

Internet Gambling: Risky Business

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Introduction

Given the societal dependence on the Internet, it comes as no surprise that the gambling industry has been infiltrated. The ability for an individual to gamble via Internet casinos and websites emerged in the mid 1990's. For the research that has been done since then, Internet gambling has become one of the most debated technological advancements of the 20th and 21st centuries. This is, in part, due to the multi-faceted economic, political, and social controversy that envelops its offline counterpart. Said controversy includes the morality of playing at legalized casinos, the effectiveness of the tax system implemented for legalized casinos, what effects a new casino has on the economy, and if the amount of tax revenue generated from gambling at the offline casinos really compensates for the socioeconomic problems that arise because of it. Internet gambling is in the same vein, as much of the debates from offline gambling carry over, which I will discuss in further detail later. Though it is true that Internet gambling displayed a global revenue of nearly \$30 million in 2010¹ and shows signs of continued growth since then, there is minimal available research on the topic in comparison to offline gambling.

At the start of the 21st century, it became noticeable that this new market was creating problems. In 2006, Congress introduced legislation, Unlawful Internet Gambling Enforcement Act (UIGEA), that prohibits financial transactions to offshore, unlicensed Internet casino site operators, but does *not* clearly define illegal online gambling. UIGEA aims to support legal, regulated online gambling; however, the unclear meaning of illegal gambling yields different interpretations of legal online

¹Stewart (2010).

gambling, making it difficult for UIGEA to be legitimate.

This thesis defines legal online gambling as the choice of an individual to use a licensed Internet website as their only vehicle for gambling. It disregards the unlicensed sites, often located in remote areas, that exploit individual gambling behavior to make a profit. Online gambling, legal or illegal, is characterized by an individual going to “Internet websites to place bets on sporting events, to play poker, and to participate in a range of electronic casino games, including slot machines, blackjack, craps and roulette” (Stewart, 2010). Therefore, one who participates in online gambling does not absorb any transactions costs and does not have to leave home. These gamblers are attracted to the solidarity associated with playing online; they do not have to physically interact with any other gamblers. Also, these players value anonymity and are indifferent to exclusively paying online.² Indeed, there are other important attributes associated with online gambling, as well as the individuals who choose to play online, that differentiate it from offline gambling. I examine these later in this thesis.

On the contrary, offline gambling excludes Internet games, mobile phone gambling, or any game that requires Internet access and exclusively online payment to play. It attracts a different type of gambler. The action of gambling offline is characterized by social interaction, a physical location that the individual travels to in order to gamble, and non-online payment.³ Players value the easily accessible recreational activities and amenities when gambling at a casino. These include alcohol, food,

²The form of payment is website specific, whether that be via a credit card transaction or e-cash payment.

³Offline gamblers can physically see their money won or lost.

hotel rooms, and other forms of entertainment available to a consumer or tourist, such as “shows”, pools, and shopping, to name a few. These forms of entertainment are dependent on (a) the location of the casino and (b) the type of casino they choose to gamble at. The distinction between offline and online gambling is one of the main motivating factors for my research.

Due to the rich literature and the characteristics of offline gambling, this thesis will focus on online gambling and its corresponding private and social benefits and costs. The individual gambling on Internet websites generates new unintended negative consequences and exacerbates the existing externalities associated with offline gambling. In turn, these create market inefficiencies that cannot be corrected. In the first section of this thesis, I discuss the relevant literature, which is aimed at aiding our understanding of the nature of Internet gambling and the individuals that participate in this behavior. Following this discussion, I manipulate the two consumer utility maximization model. The mathematical analysis of my model will yield results, which will spur even more discussion and future research.

Review of Literature

The study and analysis of Internet gambling is relatively sparse. Much of the research pertaining to the social and economic impact of gambling is restricted to non-Internet casinos. The bulk of the research that has been done on Internet gambling is the analysis of various externalities that arise as a result of the development of Internet

casino industries and the individual choice to gamble online. Many studies⁴ find that pathological gambling and underage gambling impose negative consequences on third parties. Such negative consequences contribute to levels of crime, cause an increase in complementary problems⁵, cause a loss in tax revenue, increase the supply of Internet casinos, and spur conflicts associated with regulation and legalization of the industry.

Dewar (2001) performs an in-depth analysis of the consequences associated with Internet gambling in order to enhance her discussion of how and why government is imposing regulation in Australia, USA, and Britain. Her main focus is that individuals in support of prohibition of Internet gambling argue, “it will lead to increases in problem and pathological gambling; criminal elements would find it all too easy to become involved; the integrity of operators cannot be currently guaranteed; it takes money from regulated terrestrial gambling and associated businesses; and leaches money from people but does not pay anything back to society as companies are located offshore and are therefore not subject to taxation”, all of which arguably create externalities in society. Hence, her argument for prohibition of Internet gambling. Griffiths and Parke (2002) support Dewar’s claims with a similar approach. Their skepticism of Internet gambling leads them to ask questions like, “In cyberspace, how can you be sure that adolescents do not have access to Internet gambling by using a parents credit card? How can you be sure that a person does not have access to

⁴Clarke and Dempsey (2001); Cotte and Latour (2009); Dewar (2001); Eadington (1998); Fiedler and Philander (2012); Kaplan, LaBrie, LaPlante, Nelson, Shaffer (2008); Jackson and Rex (2009); Philander (2012)

⁵Generally called the Spillover Problem(Jackson and Rex, 2009). These are other vices exacerbated from Internet gambling, i.e. excessive drinking, smoking, and pornography (Dewar, 2001).

Internet gambling while they are under the influence of alcohol or other intoxicating substances? How can you prevent a problem gambler who may have been barred from one Internet gambling site from clicking to the next Internet gambling link?" Again, the presence of the consequences mentioned by Dewar is suggested from the questions they ask. These are only a couple accounts of harm created by Internet gambling.

Both authors find that society is negatively impacted by these consequences. A negative impact that is particularly discussed is problem gambling, formally known as pathological gambling.⁶ Pathological gambling is defined as, "participation in gambling to the point where it causes serious harm to oneself and others" (Manzin and Biloslavo, 2008, 102). By simply combining the definition of an externality with the definition of problem gambling, it is clear that the actions of a problem gambler impose 'harm' on others and, thus, is a negative externality.

Some literature focuses more on the issue of problem gambling. Dewar cites Griffiths (1999) findings that problem gambling is a solitary affair, suggesting that gambling takes place on the web. Griffiths comments on the fact that an operator of an Internet gambling site cannot accurately determine whether or not a player is under the influence of drugs or alcohol. It is implied that the act of problem gambling and the harm that is imposed on society from this action is perpetuated by Internet casinos or websites. A player cannot be controlled or monitored to the extent in which they can be at an offline casino. It is possible for an individual to gamble into oblivion. This can potentially lead the gambler to neglect his or her family and/or

⁶Pathological gambling and problem gambling will be used interchangeably throughout the remainder of this thesis.

lose time and resources that could have been allocated to the consumption of other goods or services. According to Dewar's studies, this problem is one of the reasons Australia, USA, and Britain have implemented regulation. The goal of government regulation of online casinos is to mitigate this problem in online gambling, similar to government methods for mitigating problems associated with offline gambling. Through such regulation, a gambling site is required to place visible reminders for people to gamble responsibly and have "facilities such as cooling off periods and self-exclusion" (Dewar, 2001). This is one way that regulators try to control the problem.

There are other consequences generated from Internet gambling as well. One of these other consequences is unique in that it is generated by both the operator and the player of an Internet site: crime. Dewar cites that crime is composed of hacking, fraud by operators, and money laundering. Most of the externalities generated by the site operator can be prevented if operators are willing to take the appropriate precautions. Dewar claims that it is essential for the operators of an Internet casino to earn the trust of their customers by ensuring the customer a fair game with true outcomes.⁷ Not only that, but she also claims that it is important that players are protected from hijacked credit card information and identity theft.⁸ Griffiths and Parke (2002) raise concern when they pose the question, "How can an Internet gambler be sure that they will receive any winnings from an unlicensed Internet casino operating out of Antigua or the Dominican Republic?" Any criminal action

⁷Loo and Summerfield (2010) find, "online gamers must be assured that they have a fair chance to win, and that operators are conducting themselves properly".

⁸Clarke and Dempsey (2001) support this claim.

from a site operator will affect the consumer. Both studies find that security is important and necessary for an operator to consider.

On a similar note, Dewar and other scholars⁹ find that the Internet makes it easier for underage gambling to happen. ‘Children’ have easy access to parents’ credit cards or to other family members’ form of payment. Online underage gambling is an issue because children are not liable for any gambling debts. That is, the site loses any money accrued by the underage gambler and must repay proceeds to the bank. Just as all other externalities mentioned above, the problems caused by underage gambling are not only exacerbated because of the Internet, but also generate a negative impact on society. The site operator is worse off because they lost money and the underage gambler’s family is worse off because they have to cope with these issues.

Most of the existing literature hints at one of several proposed solutions to these issues of externalities: taxation. Even though offline gambling implements a similar system of taxation, there are different consequences for the Internet gambling industry. Dewar finds that governments may have trouble imposing taxes for the offline casino industry because of “public perception”. If one perceives a tax to be too low, “it could be regarded as encouraging people to gamble...If it is too high then the government could be seen to be trying to make too much money from it” (Dewar, 2001). With any vice, governments are conflicted when deciding how much to tax. It is difficult to tax offline and online gambling as a means of mitigating externalities because it is often viewed as regressive and socially destructive.¹⁰ Eadington (1998) makes this argument. He claims that wealthy individuals have more discretionary in-

⁹LaBrie, Kaplan, LaPlante, Nelson, and Shaffer (2008).

¹⁰Johnson and Rex (2009).

come to dispose of by gambling. These wealthy individuals do not necessarily gamble for additional income to spend on necessities, as those individuals that are of lower socioeconomic status do. Rather, the wealthier folk are more likely to gamble for entertainment, as opposed to the poorer folk who are more susceptible to the false assumption of the action yielding a higher level of income. Eadington's arguments apply to offline and online gambling as well.

Though most of these consequences are negative, there is a positive. Because of the low start-up costs, there will naturally be more entry into the market for online gambling (which is observed from its growth¹¹), competition will be stimulated, and operators will have to improve user experience to stay ahead of the competition. This could be manifested with the creation of graphics jobs, an obvious positive impact on society. The analysis of the regulation and government intervention of Internet casinos from which we can extract positive and negative economic consequences.

They can also be extracted from a different type of analysis of Internet gambling. Eadington (1998) examines casinos from the consumer perspective. Eadington argues that gambling is a commodity in order to defend his idea that the casino market is inefficient. He discusses the characteristics of gambling and how those characteristics negatively impact the surrounding community. One of his most important findings is that gambling is a, "demerit good that generates no utility in its own right but squanders an individuals talents, efforts, and resources in a fruitless pursuit of false dreams of enhanced income or wealth" (59). The very definition of "demerit good"

¹¹Biloslavo and Manzin (2008) say that "the online gambling market has been growing at a rate of 20% per year" (107); Clarke and Dempsey (2001); Dewar (2001); Garlitos (2013) says that, "online gambling already generates \$30 billion in gross wins globally"; Loo and Summerfield (2010); Philander and Fielder (2012); Stewart (2010); UNLV Center for Gaming and Research (2014).

implies that it generates a negative economic impact. An individual will gamble as long as they maintain the false perception of utility gain. Because there is a high probability that this level of utility is never fully achieved, an unexpected cost is imposed on the gambler. This cost is internalized by the gambler, but it ultimately creates a domino effect in terms of costs for gamblers and non-gamblers. Others, those of whom are associated and not associated with the gambler, will also bear the cost of externalities generated by constant gambling. Eadington's argument extends further to show that there is no simple solution to mitigating externalities because of such complexity.

Cotte and Latour (2009) examine casinos from a similar structural perspective as Eadington. Rather than directly analyzing casinos, the action of gambling, and the associated externalities from the consumer perspective, they discuss gambling as an individual consumption experience. Cotte and Latour compare the experience of offline casino gambling with online casino gambling to show that the two are different. They find that there is a specific demographic associated with online gambling. An online gambler is, in general, attracted to the anonymity, lack of social connectedness, and lack of transactions cost that come with online gambling. The offline gambler is exactly the opposite: they gain more utility from the social aspect of gambling than from playing the game itself. Biloslavo and Manzin's (2008) findings are concurrent with that of Cotte and Latour, but they add that, "The gamblers who visit online casinos have a positive attitude towards information technology, and are representatives of the younger generation" (108). All of this exploration of consumer demographic helps to explain what the consumer's private benefits are with respect

to the two vehicles for gambling.

Even though data for online gambling is few and far between, namely due to conflicts with legalization, Summerfield and Loo (2010) show that interest in the online gaming industry is growing rapidly. They discuss the prevalence of online gaming in different geographic regions, noting that the United States, China, and South Korea all remain hindered by legislation that prohibits online gambling. Even though their research was done approximately four years ago, legislative limits still inhibit growth of the online gaming sector to some degree.¹² Consequently, we do not have a lot of data to demonstrate any trends in the Internet gambling industry or to display the affects it has on society.

Stewart (2010) encourages the United States government to regulate Internet casinos because a “tightly-regulated online poker industry that protects consumers, grows jobs, and generates meaningful new tax incomes” (21) is possible. He argues for this conclusion after discussing the rapid growth, prosperity, and legalization of the online gambling industry in many other nations and current proposals to legalize it in the United States. He draws on several criminal prosecutions of site operators to support his argument, as the prosecutions exemplify the inelastic demand for online gambling. In particular, Stewart focuses on the “Black Friday indictment”, which was the indictment of 11 individuals associated with the three largest Internet poker operators that still accepted bets from U.S. residents” (24). These companies “enjoyed a dominant position in the global Internet poker market, with a combined market share of more than 60 percent. They achieved that dominance to a consid-

¹²Stewart (2010).

erable degree because they continued to serve American players” (24). Even though the online gambling market experienced decrease in demand immediately following the indictment, the industry was virtually unaffected in the long run. He notes that demand jumped back up for online gambling on unlicensed websites and that legalization will help eliminate some of the demand to offshore sites, while benefitting the nation. That being said, there have been several studies purely dedicated to the development of legalized Internet casinos.¹³

Smeaton and Griffiths (2004) research the social responsibility behind legal Internet gambling sites. Lack of social responsibility is a problem, they argue, for the online gambling industry. They performed an exploratory study where they ask roughly 14 questions about 30 U.K. gaming websites. They find that most of these sites do not check or verify age, do not have any reference to help for pathological gambling, do have practice or demo modes, do have easy access to account balance, and do border on encouraging the consumer to continue gambling. According to the authors, there are “good practices” and “bad practices” characterizing each of these, which is the basis of their rationale for making recommendations to the gaming sites. Because the authors are making recommendations to these sites, we are drawn to the conclusion that the very action of an individual online gambling imposes some sort of cost and externality to society. Smeaton and Griffiths (2004) offer ways for the site operators to improve their websites in hopes of helping to mitigate some of the externalities generated by these individuals that choose to access these sites to gamble.

¹³*Ibid.*

An economic model

Though prior research regarding the effect of an individual's choice to gamble via an offline casino is important and absolutely necessary, this thesis will not regurgitate any work that has been done. My objective is to determine the seemingly unquantifiable effect an individual's choice to gamble online has on society. The following mathematical model presents an in-depth analysis of the utility maximization of two consumers, an individual that consumes Internet gambling and an individual that does *not* consume Internet gambling. I model the costs that accumulate privately with a single individual consumer of Internet gambling and those that accumulate socially with two distinct individuals. From the results of this mathematical analysis, I am able to make several conclusions that spur discussion of the implications that arise from my results.

First, let us outline some basic assumptions pertinent to the development of the model.

1. Agents, of whom will be referred to in this thesis as individuals or consumers that choose to gamble online behave rationally, including pathological gamblers.¹⁴
2. The Internet gambling sites are legal.¹⁵
3. Externalities are strictly monotonically increasing. That is, the more an indi-

¹⁴This comes from Rational Addiction Theory by Becker and Murphy (1988). They argue that gamblers maximize their utility when they gamble and that they have access to appropriate and accurate information about the addictive nature of gambling.

¹⁵Offshore, unlicensed, illegal Internet gambling sites have different variables for cost and benefit. Their impact is difficult to analyze because of the lack of information, data, and research.

vidual gambles online, the greater cost will be imposed internally and externally.

In order to set the stage for this model, we consider some costs and benefits of Internet gambling. From basic cost/benefit analysis, we know that total benefit is the sum of private benefit and social benefit, while total cost is the sum of private cost and social cost. For Internet gambling, social benefit is composed of the additional revenue for the existing offline casinos that have an Internet counterpart, the increase in the quantity supplied of gambling sites, and the additional revenue for the economy through taxation.¹⁶ Private benefit is composed of utility received from anonymity and solidarity. Cost is a tad bit different, in that social and private cost are composed of the same effects: pathological gambling, underage gambling, crime¹⁷, and the increase in other addictions associated with the Internet and/or gambling.¹⁸ These outputs, total benefit and total cost, are externalities, borne by both the consumer and society. More specifically, the individual that chooses to gamble online produces these positive and negative externalities privately, on themselves, and socially, directly and indirectly on others. These externalities are the unintended consequences of Internet gambling. I express this mathematically in the following way.

Suppose there are two consumers, I_1 and I_2 . I_1 represents the individual that

¹⁶This holds under assumption (2). Government plays a role by taxing those legal online casinos.

¹⁷There are two perspectives on crime in Internet gambling. See the discussion in the Review of Literature for further explanation.

¹⁸These include pornography, alcoholism, and smoking.

consumes Internet gambling. I_1 has a utility function given, simply, by

$$U_{I_1} = f_1(C_1, x_1),$$

where C_1 is a variable representing “n” consumption goods and x_1 is a variable representing the quantity of Internet gambling. I_2 represents the individual that does not choose to participate in online gambling. I_2 's utility function is similar to that of I_1 ,

$$U_{I_2} = f_2(C_2, x_1).$$

It is similar in that this utility function takes x_1 as an input because x_1 is only a choice variable for the first individual, but has an affect on I_2 . It differs with C_2 , or I_2 's consumption of “n” goods.¹⁹ I_2 's utility, therefore, is based on their consumption of other goods as well as I_1 's consumption of Internet gambling. I_1 's consumption of x_1 has a negative impact on the second consumer and generates a negative externality. Mathematically, we assume

$$\frac{\partial U_{I_2}}{\partial x_1} < 0.$$

This is interpreted as: a small increase in x_1 will decrease the consumer's overall level of utility; x_1 decreases I_2 's well-being because of the unintended consequences caused by I_1 's participation in online gambling. Graphically, U_{I_2} is concave everywhere because of decreasing costs and externalities, even though I_2 does not choose the level of output, x_1 .

¹⁹ C_1 and C_2 are different variables because we do not assume that the two consumers purchase the same “other” goods.

Basic microeconomic theory assumes that each consumer aims to maximize their total private benefit, or utility, subject to their budget constraint. This is directly applied to the consumer's levels of Internet gambling. The budget constraint for I_1 and I_2 is given

$$Y_1 = x_1 p_{x_1} + C_1 p_{C_1}, p_{x_1} \geq 0, p_{C_1} \geq 0 \text{ and}$$

$$Y_2 = x_1 p_{x_1} + C_2 p_{C_2}, p_{x_1} \geq 0, p_{C_2} \geq 0,$$

respectively. The “price” paid to gamble via Internet site is denoted p_{x_1} , the price paid for all other goods for the first consumer is denoted p_{C_1} , the price paid for all other goods for the second consumer is denoted p_{C_2} , and the fixed level of income is denoted Y_1 and Y_2 for I_1 and I_2 , respectively. It is possible for these to be two distinct levels of income.²⁰

With this information, we have a utility maximization problem. It is given by

$$P_{b_i}(C_i, x_1, Y_i) = \max_{x_1} U_{I_i}(C_i, x_1), \text{ where } i = 1, 2 \text{ subject to the respective budget constraints.}$$

P_{b_i} denotes the private benefit generated from each consumer's maximization of utility.

Because this model accounts for rational behavior, we must assume that each individual spends a certain amount of their income on these “other” goods. In our case, the individual aims to maximize their amount of Internet gambling. Therefore, the individual aims to consume only the minimum amount of “other” goods (referred to as necessities hereinafter). For each additional unit of consumption of C_i , there

²⁰Other allocations of wealth, like savings accounts, are not accounted for.

will be less available income for x_1 . Similarly, for each additional unit of consumption of x_1 , there will be less available income for C_i . The relationship between these goods is manifested in the concept of the Marginal Rate of Substitution. Mathematically, we assume

$$\frac{MU_{x_1}}{MU_{C_i}} = -\frac{p_{C_i}}{p_{x_1}}.$$

The basic idea is that the ratio of the marginal utilities of each “good” is exactly equal to the negative ratio of the prices of each good.

It is in the best interest of a gambling individual to consume the bare minimum in order to have left over income for consumption of an amount of Internet gambling that maximizes their utility. In this model, I assume there exists a fixed amount of income allocated to consumption of the minimum amount of necessities this individual can consume in order to maintain health, denoted F_{C_i} . The residual income is allocated to the consumption of Internet gambling in order to ensure that the consumer maximizes their utility subject to the “left over” income, denoted $Y_i - F_{C_i}$, but for simplicity, I call this amount G_i . The amount of income an individual allocates to the consumption of C must be less than that individual’s total income subtracted from that same amount of income for the consumption of C . Mathematically, this is given by the inequality: $F_{C_i} < G_i$. This is the least amount possible this person can consume of C to be considered rational. An individual purchases more online gambling than necessities and thus only purchases absolute necessities.

Furthermore, this model assumes there is enough of this residual income to properly satisfy the desire to gamble online. The marginal utility, the per unit change in utility from an increase in the amount gambled, is greater than the value of the next

best alternative, which is the price paid for necessities. This means that gambling brings more utility to a consumer, given that they must spend some amount of their income on necessities.

Let us look at a model that accounts for this theory. I assume Y_i and C_i are unaffected by the consumption of Internet gambling, x_1 . Simply put, we know that an individual consumes necessities and it is considered moving forward; however, we focus solely on an individual's unconstrained consumption of Internet gambling. Using the above assumptions, we can revise the utility function to fit the "unconstrained" maximization problem mold. The revised utility function is a sum over γ_i , the consumer's utility from consumption of gambling, and V_i , the utility from consumption of necessities. We now have a special case of utility as additively separable between Internet gambling, x_1 , and necessities, C_i . Mathematically, we assume

$$U_{I_i} = \gamma_i(x_1, p_{x_1}) + V_i(C_i, Y_i, p_{C_i}).$$

Also, we must assume for this unconstrained utility maximization problem, that the "price" of Internet gambling does not affect the maximum level of utility. Agents that choose to gamble online play regardless of any fees the site may charge and play regardless of or how much is won or lost.²¹

The people that get utility from gambling online are different psychologically than the people that get utility from gambling offline. Those that are attracted to online gambling are people that play because they genuinely like the game, people

²¹For this to be valid, we must keep in mind our prior assumption that the individual has allocated enough income to consumption of necessities.

that value anonymity, and people that appreciate the lack of social connectedness. Agents that gamble online do not have the physical connection to money unlike agents that gamble offline; they do not see their winnings and do not experience their winnings being taken away from them by a dealer. Because of the lack of physical connection and its addictive nature, online gambling is said to promote continuous play. Uncontrollable, continuous play is one of the main determinants of pathological gambling. The continuous play with lack of real, physical contact to money can contribute to a gambler's debt.²² Furthermore, the uncontrollable play or addiction to Internet gambling leads to gamblers neglecting their families because all of their free time is spent gambling. It is also said to affect work ethic and time at work. Because actions are not monitored like in an offline casino, online gambling tempts the pathological gambler to give in to their addiction. One can gamble as much as they want for any amount of time, all the while remaining oblivious to what is happening to their money if they are not paying close attention. A pathological gambler is averse to fees charged by the site; prices do not affect them because of their perceived level of utility from online gambling.

Similarly, underage gamblers have a tendency to gamble into debt, whether intentional or unintentional. They use someone else's credit card to play. Contrary to the pathological gambler, unless said pathological gambler also happens to be underage, an underage gambler is not responsible for any debt they accrue on an online site. Rather, the site operator is held responsible and must pay the amount of expense accumulated from the actions of the underage gambler. The rationale

²²Debt is another externality, borne out of offline and online gambling, that can lead to that gambler committing more serious crimes to pay back their debt.

behind this is traced back to the operator's age screening mechanism. They differ from site to site, but the basic idea is same across all sites. It is supposed to prevent underage gambling from occurring and, in some cases, is not effective. Underage gambling is unique in that it is a negative externality to the site operator, the family of the underage gambler, and the owner of the credit card. The problems and externalities caused by underage gamblers and pathological gamblers are numerous. The in-excludability of cyberspace makes these individuals susceptible to gambling online. The analysis of the online gambler demographic allows us to continue under the assumption that participation in online gambling occurs no matter the "price".

In this model, there is one consumer that chooses to gamble online, called I_1 . Given our assumptions, it must be the case that there is some positive level of gambling, $x_1 \geq 0$, that maximizes the consumer's level of utility, denoted $\gamma_1(x_1, p_{x_1})$. Therefore, the optimal level of x_1, x_1^* , satisfies the first order necessary condition when

$$\frac{\partial U}{\partial \gamma_1}(x_1^*) = 0 \text{ if and only if } x_1^* > 0.$$

One of the general concepts of marginal utility is that when the marginal utility of any good is strictly positive, the consumer of that good should and will obtain more of it. Above, however, the online gambler will stop gambling because he or she will not receive additional benefit from continual play. If the online gambler plays longer than the maximum threshold value (where they receive the greatest benefit), they experience diminishing marginal utility. The above first order condition means that the optimal level of x_1, x_1^* , is when the marginal utility with respect to x_1^* is exactly equal to zero. This is the maximum. Such a maximization problem satisfies the

second order sufficient condition when

$$\frac{\partial^2 U}{\partial \gamma_1^2}(x_1^*) < 0.$$

The second order sufficient condition above shows that the slope of the marginal utility is strictly negative. It implies concavity of γ , the individual utility function. Because the optimal level of Internet gambling is strictly positive, $x_1^* > 0$, there is an interior solution when $\frac{\partial U}{\partial \gamma_1}(x_1^*) = 0$. Thus, this shows that utility diminishes immediately following this maximum point and it supports the theory that a *rational* individual stops gambling online when utility diminishes.²³ This is only the case for a single consumer of Internet gambling, though.

My model aims to display the effect of Internet gambling on at least two consumers. That being said, I now discuss the social benefit of Internet gambling. In practice, social benefit, otherwise commonly referred to as the Pareto optimal or “efficient” level of output, must maximize the joint surplus of the two consumers. Similar to our single individual case above, the multiple consumer case is a maximization problem. This objective function is given by

$$S_b(x_1) = \max_{x_1 \geq 0} \gamma_1(x_1) + \gamma_2(x_1).$$

The optimal amount of output, denoted x_1^o , is satisfied by the first order necessary

²³This concept is validated by the Law of Diminishing Marginal Utility. In the context of this thesis, it implies that each additional unit of online gambling added after the maximum amount of online gambling is achieved brings diminishing utility levels, instead of increasing utility levels.

condition when

$$\frac{d}{dS_b}(x_1^o) = \frac{d}{d\gamma_1}(x_1^o) + \frac{d}{d\gamma_2}(x_1^o) = 0.$$

This is further simplified to the following equality

$$\frac{d}{d\gamma_1}(x_1^o) = -\frac{d}{d\gamma_2}(x_1^o), \text{ where } x_1^o > 0.$$

Again, this social benefit maximization problem is almost completely synonymous to the maximization of private benefit. The Pareto optimal allocation of output for social benefit occurs at this interior solution when the optimal level is strictly positive, $x_1^o > 0$, or where there exists some level of Internet gambling. The second order sufficient condition is satisfied when

$$\frac{d^2}{dS_b^2}(x_1^o) = \frac{d^2}{d\gamma_1^2}(x_1^o) + \frac{d^2}{d\gamma_2^2}(x_1^o) < 0.$$

This if further simplified to the following inequality

$$\frac{d^2}{d\gamma_1^2}(x_1^o) < -\frac{d^2}{d\gamma_2^2}(x_1^o).$$

This inequality tells us that the second consumer experiences a negative level of utility that is greater than the positive level of utility the first consumer experiences. Society is hurt by the individual's incentive to gamble online and that individual's participation in the activity.

Results

Upon combining the two mathematical results, private optimal level of Internet gambling and social optimal level of Internet gambling, I conclude that it is impossible to achieve an optimal level of output for both consumers unless $x_1^* = x_1^o = 0$, the boundary solution, or unless $x_1^o < x_1^*$, the interior solution.

My thesis seeks to advance the notion that neither the boundary solution, nor the interior solution can be achieved through regulatory policies targeting Internet gambling. To begin, let us address one of the standard policies that achieves a boundary solution in *offline gambling*, apply this mechanism to online gambling, and explain why it is not feasible. As stated above, a boundary solution occurs when $x_1^* = x_1^o = 0$, or when there is zero Internet gambling taking place. One common way in which the government achieves this is through the implementation of a quota on quantity of output. A quota is implemented in order to mitigate not only the consequences that arise because of externalities, but also the externalities themselves. The amount of the quota must be identical to the socially optimal quantity of gambling. By definition, it is then that the ideal Pareto improvement is achieved. In my economic model, I find that the socially optimal level of output is equal to the private level of output, which are both identical to zero.

Government policies and regulation surround offline gambling; therefore, a quota policy is feasible. The opening and operation of any new casino is subject to state law, but the casinos must be connected to the government in some fashion. When gamblers spend their money at casinos, whether that is through gambling or purchasing other amenities that are available, the government reaps the benefits, most

notably the tax revenue. That tax revenue is redistributed in the economy. The point is that “zero” output of offline gambling is tangible because each state government possesses the authority to shut down any of the casinos in their jurisdiction.

A quota policy for online gambling is somewhat of a different story. If individual participation in online gambling cannot exist, government must regulate the online casinos through their site operators. However, it is not feasible to have no online gambling. Cyberspace is vast and has no bounds or regions. The Internet cannot be regulated by the government and is a non-excludable good. Regardless of the amount of information the government has on a specific site, it cannot simply shut it down. If they were to have that power, how could one be certain that the site operator will not open another site immediately following the destruction of their old site? Not only does the government lack the ability to shut down any online site, but they also lack the ability to shut down an individual gambling online. Any individual, unless otherwise jailed, should be able to access any website they desire with an Internet connection and a credit card. Therefore, the “quota” solution cannot work.

When we have an interior solution, $x_1^o < x_1^*$, the socially optimal level of output must be smaller than the private optimal level of output in order for this to be a Pareto optimal improvement. To reiterate my second result, the negative utility the second consumer faces, of whom is affected by the externality, is greater than the positive utility the first consumer faces, of whom participates in online gambling and generates the externality. In this interior solution case, a Pigouvian tax (per unit tax) may be proposed to mitigate the externality. Government taxes gambling because it is supposed to compensate for the negative social and economic consequences that

are caused by gambling. The taxation on an externality will be carried out if the amount of the tax is greater than or equal to the harm the externality imposes on society. This is an arbitrary amount decided by the government. Through such taxation policies, the government aims to make society better off as a *whole*.

As I stated above, tax policies mitigate the problems caused by externalities, supposedly. Due to the very definition of an externality, we know that there are bound to be individuals harmed from its presence. The social, economic, and even political cost imposed on this group of “harmed” individuals is justified with the implementation of a tax because there exists a much larger group of individuals that benefit from the tax revenue that is generated from the externality. Often times, the tax revenue collected from externalities, like gambling, is redistributed amongst different sectors of society, such as the education system.

Though the offline gambling industry is currently heavily taxed, the online gambling industry does not bear the same burden. Taxing online gambling is complicated and ill-defined. It does not necessarily compensate for the specific externalities that arise because of an individual’s choice to gamble online. Let us suppose a scenario similar to the economic model above to illustrate this idea. There are two individuals. One of these individuals chooses to gamble online and the other does not, but the latter still bears the cost that comes from the first individual’s choice to gamble online. If we refer back to the review of literature, we find that the online casino’s site operator receives the individual’s (the individual that chooses to gamble online) losses and/or the fees they paid to gamble. Then, the site operator pays an amount to the “government”. However, an individual can access any gambling site, even

those for which the site operator is located in a different country. For example, an individual who resides in California can gamble on a site operating out of Australia, assuming the site is legal. The Californian should be able to reap the benefits of their decision to gamble online through the tax revenue that their state is receiving from them and other individuals similar to them. With the online gambling in our example, this is not the case. The Australian government, or whoever is in charge of collecting the tax revenue from the specific region in which the site operator is located, receives the Californian's money. Their society benefits from the Californian's choice to gamble online, even though California should be the region benefitting from it by reallocating the revenue to mitigate problems that arise from the online gambling. That individual and all of the other individuals that are affected by these externalities are worse off. Furthermore, there is no way to compensate for the consequences that come from the externalities for California. I conclude that a system of taxation cannot work because of the online gambler's power to access any site, along with the lost benefits to the region in which that gambler lives.

Though neither solution, quotas nor taxes, apply to *efficiently* mitigating the problems caused by an individual's participation in online gambling, it is possible to provide online gamblers with incentives to change their preferences and gamble offline. To reiterate once again, certain people gamble online because they desire the anonymity that is provided by the Internet, they value the lack of social connectedness, and they appreciate the act of gambling for what it is. In order to incentivize these online gamblers, then, offline gambling or casinos must provide these consumers with a similar experience and at the very least offers these same desires. That being

said, I propose that casinos offer the option to gamble at a casino, anonymously, as an incentive to online gamblers. In order to do this, casinos can provide any number of cubicles or small rooms, each containing a different “typical” casino game, for these specific individuals to play. Having such a system allows these people to stay anonymous (other players cannot enter the room), remain socially unconnected to other gamblers, and *actually* play the game without distractions. Not only that, but also casinos can collect tax revenue from these players and correctly redistribute it back to the proper region. Furthermore, casino operators will be able to monitor excessive gambling characterizing pathological gamblers and account for any under-age individual that is illegally gambling. Providing anonymous offline gambling is, then, a perfect solution to the market failure generated by the negative externalities caused by an individual’s choice to gamble online.

Conclusion

This thesis proposes that the Internet gambling “market” fails from the creation and exacerbation of negative externalities associated with one individual’s choice to gamble online. Government policies, such as a quota or tax, that account for the negative externalities caused by the act of offline gambling do not translate to online gambling. In part, this is due to the characteristics of cyberspace. The government cannot physically stop an individual from participating in online gambling, nor can they *really* shut down every single online gambling site. Consequently, they cannot stop other individuals from being hurt by the online gambler’s actions. The economic

model in this thesis displays this theory.

Rather than attempting to impose a governmental policy that will help regulate the Internet sites, I posit that casinos should instead provide an experience similar to that of online gambling in order to properly incentivize to instead gamble offline. Because of the nature of this proposal, there is room for future research and testing. It would be interesting to impose this solution of “anonymous” offline gambling to see if it could actually cause a significant change in demand. As Internet gambling gains popularity, data will hopefully be published, which would show us if demand is trending downward. Of course, this test would take a significant amount of time and would have to be analyzed one region at a time, but it is worth it. Internet gambling has an undeniable impact on society, that of which cannot be corrected with traditional, offline gambling solutions.

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