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**Effects of Casinos on Alcohol Behaviors:
Evidence from Native American Casino Openings**

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ABSTRACT

I provide new evidence on the effect of Native American casino openings on alcohol behaviors of Native Americans and non-Native Americans from 2004-2012 using data from Centers for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS) and difference-in-difference models with county and year fixed effects. Native American casino openings are associated with significant increases in drinking participation in the past month and the average number of drinks consumed per occasion for non-Native Americans. I also find that Native American casinos are associated with significant increases binge drinking among non-Native Americans by 11%; effects on Native Americans are inconclusive. The casino-related increases in binge drinking for non-Native Americans are larger among men, 18-40 year olds, and individuals with a high school degree or less. These findings provide a mechanism for results from previous work that casinos increase drunk driving fatalities and crime.

Keywords: Native American casino, alcohol behaviors, binge drinking

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I. INTRODUCTION

Native American casinos in the United States earned a total of \$28 billion dollars in revenue in 2013, while Las Vegas earned \$6.5 billion dollars over the same year.¹ Native American casinos are currently operating in 29 states with plans to open additional casinos in New York and Arizona. Planned Native American casinos lead to fierce political debate and millions of dollars in lobbyist spending as states and communities decide between the potential benefit of increased tax revenue and the potential negative externalities associated with casinos.

My paper provides an important potential mechanism that explains why casinos are associated with social ills. I show that Native American casinos are associated with increases in alcohol behavior, particularly binge drinking, which may lead to social ills such as crime, drunk driving, and violence. Of the few studies that have analyzed the effects of casinos, most highlight loss of money through gambling and tourism as the mechanisms for bad outcomes. However, there has been extensive work that shows increased alcohol consumption leads to the same social ills with which casinos are associated. By bridging these two separate literatures, I provide a better understanding of how casinos may lead to social ills and I provide information that policy makers may use to mitigate the negative impact of casinos.

Native American casinos have been in operation in the United States since the Indian Gaming Regulatory Act (IGRA) was passed in 1988, yet little work has been done to

¹ http://www.nigc.gov/Gaming_Revenue_Reports.aspx;
http://gaming.unlv.edu/reports/NV_1984_present.pdf

measure the effect of such establishments on alcohol behavior. Several small scale behavioral studies have found a strong correlation between gambling and increased alcohol consumption, but none have utilized the nationwide variation in geographic location and timing following Native American casino openings to examine the effect casinos on alcohol behavior.² The IGRA stipulates that Native American casinos may be operated on reservation land and the variation of these casinos over time provides a natural experiment to test claims that Native American casinos lead to potentially harmful alcohol behavior.

In this paper, I provide the first evidence of the effect of Native American casino openings on alcohol behaviors of non-Native Americans and Native Americans from 2004-2012. I use the Centers for Disease Control's Behavioral Risk Factor Surveillance Survey (BRFSS) to estimate difference-in-difference models that include fixed effects for county and year and yearly county-specific unemployment rates. I provide one of the first comprehensive analyses on drinking outcomes that include: consumption of alcohol in the past month, average number of drinks consumed on an occasion, number of days in the past month when alcohol was consumed, participation and frequency of binge drinking, and participation and frequency of drunk driving.³

I find that counties with a Native American casino opening are more likely to have increases in drinking behavior. There is a 1.5% increase in non-Native Americans having any alcoholic drink in the past month and an 11% increase in binge drinking. Binge

² Stewart et.al. (2002) monitor alcohol behavior while gambling in a controlled experiment and find increased participation in and consumption of alcohol relative to a control group. Walker, Clark, and Folk (2012) use data from the National Youth Longitudinal Survey and report that individuals who gambled in a casino were more likely to binge drink.

³ "Participation" refers to any time in the past month that an alcohol behavior was reported. "Frequency" refers to the number of days in the past month that the alcohol behavior was reported.

drinking results are inconclusive for Native Americans. Further analysis reveals that of the non-Native American residents, males, residents with a high school diploma or less, and residents ages 18-40 have the largest increases in binge drinking. Results are robust to several specifications including the addition of state-year interactions, casino size measured by square footage, and casino openings within varying distance measures to an individual's county of residence.

My research expands the knowledge of the effects of casinos and makes a crucial contribution to the literature. I bridge an existing body of research that shows casino openings are associated with bad health and social outcomes and a body of research that finds consuming alcohol increases the likelihood of those same bad health and social outcomes. My research suggests that Native American casino openings lead to increases in binge drinking and other measures of alcohol consumption, which provides a potential mechanism for findings that casinos lead to bad health and social outcomes. I also explore the effect of Native American casino openings on several alcohol behaviors in great detail, with several controls and robustness checks. Finally, I extend the time period of analysis beyond previous research to include 2004-2012.

This research provides a wide scope of analysis of changes in drinking behavior associated with Native American casinos and makes a substantive contribution to the decision making process of opening a casino. I expand the analysis of the health outcomes affected by Native American casinos to include non-Native Americans. While the results for Native Americans are statistically insignificant and inconclusive, I show that the majority of negative impact of Native American casinos falls on non-Native Americans.

My work informs the decision to open casinos that still occur in the present day.⁴ States and communities that have approved new Native American casino construction have accounted for the benefits of a new source of tax revenue, but the unintended externality of increased binge drinking may lead to a non-optimal decision if ignored.

The rest of the paper is as follows: Section II describes previous literature, Section III details the empirical approach and data, Section IV describes results, and Section V provides a discussion and concludes the paper.

II. PREVIOUS LITERATURE

Following the 1988 Indian Gaming Regulatory Act (IGRA), there was a rapid increase of Native American casino openings. Most of the literature exploring the effects of Native American casinos has focused on the effect on crime rates and financial well-being, and by comparison, few studies have examined the effect on the health outcomes and behaviors. A large body of research has examined the economic impact of Native American casinos on neighboring communities. Research has shown that casino openings decrease housing values (Huang, Humphreys, and Thompson, 2014; Gazel, Rickman, and Thompson, 2001) and increase personal bankruptcy (Garrett and Nichols, 2008; Barron, Staten, and Wilshusen, 2002). Other scholars have explored the effects of Native American casino openings on illegal behavior, finding that casinos increased drunk driving (Cotti and Walker, 2010). Wolfe et al. (2012) is one of the few papers that investigate the effect of

⁴ <http://www.nativetimes.com/index.php/business/gaming/10497-casino-study-renews-hope-for-maine-s-indian-tribes>

Native American casinos on health outcomes on Native Americans exclusively. Using BRFSS data from 1988-2003, they find small improvements in health outcomes and a small increase in the number of days of binge drinking.⁵

Studies have also analyzed the potential negative effects of casino openings more generally (not limited to Native American casinos). Huang and Humphreys (2014) show a 6-7% decline in housing values as a result of a casino opening in an urban location. Grinols and Mustard (2006) study casino openings from 1977-1996 and find that a casino opening is associated with an 8% increase in crime in a county. Cazal, Rickman, and Thompson (2001) perform a case study of Indian casino openings in Wisconsin and find increases in aggravated assault and automobile theft in counties with a casino opening. Wilson (2001) and Stitt, Nichos, and Giacopassi (2003) examine case studies of riverboat casino openings on crime in surrounding counties. They find mixed results that are likely due to the limited scope of the data. Each of these papers highlight gambling losses and tourism as potential sources of increased crime associated with casino openings. Adams and Cotti (2010) examine casino openings from 1990-2000 and the effect on drunk driving rates. They find that casino openings are associated with a 9% increase in drunk driving.

⁵ Researchers have also examined the effect of Native American casino openings on employment and income. Evans and Topoleski (2002) report the change in employment for Native Americans and non-Native Americans in counties with Native American casino openings between 1988-2000. They find that four years after an Indian casino opening, there is a 12% increase in the employment to population ratio, the number of working poor has decreased by 14% for the Native American population, and a 2% decrease in mortality for the casino county. Akee et al. 2010 and Akee et al. 2013 use the Great Smoky Mountain Study to analyze the effect of unconditional income transfer payments on children's health outcomes. Akee et al. 2010 finds that a \$4,000 transfer payment leads to an additional year of education and a lower probability of committing a minor crime. Akee et al. (2013) reports the same transfer payment increases the BMI of children from low SES families relative to children from high SES families.

Unlike a typical drinking establishment, Native American casinos may lead to more intense drinking behavior as a result of the “Las Vegas-style” gaming activities they provide. Two studies explore the biological mechanism for the frequent association of casino gaming with alcohol consumption. Stewart et al. (2002) examine differential levels of alcohol consumption among gamblers and non-gamblers. They report that individuals engaged in gambling activities were much more likely to drink alcohol over non-alcoholic beverages, compared to a control group that did not gamble. Grant, Kushner, and Kim (2002) describe the neurological process that may cause gambling to lead to increased alcohol consumption. If the brain develops an inability to regulate serotonin or dopamine, there may be a biological disposition or inclination toward drinking while gambling. These studies provide support for my work examining Native American casino openings and their effect on binge drinking.

There are a variety of social ills that have been associated with casinos. Casinos have been linked to psychiatric disorders, prostitution, hard drug use, adverse outcomes for children. Walker, Clark, and Folk (2012) use the National Longitudinal Study of Adolescent Health to estimate the association of gambling with drinking and paying for sex. They find that individuals that gambled increased the probability that they participated in drinking by 7 percentage points and they were 2.4 percentage points more likely to have paid for sex. The negative effects of gambling expand beyond individual behavior. Jacobs et al. (1989) reports that children of compulsive gamblers are more likely to smoke and drink. Cunningham-Williams et al. (1998) find that men are three times as likely to develop a gambling problem and that having a gambling problem is associated with an increased

risk of alcoholism and tobacco dependence. They report that casual gamblers (individuals who had placed at least two bets in their lifetime) are more likely to be male and that they have a higher likelihood of suffering from periods of major depression and phobias. These papers underscore the importance of studying the results of Native American casinos beyond increased tax revenue. They have found that there are detrimental health outcomes associated with the main activity that Native American casinos provide, gambling.

A separate literature studies the casual effects of alcohol consumption on social ills such as property damage and crime. Carpenter (2007), Joksch and Jones (1993), Markowitz and Grossman (2000) use a variety of empirical strategies to isolate plausibly exogenous variation in alcohol consumption and its effect on property crime, vandalism, and child abuse, respectively. Other studies have reported associations with alcohol consumption and self-reported arrests,⁶ physical violence,⁷ and spousal abuse by husbands.⁸ Dee (2001) finds a 7% decrease in traffic fatalities after states lowered blood alcohol content standards from 0.10 to 0.08. Dee and Evans (2001) report a similar relationship between “Zero Tolerance” laws and alcohol-related traffic fatalities. This area of research clearly establishes an association between alcohol use and negative health outcomes and social ills. These same negative health outcomes and social ills are associated with the opening of casinos, yet no one has examined the effect of Native American casinos on non-Native Americans and Native Americans.

⁶ Saffer (2001)

⁷ Markowitz (2001)

⁸ Markowitz (2000)

My work contributes to the prior literature in three important ways. By finding that Native American casinos increases binge drinking and alcohol consumption I provide a mechanism for how the opening of a Native American casino leads to bad outcomes. This result bridges the literature finding that casinos increase bad outcomes and the literature finding that alcohol use increases bad outcomes. This result is unique, because I focus on alcohol behaviors related to Native American casino openings that have not been previously studied in detail⁹: binge drinking participation and intensity, consumption of any alcohol in the past month, the average number of days when an individual consumed alcohol, the average number of drinks consumed on an occasion, and drunk driving participation and intensity. In addition, I analyze the effects of Native American casino on both the Native American and non-Native American populations, and I study a more recent period (2004-2012), which witnessed 58 Native American casino openings in 16 different states.

III. DATA AND EMPIRICAL APPROACH

I use variations in the opening and closing of Native American casinos from 2004-2012 to examine county level changes in alcohol behaviors. I have the universe of Class III Native American casinos that opened and those that are in operation from 2004 through 2012. The Native American casino data includes the name of the casino, tribe that controls the casino, opening date, number of slot machines, approximate square footage of the

⁹ Wolfe (2012) examines the effect of a Native American casino opening on Native American binge drinking.

gaming floor, the location by county, and the zip code.¹⁰ Bill Evans, Barbara Wolfe, and Jessica Jakubowski provided the original data set with information from 1988-2005.¹¹ I updated the casino information to include 2006 -2012 using a variety of sources. I started with the list of tribes and their casinos available on the National Indian Gaming Commission website.¹² The document provides the name of the tribe, the name of the casino, casino address, and telephone number. I then used several gambling websites to confirm and augment the list with new opening dates and casino information.¹³ The collection of data represents a comprehensive list of Native American casino opening and closing dates for the entire United States.¹⁴ There are 362 Native American casinos located in 156 unique counties that have a median population size of 44,618 inhabitants.

Figure 1 provides a map of Native American casinos that opened between 2004-2012 in the United States. Most Native American casinos are located in the Midwest, the West Coast, and the Southwest. Figure 2 shows the number of new casino openings by year. There are a consistent number of casinos opening from year to year from 2004 to 2012. The majority of Native American casinos are smaller than the typical casino found in Las Vegas or Atlantic City. However, the largest casino in North America is a Native American casino. The Foxwood casino, located in Connecticut, has over 300,000 square feet of

¹⁰ I am grateful to Bill Evans, Barbara Wolfe, and Jessica Jakubowski for providing data on Native American casino openings.

¹¹ Brad Humphreys provided the data on non-Native American casinos, which includes riverboat casinos, “cruises to no where”, and land based casinos.

¹² http://www.nigc.gov/Reading_Room/List_and_Location_of_Tribal_Gaming_Operations.aspx: accessed May 1, 2014

¹³ The main website used was http://500nations.com/Indian_Casinos_List.asp : accessed May 1, 2014.

¹⁴ While the list is comprehensive, I did not include all casinos in the data set. I removed casinos with names that made it obvious their sole business purpose was something other than gaming. For example, the Dyno-Mart with 20 slot machines and TJ’s Variety Store with 16 slot machines were not included as casinos.

gaming space. The mean casino size is 40,000 square feet of gaming space along with typical casino features that include a hotel, restaurants, and an entertainment venue.

In addition to this Native American Casino data, I use the Behavioral Risk Factor Surveillance System (BRFSS) for individual- and household-level outcomes. The survey is a national telephone survey conducted by the Centers for Disease Control (CDC) and administered by each state. The survey is a repeated cross section of the United States from 1984 to the present day. The annual survey consists of a “core” questionnaire and a group of “modules.” All states administer the core questions and each state may choose whether to ask the module questions. A CDC employee calls a household and asks each question as it relates to the individual or the household of that individual. These include a wide variety of questions that relate to demographics, self-reported health, drinking and smoking behaviors, health insurance coverage, and other health related questions. I have a sample of 48,199 self-reported Native Americans and 3,177,679 non-Native Americans living in 2,412 counties from 2004-2012.¹⁵ I am able to examine the effect of Native American casino openings on both populations over the 2004-2012 time period.¹⁶

The summary statistics of the Native American and non-Native American populations from 2004-2012 with sample weight adjustments are presented in Table 1. The differences

¹⁵ The CDC restricts the FIPS county codes from public use data set if the county has a population smaller than 10,000 people or if the number of people sampled from the county is under 50. It is the current policy of the CDC that only an employee of the CDC may gain access to this restricted data, despite my numerous attempts.

¹⁶ I highlight the motivation for studying 2004-2012 in appendix Figure 1. Wolfe et.al. (2012) has previously studied 1988-2003 using restricted access BRFSS data. Before 2004, there are fewer individuals in the Public Use BRFSS data with geographic indicators in counties that gain a casino. As it is shown in Appendix Table 1, I have a much better coverage rate over the 2004-2012 time period that provides better specification of the model.

in means for demographic and alcohol behavior variables highlight key differences between the two populations. A higher proportion of non-Native Americans have some college education or more and are more likely to be married or co-habiting relative to Native Americans. Native Americans are 6 years younger relative to their non-Native American counterparts. 30% of Native Americans in the sample live in a county with a Native American casino and only 15% of non-Native Americans live in a county with a Native American casino. Non-Native Americans are more likely to have consumed alcohol in the past month (8% points) and drink more frequently (1.03 days) than Native Americans. Native Americans drink 0.30 more drinks on an average occasion than non-Native Americans which translates to 2 more drinks consumed per month. Native Americans and non-Native Americans are equally likely to have engaged in binge drinking activity, however Native Americans binge drink more frequently. Non-Native Americans and Native Americans have the same rates of drunk driving in the past month, while Native Americans have higher frequency of driving under the influence in the past month than non-Native Americans.

I use a difference-in-difference fixed effects model to measure the effect of a casino opening on the drinking behavior of Native Americans and non-Native Americans. I follow the model in Cotti and Walker (2010) and I include fixed effects for each county and year, demographic variables, year-county specific unemployment rate, and a control for non-Native American casinos. Specifically I estimate the following difference-in-difference model:

$$(1) Y_{ict} = \alpha + \beta_1(\text{Any NA Casino In County})_{ict} + \beta_2 X_{ict} + \beta_3 Z_{ct} + C_c + T_t + \varepsilon_{ict}$$

where Y_{ict} includes outcome variables for alcohol behavior. The variable $(Any\ NA\ Casino\ In\ County)_{ict}$ refers to any Native American casino opening or existing Native American casino within a county and in a particular year and X_{ict} is a collection of control variables including sex, education, age, and marital status. The variable Z_{ct} is a vector of county year varying controls that includes county unemployment rate and the presence of non-Native American casinos in a county. The variables C_c and T_t are county and year fixed effects. ε_{ict} is an independently distributed standard error clustered at the county level. The fundamental assumption is that Native American casinos are uncorrelated with unobservable characteristics that may affect drinking behavior. I use county unemployment by year from the Bureau of Labor Statistics to control for county-specific economic factors.¹⁷

IV. RESULTS

I find that non-Native Americans living in a county when a Native American casino opens show substantial, statistically significant increases in binge drinking and other alcohol behavior. These increases are concentrated among men, 18-40 year olds, individuals with high school education or less, and non-smokers. I present detailed effects of Native American casinos on drinking that provide a plausible mechanism for previous work that shows casinos are associated with social ills.

¹⁷ Ruhm and Black (2002) show that the intensity of drinking for existing drinkers is procyclical, therefore, I use county unemployment by year as a control.

Table 2 presents the results of the reduced form model described in equation (1) on the effect of a Native American casino opening on drinking behavior from 2004-2012. The first row reports outcomes for all individuals in the sample, the second row focuses on Native Americans, and the third row presents outcomes for non-Native Americans. Columns 1, 3 and 4 suggest that the opening of a Native American casino in a county leads to higher rates of drinking participation and consumption. Column 1 reports that non-Native Americans are 1.5% more like to have had a drink in the past month as a result of a casino opening. Native Americans have a large, statistically insignificant increase. Coefficient estimates in column 3 show increases in the number of drinks consumed by Native Americans and non-Native Americans. Column 4 presents an 11% increase in binge drinking for the non-Native American population after a Native American casino opening.

There are potential differences between drinkers and non-drinkers. Table 3 presents coefficients for estimates of Equation 1 limited to individuals that indicated having consumed alcohol in the past month. Column 5 highlights a 17% increase in binge drinking among non-Native Americans who drank in the past month due to a Native American casino in their county of residence. The number of drinks consumed by non-Native Americans has also increased, but only marginally. In contrast, the average number of days both groups drank last month decreases, by a large magnitude for Native Americans, but without statistical significance. The effect of a Native American casino opening on drunk driving participation is inconclusive for both non-Native Americans and Native Americans. Drunk driving intensity for both groups increases, but this result is not

statistically significant. An explanation for the findings on drunk driving are explored further in the next section.

The robustness of the large, statistically significant increase in binge drinking by non-Native Americans after a casino opens is further examined in Table 4. Column 1 provides the baseline measure for non-Native Americans from Table 2 for the effect of a Native American casino opening on non-Native American binge drinking. Column 2 reports results for specifications that controlled for the size of the casino and these results show similar effects of small and large Native American casinos on non-Native American binge drinking.¹⁸ I add census region year interactions, census division year interactions, and state year interactions to the baseline model and report the coefficient on Native American casinos from these specifications in Columns 3, 4, 5. The interactions provide an unrestricted control for any differences in each geographic measure over time and controls for confounding factors that may influence binge drinking and change over time within the census region, census division, or state. The results for non-Native American binge drinking are similar in magnitude and statistical significance to the baseline level. The final two columns restrict the sample to only states (Column 6) and only counties (Column 7) that ever had a Native American casino open between 2004 and 2012. The results are consistent with the baseline estimate. I perform similar robustness checks for non-Native

¹⁸ I have information on the square footage of the gaming floor of the casino. 10% of the sample has missing square footage data. I considered the missing data to indicate a “small” casino. The median size of casinos is 40,000 square feet. Native American casinos were considered “large” if they were above the median and “small” if they were below. I performed a regression where casinos with missing data were dropped and results were similar. I also have information on the number of slot machines in the casino. Some casinos focus on card and table games, such as poker, which would provide a poor representation of the casino’s size by using slot machines.

American's drinking participation in the past month and average drinks consumed on an occasion.¹⁹ The results are provided in Appendix Tables 1 and 2.

Table 5 reports results in Row 1 for drinking in the past month and in Row 2 for the average number of drinks consumed on an occasion, broken down by four demographic variables: gender, education, age, and smoker status. Women increase drinking participation in the past month as well as the average number of drinks consumed in one occasion. Men have increases in both outcomes, but they are not statistically significant. Individuals with a high school degree or less present increases in both drinking participation in the past month and the average number of drinks consumed. Non-Native Americans with a college degree or more have small, statistically insignificant increases in both drinking outcomes. Non-Native Americans under 41 years old increase the number of drinks they consume by 14% and individuals 41 years old and older are 4% more likely to have had alcohol in the past month. Non-smokers are more likely to have consumed alcohol in the previous month and increase the average number of drinks they consume, whereas smokers have statistically insignificant increases in both drinking outcomes.

I further investigate the increase in non-Native American binge drinking in Table 6 by four demographics: gender, education, age, and smoker status. The first row reports coefficient estimates of a Native American casino opening in a county for any instance of binge drinking in the past month and the second row presents the results for the number of days of binge drinking in the past month. I find that men, individuals with a high school

¹⁹ I completed an additional robustness check for the effect of a Native American casino opening within 50, 25, 10, and 5 miles of a county. I used ArcGIS to measure the distance from the centroid of a casino zip code to the centroid of each county. The results are similar to the baseline specification and are available upon request.

degree or less, and 18-40 year old have large, statistically significant increases in both outcomes. Men have 11% and 7% increases in binge drinking participation and the number of days of binge drinking in the past month, respectively, and women have a marginally significant increase in binge drinking participation.²⁰ Column 4 reports a 19% increase in binge drinking participation for individuals with a high school education or less and a 26% increase in the number of binge drinking days for the same group. Non-smokers are 9% more likely to binge drink after a casino opening while smokers have a statistically insignificant increase. Non-Native Americans 18-40 years old have a 24% increase in binge drinking participation and a 28% increase in the number of days of binge drinking. I find that individuals with a college degree or more, smokers, and 41 year olds and older have statistically insignificant changes in binge drinking behavior.

V. DISCUSSION AND CONCLUSION

My results suggest that the opening of Native American casinos significantly increases binge drinking and other alcohol behavior among non-Native Americans. These findings are large and statistically significant, but supported by evidence in other areas of research in alcohol consumption.

The 11% increase in binge drinking is an increase that is likely a causal mechanism that explains the research that finds casinos lead to increased crime, prostitution, and drunk driving.²¹ While large, this is a plausible increase for several reasons. Walker, Clark, and

²⁰ Reported percentage is calculated from the reported means of 0.16 and 0.63 for binge drinking participation and number of times binge drinking occurred in the past month, respectively.

²¹ Walker, Clark, and Folk (2012), Grinols and Mustard (2006), Adams and Cotti (2010), respectively

Folk (2012) use the Youth Longitudinal survey and find that individuals who had gambled in a casino in the last year showed a 20% increase in binge drinking over the last month. While their study finds a correlation of gambling and binge drinking, the results show an increase of similar size to the results I find using a difference-in-difference approach.

Native American casinos tend to establish in smaller counties²² where their novel attraction may be greater than in a larger county. Scribner, Cohen, Fischer (2000) show that drinking rates climb as the density of drinking establishments increases. Since most Native American casinos have a full cocktail service for gamblers, at least one bar, and a restaurant, the casino may be considered a very large drinking establishment.

The increase in binge drinking that arises as a result of the mix of activities is further supported by behavioral and medical literature. Stewart et al. (2002) show that individuals participating in gambling activities are much more likely to choose to drink alcohol and drink in larger quantities than individuals in a non-gambling situation. Medically speaking, the physiological response to the act of gambling leads to changes in brain chemistry that increases the desire for alcohol.²³ All this is to say that a casino is not a typical establishment that has alcohol to offer its patrons; rather, it is an establishment that makes them likely to consume larger quantities of alcohol than they would otherwise.

The fact that I find no result for drunk driving is most likely due to the non-specific question asked in the BRFSS survey.²⁴ Without a precise definition of what “perhaps too much to drink” means compared to the clear definition for binge drinking, I find it plausible

²² The median population of a county with a Native American Casino is 25,597 inhabitants.

²³ van Holst et.al., (2010)

²⁴ BRFSS drinking and driving question: “During the past 30 days, how many times have you driven when you’ve had perhaps too much to drink?”

that the results could be inconclusive.²⁵ The ideal question would ask, “Have you driven one hour after having consumed 5 or more drinks over the course of one sitting?” Cotti and Walker (2010) find a 9.2% increase in drunk driving after any casino opening and an even larger effect in casino that open in smaller counties. My finding of an 11% increase in binge drinking after a Native American casino opening is within a reasonable range of Cotti and Walker’s findings and highlights an additional potential causal mechanism.

I am able to show several interesting results of binge drinking broken down by demographics. Women are more likely than men to increase participation in drinking in the past month. Thombs (1993) reports that women are more likely to drink to feel sociable in surroundings with alcohol. That is to say, they are more likely to have “a drink in hand” to be social, as opposed to drinking a large quantity of alcohol. This is also consistent with my findings for binge drinking participation and frequency for women. There is a statistically significant 2% point increase in having 5 or more drinks on an occasion for women, but no significant increase in binge drinking frequency. When one considers that an evening at the casino could consist of dinner, a performance, and gambling afterward, the “occasion” when an individual consumes alcohol lasts much longer and provides a more casual setting with which to consume alcohol.

My results find that men are more likely to increase binge drinking participation and frequency. Carpenter, Dobkin, and Warman (2014) show that young, Canadian men are twice as likely to participate in “extreme drinking” as women once they reach the minimum

²⁵ BRFSS binge drinking questions: “Considering all types of alcoholic beverages, how many times during the past 30 days did you have 5 or more drinks on an occasion?”

legal drinking age.²⁶ Similarly, I find that men that gain access to a new Native American casino in their county are much more likely to engage in binge drinking.

Several other studies support the difference in binge drinking by gender. Thombs (1993) reports that men react to situations with alcohol by consuming a larger quantity than women. Giacomassi, Stitt, and Vandiver (1998) show that men are more likely than women to gamble in a casino and drink more. It is possible that the effect of a casino on men's alcohol behavior after a Native American casino opening is much stronger because they are more inclined to drink heavily while gambling than their female counterparts.

Native American casinos appear to have a much strong effect on 18-40 year olds than those over 41. There is a statically significant increase in drinking participation in the past month among the younger cohort and that is most likely attributable to the wide range of activities offered by the casino in conjunction with alcohol service. However, the younger population is much more likely to increase their drinking intensity after a Native American casino has opened. It could be that the younger demographic group is less risk averse than the older demographic group. Cox (1998) finds that gambling increases with age up to age 39 and then begins to decline. Given the connection to gambling and increased alcohol consumption, this could be the reason that the younger demographic group consumes more drinks on an occasion and increases binge drinking participation and frequency.

Finally, individuals with a high school diploma or less and non-smokers increase all aspects of their drinking behavior. The result for those with less education is consistent with work by Muthen and Muthen (2000) that finds high school drops out have a much

²⁶ Extreme drinking is defined as 10 or more drinks for men, 8 or more drinks for women.

higher rate of heavy drinking than those that attend college. Non-smokers increasing their consumption of alcohol without any similar statistically significant increase in smoker's alcohol behavior is interesting compared to the findings in the literature that test the cross-price elasticity of drinking and smoking. Dee (1999) finds that alcohol and cigarettes are compliments among teens by using an increase in the minimum legal drinking age to show a decrease in cigarette use. Decker and Swartz (2000) show that higher alcohol prices decrease drinking and cigarette consumption, but that increases in cigarette prices lead to an increase in drinking. Picone, Sloan, and Trogdon (2004) study smoking bans and find that there is a positive effect of cigarette prices on alcohol consumption. The act of smoking may have already led to a higher consumption of alcohol so that a Native American casino does not lead to an individual changing their drinking behavior. For the non-Smoker, the Native American casino may provide a unique experience that leads to a statistically significant increase in alcohol use.

There are a few limitations to the paper. I cannot analyze earlier periods in the BRFSS data because of a lack of coverage of casino openings. Appendix Table 1 shows very low coverage of casino openings from 1988-2003 that would result in a misspecification of the model if the time period were included. I am able to identify Native Americans in the BRFSS data, but the small sample size prevents a precise estimate of the effect of Native American casino openings on drinking behavior. Finally, all drinking outcomes are self-reported which could lead to bias in the estimates. This type of self-reported data is used throughout the literature and I am confident that the nature of the questions I am studying would most likely result in a downward bias since the stigma of binge drinking is negative.

While I have shown strong evidence to support that Native American casino openings increase alcohol behavior and binge drinking, this paper is one part of the overall research on Native American casinos. I have attempted to better inform the policy making discussion by pointing out a potential mechanism for many of the documented social ills associated with casinos. This information could be used to mitigate harmful externalities in a similar manner to sporting event that stop selling alcohol before a game has ended.

My results provide an important piece of insight into the larger discussion of Native American casino openings. Many states and communities have been in favor of these new establishments as a source of increased tax revenue that does not require the passage of politically unfavorable tax increases since the Great Recession. I point out the unintended social impact of these casinos by showing an increase in binge drinking and other alcohol behaviors that have been tied to numerous social ills such as: drunk driving, crime, and prostitution. In the future, I plan to use this same design for future work that will examine the effect of Native American casino openings on: hospitalizations, birth outcomes, substance use treatment facility admissions, and other non-drunk driving fatalities.

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Figure 1
Native American Casino Openings from 2004-2012

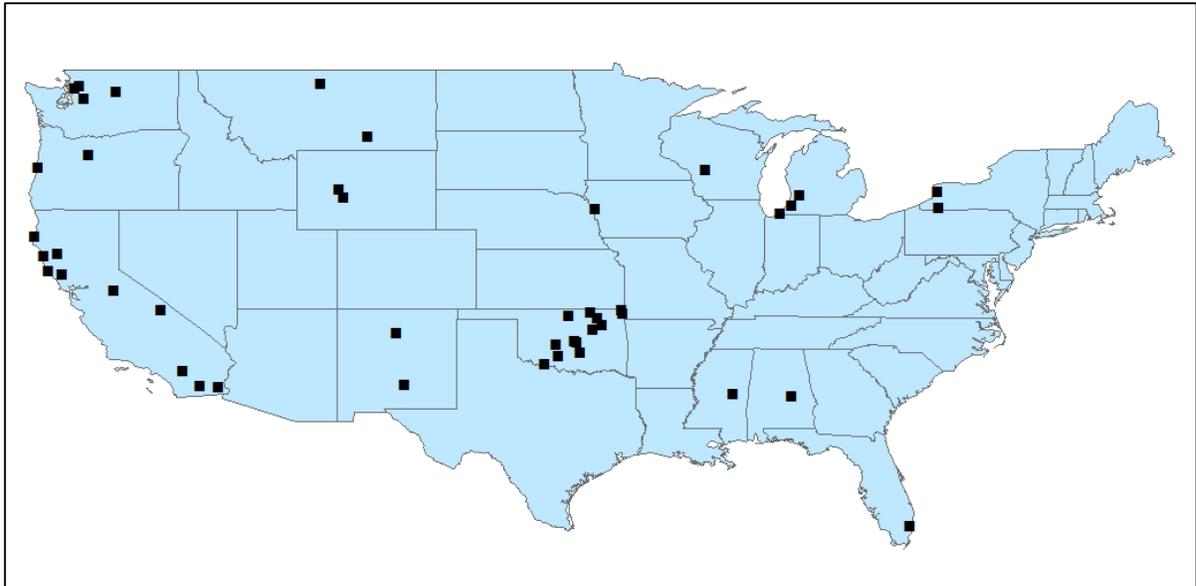


Figure 2
Number of Casinos Open and Operating by Year

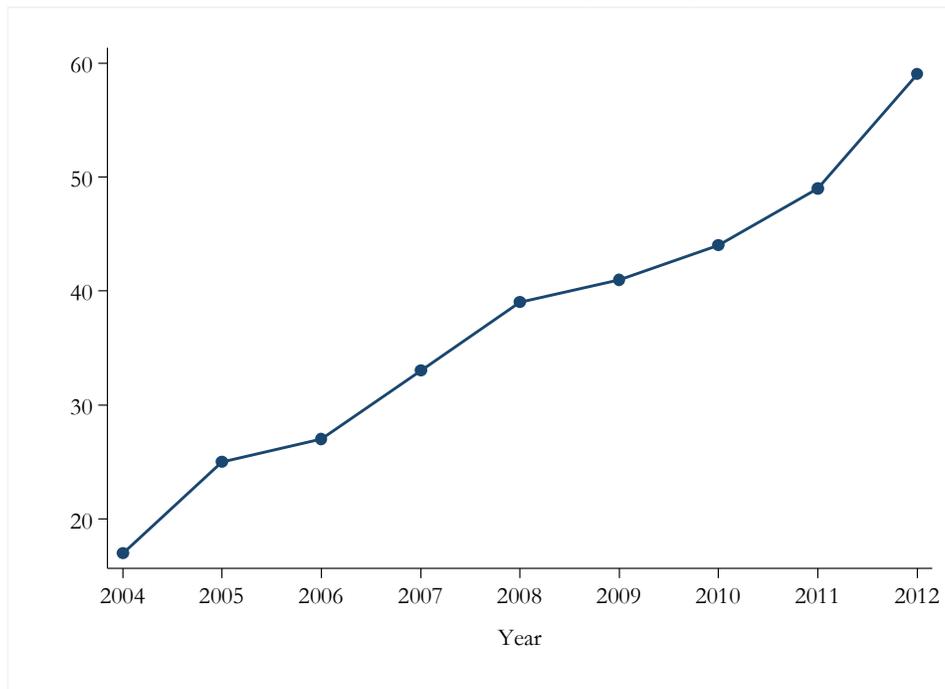


Table 1
Summary Statistics

Panel A		
Variable	Native Americans	Non-Native Americans
Any Past Month Drinking	0.46	0.54
Number of Days Drank Last Month	3.45	4.48
Avg. Number of Drinks Consumed on an Occasion	1.61	1.32
Number of Drinks Consumed in the Past Month	14.35	11.95
Any Binge Drinking Past Month	0.19	0.16
Number of Times Binge Drinking Last Month	0.94	0.63
Any Drunk Driving Past Month	0.02	0.02
Number of Times Drunk Driving Last Month	0.06	0.04
Percentage of Observations in a County with a Native American Casino	0.26	0.14
Proportion with High School Degree or Less	0.57	0.40
Proportion with Some College or More	0.43	0.60
Married or Cohabiting	0.53	0.62
Single	0.25	0.20
Female	0.44	0.51
Age	42.5	46.4
Sample Size	48,199	3,177,697

Weighted means, 2004-2012 BRFSS.

Table 2
Native American Casinos and Alcohol Behaviors
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Any past month drinking	Avg # days drank past month	# drinks consumed on days drank past month	Any binge drinking past month	# times binge drinking past month	Any drunk driving past month	# times drunk driving past month
<i>Full sample</i>							
Any Native American Casino in county	0.019*** (0.003)	0.058 (0.145)	0.097*** (0.036)	0.0183** (0.003)	0.030 (0.032)	0.000 (0.003)	0.017 (0.011)
R ²	0.107	0.077	0.075	0.080	0.036	0.019	0.010
Observations	3,158,163	3,138,006	3,127,382	3,129,785	3,129,785	1,683,117	1,683,117
<i>Native Americans only</i>							
Any Native American Casino in county	0.193 (0.134)	0.223 (0.912)	0.348* (0.185)	0.015 (0.031)	0.149 (0.311)	-0.034 (0.036)	0.068 (0.131)
R ²	0.180	0.178	0.169	0.173	0.213	0.214	0.282
Observations	46,981	46,690	46,379	46,407	46,407	24,667	24,667
<i>Non-Native Americans only</i>							
Any Native American Casino in county	0.015*** (0.003)	0.052 (0.141)	0.090*** (0.037)	0.019*** (0.003)	0.028 (0.034)	0.001 (0.003)	0.017 (0.011)
R ²	0.107	0.077	0.075	0.080	0.036	0.019	0.011
Observations	3,111,182	3,091,316	3,081,003	3,083,378	3,083,378	1,658,450	1,658,450

Note: Values presented are the results of a difference-in-differences model with fixed effects for year and county. I include controls for age, education, marital status, race, and county-year unemployment rate. All observations are weighted using the BRFSS sample weight. Binge drinking is defined as 5 or more drinks on an occasion. Number of Days Drinking and Number of Days Binge Drinking are defined as the number of days in the past month. Number of drinks is the number of drinks consumed on average on an occasion when an individual drank. Significance: *** p<0.01, ** p<0.05, * p<0.10

Table 3
Native American Casinos and Alcohol Behaviors among Past Month Drinkers
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Any past month drinking	Avg # days drank past month	# drinks consumed on days drank past month	Any binge drinking past month	# times binge drinking past month	Any drunk driving past month	# times drunk driving past month
<i>Full sample</i>							
Any Native American Casino in county	N/A	-0.235 (0.244)	0.109* (0.061)	0.024*** (0.005)	0.018 (0.064)	0.000 (0.007)	0.033 (0.022)
R ²		0.082	0.118	0.123	0.059	0.028	0.019
Observations		1,572,612	1,561,150	1,563,471	1,563,471	836,667	836,667
<i>Native Americans only</i>							
Any Native American Casino in county	N/A	-2.266 (2.227)	0.497 (0.407)	0.032 (0.081)	0.478 (0.927)	-0.144 (0.156)	0.201 (0.418)
R ²		0.266	0.271	0.259	0.316	0.302	0.369
Observations		17,621	17,288	17,316	17,316	9,092	9,092
<i>Non-Native Americans only</i>							
Any Native American Casino in county	N/A	-0.189 (0.231)	0.109* (0.066)	0.026*** (0.006)	0.023 (0.064)	0.002 (0.007)	0.034 (0.021)
R ²		0.082	0.177	0.122	0.058	0.028	0.019
Observations		1,554,991	1,543,862	1,546,155	1,546,155	827,575	827,575

Note: Values presented are the results of a difference-in-differences model with fixed effects for year and county. I include controls for age, education, marital status, race, and county-year unemployment rate. All observations are weighted using the BRFSS sample weight. Binge drinking is defined as 5 or more drinks on an occasion. Number of days drinking and Number of days binge drinking are defined as the number of days in the past month. Number of drinks is the number of drinks consumed on average on an occasion when an individual drank. Significance: *** p<0.01, ** p<0.05, * p<0.10

Table 4
Native American Casinos and Binge Drinking among Non-Native Americans
Robustness Analyses
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline model: control for whether county has a NA casino	Large vs. small NA casinos	(1) + region by year interactions	(1) + division by year interactions	(1) + state by year interactions	States with NA casinos	Counties that will have NA casinos
Any Native American Casino in county	0.019*** (0.003)	--	0.019*** (0.003)	0.020*** (0.004)	0.018*** (0.004)	0.020*** (0.003)	0.019*** (0.004)
Large NA Casino in county (by square footage)	--	0.020*** (0.003)	--	--	--	--	--
Small NA Casino in county (by square footage)	--	0.016** (0.007)	--	--	--	--	--
	R ²	0.080	0.080	0.080	0.080	0.078	0.072
	Observations	3,083,378	3,083,378	3,083,378	3,083,378	1,489,545	377,248

Note: Values presented are the results of a difference-in-differences model with fixed effects for year and county in addition to specification listed in each column. I include controls for age, education, marital status, race, and county-year unemployment rate. All observations are weighted using the BRFSS sample weight. Binge drinking is defined as 5 or more drinks on an occasion. Significance: *** p<0.01, ** p<0.05, * p<0.10

Table 5
Native American Casinos and Past Month Drinking among Non-Native Americans
Results by Subgroup
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline model: all adults	Men	Women	Hs or less	Some college or more	18-40	41+	Smoker	Non- Smoker
<i>Any Drinking in the Past Month</i>									
Any Native American Casino in county	0.015*** (0.003)	0.009 (0.007)	0.022*** (0.007)	0.0227*** (0.006)	0.009 (0.007)	-0.009 (0.019)	0.023*** (0.009)	0.012 (0.011)	0.012** (0.006)
R-squared	0.107	0.109	0.076	0.068	0.058	0.076	0.109	0.094	0.107
N	3,111,182	1,918,878	1,192,304	1,193,394	1,912,869	715,688	2,395,494	534,292	2,563,348
<i>Avg. number of drinks consumed on an occasion</i>									
Any Native American Casino in county	0.090** (0.037)	0.025 (0.064)	0.173* (0.093)	0.145* (0.075)	0.035 (0.045)	0.191** (0.092)	-0.008 (0.037)	0.021 (0.127)	0.091*** (0.031)
R-squared	0.075	0.058	0.050	0.048	0.051	0.031	0.040	0.077	0.041
N	3,081,003	1,904,565	1,176,438	1,179,259	1,897,008	707,920	2,373,083	525,454	2,542,452

Note: Values presented are the results of a difference-in-differences model with fixed effects for year and county in addition to specification listed in each column. I include controls for age, education, marital status, race, and county-year unemployment rate. Any drink in the past month refers to having had at least one drink in the past 30 days. Number of drinks is the number of drinks consumed on average on an occasion when an individual drank. All observations are weighted using the BRFSS sample weight. Significance: *** p<0.01, ** p<0.05, * p<0.10

Table 6
Native American Casinos and Binge Drinking among Non-Native Americans
Results by Subgroup
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline model: all adults	Men	Women	HS or less	Some college or more	18-40	41+	Smoker	Non- Smoker
<i>Any Past month binge drinking</i>									
Any Native American Casino in county	0.019*** (0.003)	0.020*** (0.006)	0.019* (0.011)	0.031*** (0.007)	0.008 (0.005)	0.039*** (0.009)	0.002 (0.003)	0.017 (0.016)	0.015*** (0.004)
R-squared	0.080	0.051	0.067	0.056	0.065	0.037	0.039	0.095	0.045
N	3,083,378	1,906,204	1,177,174	1,179,685	1,898,932	709,102	2,374,276	525,479	2,544,743
<i># times binge drinking in past month</i>									
Any Native American Casino in county	0.028 (0.034)	0.058*** (0.022)	0.014 (0.086)	0.166*** (0.058)	-0.088 (0.066)	0.180** (0.083)	-0.088 (0.081)	0.133 (0.211)	-0.017 (0.053)
R-squared	0.036	0.021	0.028	0.022	0.026	0.024	0.015	0.035	0.016
N	3,083,378	1,906,204	1,177,174	1,179,685	1,898,932	709,102	2,374,276	525,479	2,544,743

Note: Values presented are the results of a difference-in-differences model with fixed effects for year and county. I include controls for age, education, marital status, race, and county-year unemployment rate. All observations are weighted using the BRFSS sample weight. Binge drinking is defined as 5 or more drinks on an occasion. Significance: *** p<0.01, ** p<0.05, * p<0.10

Appendix Table 1
Native American Casinos and Past Month Drinking among Non-Native Americans
Robustness Analyses
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline model: control for whether county has a NA casino	Large vs. small NA casinos	(1) + region by year interactions	(1) + division by year interactions	(1) + state by year interactions	States with NA casinos	Counties that will have NA casinos
Any Native American Casino in county	0.015*** (0.003)	--	0.017*** (0.003)	0.017*** (0.003)	0.017*** (0.004)	0.013*** (0.003)	0.019*** (0.004)
Large NA Casino in county (by square footage)	--	0.010*** (0.004)	--	--	--	--	--
Small NA Casino in county (by square footage)	--	0.022*** (0.006)	--	--	--	--	--
	R ²	0.107	0.107	0.107	0.108	0.099	0.079
	Observations	3,111,182	3,111,182	3,111,182	3,111,182	1,503,251	380,744

See notes to Table 4.

Appendix Table 2
Native American Casinos and # Drinks Consumed on Days Drank among Non-Native Americans
Robustness Analyses
BRFSS Adults 2004-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline model: control for whether county has a NA casino	Large vs. small NA casinos	(1) + region by year interactions	(1) + division by year interactions	(1) + state by year interactions	States with NA casinos	Counties that will have NA casinos
Any Native American Casino in county	0.090*** (0.037)	--	0.085** (0.036)	0.087** (0.036)	0.081** (0.038)	0.069* (0.041)	0.112*** (0.042)
Large NA Casino in county (by square footage)	--	0.078*** (0.026)	--	--	--	--	--
Small NA Casino in county (by square footage)	--	0.108 (0.086)	--	--	--	--	--
	R ²	0.075	0.075	0.075	0.075	0.076	0.075
	Observations	3,081,003	3,081,003	3,081,003	3,081,003	3,081,003	1,488,271

See notes to Table 4.

Appendix Figure 1
The Percentage of Casinos with Sample Observation by Year

