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Casino Effect

Casinos, and what effect does it have on crime?

By

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A Thesis Submitted to

Department of Economics

Skidmore College

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Abstract

The study examines the relationship between casinos and crime rate by using county data from different states in the USA and comparing data 5 years prior and 5 years after the opening of a casino. Casinos were only found in Nevada before 1978, but expanded to other states afterwards. Currently there are over 15,000 Casinos found in the U.S. Data was obtained through UCR, FRED, BEA. The study used multiple difference-in-difference regression models comparing the outcomes before and after the opening of a casino during the same span of time. Findings indicate that crime rate decreases when a casino is introduced to a county. Not all crimes seem to be significantly affected by the inclusion of a casino.

Introduction

The United States of America did not allow gambling until Nevada legalized casino gambling in 1931. In 1978 casinos started opening up in Atlantic City, New Jersey. Before 1989 there was no commercial casino gambling outside the states of Nevada and New Jersey. On October 17, 1988, the United States passed a federal law called the Indian Gaming Regulatory Act. The Indian Gaming Regulatory Act allows the regulation of gaming on Indian owned land. The introduction of the act allowed the establishment of the National Indian Gaming Commission, while also bringing regulated structure for Indian gaming in the United States. This allowed for casino legislation to start sweeping across the United States. This was done with state officials negotiating with Indian tribes. Right now there are more than three hundred gaming operations run by more than two hundred of the nations' five hundred and sixty-two federally recognized tribes. Of these operations, about two hundred and twenty are "Las Vegas" style casinos with slot machines and/or table games. By the year 1999, about half of the tribal members in 48 states are in tribes that run a casino style gaming operation. By 2000, Indian owned gaming operations generated about ten billion dollars in revenues, which is about one-sixth of all revenues generated by legal gaming in this country. (Evans and Topoleski, 2002). In total, there are over fifteen hundred casinos.

Due to the events of gambling legislative laws being passed state officials started to consider the legalization of commercial casinos in order to gain the goal of attracting more tourists while simultaneously generating more tax revenue. In the 90s there were a vast amounts of casinos opening across the country. Even today, the growth of casinos is expected to continue with no indication that it will be slowing down anytime soon. There has been much debate about the relationship between legal gambling and crime. There is much speculation that casinos open

the floodgates to crime because of the association gambling has with crime, but others believe that casinos can actually be beneficial to a community and increase social welfare. The casino industry has become a major lobbying force while casino gambling is generating externality costs worth up to forty billion dollars annually. Crime has been one of the largest components to these huge social costs. Which is one reason why Grinols and Mustard (2001) decided to tackle this topic.

Since 2009, there have been twenty-eight states that have opened Native American casinos. The spread of casino gambling has been very controversial. When talking about casino game developments in the United States, it is often based on the assumption that the opening of a casino leads to an increase in crime in the community of where that casino resides in, and the areas that surround it Moufakkir (2005). This is due to past relationships that casino gambling had with the mob. Individuals who oppose casinos argue that when a casino opens in a community, crime in that community increases. Those who are in favor of developing casinos argue that the arguments against casinos are just based on preconceived notions rather than hard evidence. The potential for increased crime generated by a new casino has been a constant concern among local governments and citizens in discussions about gaming.

According to Evans and Topoleski (2002) there have been a various authors (Chang, 1996; Friedman, Hakim, and Weinblatt, 1989; Gerstein et al, 1999; Grinols and Mustard, 2001; Grinols and Omorov, 1996; and Ochrym, 1990) who have investigated this issue in a number of case studies. The vast majority of the evidence seems to imply that crime increases in a community after the opening of a casino. Most of the articles examine the impact of non-tribally owned casinos. One example is Grinols and Mustard (2001) who use county-level crime data from the 1977 to 1996 period to examine the impact of land based, riverboat and tribal-owned

casinos on crime rates. They find a sharp increase in most crimes after the introduction of casinos. More will be said about this article and the rest that follow in a later section of the paper.

Theoretical Model

There are various models that I will base my research on. The purpose for this is because all of these theoretical models explain in detail why I chose the independent variables in my model, and also explain the relationship crime has with casinos. Two of the theories were introduced to me by Douglas M. Walker's *Casinomics* (2013). One of the theories is the routine activities theory, which can be applied to the increase of crime activity that happens after the introduction of a casino. The routine activities theory states that criminal activity increases when three conditions have been met concurrently. These three conditions are a lack of enforcement against crime, likely offenders, and suitable targets. These situations could be met with the opening of a new casino, especially with more tourists coming in, which will lead to an increase of more naïve and unsuspecting targets carrying money and possibly other valuables. These "likely offenders" can be the outcome of hardship such as unemployment or even low income. The crimes usually associated with this theory are burglary, larceny, and robbery. This leads to the idea that it would be best not to only look at the overall rise of crime, but to also possibly look at the rise of different types of crimes as well.

The other theory is known as the hot spot theory. This theory is the idea that most crime happens within a small area. It is possible that when a casino is introduced in a small area, like a county, it becomes the crime hotspot of said location. The reasons for this can be because of the increase number of individuals passing by, or because people are carrying much more money in order to play in the casinos. In *Casinos, Crime, and Community Costs*, by Grinols and Mustard they show the number of crimes per 100,000 individuals across time before and after the opening

of casinos in counties in Florida. This increase in crime after the introduction of the casinos can be an indication of the hot spot theory taking effect.

Grinols and Mustard (2001) mention a very popular idea that deals with pathological gambling. They believe that crime has the potential to increase through troubled and pathological gamblers. The American Psychiatric Association recognizes pathological gambling as an impulse control disorder. Individuals who are addicted to gambling can be identified as those who cannot fight the urge to continue on gambling. They have to count on other individuals to help them with their unfortunate financial situation that is caused by their unhealthy addiction. Pathological gamblers usually commit crimes in order to fund their unhealthy habit resulting in them losing control of their lives. They also talk about problem gamblers who have similar problems, but to a lesser extent. The local spread of casinos helps lower the cost of gambling for addicts, which would lead to an increase of gambling for problem, and pathological gamblers. This is shown through the swift increase of those in Gamblers Anonymous programs after the opening of casinos. They later go on to note that a Maryland study found that 62% of the Gamblers Anonymous group studied had committed illegal acts due to their gambling, 80% had committed civil offenses, and 23% were charged with criminal offenses. There was also a similar survey of nearly 184 members of Gamblers Anonymous revealing that 56% admitted stealing in order to fund their gambling addiction. The average amount stolen was \$60,700 (median \$500), for a total of \$11.2 million (Lesieur, 1998).

One last and very important theory is the economic model of crime. The economic model of crime states the idea that criminals and potential criminals are levelheaded utility maximizers who calculate the potential risks of being captured and compares them to the potential benefits if they were to become successful. If the opportunity cost of criminal behavior

were to increase, then crime would decrease. The same could be said if the probability of arrest was to increase. The introduction of new casinos could increase or decrease crime rates. The introduction of a new casino increases job opportunities and can also increase the wages of potential criminals leading to the increase of opportunity costs, and decrease of the crime rate. Evans and Topoleski (2002) inform their readers that when American Indians open casinos the amount of individuals who are considered poor, who are the ones most likely to commit crime, declines by an impressive 14% and also leads to a significant increase of employment.

Due to the multiple theories talked about in this section, and the fact that there is evidence that supports both a positive and a negative relationship between casinos and crime, has led me to think that the introduction of a casino has an ambiguous influence on the crime rate of the county that the casino was introduced to. Based on the different theoretical models and the strong support in the idea of both types of relationships between casinos and crime rate I hypothesize that with the introduction of a casino in a county will have ambiguous results to the crime rate of said county.

Literature Review

There have been multiple studies that deal with the controversial topic of the relationship between the crime rate and the introduction of casinos. The economic crime model insinuates that criminals are rational when it comes to maximizing their utility. Potential criminals try to measure the potential risks and penalties if they get caught, and compare them to the potential benefits of committing crime. There have been multiple researchers who have worked on the same topic as this article is covering. The previous researchers had their own various ways to figuring out the answer to this question, especially when compared to the way that my research

has be run. The articles that I will be talking about in this section all focus on casinos and crime rates, but look at it in different levels of territories.

Increase in Crime

In Buck and co (1991), they focus their study on Atlantic City in New Jersey. Atlantic City's first casino open the same year that legal gambling arrived in New Jersey, in 1978. The city was in an economical downward spiral. Tourists stopped visiting the beach resorts that were once popular at the time. Gambling had contributed to growth in the Atlantic City region, but it had also attracted crime. The significance of the study was in the monetary quantification of the cost of crime as capitalized in real estate values. Crime is introduced as an explanatory variable in the assessment function that captures the effect of crime on properties at various distances from Atlantic City. Theories of land use suggest that the values of real estate capture discounted present value of all locational amenities and disamenities. The direct impact of the introduction of a new industry to a region is raising the level of the bid rate gradient and changes the slope of it, but if the new industry brings in additional crime as a byproduct then the bid rent can suffer a decrease. There have been studies indicating that that Atlantic City has shown results of positive jobs and income impacts of gambling. Studies have also shown that since 1978 the level of crime had significantly increased. The level of crime attributed to casinos decreases with the distance from Atlantic City. The sources of these crimes are temporary visitors to the casino who have criminal intentions. Criminals who choose to remain permanently in the region due to new crime opportunities offered by the casinos. One last source is that crime is directly and indirectly related to the employees of the casinos. A lot of the casino employees are between the ages of twenty and thirty and are believed to be consumers of "soft" drugs, which include cannabis, DMT, and LSD. The data revolved around 64 communities including Atlantic City, which is the

base of the analysis for the econometric model. It looks at fifteen years before the opening of the first casino and fifteen years after. That goes for a total of nine hundred and sixty cases. The crime and police manpower data were derived from the New Jersey Uniform Crime Reports. The real estate, population, demographic and budgetary data are from the statements of financial conditions of counties and municipalities. The researchers used two-stage least-square method for three separate equations they used, the money variable was set at the 1970 dollar in order for there to be no discrepancies with the data. The overall level of property crime has been significantly higher since 1978. The area developed a stronger tendency toward criminal activity. Crime decreases the property values, with that being said, the cost of crime is significantly higher in Atlantic City where more crimes results from casinos.

Grinols and Mustard (2006) not only discuss about casinos and crime rates, they also have decided to mention community costs in their article. Before 1978 there were not any casinos outside of the state of Nevada. According to them casinos have been expanding all across the United States since 1990. This makes it easy for the vast majority of Americans to easily access a casino. When they wrote their article they clearly stated that the casino industry has been rapidly growing for the last decade while also becoming one of the most controversial and influential industries in the country. They pointed out that one form of motivation for this study was that from 1982 to 2000 the GDP had increased by 201% while revenues for casinos increased by more than 660%. Due to this rapid expansion extensive debate about the impact of casinos on many social, economic, and political issues began to take form. The study covers all 3,165 U.S counties at the time the study was done between the years 1977 to 1996. Crime rate data was obtained through the FBI's Uniform Crime Report (UCR). They used Census Bureau data for population density, and total county population. The Regional Economic Information System of

the Bureau of Commerce provided data on income and unemployment for all the counties. They obtained the information about the casinos from www.casinocity.com, which was interesting to read due to the fact that I got my data from different casinos using this website and cross referencing it with worldcasinodirectory.com. The study talks about different theories, but one that really stood out to me personally was the Intertemporal Effects on Crime. The theory predicts that the effects of casinos will vary over time. Crime can reduce due to improvements with opportunities in the labor market. This is observed shortly after casino openings. Increase in the crime rate may take a while to appear after the opening of a casino because one cause of the increase deals with addiction to the different types of gambling provided by the casino, which can result in theft. The results of the study were that casinos increased all crime in the FBI index except for murder. Crime increased over time thanks to casino related factors such as pathological gamblers who commit crimes due to depletion of resources. Tourists can both be victims or be the ones committing the crimes. The final comment from the study is that they realized that casinos created the crimes because the neighboring counties did not experience any crime reductions indicating that the crimes didn't shift from one county to another county with a casino. Their results concluded that casinos increased all crimes except murder, which they state is the crime with the least obvious connection to casinos. Most of the crimes showed that the impact casinos had on crime increased over time, which was a pattern that was very consistent with the ideas of how casinos influence crime. They indicated that there were crime-relieved effects of casinos that happen through the increase of employment opportunities and wages for individuals with low amount of skills. They were also able to indicate, "Law enforcement agencies can frequently use casino openings to leverage greater immediate staffing increases, but

are unable to sustain this growth.” The effect further decreases the sudden impact of casinos on crime. In time the effects are subdued by factors related by casinos that increase crime.

No Significant Outcome

The previous study focused on an entire country while William S. Reece (2010) focuses on the ninety-two counties of the state of Indiana. He examines the links among casinos, hotels, and crime from the year 1994 to 2004. He examines the relationship between casinos, number of hotel rooms, and crimes. The reason that he includes the number of hotel rooms into his model is in order to see if the opening of other public accommodations besides casinos affects the crime rates. The theory that he uses is the economic model of crime, which was proposed by Gary Becker in 1968. The theory suggests that potential criminals are utility maximizing agents who split time between their legal jobs and crime based on potential benefits and costs of each. Increasing the opportunity cost of behavior that would be considered criminal would reduce the crime rate due to the fact that the probability of arrest and conviction increases. Increasing legitimate work opportunities for potential criminals or wages for those that work would also increase the opportunity cost of crime. Based on the economic model of crime the introduction of casinos can either increase or decrease local crime rates. Higher unemployment would obviously lead to increase in robbery. New hotels and other public accommodations like casinos can reduce crime rates by increasing legal employment opportunities by eliminating crime-ridden locations. Tourists visiting these newly open casinos or other public accommodations can be very vulnerable to crime due to the fact that they usually carry large amounts of money and other valuable goods, and are outside of their normal comfort zone since they're in a new and unfamiliar location. Reece states that previous studies have only looked at the introduction of casinos, but haven't looked at the impact of the level of casino activity or the extent of other

public location. This study is the first to examine the impacts of the level of casino activity or any related activity, meaning the number of hotel rooms, on local crime rates. The data tools he uses are similar to the previous study talked about. He uses the FBI's UCR for the crime rate, but also use the Indiana Gaming Commission to obtain monthly revenue and counts of admissions for the entire period being researched. This allows him to look at the measure of casino activity to insert in his model. He uses a unique data panel with hotel accommodations. In the results he finds out that the increase of casino activity (turnstile) reduced all crime rates, the casinos themselves were not statistically significant on their effects on the crime rates.

Introducing new casinos increased local burglary rates after a lag of a few years. Besides that these results don't really show introducing a casino changes the crime rate. Increasing casino activity in the other hand leads to the reduction in local crime rates. New casinos in counties leads to the construction of new hotel rooms usually leading to the possibility of reducing the crime rates. He states that the construction of new hotel rooms seem to have reduced the levels of larceny and motor vehicle theft. When he compared casinos with crime, he found very little to no support for the idea that new casinos actually increase local crime rates.

Humphreys and Soebbing (2014) research on the topic took them outside of the United States and took them north of the border to Canada, which is the main reason I decided to look at this article. They start of by saying that communities across North America, this includes Canada, have been expanding access to legal gambling to increase government revenues generated by these activities, but an increase in crimes which are associated with casinos can increase costs in the jurisdiction in order to battle against the increase in crime. The study focuses on the relationship between legal gambling in the form of casinos and video lottery terminals, (VLTs), in bars and taverns in Alberta, Canada. Violent crimes are less common in

Canada than the United States, where most of the previous studies have been done on. The crime data was collected through the Canadian Uniform Crime Report dealing with the years from 1977 to 2008. The number of VLTs that are operated throughout Alberta are limited and have not changed over time. They mention Routine activities theory, which predicts that a crime is likely to be committed due to the convergence of three factors in one location. The first factor is an individual who is likely to commit a crime; the second factor is a target, and finally the absence of protection that would usually deter an individual from committing any crime. So think of an elderly lady walking down a dark alley on her own with no police officer in sight and a thug walking up to her. Policy makers in communities may push for more legal gambling in order to attract more tourists to said community. The increase number of tourists also increases the number of possible targets thus increasing the number of crimes simultaneously. Since Canada is less violent than the United State then the UCRs of both countries are different. Canada has more “softer” crimes on its index, crimes like breaking and entering, credit card fraud, illegal gambling, and shoplifting. Humphreys and Soebbing collected data from 78 counties in Alberta; they concluded that their results indicated that there is little relationship between the presence of VLTs and crime since the introduction of VLTs in the early 1990s. There was no statistical association between the number of VLTs in communities and breaking and entering, drug possession, illegal gambling, fraud, and robbery. The relationship between the presence of casinos in a community and crime in those communities are weak. The researchers state that the opening of a casino does have a negative relationship with shoplifting, this could be due to the idea that shoplifting has a “thrill” component and having a casino introduce could lead individuals who would have had their thrill satisfied by shoplifting now have it satisfied by going to casinos. The next set of articles will focus more on cities than on state.

The next article focuses on another city in the United States, but one that has recently been having economic troubles. Moufakkir (2005) looks at the Motor City of Detroit, Michigan. He studies the crime volume in Detroit and neighboring communities before, during, and after the three Detroit casinos opened. It seems that that the volume of certain types of crimes had slightly increased while the others decreased. There have been three major issues that have been linked with gaming and crime literature. The first one is that some researches base their conclusions on the examination of just one year of crime data, the second is that those researches did not include the ever changing population, and finally they did not control for internal validity by examining crime volume in neighboring communities and counties. Casinos have been embraced because they generate more tax revenue and increase employment, and because they keep local gaming money at home, so potential revenue does not leave the community. Crimes against tourists have been a cause for the declining numbers of domestic and international tourists, thus costing the tourism industry billions of dollars in lost revenue. It also does not help that Detroit has a reputation as a crime city. Casinos can increase crime in three different ways. These ways are that individuals may steal to support problems with their gambling addictions, casinos are attractive to potential thieves since there is a lot of money involved, and with casinos you are more than likely to see a huge crowd of people which attract petty thefts, which are the theft of valuables less than five hundred dollars. Moufakkir obtained crime data the same way the previous researchers in section did for crime, through the FBI's UCR, he also used the National Crime Victimization Survey from the Bureau of Justice Statistics, and finally he used the Survey of Inmates of Adult Prisoner Statistics Program. He looked at three years before and after the three casinos opened. To control for internal validity, state, county, tri-county, and city crime data was were examined including non-index crimes that do not show up in the FBI's UCR. In

conclusion the total crime index figures for the city of Detroit showed a steady decline from 1996 through 2002. This indicates that crime did not actually increase in the three years after the opening of the casinos. Most of the crimes did not increase except for those dealing with prostitution, and arson offenses. The article ends with the conclusion that there is no serious indication that to suggest that the volume of crime in Detroit, Michigan has increased since the openings of the casinos. The real problem is that this conclusion only deals with three years before and three years after the openings of the casinos. For there to be concrete evidence that the volume of crime in the city of Detroit has not had a volume increase of crime is by getting larger a data set by looking at a greater number of years before and after the casino openings.

In Barthe and Stitt(2009) research they take advantage of police phone calls for service data in order to be able to examine the relationship between different crime locations, known as hotspots, and gaming jurisdictions. They're viewing on how crime hotspots around casinos are different to crime hotspots that are not in the vicinity of a casino. They discuss the possible questions that can be solved with the results of their studies. Some of these questions they mention are should police departments devote special attention to casino areas? Another question they mention is should there be differential temporal deployment of resources near gaming venues? They look into the routine activity theory combined with the theory of hotspots. This is their form of a theoretical model. Based on the theory for a crime to occur there has to be a combination of someone willing to commit an act of crime and a good enough target. This so called target can be an individual or some sort of possession. Additionally, there must also be an absence of law enforcement or some sort of guardian. The guardian or law enforcer is seen as disincentive by increasing the probability of the one likely to commit the crime to get caught and have to face punishment. This leads to the probability of an act crime being committed to drop.

Casinos may seem like an ideal location for crime, but casino owners usually have on hire a lot of security guards and have in place multiple cameras in various locations. This alone act as some form of a guardian, which thus diminishes the opportunity for a crime to be committed. The data does not only include calls for service, but also includes hotspot density maps that they formed with the calls for service. The hotspot density maps were made for three types of crimes. These crimes were property crimes (burglary, larceny, auto theft, etc.), person crimes (assault, robbery, sexual crimes, etc.), and disorder items (drug activity, public drunkenness, loud music, etc.). The results to their study was that it seems that crime hotspots that were near casinos were not different compared to, when looked based on type of crime, crime hotspots that were not near casinos. The biggest difference was found to deal with calls that had to do with drunk behavior and larceny. They finish their study by saying that the data can't necessarily have definitive conclusions about certain crime types called on, there are policy implications that can be looked into. The research done can encourage local officials and law enforcement agencies that the existence of casinos will not help produce a greater amount of property or disorder crime within their jurisdiction. Also, casinos that operate 24 hours do not appear to put extra pressure on police resources at random times of day. More importantly, alcohol incidents aside, casinos do not seem to pose special complications for police agencies. They add that their findings from this study support the idea that casino venues should not hurry into adopting special units that are dedicated to the casino beats. Law enforcement officials can restrict larcenies and drunken behavior by targeting the citizens in their area with publicity or educational campaigns that will remind people to limit disorderly behavior and to watch their personal belonging more carefully during their stay at or near a casino. Problems with their data revolve mostly around police phone calls to service. Similar to collecting crime data from the UCR some crimes may actually

be underreported. Another problem is that since citizens are calling in the crimes they might describe a different crime than what is actually happening.

Both Good and Bad Outcomes

Evans and Topoleski(2002) look into the after effects of the opening of casino run by a Native American tribes. The reason this article was chosen to be look at is because the researchers use a difference-in-difference model in which they compare economic outcomes before and after tribes open casinos to outcomes over the same period for tribes that do not adopt or are prohibited from adopting gaming. This means they compare the opening of casinos between tribes that do open them and those that do not. They indicate that at the time there was about over 310 casinos that were run by Native American Tribes. That is only a small fraction of the over 1,500 there is in the United States in total. They indicate that Native Americans are one of the poorest individuals in the country. In order to motivate economic growth and development, multiple tribes opened casinos with Las Vegas-style gambling card table games around late 70s, early 80s. The data on economic outcomes such as the number employed, the number and percent unemployed was collected from The Bureau of Indian Affairs (BIA). The BIA only had data for 1983, 1989, and odd numbered years in the 1990's. Data for tribal owned casinos such as opening dates was collected through various websites online. One website they used in particular was casinocity.com. For county level statistics, like the economic characteristics for the area near where the Native American tribes were located, was collected through the Bureau of Economic Analysis (BEA) and they also used the U.S. Census Bureau of for data between the years 1990 and 1999 and from the University Consortium for Political and Social Research (ICPSR) for the 1980-1999 period. Overall findings that there were little constant change in property crimes per 100,000 up until the fourth year after a casino has open.

After more than four years of opening property crimes increased by 174 per 100,000 people in counties with Indian-owned casinos which was about 4.4 percent of the median value for counties in the year a casino opened. All the increase in property crime comes from the rise of auto thefts and larceny. Violent crime seems to increase only after four years a casino has opened. They also indicate employment had increased by about 26 percent, Tribal gaming operations seem to have both positive and negative spillovers in the surrounding communities. There was evidence in health benefits, mortality had fallen by 2 percent in a county with a casino. Negative outcomes were that 4 years after a casino opens, bankruptcy rates, violent crime, and auto thefts and larceny are up 10 percent in counties with a casino.

The articles mentioned in this section had different research methods than I currently have plan. While most of the research models focus on mostly one state or one city, my model will be focusing on different counties from different states in the United States. I will also be using other counties as control variable which was similar to some of the articles mentioned in the section, but I will be using a difference in difference model which I'm pretty sure really hasn't been mentioned in any of the articles above. I've also gathered crime data from the FBI's UCR, which is pretty much where everyone obtains their crime data. I will also be looking at a five year, but will be looking at five years prior to the opening of a casino in a county and five years after the opening of said casinos. I will be using a panel data set and will have multiple regressions looking at the overall crime rate and looking at the regression between casinos and each crime in the FBI's crime index, which is similar to what the previous researchers have done.

Methodology

The data set collected revolved around various casinos from across the United States of America. Even though the United States has casinos in practically every state, the states of

Hawaii, Tennessee, Vermont, and Utah do not have casinos, the casinos selected to be in the study must have to meet certain criteria. In order to be considered a part of the data set, the casinos chosen had to be the only casino in the individual county. This was done so there would not be any interference on any of the dependent or independent variables from a second interfering casino. The time period that the data will be looking is five years prior to the opening of the casino and five years after the opening of the casino. I obtained data on only land based casinos, and American Indian casinos. Other types such as racinos, and riverboat casinos were not included in my data search.

Originally I decided to make sure that the casinos I looked at were at least 100 miles away from the next closest casino. The reason for this is because I did not want the data to be manipulated by the interference and influence of another casino. I looked at citywide data for the cities in which the casinos were located, but when I tried to look up the economic data for some of the cities through various websites I came to the conclusion that data is not available for every single city. When I came to this conclusion, I realized that the next best thing that should be done was to go a little bit bigger and look at the data of not individual cities, but at individual counties.

I looked up the information of the data, which included name, location, and date of opening, from the World Casino directory, and crossed reference casinocity.com. Once I obtained the location of a casino I would look up what county it resided in based on the city and state located. For the regression model, I decided that casino would be a dummy variable represented by Dpost, and it will be equal to one for the years after it was opened and it will equal zero prior to its opening. After I established the casinos and counties I would be looking at for the data set, I looked up the crime rate for those counties five years before and five years after the opening of the casino.

The crime rate data was obtained from the Federal Bureau of Investigation, (FBI), Uniform Crime Reports, (UCR). The Uniform Crime Reports is collected and prepared by the National Archive of Criminal Justice Data. I've decided that the crime rate would include both violent crime and property crime. The UCR will be used to find data for a total of five states. For the UCR, violent crimes are murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault. Property crime accounts for burglary, larceny-theft, and motor vehicle theft. The data is recorded per 100,000 population. The variable for the crime rate for my regression model will be represented by *Crimit*. The problem with gathering crime rate data, is that unfortunately not every crime is reported, so there is no telling how many crimes, violent or property, have really been committed. Another problem that I came across when gathering data for each county, is that the years the UCR has is from 1985 to 2012. Since there is no data from the past few years, I had to drop all the casinos that I managed to find data for that had opened in 2008 and later. Another problem I came across with the UCR is that I had to look at the crime rate for every town and/or city in the county individually because there was no whole county data. In actuality, not every town or city in the county has crime rate information reported to the UCR. I decided to use the information on the towns and cities in the counties that did have their crime rates reported. This obviously influences the data since not every single crime is being accounted for. I decided to just use the crime rate data of the cities and towns that did report in the county. I figured that the casino would still have the same effect of the crime rates that were reported for counties regardless of the lack of some information. What was also unfortunate was that some counties didn't have any town or city that had any crime rate data reported, so I had to eliminate some of the counties as well. In the end I was unfortunately down to four counties, but since I was looking across a total of 10 years this led to fifty observations before inserting the

control group variables, which is sufficient enough since the recommended number of observations when running statistics is 30.

I have decided to obtain income information about the location of where the casinos are. The reason for this is that income is viewed as a factor for an individual to commit a crime. If the individual is low on income then the opportunity reward for committing a crime increases for said individual. I tried to obtain the per capita income for each county that the casinos were located in. The income data was obtain through the Federal Reserve Economic Data's, (FRED), website. The problem I ran into when trying to collect the income data was that not every city or town within the county has yearly data available. This unfortunately cuts down the amount of data that could have possibly been obtain. Since the value of the dollar has changed throughout the years, especially when looking at casinos that have opened in different points in time, I've decided to look at the annual per capita personal income of the counties on an index scale pinned on the year 2001. The scale is set to hit one hundred when the year being viewed is 2001, the scale for the years before and after 2001 will be based by it. The income was put with a scale index based on the year 2001. I was able to receive the per capita income for all the counties of the remaining casinos, for five years prior to the opening and five years after the opening. I decided to just use the data that was available for the cities and towns in the counties and see how they would change over time with the introduction of the casino. For the regression model the income variable will be *Incomit*.

An independent variable that will also be looked at in this study is the unemployment rate of the counties. The reason for adding the unemployment rate to the equation is the idea that crime rate and unemployment rate have a positive relationship with each other. If unemployment increases so does the crime rate. For the unemployment rate I gathered the data the same way I

did for the income. I used the (FRED) website to obtain the unemployment rate for each county for the years prior and after the opening of the casinos. The unemployment rate collected from the website is the annual average measured in percentage. The variable for the regression model is labeled as *Unemit*.

Population is another independent that I've decided to insert into my regression model for this research. The usual idea of population that comes to mind is that as the population of an area increases so does the crime rate. The information for the population of each county was obtained through the United States Department of Commerce, Bureau of Economic Analysis' website, (bea.gov). The population number is the actual number recorded for the county, so nothing was done to alter this information. The variable for population on my regression model is *Popit*.

Even though these variables were chosen and the gathering of the data was mostly successful, the information collected is incomplete. To start off even though I was successful in obtaining crime rate data for the counties being observed in this study, not every town and/or city reported their crime rate to the UCR database. Also another big factor is that in reality not every crime that occurs in an area is reported. The reason for this could be a result of police officers overlooking the crime or failing to report it, another reason can also be that the victims of a crime are afraid to report the crime in fear of being attacked again. The reported data is also voluntarily and self reported by the law enforcement agencies, which can lead to discrepancies. The UCR data report only records crimes that are consider serious in incidents that various crimes have been committed. Since the crime rate data is incomplete it does not represent the counties to its full extent which can possibly skewed the data.

With the obtained data I was able to run summary statistics for casino counties and also for non-casino counties, which is presented in table 1. The non-casino counties had no casinos in

any of the years in the sample. Casino counties had casinos for five years of the sample. The casino counties had on average higher population, unemployment rate, and higher crime rates. Non-casino counties on average had higher income. Having run the summary statistics will help further analyze the data obtained from the multiple regressions that will come up further down the paper.

The results from the multiple regressions were interesting to look at. There were some surprising outcomes that definitely make it clear that there should be further study with a significant greater amount of observations in the economic models. Before running the regressions it was decided it would be best to make visual representations of the crime rates of the treated counties and compare them to the control counties. The treated counties and control counties are represented through graph 1 and graph 2 respectively. When looking closely at the graphs you will see negative numbers for years in the x-axis. The years associated with negatives number represents years before the introduction of a casino in the treated counties leading to the induction of the positive number representing years after the introduction of the casino. The treated counties and their respected neighboring control counties are both represented by the same color in their own graphs. When you look at both graphs you can see that the crime rate for control counties, with the exception of St. Joseph County, had actually increase after the introduction of a casino in their respective neighboring treated county. As for the counties who had the casinos it seems that for the majority of the time after the introduction of a casino the crime rate either started to decrease or became stagnant. One may make the assumption based on the graph that the introduction of the casino alone was sufficient enough to reduce the crime rate of the county that it was introduced to. To make this conclusion solely based on the outcome of graphs is not rational, which is why it is necessary to run multiple regressions with the inclusion

of control variables that can explain the outcome of the crime rate in order to get as much of an understanding to figure out if there is a positive relationship or any relationship between casinos and the crime rates of counties. Looking at both graphs side by side you're able to visualize how the difference-in-difference model will work out. You just have to look at the difference between the treated counties and their control counties while also looking at the difference at the time periods before the introduction of the casino and after the introduction of the casino.

Econometric Model

General Crime

In this section I will describe, in as much detail as possible the statistical model that will be used in my analysis of the relationship between casinos and crime rates. As mentioned before the data set includes information for all of the different counties in this study. This includes information five years before the opening of the casino and five years after the initial opening of the casino in the county. To be able to estimate the aftermath of the crime rates in the counties after the inclusion of a casino I have decided to use a difference in difference model. For this model, I will be comparing the outcomes of crime rates of counties before and after the introduction of a casino with the outcome on crime rates over the same period of time for counties that did not have an introduction of a casino. The counties with the casino will be considered the treatment group, while those without a casino will be considered the control group for this model. The outcomes of these models will be discussed in the next section of this paper.

The specific empirical blueprint for one of the robust regression models used in this study is as follows

$$(1) Crim_{it} = \beta_0 + \beta_1 * Dtr_{it} + \beta_2 * Dpost_{it} + \beta_3 DtrXDpost_{it} + \varepsilon$$

As it was mentioned before $Crim_{it}$ represents the crime rate of the counties being observed in the study, which was obtained through the UCR. The variable ε represents any distinctive errors that may occur. The variable Dtr is a representation of a dummy variable. This dummy variable is a representation of the counties that are treated in the experiment. The treated counties are those that will have casinos, they are represented with a one, while the control counties, those who will not have a casino, are represented with a zero. The variable $Dpost$ is a representation of another dummy variable for the time before and the time after the inclusion of the casinos to the treated counties. Zero is representing the time before the introduction of the casino in the treated counties through the variable, and one for the time post the introduction of said casinos. Lastly the variable $DtrXDpost$ represents the most important part of this difference in difference model. This is the multiplicative outcome between Dtr and $Dpost$. The dummy variable is one only when inferring to the treated counties after the inclusion of the casino in said counties. It is zero for any other combination. A positive β_3 would indicate that the introduction of a casino would lead to an increase to the crime rate of the treated county.

A second difference in difference economic model is used to further look into the relationship between crime rates and casinos. For this economic model it is an extension of the original model previously mentioned. The difference between the two models is that the second model has the addition of four dummy variables.

$$(2) Crim_{it} = \beta_0 + \beta_1 * Dtr_{it} + \beta_2 * Dpost_{it} + \beta_3 DtrXDpost_{it} + \beta_4 * Match_{County1} + \beta_5 * Match_{County2} + \beta_6 * Match_{County4} + \beta_7 * Match_{County5} + \varepsilon$$

The Match County dummy variables are used in this regression model in order to match the treated counties with their respective neighboring control counties. By adding these dummy

variables into the economic model it allows there to be a diminishing effect on unaccounted for random variables that can affect the outcome of the regression model.

The third regression model is not different than the previous two, but has the inclusion of the independent variable data that was mentioned in the previous section of this paper. With the addition of these covariates the regression model would become more accurate due to the fact that these variables are closely associated with crime rates. The regression model is as follows

$$(3) \text{Crim}_{it} = \beta_0 + \beta_1 * \text{Dtr}_{it} + \beta_2 * \text{Dpost}_{it} + \beta_3 \text{DtrXDpost}_{it} + \beta_4 * \text{Match}_{\text{County}1} + \beta_5 * \text{Match}_{\text{County}2} + \beta_6 * \text{Match}_{\text{County}4} + \beta_7 * \text{Match}_{\text{County}5} + \beta_8 * \text{Incom}_{it} + \beta_9 * \text{Unemp}_{it} + \beta_{10} * \text{Pop}_{it} + \varepsilon$$

Influence between Types of Crime

To look deeper into the relationship between the introduction of a casino and the crime rate of the county, I have decided to look at the crimes in two groups. The groupings of the crime would be property crimes and non-violent crimes. In the UCR database it refers to property crime as burglary, larceny-theft, and motor vehicle-theft. Violent crime refers to murder and non-negligent manslaughter, forcible rape, and robbery. The regression model for property crime, where PropC_{it} represents property crime, is

$$(4) \text{PropC}_{it} = \beta_0 + \beta_1 * \text{Dtr}_{it} + \beta_2 * \text{Dpost}_{it} + \beta_3 \text{DtrXDpost}_{it} + \beta_4 * \text{Match}_{\text{County}1} + \beta_5 * \text{Match}_{\text{County}2} + \beta_6 * \text{Match}_{\text{County}4} + \beta_7 * \text{Match}_{\text{County}5} + \beta_8 * \text{Incom}_{it} + \beta_9 * \text{Unemp}_{it} + \beta_{10} * \text{Pop}_{it} + \varepsilon$$

If there were any indication that casinos increase property crime then there would be a positive coefficient for β_3 which would be representing that compared to the control counties, treated counties' increase in property crime is influenced by the inclusion of casino in its community.

The regression model for the outcome of violent crimes after the insertion of a casino in a county

is the same as the one for property crime, except that the response variable is represented as $Violen_{it}$.

Specific Acts of Crime

Doing research on this topic and reviewing works done by authors researching the same topic has led to the idea of looking more into the UCR. Since this research is looking into the impact that the introduction of a casino has to the crime rate of the county the casino is introduced to, it makes sense to look at the outcomes of each specific crime that is describe in the UCR database. By looking into each specific crime, it will allow me to see if casinos have a greater impact on certain types of individual crimes more than the others in the database. It makes sense to thoroughly look into each crime because it seems unlikely that an inclusion of a casino can have a significant influence to the murder rate or even to forcible rate. I expect there to be a significant influence on crimes such as robbery, burglary, and larceny. Especially when dealing with pathological gamblers who are addicted, and cannot stop. They will do anything that they would see within their reason to be able to gamble again and try to obtain some winnings from their addiction. The regression models for each of the seven crimes that will be focused on in this study, will be the same as the previous regression models, when the crimes were separated into two different categories, except the dependent variable will be different for each crime and will be a representation of the crimes. Before discussing the results of the regressions shown some of the covariates must be discussed. Three of the independent variables are burglary, larceny, and robbery. These variables may seem similar, but are quite different. Even though all of these crimes involve theft, the only one of these three that is considered to be a violent crime is robbery, due to the fact that it deals with using force or threatening to use force in order to commit the theft. The difference between the property crimes of burglary and larceny

is that being charged with burglary means that the individual being accused has broken into an establishment or building that the said individual was not invited to in order to commit the act of theft.

Results

When analyzing the first regression, basic regression, for the introduction of the casino, which the results can be seen in table 2, the results don't seem to be that much promising. The key variable in this difference in difference regression, $DtrXDpost$, indicates that the introduction of a casino will decrease the crime rate by 2,104 per 100,000 population. The problem with this though is that it is not significant enough with a p-value greater than twenty nine percent. It also does not help that the model can explain less than ten percent for the change in crime rate.

The second regression mentioned in the previous section is an improved version of the first regression that was done. The result of this model, shown in table 3, is the outcome of introducing the Match County dummy variables, which grouped the treated counties with their respective control counties. This allows the regression model to put into consideration the crime rate of the control counties neighboring their respective treated counties before, and after the introduction of the casino. You will first notice that even though I added the match dummy variables they do not appear in table 3, the reason for that being is that the coefficients and statistical significance of these dummy variables are irrelevant, they are just used for the grouping factor and nothing else. The outcome of the second regression model indicates that the introduction of the casino decreases the crime rate exactly the same as indicated by the first, but this time it has statistical significance with a p-value of less than one percent. Not only did the statistical significance change, but also the R-squared increased to about eighty one percent indicating that this model is more of an appropriate fit for the change of crime rate in the

counties. Based on the regression counties experience a decrease of 2,104 crimes per 100,000 population with the introduction of a casino. This can be compared to the average crime rate of about 7,963 per 100,000 population for the counties with no casinos.

The next regression just adds the covariates, income, population, and unemployment, which could have an effect on the crime rates in each of the counties. The results in table 4 reveal that the introduction of a casino has correlation with the crime rate of a county. The table shows with the introduction of a casino with the consideration of the covariates decreases the crime rate by 2,171 per 100,000 population with a p-value less than five percent giving it statistical significance. This outcome can also be compared with the average crime rate of about 7,963 per 100,000 population for the counties with no casinos. The covariate that is statistically significant based on this regression model was only population. For population the increase of one individual will increase the crime rate by 0.00455 per 100,000 population. The increase by just one person is relatively small compared to the crime rate of the non-casino counties. It will take a significantly high increase in the population of the county for there to even be a significant increase on the crime rate. In regards to the unemployment rate, even though it was not statistically significant, the regression model reveals that for every percent increase to the unemployment rate then the crime rate increases by 642.5 per 100,000 population. Even though it is not statistically significant with a p-value of eleven percent it goes with the idea that unemployment does increase crime.

Another way into viewing the relationship between the introduction of a casino and the crime rate of a county is by looking at the overall crime rate into two separate categories just how the UCR database has. By looking at the regression models for violent crime and property crime we can see if there is a difference in the effect that the entry of a casino in a new area has

on different categories of crime. We would be able to determine if there is a difference in relationships between the two categories under the presence of casino, as in to see if there is a chance of a positive relationship in either category.

The results shown in table 5 indicate that there is no positive relationship between the inclusion of a casino and the violent crime rate or with the property crime rate. For the violent crime rate the introduction of a casino seems to decrease crime in this category by 515.6 per 100,000 population, while for property crime the establishment of a new casino decreases the crime rate by 1,657 per 100,000 population. This is compared to violent crime rate of about 727.24 per 100,000 population and the property crime rate of 7235.75 for the non-casino counties. It makes sense that the debut of a new casino will decrease property crime more than violent crime since there is more of a link within every county in this study had much more property crime than there was violent, by a great significant amount. You will also notice that similar to the overall crime rate, both property and violent crime seem to be significantly affected by population. If the population were to increase in the counties so would the crime under both categories. There is one difference that can be noticed in the table and that is that the regression model for violent crimes indicates that not only the covariate that is population is significant, but so is income. For every point increase on the income index scale the violent crime rate decreases by about 12.57 per 100,000 per population.

The last set of regressions done in this study compares all seven crimes under the UCR database and how the introduction of a casino may affect them. The results of these regression results are shown in table 6. The first thing you may notice when viewing the table is that rape, murder, and burglary are not statistically significant when it come to their relationship with the introduction of a casino. The introduction of a casino on the other hand seems to have a

significant relationship between the other two crimes under the violent crime category, robbery, and aggravated assault, actually reveal that the regression model embraces the idea of these two crimes to being affected by the presence of a new casino. The regression model indicates that if a county were to introduce a casino into its community then said community would see a fall in robbery by 80.42 per 100,000 population. There seems to be a greater decline for the rate of aggravated assaults. According to the regression run for aggravated assaults it indicates that there is an influential reduction when the county is under the presence of a newly introduced casino. With a new casino residing in a county the aggravated assault rate decreases by 419.9 per 100,000 per population. Such a significant decrease would seem to bring about a safer community presence.

Even though the presence of a casino does not seem to have any significant influence to the burglary rate of a community the regression seems to reveal that the other two property crimes, larceny, and motor theft are significantly influence by such a presence. Larceny seems to decrease by 1,077 per 100,000 per population after the introduction of casino. For the crime of grand theft auto there is indication that the county where the casino is introduced to will see a decrease of 393.1 per 100,000 per population. Overall it seems that the addition of a casino seems to have a greater influence in decreasing the rate of property crime rate compared to how much it decreases the violent crime rate of a county.

Conclusion

In conclusion, based on the results of this study the introduction of a casino has a positive influence in the counties that it is introduced to. The regression models indicated that overall, the crime rate should decrease; with significant decreases coming to the robbery, aggravated assault, larceny, and vehicle theft rates. It is safe to assume based on this data that the economic model of

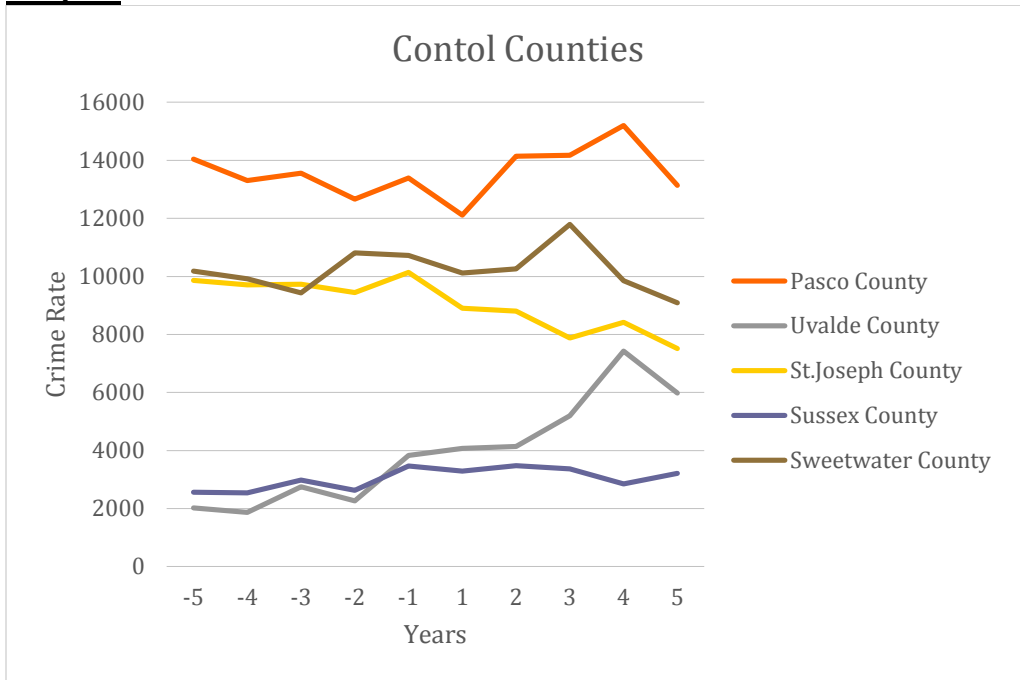
crime seems to hold some truth. With a new casino being introduced to a county, this would lead to the creation of more jobs, which will increase the opportunity cost of an individual committing any type of crime. Another explanation is that with the introduction of the casino, there was a stronger presence of law enforcement around the community, and also security hired by the casino owner. This would lead to a higher chance of getting caught committing any form of crime, thus increasing opportunity cost for said crimes. One last idea for the overall decrease in crime, is that it is possible that some of the individuals who would commit these crimes may fulfill this type of rush/risk taking by gambling in the casinos themselves. Individuals are able to obtain the rush they get from one activity by doing a completely different type of activity. Gambling could be a good substitute for theft.

Some errors that could have affected the results of this study is that as mention previously the UCR does not have the crime data for every single town and/or city in the county. There are even crimes that are never recorded. This does not allow us to obtain the true crime rate of every county under this study. There are also important variables that could have been left off the regression models that could have had a significant influence to the outcome of some variables.

This study could also be looked at even further. Since there a limited number of counties in the study future researchers can try to add more counties that fit the standards mentioned in the beginning of this paper. Since it is such a tedious task looking up the other counties may take quite a significant amount of time.

Appendix

Graph 1



Graph 2

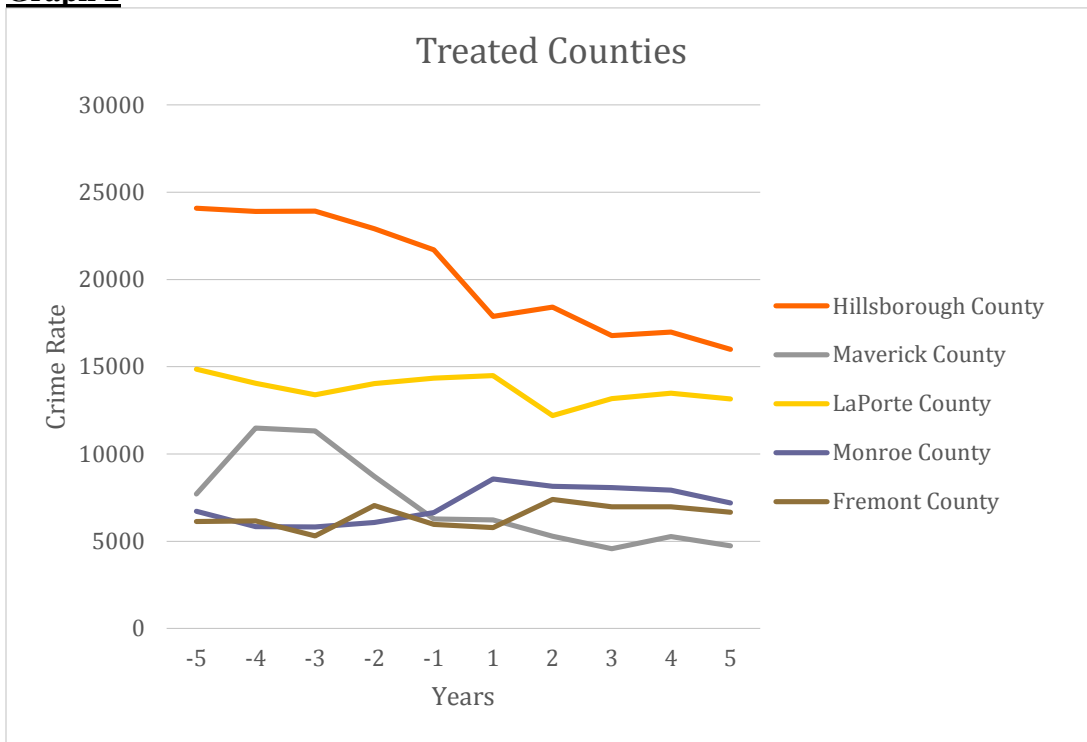


Table 1

Variable	Control Counties					Counties with Casinos				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
CrimeRate	50	7963.592	4117.389	1868.1	15203.6	50	10933.56	5745.822	4566.4	24085.8
Income	50	91.87412	23.39715	47.23565	134.9	50	90.67621	23.05765	45.3881	126.9
Population	50	175673.5	145215.1	23422	462607	50	291545.1	415696.2	33565	1214050
Unemployment	50	.06678	.0292828	.028	.143	50	.1024	.0866103	.027	.338
ViolentCrime	50	727.238	489.2546	74.4	1779.9	50	1079.856	1072.843	111.5	3698.4
PropertyCr~e	50	7235.754	3662.706	1593.8	13627.7	50	9853.702	4742.909	4312.3	20499.4
Murder	50	8.016	7.355835	0	24.5	50	9.176	8.275969	0	28.6
Rape	50	53.0406	45.69257	0	153.3	50	61.88	45.16181	3.8	198.9
Robbery	50	162.524	171.9213	4	481	50	306.414	356.248	0	1205.3
Aggravated~t	50	504.262	340.7593	46.1	1219.2	50	702.368	712.2108	49.1	2416.3
Burglary	50	1643.718	1017.344	308.7	3593.4	50	1705.668	1079.977	528.7	3998.1
Larceny	50	5198.066	2589.882	870.8	9522.8	50	7226.592	2859.684	3331.4	13407.9
MotorTheft	50	393.968	288.4663	30.2	920.9	50	921.42	959.5599	67.4	3564.8

Table 2

VARIABLES	(1) CrimeRate
Dtr	4,022** (1,603)
Dpost	423.5 (1,175)
DtrXDpost	-2,104 (2,005)
Constant	7,752*** (886.6)
Observations	100
R-squared	0.097
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

Table 3

VARIABLES	(1) CrimeRate
Dtr	4,022*** (751.7)
Dpost	423.5 (600.0)
DtrXDpost	-2,104** (941.6)
Constant	9,682*** (437.0)
Observations	100
R-squared	0.809
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

Table 4

VARIABLES	(1) CrimeRate
Dtr	3,463*** (767.4)
Dpost	1,101 (1,181)
DtrXDpost	-2,171** (924.6)
Unemployment	642.5 (6,034)
Population	0.00455*** (0.00134)
Income	-35.67 (46.01)
Constant	11,858*** (3,532)
Observations	100
R-squared	0.827
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

Table 5

VARIABLES	(1) ViolentCrime	(2) PropertyCrime
Dtr	448.9*** (129.9)	3,015*** (670.3)
Dpost	202.0 (153.0)	900.6 (1,057)
DtrXDpost	-515.6*** (130.1)	-1,657** (826.6)
Unemployment	-1,032 (773.5)	1,675 (5,387)
Population	0.00158*** (0.000191)	0.00297** (0.00120)
Income	-12.57* (6.373)	-23.11 (40.99)
Constant	1,717*** (500.4)	10,140*** (3,134)
Observations	100	100
R-squared	0.875	0.808
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Table 6

VARIABLES	(1) Rape	(2) Murder	(3) Robbery	(4) Aggravated Assault	(5) Burglary	(6) Larceny	(7) Motor Theft
Dtr	14.01* (7.056)	1.487 (1.857)	106.2*** (25.56)	326.5*** (120.9)	-44.59 (122.2)	2,394*** (507.9)	665.5*** (113.6)
Dpost	21.85* (11.98)	-0.0492 (2.938)	29.51 (32.77)	149.5 (129.1)	-88.38 (205.0)	839.2 (810.1)	149.8 (144.9)
DtrXDpost	-10.34 (9.622)	-3.702 (2.246)	-80.42*** (30.40)	-419.9*** (114.2)	-187.2 (150.2)	-1,077* (639.5)	-393.1*** (136.9)
Unemployment	-22.55 (58.05)	-2.329 (13.30)	-489.2*** (153.9)	-518.1 (720.4)	3,116** (1,186)	1,855 (4,494)	-3,296*** (709.7)
Population	-3.45e-06 (2.14e-05)	1.43e-05*** (4.22e-06)	0.000800*** (6.78e-05)	0.000766*** (0.000149)	0.000762*** (0.000217)	0.000774 (0.000848)	0.00143*** (0.000316)
Income	-1.002* (0.520)	0.0414 (0.111)	-2.139 (1.359)	-9.462* (5.449)	-0.673 (8.105)	-14.03 (31.76)	-8.402 (6.053)
Constant	158.6*** (41.24)	9.649 (8.714)	362.2*** (105.0)	1,187*** (430.4)	1,937*** (637.8)	6,907*** (2,438)	1,297*** (491.4)
Observations	100	100	100	100	100	100	100
R-squared	0.756	0.544	0.941	0.778	0.885	0.728	0.826
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1							

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