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Casino Gambling and Crime: A Panel Study of Wisconsin Counties

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The potential relationship between gambling and crime has been a key issue among supporters and opponents of the recent spread of casino gambling in the US. This paper empirically investigates the potential link between casino gambling and crime for Wisconsin counties using the theoretical framework of Becker. Our results show that the existence of a casino within the boundaries of a county led to an increase in the county's crime rates. The results also suggest that a strong spillover effect took place across space, with counties adjacent to casino-counties experiencing higher crime rates. Copyright © 2001 John Wiley & Sons, Ltd.

INTRODUCTION

The American gambling industry has experienced astonishing growth rates in the last three decades, resulting in legalized gambling in 48 of the 50 states.[1] Moreover, in the 1990s, casino gambling led the industry's expansion. Since New Jersey broke Nevada's monopoly on legal commercial casino gambling in 1978, nine other states have authorized commercial casinos. In addition, casino gambling on Indian reservations has spread quickly across the country as a result of the Indian Gaming Regulatory Act of 1988. To date, Native American casinos can be found in about 20 states.

In 1988, there were only 53 American casinos outside of the state of Nevada, and 12 of these were in Atlantic City. Within 10 years, there were 324 casinos outside Nevada, an amount equal to the number of casinos within the state. Over a 16-year period of time, 1982–1998, casino gambling revenues (amounts *won* from players) increased from $4.2 billion a year to $29.5 billion, an increase of 600%. While there were no Native American casinos in 1982 (there were bingo halls), the 200 plus Native American casinos of 1998 produced revenues of $7.2 billion, or 24.4% of the revenues of all casinos in the United States. The explosion of casino gambling has been slowed by the fact that there has been a saturation of eligible jurisdictions, but the growth line for casino gambling continues to be strong. In March 2000, the voters of California approved a process for legalizing casino developments for the more than 100 tribes (rancherias) of the state.[2]

Supporters and opponents of the spread of gambling in the United States make radically different claims regarding the economic and social impacts of the growth of legal gambling in the United States.[3] The potential relationship between gambling and crime has been a key issue in the debate. Opponents of gambling suggest that various forms of street crimes, such as robberies and automobile thefts, come with gambling, as well as problems with connections to organized crime. Contrarily, proponents of gambling contend that the evidence on possible connections between crime and gambling is rather weak. To be sure, they argue that because gambling leads to job growth in gambling communities, crime may actually go down.

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Studies of the connection between crime and gambling have yielded mixed results. For example, most studies linking organized crime to gambling are anecdotal or based on testimony of law enforcement personnel (e.g., Peterson, 1951, 1965; US Senate Committee, 1951; Demaris and Reid, 1963; Skolnick, 1978; Dombrink, 1981; Mahon, 1981; Demaris, 1986; Johnston, 1992; Thompson, 1997). Regarding street crime, Sternlieb and Hughes (1983), Friedman *et al.* (1989), and Hakim and Buck (1989) show a positive relationship between the presence of casino gambling and crime rates. The two 1989 studies cited also focus on the spillover of crime to surrounding communities of Atlantic City. However, Albanese (1985) and Chicaros (1994) suggest that higher incidence of crime in Atlantic City was owing in a large part to increases in visitor traffic. To be sure, Ochrym and Park (1990) compare gaming communities with other tourist destinations that did not have casinos, suggesting that rates of crime were quite similar among them. The mixed results of both anecdotal and empirical studies in the literature suggest a need for more research on the connection between crime and gambling.

In 1991 and 1992, the 11 tribal governments of Wisconsin successfully negotiated compacts with state authorities that permitted the introduction of slot machines and blackjack games at 17 locations in the state. By 1992 then, Native American casinos were operating in 14 Wisconsin counties. The question that can be asked is, did crime increase in Wisconsin counties with the introduction of casino gambling?

Using a more sophisticated empirical approach, we investigate whether there is a relationship between casino gambling and crime in Wisconsin counties. We use panel data for all Wisconsin counties, including data both before and after the existence of casino gambling. In addition, we include control variables to isolate the effect of gambling on crime in the county and nearby counties. Our results suggest that the emergence of casino gambling significantly increased county crime rates. Moreover, our results suggest that crime increases in counties adjacent to those containing casinos.

The rest of the paper is organized as follows. The next section briefly outlines a basic economic model of crime, in which crime is specified as a general function of the net return per criminal offense. The third section then discusses how casino gambling may potentially impact crime using the basic model presented in the second section. The fourth section describes the empirical model and its estimation. The fifth section reports on the empirical results, while the final section contains a summary conclusions.

AN ECONOMIC MODEL OF CRIME

Since the seminal work of Becker (1968), economic analysis has been frequently used to investigate the issue of crime. For excellent recent examples and surveys, see DiIulio (1996), Ehrlich (1996) and Freeman (1996). Becker's model assumes that the criminal act is the result of a rational choice based upon the relative marginal gains and costs associated with illegal versus legal activities. Thus, the aggregate supply of criminal offenses is influenced by both the expected benefits of the criminal activity and the expected costs.

Using the notation of Ehrlich (1996), gains consist of the expected payoff of the criminal activity, w_i. Costs, on the other hand, include the direct costs to carry out the illegal activity (including self-protection to avoid getting caught), c_i; the forgone income of a legitimate activity, w_l; the probability of getting caught and convicted, p_i; and the potential level of punishment if caught, f_i. We can write the general function for the net return per offense (π_i) as follows:

$$\pi_i = w_i - c_i - w_l - p_i f_i \tag{1}$$

According to Equation (1), it can be argued that a rational, risk-neutral potential criminal, faced with the choice between two alternative illegal activities (or between an illegal and a legal), chooses the alternative with the highest expected net return. Thus, changes in the expected net return per offense impact the supply of offenses in two ways. First, active offenders can either increase or decrease the number of illegal activities they perform (amount of time and resources allocated to illegal activities). Second, marginal offenders would enter or exit from criminal activities depending upon the actual return to crime compared to their respective threshold levels to commit an illegal act (see Ehrlich, 1996).

Hakim (1980) argues that individual offenders make an additional decision regarding where to commit a crime within a multi-community region based upon the relative return to crime in those

communities. This argument can be explained using Equation (1). If c_i represents all costs directly related to carrying out a criminal activity, including transportation and other additional costs if the activity is to be carried out outside the residence of the potential criminal, some level of exporting and importing of criminal activities will likely occur across space. In other words, the aggregate supply of offenses in one region is the sum of domestic and imported supplies of offenses.

CASINO GAMBLING AND CRIME

The model in the previous section can be used to discuss how casino gambling may potentially impact crime, either positively or negatively. First, the presence of a larger number of people carrying cash may be a likely connection between casino gambling and higher crime rates.[4] Larger numbers of people carrying cash increase the expected monetary payoff for criminals (increased w_i). For example, if, on average, local residents visit the casino more often than they would go out in the absence of local gambling, these residents are more exposed to crime (outside homes), and their homes and cars are also more exposed to predatory crime (Cohen, 1981). In addition, there may be increasing returns to scale in the production of crime: a spatial concentration of potential targets most likely reduces costs such as those associated with collection of information on crime opportunities and, consequently, reduces the average cost per illegal activity (c_i). Similarly, a criminal may also be able to blend in easier with a constantly changing crowd, decreasing the risk of being identified and caught by law enforcers (p_i). On the other hand, if casinos increase the local government tax base and more is spent in police enforcement, a higher p_i would reduce the net return to illegal activities, offsetting the above factors somewhat.

On the other hand, those in favor of casino gambling argue that casinos create jobs resulting in higher opportunities for 'legal activities' (higher w_l), hence, likely reducing crime rates. Yet, there are two additional issues related to this job-creation argument. First, not all casino spending represents a net increase in spending in the area economy. For example, shifts in resident expenditure patterns from non-casino businesses toward casino gambling create job losses in non-casino sectors of the economy (Gazel *et al.*, 1996). Also, job losses in adjacent counties may occur as a result of less spending in the county that result from resident visits to neighboring casinos. Therefore, only the net job impact, if positive, would help to reduce crime offenses. Second, even in the case of positive net job creation, higher levels of income and wealth in the local area could increase the expected payoff of criminal activities (w_i), resulting in a higher number of offenses. Overall then, increased jobs associated with casinos may or may not be expected to reduce crime.

Crime may also increase because of the effect of debts incurred by resident gambling, particularly pathological and problem gambling. Thompson *et al.* (1997) conservatively estimate that the prevalence of serious problem gamblers in Wisconsin is 0.9%, in which casinos are responsible for 0.38%. Legal activities may simply not yield sufficient return to pay off the debt (i.e. w_l may be below a required minimum amount). The majority of Wisconsin problem gamblers in treatment that were interviewed in Thompson *et al.* (1999) admitted to crimes as a result of their gambling activity, primarily property crimes.

Finally, crime rates may simply go up because of increased visitor days (Albanese, 1985; Chicaros, 1994). Given existing propensities to commit crimes of various types by residents and visitors alike, more visitors to an area may increase its crime rate simply because the rate is calculated based upon the resident population. Crime rates based on resident population plus visitors are unavailable because of the lack of county data on the number of visitors and their reasons for the visit. Finally, visitors may become targets that attract criminals to the area, as additional potential targets increase the expected benefits of criminal activity in the area.

EMPIRICAL MODEL

Panel data for all Wisconsin counties are used to examine whether crime increased with the introduction of casino gambling.[5] We examine both FBI Index offenses and Non-Index offenses. Index offenses include murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, theft, motor vehicle theft and arson. Non-Index offenses include those such as

forgery, fraud, embezzlement, stolen property, vandalism, weapons violations, prostitution, sex offenses, possession and sales of illegal drugs, gambling, family offenses, driving while intoxicated, disorderly conduct, and liquor law violations. Although arrests/population is not an ideal measure of crime, it is the way that Non-Index violations are recorded. Moreover, aside from influences of increased enforcement, arrests should be positively correlated with crimes, and increased arrests incur legal costs on the county.[6]

In addition to examining the general link between all offenses and casino gambling, which implicitly treats each offense as having equal social costs, we investigate this relationship for various categories of offenses. For Index offenses, data are available for all categories from 1981 to 1994 (for a total of 1008 observations); whereas, data are available from 1981 to 1994 for total Non-Index arrests, and from 1985 to 1994 (for a total of 720 observations) for its different categories.

For each type of crime, the general form of the model can be written as

$$R_{i,t} = \beta_{1,i} + \beta_{2,t} + \sum_{k=3}^{K} \beta_k X_{k,i,t} + D_{i,t} + e_{i,t}, \qquad (2)$$

where $R_{i,t}$ is the natural log of the crime rate for county i in time t; $\beta_{1,i}$ represents the county fixed effect; $\beta_{2,t}$ is a time fixed effect; $X_{k,i,t}$ is the natural log of the kth independent variable, $D_{i,t}$ is a dummy variable that indicates the availability of casino gambling at time t, and $e_{i,t}$ is the random disturbance term.

The county fixed effects ($\beta_{1,i}$) account for unexplained cross-sectional differences in crime rates. For example, the fixed effect for Milwaukee County accounts for the fact that it has a higher crime rate for a variety of omitted explanatory factors (e.g., population density). Similarly, as only permanent residents are counted in calculating crime rates, tourist counties may have higher crimes for this reason alone, and county fixed effects capture this. Time fixed effects ($\beta_{2,t}$) capture the influence of changes in crime common across counties due to statewide or national trends. The inclusion of county and time fixed effects cause the slope coefficients to only reflect the average of time series relationships between the variables unique to the counties in the study. The casino-dummy ($D_{i,t}$) accounts for the change in the crime rate attributable to the existence of casino gambling.

Several additional independent variables ($X_{k,i,t}$) often cited in the literature as related to crime rates are also included. For example, to account for the changing composition of the population, we include the share of the population that is male (%Male), the share of the population between the ages of 18 and 34 (%Pop1834), and the share of the population that are black (%Black).[7] To account for effects of growth and economic conditions on crime, the unemployment rate (Unemp) and population growth (Popgrowth) are also included.[8,9]

Our model in the second section suggests that arrest rates, conviction rates and lengths of prison sentences would be related to crime rates. However, conviction rates and lengths of sentences are not available for the counties. Although, all else being equal, increases in the arrest rate (defined as the number of clearances divided by the number of reported crimes) have been shown to lead to a lower crime rate (e.g. Lott and Mustard, 1997; Levitt, 1998), we do not include it in our empirical model. For one, if arrest rates are positively correlated with the opening of the casinos, omitting them biases the coefficient of the casino dummy variable downwards, against finding a positive link between casinos and crime. Thus, our casino coefficient could be interpreted as an estimated lower bound effect. Second, because there is severe underreporting of crimes, measurement error exists in both the dependent variable and the arrest rate. Because the number of crimes enters the denominator of the arrest rate, this type of measurement error biases the arrest rate coefficient in the negative direction instead of the usual direction of zero that is associated with measurement error in only the dependent variable (Levitt, 1998), and the other coefficients in the regression would be biased.[10] Nevertheless, Grinols *et al.* (2000) report that exclusion of the arrest rate does not much affect the estimated effects of casinos on crime.

RESULTS

The results are divided into two parts: Index crime results; and results for Non-Index arrests. Index crimes are comprised of violent and property crimes, in which property crimes were 93.2% of total reported Wisconsin Index crimes in 1994 (Wisconsin Office of Justice Administration,

1994). Non-Index arrests include those for forgery, fraud, embezzlement and possession of stolen property. These are criminal activities that may be means for obtaining money to pay for gambling debts, accounting for 5.2% of Non-Index arrests in 1994. Other categories of Non-Index arrests include offenses such as simple assaults (other than aggravated), weapons violations, prostitution, sex offenses (other than rape), gambling violations, driving while intoxicated, disorderly conduct, drug violations (including both possession and sales), and liquor law violations (other than driving while intoxicated (DWI)). As there are only data on arrests for Non-Index offenses, they will be emphasized less.

Results for Index Offenses

Table 1 shows the results for total Index crimes and the categories of violent and property crimes. The first column for each category corresponds to the model with all control variables. Subsequent columns contain results for models where insignificant variables and variables with coefficients of the wrong signs were omitted, and where all control variables were omitted. In some instances, the latter two models are the same.

From column (1), we see that the opening of a casino in the county significantly increased Index crimes at the 0.10 level. Relative to all other counties (including those adjacent), the existence of a casino within the boundaries of a county led to a 6.4% increase in the county's Index crime rate during 1992–1994. None of the control variables in the regression are statistically significant. Thus, after omitting all (insignificant) variables, column (2) shows that the casino variable is significant below the 0.05 level. Having a casino in the county is now estimated to have increased crime by 8.6%. Columns (3) and (4) show that property crimes were less significantly related to the opening of casinos. Only after omitting the insignificant (all) control variables (column (4)) was the property crime rate significantly linked to the opening of casinos at the 0.10 level. The violent crime rate was not significantly linked to the casino variable in column (5), but was when variables were dropped that had the wrong sign or were insignificant (column (7)). Similarly, when all control variables were omitted in column (6), the casino variable was significant below the 0.05 level. The results of columns (6) and (7) suggest that violent crimes increased about 30% with the opening of the casino.

Table 2 examines the components of property crimes. Larceny, which comprised 72% of all property crimes, was only close to significance when all control variables were omitted that had the wrong sign or were insignificant (column (2)). Burglary never approached significance. Only motor vehicle theft emerged significantly linked to

Table 1. Total Index Crimes and Major Categories (Absolute Values of *t*-Statistics in Parentheses)

Variable	Total Index crimes		Property crimes		Violent crimes		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
%Male	0.181		0.098		2.493		0.710
	(0.736)		(0.391)		(3.211)***		(3.154)***
%Pop1834	−0.211		−0.176		−3.778		
	(0.484)		(0.395)		(2.727)***		
%Black	2.124		2.092		1.360		
	(0.969)		(0.942)		(0.197)		
Popgrowth	0.012		0.050		−0.355		−0.357
	(0.273)		(1.157)		(2.657)***		(2.626)***
Unemp	−0.003		−0.009		−0.032		
	(0.697)		(0.240)		(2.787)***		
County	0.064	0.086	0.0510	0.068	0.102	0.303	0.300
	(1.654)*	(2.332)	(1.288)	(1.805)	(0.836)	(2.528)	(2.518)**
		× **		× *		× **	
R^2	0.828	0.827	0.819	0.822	0.580	0.553	0.561
No. obs.	1008	1008	1008	1008	1008	1008	1008

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

Table 2. Property Crime Categories (Absolute Values of *t*-Statistics in Parentheses)

Variable	Larceny		Burglary			Motor vehicle theft		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
%Male	−0.790		−0.236			1.938		0.170
	(0.284)		(0.607)			(2.899)***		(0.883)
%Pop1834	−0.039		0.837			−3.574		
	(0.078)		(1.208)			(3.000)***		
%Black	0.894		−2.419			13.507		19.954
	(0.361)		(0.699)			(2.270)**		(3.401)***
Popgrowth	0.042		0.053			−0.289		−0.294
	(0.874)		(0.795)			(2.520)**		(2.533)**
Unemp	−0.013		0.021		0.024	−0.0127		
	(3.232)***		(3.550)***		(5.368)***	(1.281)		
County	0.028	0.066	0.060	−0.019	0.043	0.117	0.291	0.237
	(0.638)	(1.560)	(0.977)	(0.315)	(0.716)	(1.114)	(2.840)***	(2.290)**
R^2	0.819	0.815	0.753	0.744	0.751	0.502	0.479	0.489
No. obs.	1008	1008	1008	1008	1008	1008	1008	1008

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

the opening of casinos. Based on column (8), the opening of casinos increased automobile thefts by 23.7% relative to all other counties.

In Table 3, we break violent crimes into two categories: robbery and other violent crimes. Other violent crimes include murder, forcible rape and aggravated assault. Murder and forcible rape were not separately examined because most small and medium-sized counties contained few if any of these offenses for most years.

From Table 3, we observe that robbery, which comprised 41.8% of violent crimes in Wisconsin during 1994, is insignificantly related to the opening of the casinos. Other violent crimes, however, are significantly related. Based on the results of column (6), other violent crimes, in which aggravated assaults comprised 82.2% of this category in 1994, increased 32.1% with the opening of the casinos. Aggravated assaults are sometimes committed during a robbery, so some may have a property motive.

As many of the visitors to the casinos came from adjacent counties, we also consider whether crime increased in these counties. We examine

Table 3. Violent Crime Categories (Absolute Values of *t*-Statistics in Parentheses)

Variable	Robbery			Other violent crimes		
	(1)	(2)	(3)	(4)	(5)	(6)
%Male	1.651		1.375	4.045		2.529
	(1.576)		(4.535)***	(4.420)***		(9.427)***
%Pop1834	−0.502			−3.545		
	(0.268)			(2.170)**		
%Black	21.043		21.300	−4.990		
	(2.257)**		(2.298)**	(0.612)		
Popgrowth	−0.092			−0.293		−0.292
	(0.509)			(1.862)*		(1.801)*
Unemp	0.031		0.029	−0.062		
	(2.001)**		(2.316)**	(4.583)***		
County	−0.022	0.011	−0.018	0.076	0.374	0.321
	(0.135)	(0.068)	(0.111)	(0.527)	(2.523)**	(2.260)**
R^2	0.622	0.611	0.622	0.521	0.439	0.489
No. obs.	1008	1008	1008	1008	1008	1008

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

whether the opening of the casinos affected crime in the adjacent counties by adding dummy variables for them: dummy variables are defined for whether the county is adjacent (but does not contain a casino) to one county that contains a casino, and for whether a county is adjacent to two or more counties that contain casinos. These dummy variables were added to the models that contained only the control variables that were significant or had correct signs.

The results of adding the dummy variables to the Index crime regressions are presented in Table 4. In the regression for total Index crimes, the equality of the coefficients for the dummy variable for whether a county contained a casino, and the dummy variable for counties that were adjacent to two or more counties, could not be rejected at the 0.05 level. The impact on crime from being adjacent to two or more counties with a casino then is the same as if the casino contained a casino. Thus, the restriction that the coefficients are equal was imposed. However, the equality of the coefficient for the dummy variable defined for counties that were adjacent to only one county with the other two coefficients was rejected at the 0.05 level. These restrictions were also then maintained in the regressions for the various categories of Index crimes.

From column (1) in Table 4, the results reveal that being adjacent to two or more counties that contain a casino significantly increased Index crimes in the county. The coefficient is interpreted as crime increasing 7.5% in counties with casinos or in those adjacent to two or more counties with casinos, relative to counties without casinos and those that were only adjacent to one county with a casino (as its coefficient was statistically equal to zero). Both categories of Index crimes are now significantly related to the opening of the casino in the county or in two or more adjacent counties. Violent crimes relative to population are estimated to have increased 39.6%, while property crimes are estimated to have increased 5.9%.

The results for the categories of violent and property crimes appear in Table 5. The results conform to the earlier results in Tables 2 and 3. Other violent crimes and automobile theft appear significantly linked to the opening of casinos, while robbery and burglary are not, and larceny hangs on the verge of being significant. Other violent crimes are estimated to have increased 47.1%, while motor vehicle theft is estimated to have increased 24.4%.

The equality of effects for counties that are adjacent to two or more counties with casinos, and counties that contain casinos, is noteworthy. For one, increased crime in counties containing casinos is not simply displacing crime in nearby counties. Only for burglary is there evidence that crime is reduced in a nearby county (for counties adjacent to only one county with a casino). Second, increased crime in counties that are adjacent to two or more counties is less likely attributable to increased number of visitors that do not get counted in the population in the calculation of the crime rate. While it may be true that visitors from long distances travel through these counties, it is also true that many of the residents in these

Table 4. Spillover of Index Crimes to Adjacent Counties (Absolute Values of *t*-Statistics in Parentheses)

Variable	Total Index crimes	Violent crimes	Property crimes
	(1)	(2)	(3)
%Male		0.710	
		(3.179)***	
Popgrowth		−0.367	
		(2.720)***	
Adjacent_1_county	−0.026	0.035	−0.027
	(0.920)	(0.383)	(0.916)
Adjacent_2_county+county	0.075	0.396	0.059
	(2.825)***	(4.672)***	(2.186)**
R^2	0.828	0.568	0.822
No. obs.	1008	1008	1008

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

Table 5. Spillover to Adjacent Counties of Detailed Index Crime Categories (Absolute Values of *t*-Statistics in Parentheses)

Variable	Robbery	Other violent	Motor vehicle theft	Burglary	Larceny
	(1)	(2)	(3)	(4)	(5)
%Male	1.379	2.533	0.189		
	(4.540)***	(9.527)***	(0.989)		
%Black	20.189		18.719		
	(2.191)**		(3.218)***		
Popgrowth		−0.307	−0.300		
		(1.910)*	(2.594)***		
Unemp	0.032			0.021	
	(2.496)**			(4.681)***	
Adjacent_1_county	−0.005	0.058	0.176	−0.184	0.019
	(0.043)	(0.536)	(2.220)**	(3.997)***	(0.576)
Adjacent_2_county + county	0.137	0.471	0.244	0.051	0.049
	(1.175)	(4.666)***	(3.333)***	(1.195)	(1.617)
R^2	0.622	0.499	0.495	0.756	0.816
No. obs.	1008	1008	1008	1008	1008

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

adjacent counties visit the casinos, spending less time in their counties of residence.

Regarding the control variables, although many of them were often insignificant, it is important to note that cross-sectional differences in county crime rates were captured by the county-specific intercepts, and common time-series changes were captured by the time fixed effects. Nevertheless, the percentage of the population that is male was consistently positive for violent crimes, and the percentage of the population that was African–American was significantly positive for robbery and automobile theft.[11] The unemployment rate was only positively and significantly related to robbery and burglary. Lagged population growth was negatively and significantly related to other violent crimes and automobile theft, perhaps reflecting the benefits of economic development associated with growth.

Results for Non-Index Arrests

Table 6 contains the estimated increases in Non-Index arrests (as shares of resident population)

Table 6. Non-Index Arrests (Absolute Values of *t*-Statistics in Parentheses)

Variable	All Non-Index arrests		Sum of monetary gain		All other Non-Index	
	(1)	(2)	(3)	(4)	(5)	(6)
%Male	3.311	−0.116	0.752		3.366	−0.098
	(6.276)***	(0.946)	(0.519)		(6.358)***	(0.801)
%Pop1834	−7.339		−4.486		−7.402	
	(7.722)***		(1.719)*		(7.761)***	
%Black	7.277		23.794	34.527	6.909	
	(1.537)		(1.831)*	(2.654)***	(1.455)	
Popgrowth	0.021		−0.031		−0.021	
	(0.321)		(0.171)		(0.316)	
Unemployed	−0.051		−0.057		−0.050	
	(5.235)***		(2.144)**		(5.125)***	
County	0.148	0.364	0.473	0.543	0.139	0.354
	(2.421)**	(5.535)***	(2.809)***	(3.293)***	(2.260)**	(5.375)***
R^2	0.773	0.708	0.640	0.622	0.769	0.704
No. obs.	1008	1008	720	720	720	720

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

associated with the opening of the casino in the county. From Table 6, we see that the opening of a casino in the county had an estimated statistically positive effect on the arrest rate for Non-Index arrests. With all the control variables included in the model, the opening of casinos is estimated to have increased all Non-Index arrests by 14.8%. After eliminating insignificant variables and those with the wrong sign, however, the estimated effect rises to 36.4%.

The estimated effect of casinos on arrests for forgery, fraud, embezzlement and receiving stolen property ranges from 47.3 to 54.3%. Similarly, the estimated effect for all other Non-Index arrests ranges from 13.9 to 35.4%. Recall that the all other category includes many offenses which are not associated with explanations of monetary gains. The greatest number of offenses within this category for Wisconsin in 1994 were for DWI, liquor law violations, and disorderly conduct. Together, they comprised 45% of other Non-Index arrests.

As with Index offenses, to examine the effects on arrests in counties adjacent to those with casinos, we add separate dummy variables for counties that were adjacent to only one county with a casino, and for counties that were adjacent to two or more counties with casinos. These were added to the parsimonious models in which insignificant variables and those with coefficients of the wrong sign had been omitted. In contrast to the results for Index offenses, we failed to reject the equality of coefficients for all three casino variables at the 0.05 level. That is, the effect on arrest rates of a casino opening is estimated to be the same for the county of location and all adjacent counties. We then impose this restriction in all regressions for Non-Index arrests.

Table 7 contains the results for the models that impose the restriction that the effects be equal across the three casino variables. The arrest rate for all Non-Index offenses is estimated to have increased 34.6% in counties containing casinos and those adjacent. The effect for arrests related to offenses directly related to expected monetary gains remains slightly larger in comparison to arrests for all other offenses: 39.1% versus 34.4%.

SUMMARY AND CONCLUSION

The potential relationship between gambling and crime has been a key issue among supporters and opponents of the spread of casino gambling in the United States. Based upon the basic model of crime by Becker (1968), and using panel data for all Wisconsin counties from 1981 to 1994, this paper examined the link between the opening of 17 Native American casinos in 14 counties throughout the state and crime. Our results suggest that some forms of crime do increase with the opening of casinos.

The broad categories of Index crimes, violent and property crimes, were both estimated to have significantly increased because of the opening of the casinos. Specific Index categories linked to casinos include: non-robbery violent crimes (primarily comprised of aggravated assaults) and motor vehicle theft. Moreover, crime was estimated to have spilled over into adjacent counties. Counties adjacent to two or more counties that

Table 7. Spillover of Non-Index Arrests to Adjacent Counties (Absolute Values of *t*-Statistics in Parentheses)

Variable	All Non-Index arrests	Sum of monetary gain	All other Non-Index
	(1)	(2)	(3)
%Male	−0.082	−1.116	−0.066
	(0.714)	(3.724)***	(0.573)
Adjajent_1_county+adjacent_2_county+county	0.346	0.391	0.344
	(10.495)***	(4.566)***	(10.415)***
R^2	0.740	0.630	0.736
No. obs.	1008	720	720

* Denotes statistically significant at or below the 0.10 probability level; ** denotes statistically significant at or below the 0.05 probability level; *** denotes statistically significant at or below the 0.01 probability level.

contained casinos were estimated to have their crime rates increased as if they contained casinos themselves. Being adjacent to only one county with a casino did not significantly influence its crime rate.

Total arrests for Non-Index offenses relative to population also were statistically linked to the opening of casinos. Specifically, the largest effect occurred for the category that consisted of fraud, forgery, embezzlement and possessing stolen property. Arrests for other Non-Index offenses also were estimated to have increased in response to the opening of the casinos. Regarding the spillover of crime to adjacent counties, it was estimated that counties that were adjacent to just one county containing casino saw their Non-Index arrests increase by the same amount as counties that contained a casino, or were adjacent to two or more counties that contained casinos.

The Wisconsin findings in the study of crime and casino gambling should be useful for policy makers considering new legalization of casino gambling, and also implementation of permissive policies toward the establishment of casinos. The Wisconsin findings can be generalized to other jurisdictions as the nature of gambling in Wisconsin is quite typical of that found in almost all casino states, albeit it is different than the pattern of casino distribution found in Nevada and Atlantic City. The casinos in Wisconsin are individual properties with local monopolies. They are widely scattered across the state with some in urban but most in rural locations. Although they are Native American casinos, they do resemble in terms of size and manners of operation the many riverboat casinos found throughout middle America (The Ohio–Missouri–Mississippi river corridor). As Thompson (1997) shows, Wisconsin casinos are also very representative of Native American casinos in adjacent states of Minnesota, Iowa, and Michigan, as well as those in a score of other states.

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NOTES

1. Thirty-seven states and the District of Columbia established lotteries after New Hampshire started the trend in 1963. Parimutuel gaming is now permitted in some form in over 40 states, and 46 states allow charitable bingo.
2. See Thompson (1998, pp. 627–641) and Christiansen (1999, pp.17–25).
3. The controversy resulted in the creation of a commission to study the impacts of gambling in the United States. In 1996, the United States Congress passed and President Clinton signed the National Gambling Impact Study Commission Act. For an analysis of the Act, see Whyte (1997).
4. As mentioned in the introduction, Indian gambling establishments in the United States won around $7.2 billion in 1998, close to one-quarter of all casino revenues in the US. Gazel *et al.* (1996) estimated that the 17 Indian casinos in Wisconsin won around $600 million from patrons in 1995. Gross gambling revenues represent the minimum amount of the volume of money gambled since patrons, on average, do not lose the entire amount they wage. It is true that not all monies wagered or lost in a casino were carried in as cash. However, large amounts of money are carried in and out of casinos as cash. Those who win and those who do not lose all the cash they brought or cashed through ATMs, check, credit cards, etc, are likely to carry with them these cash amounts when they leave the casino.
5. For detailed definitions of different types of crime and explanations of how the crime data were collected, see the various issues of *Crime and Arrests* published by the Wisconsin Office of Justice Assistance, Statistical Analysis Center. Demographic data are from the 1980 and 1990 Census of Population and interpolated (or extrapolated) for the remaining years. Unemployment data are from the Bureau of Labor Statistics. Population growth is based upon data from the US Census Bureau.
6. Arrests divided by population is not necessarily indicative of an increase in the probability of getting caught as is the traditional arrest rate defined as clearances divided by reported crimes.
7. For statistics related to gender, age and race, as well as reasons why they are related to crime, see Freeman (1996).
8. The lag of population growth is included to avoid bias arising from current population being in the denominator of the dependent variables (crime rates).
9. Unemployment has been found to be significantly linked to crime, but the effect is not large (Freeman, 1996). To the extent that growth is associated with economic development and improved earnings, crime rates may decline. Gould *et al.* (1998) conclude that, although both are significant determinants of crime, higher wage rates reduce crime more than lower unemployment rates.

10. The arrest rate also is undefined in instances where the crime rate is zero, which would reduce the number of observations available for the analysis.
11. The reasons for the higher crime rate among the black population have received considerable attention elsewhere, and will not be discussed extensively in this paper. For example, lack of legal economic opportunities and discrimination (i.e. a low w_l) are often cited as underlying the higher crime rate among the African–American population. Alternatively, it may be that the variable is capturing the effects of 'white flight', and the adverse area dynamics associated with it, such as the loss of physical and human capital, or some other dynamics not identified by the equation. Therefore, as we do not attempt to account for these other factors, too much should not be inferred from the result.

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