

Online Poker in North America: Empirical Evidence on its Complementary Effect on the Offline Gambling Market

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Abstract

The relationship between online gambling and offline gambling is still an unsettled question: Is online poker mainly a new way of distribution, substituting the offline gambling products? Or does it add to the portfolio of gambling products as a complement, increasing not only the total volume of revenues but also the revenues of each product? This paper is first to shed light on this issue, using a cross-section of online poker revenue and offline gambling revenue in all U.S. states and Canadian provinces. The main finding is that online poker and offline gambling are complementary goods, which suggests that the presence of online poker may increase demand of offline gambling overall. These findings suggest that the offline gambling industry should not generally be adverse to the expansion of Internet poker. This study also reveals the most accurate estimates to date of the online poker market size in 2010 in U.S. states and Canadian provinces/territories.

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Introduction

The introduction of a new medium to provide an existing product is an issue that has been observed in many industries. The overall impact is generally the balance of stimulated growth in the market from the new medium less the loss of the incumbents' share in the old medium. Much in the way that the automobile replaced the horse and buggy, many industry observers feel that growth in online gaming may come at the expense of offline (or brick and mortar) casinos. [21, 22] Understanding the nature of this relationship is quite important from a policy perspective. If the relationship is substitutionary as many believe, then the introduction of widespread legal online gaming may come at the expense of casino operators, and tax revenue generated from those operations. However, if the relationship is complementary there should be fewer direct economic concerns about the spread of online poker, but more focus on the epidemiological risks of more gambling through both mediums.

In this study, we seek to empirically estimate the relationship between traditional offline gaming revenue and one specific form of online gaming that has received much attention for regulation in the U.S.¹ and Canada², Internet poker. We use data from the Online Poker Database of the University of Hamburg (OPD-UHH)

¹See the discussions during the last years in the Gaming Law Review and Economics as well as lots of media coverage on this issue.

²The regulation of online poker is quite different in Canada with Quebec and British Columbia introducing a state-owned online poker provider, while being not regulated and/or forbidden in other provinces.

to estimate the market sizes of online poker in each state of the U.S. and Canadian provinces. The data covers 87% of the online poker market in the U.S. and 65% of the Canadian market and applies to 2010 and falls into the relatively stable post-UIGEA/pre-Black Friday period.³ Extrapolated to the whole market, we use this data to provide a cross-sectional analysis of its relationship to the offline gambling revenues in the respective states and provinces.

This article is structured as follows: In the literature section we provide an overview of the limited research on the online poker market and the relationship between online and offline gaming. In the subsequent two sections we provide accurate estimates of prevalence and size of the online poker market in North America in 2010, sub-divided by U.S. states and Canadian provinces/territories. We then turn to the question of whether online poker and offline gaming are gross substitutes (whose consumption reduces demand for the other product) or gross complements (whose consumption increases demand for the other product). We answer this question with the help of ordinary least squares regression models. Afterwards, we describe the limitations of our study and provide a discussion of the results.

³Specifically, the data was gathered between October 2009 and March 2010.

Literature

To the authors' knowledge, the studies using the OPD-UHH are the only academic research on the prevalence and market size of online poker. The total market size of online poker is estimated at 3.6 billion USD in worldwide revenue per year, with the U.S. representing the largest market with nearly \$1 billion in revenue. [8] An important variable to explain the market size of online poker in a country was found to be income per capita. However, when investigating the homogenous countries of the European Union, Internet activity was found to have the strongest correlation with the prevalence of online poker. [9] Another study of the data of the OPD-UHH found that legal status does not seem to have any influence on prevalence at the national level.⁴ [7].

To date, no peer-reviewed study has empirically examined the relationship between online poker and offline gaming, however there is some evidence that the overall relationship between all of online gaming and casino gaming is substitutionary. [18] That study did not examine poker specifically, and instead aggregated all forms of online gaming. Walker and Jackson estimate the relationship between several offline gaming industries, finding some complementary relationships and some substitutionary relationships. They find that casino gaming is positively related to in-state tribal casino gaming, but negatively related to lottery gaming. [26] They also reinforce the earlier finding by Siegel and Anders of a negative relation-

⁴Note that data in that study precedes the pre-Black Friday period.

ship between lottery gaming and tribal casino gaming. [20] Elliot and Navin find that an additional dollar in casino tax revenue is offset by an estimated \$0.83 reduction in lottery revenue, however, Fink and Rork revise these estimates by providing a remedy of the potential selection bias in states with casino gaming and provide a revised reduction estimate of \$0.56. [5, 11]

Regarding the determinants of gaming revenue, Philander reinforced earlier findings from Morgan and Vasche, Suits, and Thalheimer and Ali that income/economic output are important to demand. [15, 18, 23, 25] Logically, those studies also found that the availability of gaming (in various forms) will positively affect gross gaming revenues. In online poker, availability is primarily determined by Internet access rates, but also can be affected by regulation.⁵ This suggests that Canadian provinces may have different output levels than U.S. states since their financial transactions are not inhibited by the UIGEA. Also, Washington state online poker revenue may be affected by its specific regulation that makes online gaming illegal. During this study's data collection period, the World's largest online poker room, Pokerstars, did not allow wagers from players located in Washington state.

⁵Technically, an online poker player only needs to have a computer with a stable internet connection to participate in the games. However, legal constraints can form another barrier, e.g. when it is illegal to take part in online poker. The regulation may be seen as a continuum from a free market, over a regulated market with advertisement restrictions to a complete and enforced ban. Hence, online poker has a higher availability in a jurisdiction where it is legal than in a jurisdiction where it is prohibited.

The US Online Poker Market

Data from the OPD-UHH shows that in the period from September 2009 to March 2010, 1,429,943 Americans (.46% of the population) played online poker for real money.⁶ Overall, 981 million USD in gross gaming revenue flows from the U.S. to foreign site operators. The number of players, the prevalence of play in the population, and the market size for each state, as well as the District of Columbia and Puerto Rico, is shown in Table 1. The largest market for online poker is California, with roughly 178,000 active players and \$155 million in playing volume, which translates to a market share of 16%. It is followed by New York where 83,000 players generate revenue of \$72 million for the poker sites and Texas with 108,000 players and a playing volume of \$62 million. The states with the highest proportion of online poker players per capita are New Hampshire and Nevada with .97% and .96%. As the column “Prevalence region/country” shows it is twice as likely for a person from these states to play online poker as compared to the country average. Alaska follows with .79% of the population gambling online on poker, along with North Dakota and Massachusetts with .77% and .72% respectively. Maryland, Hawaii, West Virginia have an average prevalence of online poker. Interestingly, although the most famous poker form is called Texas Hold'em⁷, the proportion of online poker players in Texas is less than the national

⁶For a detailed description of the data see [7] or [9].

⁷59% of all online poker players play No Limit Hold'em, 17% play Fixed Limit Hold'em and 5% Pot Limit Hold'em [6]. Of the many other poker forms, Pot Limit Omaha is the most famous with a 9% player share.

average.

| Rank | State | Population | Players ⁸ | Prevalence population | Prevalence region/country | Revenue in mil. U.S.\$ | Market share |
|------|----------------------|--------------------|----------------------|-----------------------|---------------------------|------------------------|--------------|
| | U.S. Total | 310,973,838 | 1,429,943 | 0.46% | 1.00 | 981.01 | 100% |
| 1 | California | 36,961,664 | 178,350 | .48% | 1.05 | 154.59 | 15.88% |
| 2 | New York | 19,541,453 | 82,824 | .42% | .92 | 71.52 | 7.35% |
| 3 | Texas | 24,782,302 | 107,746 | .43% | .95 | 62.36 | 6.41% |
| 4 | Illinois | 12,910,409 | 68,210 | .53% | 1.15 | 56.21 | 5.78% |
| 5 | Florida | 18,537,969 | 80,289 | .43% | .94 | 47.57 | 4.89% |
| 6 | Nevada | 2,643,085 | 25,484 | .96% | 2.10 | 37.58 | 3.86% |
| 7 | Massachusetts | 6,593,587 | 47,425 | .72% | 1.56 | 35.62 | 3.66% |
| 8 | Pennsylvania | 12,604,767 | 51,880 | .41% | .90 | 32.72 | 3.36% |
| 9 | Ohio | 11,542,645 | 60,558 | .52% | 1.14 | 32.11 | 3.30% |
| 10 | New Jersey | 8,707,739 | 38,095 | .44% | .95 | 29.13 | 2.99% |
| 11 | Michigan | 9,969,727 | 47,512 | .48% | 1.04 | 26.88 | 2.76% |
| 12 | Virginia | 7,882,590 | 34,229 | .43% | .94 | 23.90 | 2.46% |
| 13 | Minnesota | 5,266,214 | 32,726 | .62% | 1.35 | 22.87 | 2.35% |
| 14 | Maryland | 5,699,478 | 26,573 | .47% | 1.01 | 21.60 | 2.22% |
| 15 | Georgia | 9,829,211 | 34,985 | .36% | .77 | 21.38 | 2.20% |
| 16 | North Carolina | 9,380,884 | 33,496 | .36% | .78 | 20.49 | 2.11% |
| 17 | Washington | 6,664,195 | 27,604 | .41% | .90 | 20.37 | 2.09% |
| 18 | Wisconsin | 5,654,774 | 26,798 | .47% | 1.03 | 19.99 | 2.05% |
| 19 | Colorado | 5,024,748 | 29,674 | .59% | 1.28 | 17.98 | 1.85% |
| 20 | Arizona | 6,595,778 | 28,651 | .43% | .94 | 17.50 | 1.80% |
| 21 | Missouri | 5,987,580 | 26,908 | .45% | .98 | 16.76 | 1.72% |
| 22 | Indiana | 6,423,113 | 33,074 | .51% | 1.12 | 16.34 | 1.68% |
| 23 | Oregon | 3,825,657 | 21,183 | .55% | 1.20 | 14.76 | 1.52% |
| 24 | Connecticut | 3,518,288 | 19,189 | .55% | 1.19 | 11.58 | 1.19% |
| 25 | Tennessee | 6,296,254 | 22,262 | .35% | .77 | 10.51 | 1.08% |
| 26 | Arkansas | 2,889,450 | 18,135 | .63% | 1.36 | 9.15 | .94% |
| 27 | Kentucky | 4,314,113 | 16,467 | .38% | .83 | 8.81 | .90% |
| 28 | Iowa | 3,007,856 | 15,986 | .53% | 1.16 | 8.46 | .87% |
| 29 | Alabama | 4,708,708 | 17,030 | .36% | .79 | 8.40 | .86% |
| 30 | South Carolina | 4,561,242 | 13,104 | .29% | .62 | 7.06 | .73% |
| 31 | Oklahoma | 3,687,050 | 15,297 | .41% | .90 | 6.29 | .69% |
| 32 | Kansas | 2,818,747 | 13,516 | .48% | 1.04 | 6.34 | .65% |
| 33 | New Hampshire | 1,324,575 | 12,785 | .97% | 2.10 | 6.24 | .64% |
| 34 | Maine | 1,318,301 | 9,116 | .69% | 1.50 | 5.54 | .61% |
| 35 | West Virginia | 1,819,777 | 8,203 | .45% | .98 | 5.58 | .57% |
| 36 | Nebraska | 1,796,619 | 8,812 | .49% | 1.07 | 5.52 | .57% |
| 37 | North Dakota | 646,844 | 5,002 | .77% | 1.68 | 4.98 | .51% |
| 38 | Mississippi | 2,951,996 | 9,969 | .34% | .73 | 4.96 | .51% |
| 39 | Louisiana | 4,492,076 | 13,369 | .30% | .65 | 4.92 | .51% |
| 40 | Alaska | 698,473 | 5,522 | .79% | 1.72 | 4.90 | .50% |
| 41 | New Mexico | 2,009,671 | 7,118 | .35% | .77 | 4.53 | .47% |
| 42 | Hawaii | 1,295,178 | 6,017 | .46% | 1.01 | 4.51 | .46% |
| 43 | Montana | 974,989 | 5,570 | .57% | 1.24 | 3.68 | .38% |
| 44 | Idaho | 1,545,801 | 7,398 | .48% | 1.04 | 3.67 | .38% |
| 45 | Utah | 2,784,572 | 8,640 | .31% | .67 | 3.46 | .36% |
| 46 | Rhode Island | 1,053,209 | 6,149 | .58% | 1.27 | 3.38 | .35% |
| 47 | District of Columbia | 599,657 | 2,454 | .41% | .89 | 2.51 | .26% |
| 48 | South Dakota | 812,383 | 4,590 | .57% | 1.23 | 2.13 | .22% |
| 49 | Vermont | 621,760 | 3,870 | .62% | 1.35 | 1.93 | .20% |
| 50 | Delaware | 885,122 | 3,501 | .40% | .86 | 1.44 | .15% |
| 51 | Puerto Rico | 3,967,288 | 2,509 | .06% | .14 | .99 | .10% |
| 52 | Wyoming | 544,270 | 2,990 | .55% | 1.19 | .85 | .09% |
| | n.a. ⁹ | 1,095 | | | | | |

Source population data: U.S. Census Bureau, 2009.

Table 1: The U.S. Online Poker Market in 2010.

The Canadian Online Poker Market

Although the absolute size of the market is smaller in Canada with 220 million USD, the prevalence of online poker is nearly twice as high as in the U.S.: roughly 307,000 Canadians, or .90%, of Canada plays poker online for real money (see table 2). Ontario's 110,000 players generate the largest share of activity representing 37.7% of the total market. Quebec and British Columbia follow with 18.7% and 17.3%, which is interesting in so far as Quebec has a much higher population than British Columbia. The highest share of players per capita can be found in the low populated regions of the Northwest Territories, Nunavut, Yukon Territory, and Prince Edward Island. The prevalence of online poker in those jurisdictions is 1.6 to 2.7 times higher than over the whole country. The Northwest Territories has a prevalence rate over five times the prevalence rate in the overall U.S..

| Rank | Region | Population | Players ¹⁰ | Prevalence population | Prevalence region/country | Revenue in mil. US\$ | Market share |
|------|---------------------------|-------------------|-----------------------|-----------------------|---------------------------|----------------------|--------------|
| | Canada Total | 34,108,800 | 306,596 | 0.90% | 1.00 | 219.63 | 100% |
| 1 | Ontario | 13,210,700 | 110,159 | .83% | .92 | 84.15 | 37.72% |
| 2 | Quebec | 7,907,400 | 66,912 | .85% | .94 | 41.66 | 18.67% |
| 3 | British Columbia | 4,531,000 | 42,299 | .93% | 1.03 | 38.67 | 17.33% |
| 4 | Alberta | 3,720,900 | 40,918 | 1.10% | 1.22 | 36.47 | 16.35% |
| 5 | Manitoba | 1,235,400 | 13,356 | 1.08% | 1.20 | 7.17 | 3.22% |
| 6 | Saskatchewan | 1,045,600 | 12,303 | 1.18% | 1.31 | 6.74 | 3.02% |
| 7 | New Brunswick | 751,800 | 6,859 | .91% | 1.01 | 2.74 | 1.23% |
| 8 | Nova Scotia | 942,500 | 6,373 | .68% | .76 | 2.63 | 1.18% |
| 9 | Newfoundland and Labrador | 509,700 | 3,045 | 0.60% | .67 | 1.38 | .62% |
| 10 | Prince Edward Island | 142,300 | 1,990 | 1.40% | 1.56 | 0.74 | .33% |
| 11 | Yukon Territory | 34,500 | 647 | 1.88% | 2.09 | 0.31 | .14% |
| 12 | Northwest Territories | 43,800 | 1,075 | 2.45% | 2.72 | 0.26 | .12% |
| 13 | Nunavut | 33,200 | 660 | 1.99% | 2.21 | 0.16 | .07% |

Source: population data: Statistics Canada, CANSIM, Population by year, by province and territory, 2010.

Table 2: The Canadian Online Poker Market in 2010.

The Relationship to the Offline Gaming Market

Methodology

In order to estimate the relationship of the 1.2 billion USD North American on-line poker market and the offline gaming market, several ordinary least squares regression models with different specifications to test for variable significance were developed. The dependent variable of this empirical analysis is the estimated annual online poker revenue for each U.S. state, the District of Columbia, and each Canadian province. As there are no empirical studies that the authors are aware of that have clearly defined the determinants of the demand for online gaming, this study draws on literature of offline gaming demand and socio-demographics characteristics of online gamblers, to define a set of potential control variables.

The variable of interest, casino revenue, was compiled from a number of sources. U.S. commercial casino revenue, along with racetrack casino revenue, casino counts, and gaming machine counts were obtained from the 2010 American Gaming Association State of the States Report [2]. Since U.S. tribal casino revenue is not publically reported in all U.S. states where tribal gaming occurs, estimates of its revenue were obtained from Meister's annual report on tribal gaming [13].

¹¹ U.S. lottery revenue was obtained from the Tax Foundation. [24] Canadian

¹¹For confidentiality reasons, gaming and non-gaming revenue figures for Alabama, Alaska, Colorado, Mississippi, Nebraska, Nevada, North Carolina, Texas, and Wyoming are aggregated by [13] into "Other States with Indian Gaming." To address this issue a log-log regression model using number of slot machines and number of tribal casino locations as independent variables was

casino revenue, racetrack casino revenue, lottery revenue, tribal casino revenue, casino counts, and gaming machines counts were all obtained from the Canadian Gambling Digest. [4] Since the revenue estimates are aggregated for all outlets within each province, the variable of interest is defined as the sum of these values. An alternative proxy variable for the size of the offline gaming industry is also used in model estimation, namely, the total number of gaming machines in commercial/racetrack casinos, tribal casinos, and non-casino locations.

Results

As shown in Table 3, there appears to be a positive relationship between the dependent variable (online poker revenue) and the variable of interest (offline casino revenue). The alternative proxy variable for offline gaming demand, “Number of Machines in Casinos and Non-Casinos”, appears to perform equally as well as the primary revenue variable, and exhibits the same complementary relationship. This finding is contrary to prior findings [18] on the relationship between the online gaming industry (including casino style games and sports betting) and the offline casino industry, suggesting that online poker may exhibit a unique relationship with the offline casino industry. Given a jurisdiction generates an additional \$1 million in offline gross gaming revenue, we would predict an additional

developed using the state specific data they did provide for the 19 other states. The R-Squared of this model was 0.95, and the sum total of the estimated state specific values was \$1,074 million, while the aggregated total provided by Meister was 1.1% different at \$1,086 million, suggesting the estimates should be reasonably reliable. The state estimates were then proportionally increased to reach the \$1,086 million aggregate total.

2,700 USD in online poker revenue. Although this effect may appear to be relatively small, the finding is robust across many model specifications, suggesting a stronger argument for validity. Potential explanations for this relationship are provided in the Discussion and Perspectives section. Contrary to the offline casino finding, the coefficient on lottery sales was not found to be significantly related to online poker revenue. This suggests that the presence of a larger offline casino market will positively affect online poker activity, but that the lottery market has no impact on online poker demand.

A few other results from the empirical analysis are worth noting. As expected, the population size and Internet user rates are both found to be positively related to online poker revenue. As the population in a jurisdiction increases, and as an increasing proportion of the population has access to the Internet, online poker activity increases. Both regional dummy variables, depicting Washington state and Canadian province, are significant. Canada is found to have higher comparative online poker revenue than the U.S.. In part, this may be the case since financial transactions with operators are much less restricted in Canada than in the U.S., where the UIGEA has inhibited the ability for players to deposit/withdraw money to/from their accounts. Washington state is found to have a significantly smaller market size than the other jurisdictions. Washington was the only jurisdiction during the estimation period where regional legislation made wagering online explicitly illegal, and where Pokerstars did not accept wagers. Finally, disposable income is found to be statistically significant in only Model 7. Multicollinearity

does not seem to be the cause of the lack of robust estimates, as all variables' variance inflation factors are less than 1.5. A Shapiro-Wilk test did not reveal a significant departure from normality in the model residuals, $z=1.067$, $p=0.143$. We therefore find the required assumptions to fit an OLS model do not appear to be violated. The adjusted R^2 of the full model was 0.92, suggesting a well-fitted model. In general, the direction of coefficients for the explanatory variables in Table 3 are consistent with results in prior studies and/or economic theory, with exception to the relatively unrobust income coefficient estimates.

Other model specifications were estimated in order to test for variable significance. Where these variables were found to be insignificant in the fully specified models (6 & 7), they were generally dropped from the final specification in order to reduce inference issues from multicollinearity. However, Model 8 includes the lottery revenue variable to illustrate the statistically insignificant relationship. Variables tested, but excluded from the results in Table 3 because of insignificance, include smoking prevalence rates, heavy drinking prevalence rates, higher education levels, unemployment rates, and gross domestic product.

| Dependent Variable: Online Poker Market Size (USD) | | | | | | | | |
|--|--------------------------------------|----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Coefficients | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) | Model (7) | Model (8) |
| Casino Revenue (Millions of USD) | 2544.61*** (4.28) | 2584.04*** (3.58) | 2548.90*** (4.30) | | 2588.46*** (4.41) | 2701.09*** (4.66) | | 2749.99*** (4.65) |
| Lottery Revenue (Millions of USD) | | | | | | | | 2613.61 (0.58) |
| Number of Machines in Casinos and Non-Casinos | | | | 158.50*** (6.39) | | | 176.19*** (7.38) | |
| Internet Users per 1,000,000 | 78.03*** (3.84) | | 83.05** (3.26) | 82.41** (3.13) | 89.53** (3.40) | 65.42** (3.67) | 63.70** (3.57) | 65.57*** (3.74) |
| Disposable Income per Capita (Thousands USD) | | 240.23 (1.42) | -104.62 (-0.52) | -64.52 (-0.33) | -103.88 (-0.51) | 224.79 (1.49) | 283.38* (2.04) | 201.10 (1.35) |
| Population | 3.31*** (12.08) | 3.29*** (10.66) | 3.32*** (11.97) | 3.49*** (11.46) | 3.32*** (12.09) | 3.39*** (12.89) | 3.57*** (12.60) | 3.25*** (7.16) |
| Washington State Dummy | | | | | -1.24x10 ⁷ *** (-4.44) | -9.63x10 ⁶ *** (-5.07) | -9.72x10 ⁶ *** (-5.51) | -8.86x10 ⁶ ** (-3.69) |
| Canadian Province Dummy | | | | | | 1.32x10 ⁷ *** (4.53) | 1.38x10 ⁷ *** (4.40) | 1.26x10 ⁷ *** (4.58) |
| Constant | -6.21x10 ⁷ *** (-3.96) | -1.03x10 ⁷ (-1.71) | -6.23x10 ⁷ *** (-3.92) | -6.37x10 ⁷ *** (-3.92) | -6.72x10 ⁷ *** (-4.06) | -6.29x10 ⁷ *** (-4.72) | -6.43x10 ⁷ *** (-4.81) | -6.24x10 ⁷ *** (-4.67) |
| Adjusted R-square | 0.882 | 0.857 | 0.880 | 0.880 | 0.882 | 0.915 | 0.917 | 0.914 |

*Denotes significance at the 0.05 α level; **denotes significance at the 0.01 α level; ***denotes significance at the 0.001 α level. Numbers in brackets denote t-values. N=61

Table 3: Estimation Results of Ordinary Least Squares Regression.

Limitations

Although the relationship between the two revenue variables appears to be consistent across many model specifications, it would be inappropriate to infer any direction of impact or a specific causal relationship from this non-experimental design. For example, it may be the case that the presence of increased advertising from online poker operators caused an increase in demand for all gaming. Alternatively (or in addition) it may be the case that residents in states with widespread offline gaming will be more receptive to online poker gaming, thereby producing the positive association.

Further, the direction of relationship does not necessarily need to be consistent across all jurisdictions to produce this average finding. It may be the case that behavior in a state with many offline gaming options, like Nevada, would be quite different than in a state with no legal gaming options like Hawaii. For example, many Las Vegas poker rooms anecdotally observed immediate increases in patronage after Black Friday restricted access to online poker sites, suggesting some substitutionary activity (though the long-term marginal effect remains unknown).

Finally, there are some variables that may be important determinants of online poker demand that are not included in this study. For example, advertisements are widely used by online poker operators, but there are no reliable means to control for this variable in this study. Any correlation between online poker advertising and the offline revenue figure may produce some bias the results. In any case, the

findings from this study certainly have some importance for policy debates over the introduction of legal Internet poker. Offline casino stakeholders can be less concerned that the widespread introduction of legal online poker will significantly cannibalize existing demand.

Discussion and Perspectives

This paper described the prevalence and market size of the North American online poker market and the relationship between online poker and offline gambling. We used data from the Online Poker Database of the University of Hamburg (OPD-UHH) on revenue during the stable post-UIGEA/pre-Black Friday period in all U.S. states and Canadian provinces. We found that there were approximately 1.4 million U.S. players who played poker for real money over the Internet during this period. They paid \$981 million dollars in rake to site operators. The Canadian market is smaller with \$220 million, but given the country's smaller population the prevalence of 307,000 players is nearly twice as high as the rate in the U.S. (0.9% of the population compared to 0.46%). Although the reason for this difference likely depends on several factors, one important factor may be that in Canada the financial transactions between players and operators were not limited by the UIGEA. The importance of regulation on poker activity is further supported by the empirical finding that Washington state has a significantly lower online poker revenue level, given its other characteristics.

The other main objective of this paper was to investigate the relationship of this billion-dollar market to the offline gaming industry. Existing literature [18] suggests that these products are substitutes that compete with each other for gaming revenue. We used ordinary least square models to test this relationship in North America, controlling for potential explanatory variables like income per capita, population, and Internet prevalence rates. The results are surprising: overall, online poker and offline gaming do not compete for an identical market and cannibalize each other's revenue. Rather, we found a small but significant positive relationship between those variables. This indicates that the markets reinforce each other and the goods are gross complements and not gross substitutes. Depending on the model, we found that in a market with an additional \$1 million in casino revenue, we would predict an additional \$2.7 thousand in online poker revenue. That means that the larger the online poker market, the larger the offline gambling market and vice versa. On the other hands that means that a reduced online poker market has a negative effect on the size of the offline gaming industry. We further found no significant effects of the size of the lottery industry on online poker revenue. That is counterevidence to the argument for state-owned lottery monopolies, like in Germany, to "cannibalize" the demand for gambling from highly addictive products to a product with low risks of creating gambling problems. This implies taht lotteries are different from other gambling forms like slot machines.

This result has major implications for gaming operators, regulators, and addiction

stakeholders. Brick and mortar casinos can be less wary of competition from online poker, and should be more receptive to this new form of gaming as it appears to be positively related to their own revenue. Should legalization of online poker occur in more North American jurisdictions, further collaboration between online and offline operators would be expected to lead to synergistic effects, increasing the complementary relationship and profit on both sides.¹² While the complementary effect appears to be positive for these offline and online operators, it leads to the common double-edged sword for regulators. In support of legalization is the incentive to accrue the benefits of tax revenue on this product as well as increased taxes on offline gaming. Conversely, legalization leads to higher availability of this product and a larger market size, which may lead to more gambling problems. [17, pp.30], [1], [12], [19], [28]. Hence, finance departments' interest in the complementary effect between online poker and offline gaming, as an argument to legalize online poker, must be balanced against health departments' concerns around the very same finding.

Future research may try to replicate these results in a different setting and investigate why online poker is complementary towards offline gaming. This could be done by examining the effect of online poker on offline casinos using a causal model design. That is, as more data become available and allows for a large sam-

¹²For example, Caesars Entertainment Corporation has noted in their IPO filing information: "We believe that the expansion of online gaming offerings, for real money, 'for fun' and social and mobile games, will benefit our land-based portfolio due to further brand enhancement, customer acquisition in new channels, and marketing arrangements including incorporating our Total Rewards and cash-back for points programs into our online gaming offerings."

ple to be analyzed, researchers may wish to apply methods on a data set with offline revenue as the dependent variable. An endogenous selection model could be used to correct for states without casino gaming, and Internet user rates could be used as an instrument for online poker revenue. An investigation of a jurisdiction with more tightly controlled regulation, such as Sweden with government-owned *Svenka-Spel*, may allow for reasonable estimation of the amount of money spent on advertising and promotion, to infer the order of magnitude of those effects. Another starting point may be the finding that online poker shows a significant positive correlation with casino games and slot machines but not with lotteries. A potential reason could be the much lower addictive potential of lotteries in comparison to other games like slot machines.¹³ Expansion of the scope of the study into other forms of gaming, such as horse racing, may also be warranted.

¹³The higher addictive potential of slot machines compared to other gambling forms can be shown quantitatively by the corresponding prevalence rates of gambling problems as well as qualitatively by comparing criteria like frequency of events which are linked to gambling problems. Regarding the quantitative approach: in Germany, for example, the lifetime prevalence of gambling problems among slot machine gamblers was found to be between 18.9% and 33.5% (depending on whether the slot machines are located inside or outside of casinos) compared to 4.6% for lottery gamblers [14]. The 12-months prevalence rates of gambling problems were found to be 13% for slot machines compared to 0.6% for lotteries [3]. Similar numbers were also found in the United Kingdom (11.2% compared to 1%) [27]. Regarding the qualitative approach: whether the Assessment Tool to Measure and Evaluate the Risk Potential of Gambling Products (Asterig) [16] or the weighted list of criteria from Fiedler [10] is used, slot machines have high scores regarding their addictive potential.

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