<i>N</i>	<i>Mean</i>
<i>Boredom</i>	605	1.83	547	1.77
<i>Getting rich</i>	605	3.58	547	3.34
<i>Satisfaction</i>	686	7.65	614	7.68
<i>Income</i>	767	3.27	700	3.02

*Notes: This table shows mean and number of observations N for all the main relevant independent variables by gender; Boredom and getting rich are categorical variables on a scale from one to seven, satisfaction is a categorical variable on a scale of one to ten, income is a categorical variable with four categories; The mean is rounded off to two decimals.*

From this table it is noticeable that there are some differences in the variables' values amongst the two genders. Mainly, men tend to value getting rich from lotteries much more than women, and their net monthly income is higher on average. All in all, this descriptive data has shown some interesting, somewhat surprising results, although obviously it is not possible to deduce anything but correlations from these statistics.

## Empirical specifications

In the regressions that will be performed for this paper's results, the dependent variable is a binary dummy variable. This means it can only take on two values, zero and one. This means that there are three options for the type of regression to

perform here, there is a choice to be made between a linear probability model, a probit model, and a logit model. A linear probability model is the most simple one to choose, however it has some shortcomings that mean it should not be used for any academic paper. The main problem with LPM is that it often allows for impossible values of the dependent variable. For instance, there is often a negative constant, and if all variables then equal zero, that means that there is a lower than 0% percent chance that someone will buy another lottery ticket. Similarly, it is also possible in an LPM model for the probability to surpass 100%, which is obviously illogical as well. Another issue is that LPM simply assumes that there is a fully linear relationship between the dependent and independent variable, which is not necessarily the case in our dataset. Therefore, it is preferable to use either a probit model or a logit model. The differences between a probit and logit model are largely theoretical, and both can be used for this paper. However, this paper will use logit because it provides coefficients that can more straightforwardly be interpreted, and which therefore provide more of an insight into the relationships of our independent variables on whether people are more likely to buy another lottery ticket. Similarly to standard OLS regressions, the logit model has five assumptions that need to hold in order to infer causal results from the data. Let us now discuss these one by one for the different regressions this paper uses.

The first assumption is very straightforward, and it holds for all regressions that are performed and presented in this paper. It is the assumption that the dependent variable is a binary variable. This is obviously the case, because the same variable is used for all regressions. This variable is whether someone who has received a free lottery ticket decided to buy another one, and as it is a dummy variable that is either valued at zero or at one, the first assumption definitely holds for all regressions.

The second assumption is the assumption that there is a large sample. It is important to have a large sample size because it increases the reliability, and reduces error levels. In the different regressions of this paper, the sample size does differ slightly. The regressions which include the independent variables boredom and getting rich both have a sample size of 993, and the regressions which include the independent variables income and satisfaction respectively have a total of 1152 and 1160 observations. This means that the results of these last two independent variables are

slightly more reliable, however 993 is also a pretty good sample size for a regression, so it is reasonable to assume that this assumption holds for all the regressions in this paper.

The third assumption is the assumption of independence, which means that the assumptions must all be independent from each other, and that there are no matching observations. This dataset does not use any form of matching, especially because this paper only looks at those who did get a lottery ticket, there is no reason to believe that matching has been performed with this data. Along with this it is important that none of the observations are time-series. While there are a couple of variables that come from other moments than others, there is no one variable measured at several moments used in this paper's regression results. This means that the third assumption also seems to hold for the regressions of all independent variables.

The fourth assumption is about the linearity of independent variables and log odds. This means that for a logistic regression to be possibly causal, there has to be a linear relationship between the independent variable, and the log value of the dependent variable. It is quite unlikely that this assumption will hold for any of the independent variables, given that all of the independent variables that are used are categorical variables which are not normally distributed, which reduces the chances of any linear relationship. Furthermore, for income, there are, as discussed earlier, both positive and negative mechanisms which may influence the relationship between income and compulsive gambling. For this reason, it is probably more likely that there is no linear relationship with the log of the dependent variable, instead the relationship is more likely parabolic shaped. Therefore, this assumption possibly does not hold for satisfaction, boredom, and getting rich, although there is no strong evidence to say it does not hold, and it is very likely not to hold for the independent variable income.

Finally, the last assumption that needs to be discussed is the assumption that there is no multicollinearity. The only control variables used in all these different regressions are gender and age. Luckily, there is no reason to believe that any of our

main independent variables have a linear relationship with gender nor with age. Therefore, it is most likely that the assumption that there is no multicollinearity does hold for all independent variables.

All in all, four out of five logit assumptions seem to hold for all regressions, and there is not strong enough evidence to say assumption four does not hold for all regressions except the one with income as the independent variable, where the evidence strongly points to the assumption not holding. This means that a logit regression seems to be a good choice for the available dataset, as it fits well with the analysis this paper attempts to do. However, it is still important to recognise that there is a good chance that assumption four is violated, in which case causal conclusions cannot be drawn from this paper's results.

## Results: Reasons for gambling

Now let us move on to the results. This is possibly the most important part of this paper, as it will present and explain the findings of this paper's analyses. However, before doing that it is important to have a look at the regression functions. Obviously, to find the real probability of buying another lottery ticket in this paper the value of LotteryTicket would have to be plugged into the logit formula, which in all cases

equals the formula  $\frac{1}{1 + e^{-\text{LotteryTicket}}}$ . In this paper, the results will be divided into two

sections: this one, which discusses boredom, and getting rich, as reasons for gambling; and the next one, which discusses a person's satisfaction in life and monthly net income. Firstly we will discuss the reasons for gambling and their relationship to a gambling problem, specifically the relationship of alleviating boredom with gambling and wanting to get rich by gambling and gambling more. For these variables, a multiple regression will be used with gender and age as control variables, while there will also be an interaction term with gender to see if the effect of these independent variables is different for men than it is for women. Let us now have a look at the formulas for these regressions:

(1)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Boredom} + \beta\text{Gender} + \gamma\text{Age} + \epsilon$$

(2)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Boredom} + \beta\text{Gender} + \gamma\text{Age} + \delta\text{Boredom} * \text{Gender} + \epsilon$$

(3)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{GettingRich} + \beta\text{Gender} + \gamma\text{Age} + \epsilon$$

(4)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{GettingRich} + \beta\text{Gender} + \gamma\text{Age} + \delta\text{GettingRich} * \text{Gender} + \epsilon$$

Regression (1) shows the relationship between boredom and buying another lottery ticket. It shows a constant value for the regression, and it includes the main independent variable boredom, with gender and age as control variables. Finally, an error term is present. Regression (2) is very similar, with the obvious exception that an interaction term between gender and boredom has been added, to see if the effects of this variable are higher for one gender than for the other. Regression (3) is similar to regression (1), except boredom has been replaced with another independent variable, namely getting rich, and regression (4) is equal to regression (3), with the exception of the added interaction term between getting rich and gender. The results of these regressions are presented in Table 2 under this paragraph, and will be discussed one by one here.

In terms of the regressions of boredom on buying lottery tickets, the first regression shows no significant effect of boredom on buying another lottery ticket. However, it does show a positive effect of age on buying more lottery tickets at the 1% significance level. This coefficient is valued at 0.016, which means that for every increase in age by 1 year, the odds of buying another lottery ticket increases by 1.6%. This effect may seem quite small, but because everyone in the dataset is at least 18 years of age and some of the respondents are very old, this very low coefficient will always have a pretty sizable effect on the outcome of this equation. Therefore, according to this regression, the older someone is, the more likely they are to buy more lottery tickets. This may be caused by the fact that older people tend to have a higher income than younger people, but it may also be the case that older people just enjoy lotteries more than younger people. Moving on to the second regression equation, this one discusses the same variables as regression (1), however it adds the interaction term between boredom and gender. In this regression, unlike in the first regression, boredom does show a significant effect on the 10% significance level. Somewhat unexpectedly however, this effect is negative, at a coefficient value of -0.364, which means that in this regression the odds of buying another lottery ticket drop by 30.5% per extra lottery ticket bought. This would mean that someone who highly values alleviating boredom by playing lotteries is less likely to get addicted than those who value it less. This may mean that boredom is not a major reason for people to become compulsive gamblers or even get addicted, however it is important to be careful, and keep in mind that the relationships in this table, or the lack thereof, are merely correlations, and cannot be deemed causal. Interestingly, the interaction term between boredom and gender is significant at the 10% significance level, and is positive, which would mean that although men are more likely to buy another lottery ticket in general, as shown by the coefficient value of -0.537 for gender, which is significant at the 1% significance level, women are more likely to be influenced into buying more lottery tickets due to boredom, and their wish to alleviate it. The coefficient for age is quite similar to its coefficient in the former regression and is still significant at the 1% significance level, which will be the case for every regression in both tables. As the effect of age on buying another lottery ticket is nearly identical in every regression, it will be omitted from the explanation of the results for all the following regressions. Continuing to regression (3), it immediately shows a significant effect at the 1% significance level for the main

independent variable, getting rich, on buying another lottery ticket. The coefficient's value is 0.230, which means that for every increase in the importance of getting rich from one to seven, the odds of buying another lottery ticket increase by 25.9%. This is quite a strong relationship, and it is an interesting, while somewhat predictable, correlation that those who gamble in order to get rich, are more willing to spend more money in order to reach that goal. The control variable gender is not significant in this case, which is notable because it was significant in the first two regressions. Finally, regression (4) is the same equation as regression (3), only with the addition of an interaction term with gender. Adding the interaction term removes the significance of the getting rich coefficient. The interaction term with gender shows that gender has no influence at all on the effect of the variable getting rich. This shows that, at least within this dataset, men and women are equally influenced into buying lottery tickets by their desire to get rich. The coefficient for gender is again significant in this regression, and gives a 20% decrease in the odds of buying another lottery ticket if the respondent is female.. Finally, the number of observations for all four of these regressions is 993, which is a very good sample to have for a regression. In conclusion, these results show several interesting correlations. Firstly, the negative relationship between boredom and buying another lottery ticket, which is present only for men, whereas for women this relationship is very slightly positive as shown by regression (2). Secondly, the relationship between buying lottery tickets out of a desire to get rich is very positively correlated with buying another lottery ticket, and this is unbiased by gender.

**Table 2**

*Regressions of reasons to play the lottery on the dependent variable buying another lottery ticket*

	(1)	(2)	(3)	(4)
<i>Boredom</i>	-0.054	-0.364*		
<i>Boredom*Gender</i>		0.045*		
<i>Getting rich</i>			0.230***	0.184
<i>Getting rich*Gender</i>				0.032
<i>Age</i>	0.016***	0.017***	0.022***	0.022***
<i>Gender</i>	-0.17	-0.537**	-0.104	-0.222***
<i>Constant</i>	-1.372**	-0.867***	-2.762***	-2.59***
<i>N</i>	993	993	993	993

*Notes: Regression of independent variables boredom and getting rich on the dummy independent variable buying another lottery ticket, which is valued at zero if no lottery ticket bought, and at one if another lottery ticket was bought; boredom and getting rich are categorical variables with values from one to seven, with seven being the highest and one being the lowest value ; gender as a dummy variable equals one if male, and two if female; age is a discrete variable measured in years of age. Significance in this table is expressed in  $p < 0.10^*$ ,  $p < 0.05^{**}$ , or  $p < 0.01^{***}$ ; all coefficients are rounded to the second decimal.*

## Results: Satisfaction and income

In this section, the regression results on satisfaction and income will be discussed.

The regressions that were used here are largely similar, however for income a quadratic variable will be used, as it seems more in line with how the relationship between income and buying more lottery tickets would likely be. Again it is important to recognise that these are all logit regressions, which means that the actual value

comes from plugging the results of the regression into the formula  $\frac{1}{1 + e^{-\text{LotteryTicket}}}$

to find a percentage increase in the odds of buying another lottery ticket. The regression equations look like this:

(5)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Satisfaction} + \beta\text{Gender} + \gamma\text{Age} + \epsilon$$

(6)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Satisfaction} + \beta\text{Gender} + \gamma\text{Age} + \delta\text{Boredom} * \text{Gender} + \epsilon$$

(7)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Income} + \beta\text{Gender} + \gamma\text{Age} + \epsilon$$

(8)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Income} + \theta\text{Income}^2 + \beta\text{Gender} + \gamma\text{Age} + \epsilon$$

(9)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{Income} + \theta\text{Income}^2 + \beta\text{Gender} + \gamma\text{Age} + \delta\text{Income} * \text{Gender} + \epsilon$$

Regression (5) shows the relationship between someone's life satisfaction and buying another lottery ticket. It is very similar to regression equations (1) and (3), as it shows a constant value, includes the main independent variable satisfaction, and includes gender and age as control variables. Regression (6) is similar to equations (2) and (4), just with satisfaction as the independent variable. Regression equations (7), (8), and (9) discuss the effect of income on buying more lottery tickets. Regression (7) just has income as the independent variable, gender and age as control variables, and an error term. Regression (8) adds the quadratic term to the equation as it would likely better fit the actual effect of income on buying more lottery tickets. Finally, regression (9) adds the interaction term between income and gender, to show whether income has a larger effect on buying more lottery tickets for either gender. Table 3 below presents the results of all of these regressions, which will also be discussed in the following paragraph.

Looking at the results of the regressions with satisfaction as the main independent variable, it is immediately clear that none of the relevant variables, including the interaction term, are significant at any level. Therefore, according to this dataset at least, those who are more or less satisfied with their life in its current state are not more or less likely to buy lottery tickets in any way. This is surprising, because the past literature very clearly showed a strong relationship between poor mental health and depression, and becoming a compulsive gambler. Moving on to the regressions with income as the main independent variable, let us discuss regression (7).

Regression (7) shows a positive coefficient for income on buying another lottery ticket at the 1% significance level. The coefficient's value is 0.393, which means that for every increase in the category of income, the odds of buying another lottery ticket increase by 48.1%. In this regression, gender is not a significant variable. It is interesting, but somewhat difficult to explain, that in some regressions it clearly shows men are more likely to buy another lottery ticket than women, whereas other regressions show no significance. Regression (8) adds a quadratic term on income to the regression. The reasoning for this was that there are opposing mechanisms influencing the relationship between income and compulsive/addictive lottery gambling, which means the highest or lowest point in this case would be theoretically likely to be somewhere in the middle. However, regression (8) does not give a

significant result for income, nor the quadratic term for income. One of the possible reasons why the quadratic term did not work in this case is that income is given as a categorical variable in this dataset, which limits the values this variable can take on and may cause bias in the results. This is something that could be improved upon in future research on this topic, and which will be discussed in more detail in the discussion section. Furthermore in regression (8) the coefficient for gender is suddenly significantly negative again, in line with some of the past regressions. Finally, the ninth regression, which adds an interaction term between gender and income, shows no significant coefficient except for the coefficient of age, which is positively significant as it is in all regressions. In terms of observations, regressions (5) and (6) have a total of 1014 observations, whereas regressions (7), (8), and (9), have 1152 observations. The reason that the number of observations is a bit lower for the analysis related to satisfaction is that the satisfaction question comes from a previous questionnaire, which means that there is a high number of people that did not answer both questions, and obviously those observations are unusable for this regression and therefore omitted from the regression. Still, the observation number is high enough for the logit assumption related to this to still hold. All in all, these regressions do show some interesting results. Firstly, the lack of a correlation between life satisfaction and buying an extra lottery ticket is very different from what the literature review has shown to be the common belief amongst academics. Secondly, the strongly significant positive effect of income on buying an extra lottery ticket is interesting, as it is also different from some of the literature, which suggested that poorer people are more likely to fall into a gambling problem.

**Table 3***Regressions of satisfaction and income on buying an extra lottery ticket*

	(5)	(6)	(7)	(8)	(9)
<i>Satisfaction</i>	0.085	-0.080			
<i>Satisfaction* gender</i>		0.118			
<i>Income</i>			0.393***	-0.297	-0.654
<i>Income^2</i>				0.123	0.137
<i>Income*gender</i>					0.181
<i>Age</i>	0.016***	0.016***	0.017***	0.018***	0.019***
<i>Gender</i>	-0.165	-1.079	-0.039	-0.047***	-0.639
<i>Constant</i>	-2.138***	-0.886	-2.948***	-2.152***	-1.165***
<i>N</i>	1014	1014	1152	1152	1152

*Notes: Regression of independent variables satisfaction and income on the dummy independent variable buying another lottery ticket, which is valued at zero if no lottery ticket bought, and at one if another lottery ticket is bought; satisfaction and income are categorical variables; satisfaction is ranked on a scale from one to ten, one being the lowest value and ten being the highest. Income is divided into four categories, with one being the lowest category and four as the highest category of income; Income in this regression is based on monthly net income; gender as a dummy variable equals one if male, and two if female; age is a discrete variable measured in years of age; significance in this table is expressed in  $p < 0.10^*$ ,  $p < 0.05^{**}$ , or  $p < 0.01^{***}$ ; all coefficients are rounded to the third decimal.*

## Results: all independent variables combined

Finally, this part of the results section will discuss and present one logit regression with all relevant independent variables included. This can help differentiate between the independent variables, and show which factors are most important in determining whether someone would want to buy another lottery ticket. The regression formula for this will be displayed down below, once again keep in mind that to find the real, interpretable value of the dependent variable, the formula  $\frac{1}{1 + e^{-\text{LotteryTicket}}}$  must be used.

(10)

$$\text{LotteryTicket} = \text{Constant} + \alpha\text{GettingRich} + \beta\text{Boredom} + \gamma\text{Satisfaction} + \delta\text{Income} + \theta\text{age} + \lambda\text{Gender} +$$

Looking at the result for this multiple logit regression, it mostly finds what the earlier logit regressions have already clearly showcased; the most important factors for buying another lottery ticket are finding it important to get rich through lotteries, and to have more income. What this regression does show however is that income is by far the most important factor in this dataset, with an increase in odds of 41.8% per categorical increase of income by one, while the getting rich variable increases odds by only 25.9% per increase in the getting rich variable by one. Again, age is a very significant factor as well, with an increase in odds of buying another lottery ticket of 2.4% per extra year lived, which is sizable given the age range in this dataset is large.

**Table 4: all main independent variables and control variables together**

	(10)
<i>Boredom</i>	-0.064
<i>Getting rich</i>	0.230***
<i>Satisfaction</i>	0.015
<i>Income</i>	0.349***
<i>Age</i>	0.024***
<i>Gender</i>	-0.017
<i>Constant</i>	-4.104***
<i>N</i>	988

*Notes: Regression of independent variables boredom, getting rich, satisfaction and income on the dummy independent variable buying another lottery ticket, which is valued at zero if no other lottery ticket bought, and one if another ticket has been bought; getting rich and boredom are both categorical ordinal variables on an increasing scale of one to seven; satisfaction and income are also categorical ordinal variables; satisfaction ranked on a scale from one to ten, one being the lowest value and ten being the highest. Income is divided into four categories, with one being the lowest category and four as the highest category of income; Income in this regression is based on monthly net income; gender as a dummy variable equals one if male, and two if female; age is a discrete variable measured in years of age; significance in this table is expressed in  $p < 0.10^*$ ,  $p < 0.05^{**}$ , or  $p < 0.01^{***}$ ; all coefficients are rounded to the third decimal.*

## Discussion

There are a lot of potential improvements to this paper. Although it finds some meaningful correlations, there are many problems with this paper that could be improved upon greatly in future research, such as the dependent variable, some of the independent variables, the time scale on which these regressions are performed, and the starting time of the analysis. First of all, the dependent variable merely discusses whether someone buys a second lottery ticket after being given the first one. Although this dependent variable can provide an interesting regression, it does not provide anywhere near enough information for it to be a genuine measurement of gambling addiction or problematic gambling. In an ideal world, the dependent variable could portray problem gambling/gambling addiction in a better way. Firstly, it would show the respondent's gambling behavior over a much longer time, to see the development of gambling into a habit, and after that possibly into an addiction. It could show how, for instance, those who think they have a reasonable opportunity to get rich from gambling, quickly start to gamble more, and could also compare how this develops into an addiction for those who actually get a win early in their gambling career, in comparison to people who do not get any early wins in their gambling career. This would be interesting, as that could firstly show if it matters to gamblers if their assumptions are ever confirmed, and it could be of societal importance, if the former is the case, to keep an extra sharp eye on people who get very lucky early on in their gambling career, as they may be a potential risk factor. This way, the analysis of this paper could go far deeper, and is more likely to provide causal, useful, information, than it can now. Secondly, instead of it being a dummy variable, in an ideal world it would be a continuous variable of total money spent on

gambling over the years. This would allow for a much better assessment of not just whether someone gambles, but more so how much this is done and how likely this is to hurt their life in any significant way. Similarly, the independent variable income is a categorical variable, but with perfect information in an ideal world, this would be a continuous variable, which would give much more information than is given in the few segments that present income as a variable now. Furthermore, in future research it would help if income, and all independent variables, followed a normal distribution, and are representative for the total population. This would improve the external validity of this research. If future researchers were to manage to make these improvements to this research, it would greatly improve it, and its results then would be relevant to many. For instance, for lawmakers who want to regulate the gambling industry it would be important to know what attracts gamblers the most, as then anything related to this could be banned from advertisements. An example of this would be the getting rich variable, and then a law could be put into place banning advertisers from overselling the odds of winning in gambling advertisements. This way this kind of research could really have its use in reducing the number of gambling addicts, however much more research is needed to determine a causal effect, and also for any real research that can directly help society, many more variables need to be taken into account as possible causes of gambling addiction than just the few that were discussed here.

## Conclusion

All in all, this paper poses an interesting, and societally very relevant question. It finds that people who believe they can get rich by playing the lottery, along with people with a higher monthly net income, are more likely to buy more lottery tickets than others. Furthermore, it finds that the older someone gets, the more likely they are to buy more lottery tickets, and to some degree it finds that men are more likely to buy lottery tickets than women. There are, unfortunately, several issues with this paper that could be improved upon in future research. Due to those issues, this paper can really just draw correlations, and is incapable of finding a real causal answer to the hypothesis question that was asked. This paper proposes a method of studying gambling addiction in a way that has not been done very often before, but

struggles to find the right data and lacks the resources to do it in a way that really improves this field of study. If future research has the data and resources available, an improved version of this paper could help policy makers decide how gambling problems should be properly regulated, which may help reduce gambling addiction.

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