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THE SOCIAL AND ECONOMIC IMPACT OF NATIVE AMERICAN CASINOS

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ABSTRACT

In the late 1980s, a series of legal rulings favorable to tribes and the subsequent passage of the Indian Gaming Regulatory Act of 1988 legalized gaming operations on reservations in many states. Today, there are over 310 gaming operations run by more than 200 of the nations' 556 federally-recognized tribes. Of these operations, about 220 are "Las Vegas" style casinos with slot machines and/or table games. We use a simple difference-in-difference framework where we 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. Four years after tribes open casinos, employment has increased by 26 percent, and tribal population has increased by about 12 percent, resulting in an increase in employment to population ratios of five percentage points or about 12 percent. The fraction of adults who work but are poor has declined by 14 percent. Tribal gaming operations seem to have both positive and negative spillovers in the surrounding communities. In counties where an Indian-owned casino opens, we find that jobs per adult increase by about five percent of the median value. Given the size of tribes relative to their counties, most of this growth in employment is due to growth in non-Native American employment. The increase in economic activity appears to have some health benefits in that four or more years after a casino opens, mortality has fallen by 2 percent in a county with a casino and an amount half that in counties near a casino. Casinos do, however, come at some cost. Four years after a casino opens, bankruptcy rates, violent crime, and auto thefts and larceny are up 10 percent in counties with a casino.

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I Introduction

Native Americans living on reservations are among the poorest people in the United States, with median household incomes that are 60 percent lower and poverty rates that are five times higher than national averages. To spur economic development, a handful of tribes opened large-scale bingo halls and/or casinos with Las Vegas-style gambling in the late 1970s and early 1980s. During this period, the number and size of tribal gaming operations were severely restricted by state laws. In the late 1980s, a series of legal rulings favorable to tribes and the subsequent passage of the Indian Gaming Regulatory Act of 1988 legalized gaming operations on reservations in many states. Today, there are over 310 gaming operations run by more than 200 of the nations' 556 federally-recognized tribes. Of these operations, about 220 are "Las Vegas" style casinos with slot machines and/or table games. By 1999, about half of tribal members in the lower 48 states are in tribes that run a casino-style gaming operation. By 2000, Indian-owned gaming operations generated about $10 billion in revenues, about one-sixth of all revenues generated by legal gaming in this country.

An explicit goal of the Indian Gaming Regulatory Act (IGRA) is to promote "tribal economic development, self-sufficiency, and strong tribal governments."[1] Whether the IGRA has achieved this goal is an empirical question that to date has received little attention. In the popular press, the answer to this question varies widely. Casinos in Connecticut, California, and New York have been incredibly successful and in 2000 had combined revenues in excess of $4 billion.[2] Tribes in Minnesota and Wisconsin report dramatic decreases in unemployment rates (National Gambling Impact Study Commission Report (1999), p. 6-16). Other reports paint the opposite picture. Tribes of the Greater Sioux Nation in North and South Dakota operate about a dozen gambling facilities, but because of the

[1]25 U.S.C. 2702(1)

[2]Sean Murphy. "Tribal Gamble: The Lure and Peril of Indian Gaming. A Big Roll at Mohegan Sun." *The Boston Globe.* December 10, 2000. (http://www.boston.com/globe/nation/packages/gaming/part1.htm)

relative geographic isolation of these tribes, these gambling halls generate relatively little revenue.[3] The *Boston Globe* reports, "While a few dozen tribes lucky enough to own reservation land near major population centers make headlines with gambling casinos generating mind-boggling wealth, the vast majority of America's Indians remain mired in poverty, victimized by ill-conceived federal policies and a gathering backlash spurred by the myth that Native Americans everywhere are cashing in."[4]

In this paper, we examine the economic and social impact that Indian-owned casinos have had on reservations and the surrounding communities. We use a simple difference-in-difference framework where we 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. In the first part of the paper, we examine the impact of the casinos on some tribal economic outcomes. The results of this analysis are staggering. Four years after tribes open casinos, employment increases by 26 percent, and tribal population increases by about 12 percent, resulting in an increase in employment to population ratios of five percentage points or about 12 percent. The fraction of adults who work but are poor declines by 14 percent.

Tribal gaming operations seem to have both positive and negative spillovers in surrounding communities. In counties where an Indian-owned casino opens, we find that jobs per adult increase by about **five** percent of the median value. Given the size of tribes relative to their counties, most of this growth in employment is due to growth in non-Native American employment. The increase in economic activity appears to have some health benefits in that four or more years after a casino opens, mortality has fallen by 22 per 100,000 in a county with a casino and an amount half that in counties near a casino. Casinos do, however, come at some cost. Four years after a casino opens, bankruptcy rates, violent crime, and auto thefts and larceny are up 10 percent in counties with a casino.

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[3]Michael Rezendes. "Tribal Gamble: The Lure and Peril of Indian Gaming. Few Tribes Share Casino Windfall." *The Boston Globe.* December 11, 2000. (http://www.boston.com/globe/nation/packages/gaming/part2.htm)

[4]*Ibid.*

The paper is structured as follows. In section II, we discuss the legal and legislative events that brought about the rise of Native American gaming operations. In this section, we describe characteristics of the "compacts" that regulate gaming and discuss the current size and scope of gaming operations. In section III, we outline some of the previous work that has examined the economic impact of Native American casinos. In section IV, we present the econometric model and in section V, we outline the data used in our analysis. In section VI, we present results that examine the impact of the gaming on the tribe, whereas in section VII, we present estimates of how gaming has impacted surrounding areas.

II The Rise of Indian-Owned Gaming Operations

A. Legal and Institutional Background

Indian tribes are sovereign nations, and states have only limited power over tribes. Public Law 280 gave six states (Alaska, California, Minnesota, Nebraska, Oregon, and Wisconsin) complete criminal and limited civil jurisdiction on reservations.[5] Since its passage, Public Law 280 has been expanded to include tribes in 10 other states (Nevada, South Dakota, Washington, Florida, Idaho, Montana, North Dakota, Arizona, Iowa, and Utah). In these states, Indians on reservations are subject to that state's criminal laws, and the U.S. Supreme Court has determined that for a state to prohibit acts on a reservation under Public Law 280, the state must clearly designate the underlying conduct as criminal (Kalish, 1996). The impetus for the growth of tribally-owned gaming operations was generated by a series of legal cases where federal courts declared that some state gambling laws are civil rather than criminal in nature, greatly limiting the state's ability to regulate gaming on reservations.

Large-scale gaming sponsored by tribal governments is a relatively new phenomenon. Starting in the late 1970s, as reservations were allowed to take more control over their economic development, a

[5]PL 83-280, 28 USC § 1360(a) (2001)

number of tribes began to invest in gaming operations.[6] One such tribe was the Seminoles of Florida who opened a high-stakes bingo parlor in 1978. This bingo was an enormous success for the tribe and generated annual revenues of $100 million within ten years of opening (Eisler, 2001, p.101). The Seminole operation had larger prizes and longer hours of operation than allowed by state law, and the State of Florida sought to enjoin the high-stakes bingo games through civil suit.[7] In May 1980, the case was decided in federal court in the tribe's favor, when the court found that Florida's overall public policy toward gaming was civil rather than criminal in nature, and therefore, the state's assumption of criminal jurisdiction over Indians on Florida reservations under Public Law 280 did not apply.[8] The Seminole Tribe was allowed to continue its high stakes bingo. The Fifth Circuit Court of Appeals upheld this decision in 1981.[9]

In the late 1970's and early 1980's, other successful bingo operations were started by the Penobscot Tribe of Maine,[10] and the Mashantucket Pequot Tribe of Connecticut,[11] and a number of tribes in the Upper Peninsula of Michigan.[12]

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[6]The Indian Self-Determination and Education Assistance Act of 1975 (Public Law 93-638) allowed tribes to begin to recover the power to manage their communities. Subsequent extensions of and amendments to this law granted tribes substantial discretionary power to reallocate funds between federal programs and take responsibility for the prioritization of tribal policy. (Cornell *et al*., 1998, page 6)

[7]*Seminole Tribe of Florida v. Butterworth* 491 F.Supp. 1015 (1980)

[8]In both this and the Appeals Court decision, the court looked to *Bryan v. Itasca County* to determine the extent of state jurisdiction under Public Law 83-280. In *Bryan* the court developed the civil/regulatory, criminal/prohibitory test. Civil jurisdiction under PL 83-280 applies only in private disputes between Indians and between Indians and non-Indians in Indian Country.

[9]*Seminole Tribe of Florida v. Butterfield*, 658 F.2d 310 (1981)

[10]The Penobscot Tribe of Maine established Penobscot High Stakes Bingo was established in 1973, one of the first Indian Gaming Operations in the country, located on Indian Island, Old Town, Maine. (Source: http://penobscotbingo.com/)

[11]The Mashantucket Pequot's high stakes bingo parlor was opened on July 5, 1986 (Eisler, page 107).

[12]In the early 1980's, the Keweenaw Bay Tribe began conducting high stakes bingo games in Baraga in the Upper Peninsula of Michigan. ("A History of Indian Gaming in Michigan" found at http://www.house.state.mi.us/hfa/gaming96.htm, accessed April 16, 2002)

As the Seminole bingo operations began to prosper, the 25-member Cabazon Band of Mission Indians of Indio, California was dealt a serious financial blow when the Supreme Court of the United States decided that states could impose sales taxes on cigarettes sold to non-Indians on reservations, thereby wiping out the Cabazon's large-scale cigarette sales operation over night.[13] On October 16, 1980, the Cabazons responded by opening a poker room with backing from representatives of the Dunes Hotel in Las Vegas.[14] Within days, local police seized the tables and chips and arrested employees for allegedly violating an ordinance of the City of Indio prohibiting poker games (Mason, 2000, p. 48). The tribe filed suit in federal district court. A court order allowed the card room to operate while the matter was being adjudicated. The Ninth Circuit Court decided that the Indio police could not prohibit the games because the card room was on trust land and, therefore, not a part of the city of Indio.[15] Immediately after the decision, police from Riverside County responded and seized the tribe's gambling assets once again.[16]

The Cabazon matter was ultimately decided by the U.S. Supreme Court in *California v. Cabazon and Morongo Bands of Mission Indians*. Citing reasoning similar to that in the *Seminole* case outlined above, the court decided that while federal law gives city, county, and state authorities power to enforce criminal law on Indian trust land, these laws were not intended to make tribes subject to a state's civil code. In the majority opinion, the court also noted that only the federal government has the authority to

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[13]*Moe v. Confederated Salish and Kootenai Tribes*, 425 U.S. 463 (1976) and *Washington v. Confederated Tribes of Colville Indian Reservation*, 447 U.S. 134 (1980). In both of these decisions, the Supreme Court held that states could require tribal smokeshops on reservations to collect state sales taxes from non-Indian customers.

[14]The General Council of the Cabazon Band of Mission Indians passed tribal ordinances in February and May 1980 authorizing bingo games and the establishment of card clubs offering draw poker (Mason, 2000, p. 48).

[15]*Cabazon Band of Mission Indians v. City of Indio*, 694 F.2d 634

[16]In April 1983, the Morongo Band of Mission Indians authorized high stakes bingo that would also operate contrary to county regulations. The Cabazon and Morongo Bands sued Riverside County in Federal District Court for the Central District of California seeking a declaratory judgement that county ordinances did not apply on tribal lands and asking for an injunction preventing Riverside County from enforcing them. The court ruled in the tribes's favor, and the Ninth Circuit Court of Appeals upheld the ruling on the grounds that California's bingo law was civil/regulatory in nature and did not apply under Public Law 83-280 (*Cabazon Band of Mission Indians v. County of Riverside*, 783 F.2d 900). California appealed to the Supreme Court (*California v. Cabazon and Morongo Bands of Mission Indians,* 480 U.S. 202 (1987)).

prohibit gambling operations on Indian reservations. Therefore, if states allow a particular form of gaming within the state, it has no ability to regulate similar gaming operations on tribal land. In the case of California, bingo and card games were legal, so the court decided the laws concerning these activities were civil rather than criminal in nature.

The *Cabazon* decision had a number of far-reaching consequences. Because the federal government at the time did not prohibit gaming on Indian reservations and many states allowed (but heavily regulated) various forms of gambling, some tribes interpreted the *Cabazon* decision as allowing gambling and opened casinos shortly after the decision. State officials and gaming interests from Nevada and New Jersey began to lobby Congress to limit tribally-owned gaming operations. Not surprisingly, Native Americans did not want any federal intervention, believing that the lack of any federal laws restricting gaming on reservations and the *Cabazon* decision gave them greatest possible ability to run casinos.

The federal government dealt with the uncertainty generated by the *Cabazon* decision by passing the Indian Gaming Regulatory Act (IGRA) in 1988.[17] IGRA allows *tribes* to run gaming operations only on federally-recognized trust land and under certain conditions. IGRA divides gaming into three classes:

> Class I. Social games for prizes of minimal value and traditional forms of Indian gaming engaged in as part of tribal ceremonies or celebration;
>
> Class II. Bingo and games similar to it such as, pull tabs, tip jars, and certain non-banking card games, and
>
> Class III. All other forms of gaming including banking card games, slot machines, craps, pari-mutuel horse racing, dog racing, and lotteries.

Class I games are subject only to tribal regulation. Class II games are subject to tribal regulation with extensive oversight by the National Indian Gaming Commission (NIGC). Class III games are legal on

[17] 25 U.S.C. 2701-2721

reservations only if gaming has been authorized by a NIGC-approved tribal ordinance and agreed upon by a tribal-state *compact*. The compact specifies the nature of the gaming operation (types of games, size of the casino, etc.), and the law places the burden on the state to show that they are bargaining in good faith. The law stated that if compact negotiations take more than 180 days, tribes can sue the states in federal court for not bargaining in good faith, although this provision has not held up to legal challenge.[18]

Under IGRA, tribes can only offer Class III games when states allow these games elsewhere in the state. Any tribe in Nevada, for example, is eligible to operate a full-scale casino because gambling is legal in the state. Tribes in Oklahoma, the state with the most tribal members, can offer bingo and pari-mutuel betting because these are the only games legal in the state. The federal courts have broadly interpreted whether state laws allow gaming. For example, when the IGRA was passed, Connecticut allowed nonprofit organizations such as fire halls and church groups to operate "Las Vegas-style" casino nights as fund raisers. One year after the passage of IGRA, the Mashantucket Pequots, Connecticut's only federally recognized tribe at the time, requested a Class III gaming license, noting that because the state allows charity casinos, the state was required under the IGRA to allow the Pequots to operate their own casino. The state denied the request noting that the type of gambling operation considered by the Pequots was illegal. The Pequots sued in federal court, and the court decided in favor of the Pequots arguing that the statutes allowing gaming in certain situations rendered the rules concerning casino games civil rather than criminal in nature.[19] In a bid to prevent the Pequots from opening a casino, the state of Connecticut considered a ban on charity casino nights, but the bill was ultimately defeated. In April 1991, the Pequots began work to expand their bingo hall into a casino.[20]

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[18]*Seminole Tribe of Florida v. Florida*, 517 U.S. 44 (1996)

[19]*Mashantucket Pequot Tribe v. State of Connecticut*, 37 F. Supp. 169 (D Conn. 1990) aff'd. 913 F. 2d 1024 (2nd Cir. 1990), cert. denied-US-111 S. Ct. 1620 (1991))

[20]For an excellent account of Pequots quest to build a casino, see Eisler (2001).

The characteristics of tribal-state gaming compacts vary from state to state. Most states restrict the types of games, some restrict the size and number of casinos tribes can run, while others specify annual payments to the states. By law, states cannot tax the profits of tribal businesses, but in some states (such as Connecticut, Michigan, Wisconsin, California, and New Mexico), tribes have agreed to make annual payments to state governments. These fees are typically payments for exclusivity rights the state has granted the tribes. Eisler (2001) provides a fascinating account of how the Pequots added slot machines to their casino. The original compact between the State of Connecticut and the Pequots only allowed table games and bingo because slot machines were illegal in the state.[21] In 1992, the Pequots struck a deal with the state in which the tribe would pay $100 million annually or 25 percent of gross revenues on slot machines -- whichever was greater -- if the state allowed slot machines in Foxwoods, the Pequot's casino.[22] The payments would, however, not be made if the state allowed any other group in the state the right to offer slot machines. The Pequots altered the agreement to allow the Mohegan Indian Tribe of Connecticut to have slots in its proposed casino, as long as they paid at least $80 million per year for the privilege of having slots.[23] The large payments to the state by the tribes effectively prevented the state from granting a license for a proposed non-Indian casino in the Bridgeport area. In fiscal year 2002, payments to the state are estimated to be in excess of $350 million.[24]

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[21]Horton, Gary A. "The Nevada Casino Gaming Industry: An Analysis of Gaming Revenue Trends [With Particular Emphasis on the 1985-1986 Time Period]." Great Basin Research. p. 27. (Http://www.gb-research.com/CALottery/cal-part-4.pdf accessed April 17, 2002).

[22]"Indian Tribe Gets OK to Operate Slot Games." *The Times-Picayune.* January 14, 1993. p. A10.

[23]When the Mohegans won federal recognition and decided to open a casino, the Pequots renegotiated their agreement with the state. The result is that both the Mohegans and Pequots have identical agreements with the state. Each tribe must contribute 25% of gross slot machine revenue to the state monthly. If either tribe's contribution falls below $80 million in any year, its rate increases to 30% in order to ensure a combined $160 million minimum annual contribution. (OLR Research report found at http://www.cga.state.ct.us/2001/rpt/olr/htm/2001-r-0599.htm, accessed April 17, 2002)

[24]http://www.opm.state.ct.us/budget/2001-2003Budget/BigBook/PART1BudgetBrief.pdf (accessed April 15, 2002)

In Michigan, the state signed compacts with seven tribes in 1993, and tribes paid eight percent of the profits on slots to the state and two percent of profits to local governments.[25] A provision in the compact allowed the tribes to stop paying the profits tax to the state if the state allowed gaming elsewhere.[26] The two percent payment to local municipalities was to continue regardless. The payments from these tribes were not made once the state granted a casino license for the Detroit area in 1999.

We should note, however, that a number of tribes have operated casinos without compacts. This was especially prevalent in California and New Mexico where negotiations about the structure of compacts between tribes and states were particularly acrimonious.[27] In December 1991, sixteen tribes in California tried to negotiate compacts with the state.[28] The tribes wanted video poker and slot machines, but Pete Wilson, California's governor at the time, argued that only electronic lottery-style games where gamblers competed against each other rather than against the house were allowed. Negotiations between the tribes and governor's office subsequently broke down, and the two sides took the case to federal court.[29] Frustrated with the pace of negotiations with the state, about 40 tribes opened casinos with video slot machines without a state compact.

In 1998, Governor Wilson and the Pala Band of Mission Indians signed a "model" compact that limited the size and scope of video gambling on reservations.[30] Although most other tribes in the state balked at these restrictions, ten other tribes signed similar compacts.[31] In response to the Pala compact,

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[25]Copies of the compacts can be found at http://www.state.mi.us/mgcb/c-indian_compact_page.htm

[26]On July 28, 1999, the Michigan Gaming Control Board (MGCB) issued the first commercial Casino License ever issued in the state (to MGM Grand Detroit, LLC) (http://www.state.mi.us/mgcb/indian.htm).The last day of payments was June 30, 1999.

[27]For an extensive discussion of the compacts in New Mexico, see Mason (2000).

[28]http://www.thedesertsun.com/indiangaming/timeline.shtml

[29]The case became known as *Rumsey Rancheria of Wintun Indians v. Wilson,* 99 F.3d 321 (1996)

[30]http://www.thedesertsun.com/indiangaming/timeline.shtml

[31]http://www.lao.ca.gov/initiatives/2000/29_03_2000.html

many tribes launched the drive for Proposition 5 that would have overridden the governor's limits. A record $92 million was spent in on the Proposition 5 contest.[32] Proposition 5 received 63 percent of the vote,[33] but in August 1999, the California Supreme Court struck the new law down as contrary to the state constitution,[34] citing a 1984 initiative approved by voters and since incorporated into the California Constitution, that authorizes the state lottery and prohibits casino-style gambling.[35] Federal agents were then cleared to confiscate video slot machines on California reservations, but agents never moved against the casinos.

Following the Supreme Court decision, Governor Gray Davis began meeting with tribes to discuss an interim compact that would keep the casinos open until the issue came up for vote again.[36] A threat from federal prosecutors to close casinos without agreements by October 13, 1999, created additional urgency, and so in September 1999, 40 tribes agreed to sign compacts with Governor Davis.[37] The new compact allowed up to two casinos and 2,000 slot machines on any reservation in the state, contingent on a new referendum to change the state constitution.[38] In March of 2000, Proposition 1A was overwhelmingly approved by state voters.[39] Proposition 1A amended the state constitution to allow

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[32]"State Supreme Court to hear oral arguments in Prop. 5 lawsuit." Copley News Service. May 28, 1999, Friday 15:52 Eastern Time.

[33]"Heavy spending pays off for tribal casino backers ; With $70 million, proponents won right to keep slots ; ELECTION '98: STATE PROPOSITIONS." *The San Francisco Examiner.* November 4, 1998. p. A-28.

[34]Hotel and Restaurant Employees International Union v. Davis. 99 S.O.S. 6813

[35]"Indian casino expansion thrown out; State high court says Prop. 5 violates California Constitution." *The San Francisco Examiner.* August 23, 1999, Monday; Fourth Edition. P. A-1.

[36]http://www.thedesertsun.com/indiangaming/timeline.shtml

[37]http://www.thedesertsun.com/indiangaming/timeline.shtml

[38]" Davis, Tribes OK Accords to Allow More Gambling; Casinos: Twenty-Year Compacts Signed by 57 Indian Leaders Would Legitimize Nevada-style Gaming and Let it Expand. Deal Hinges on Voters' Approval of Ballot Measure." *Los Angeles Times.* September 11, 1999. P. A-1.

[39]Proposition 1A passed 64.6 percent to 35.4 percent. ("Big Casinos Move Fast To Cash In; Trump signs $60 million deal after Prop. 1A wins." *The San Francisco Chronicle.* March 9, 2000. P. A-1.)

Indian gaming.[40] Under the deal, gaming tribes will pay a total of $100 million a year into a state fund to combat gambling addiction and alleviate potential local impacts.[41,42] Tribes that forego gambling operations will receive payments $1.1 million per year per tribe.

B. The Growth of Indian-Owned Casinos 1988 - Present

The speed with which Indian-owned gaming operations have developed is staggering. In Figure 1, we plot the number of casinos run by Indians and the fraction of Indians in reservation service areas[43] (in the lower 48 states) that are in tribes with casinos. A few tribes had casinos prior to the passage of the IGRA but by 1989, this represented a small fraction of Indians in service areas. Our data show that by 1999, there were about 200 casinos covering 50 percent of Indians in reservation service areas (based on 1989 populations).

In Table 1, we provide some indication of the size of Native American gaming operations. In this table, we report revenues and market shares for gaming by industry for 1982 and 2000. In real dollars, revenues for legal gaming have increased threefold since 1982. Much of this growth has been fueled by new "products" namely state lotteries, Indian-owned casinos, and riverboat casinos. Of the $43 billion increase in gaming over this period over three-quarters of the growth, or $32.8 billion, was in these sectors alone. Despite the growth in these sectors, revenues to Las Vegas and Atlantic City casinos doubled over this time, while revenues from horse racing fell 18 percent.

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[40] http://www.thedesertsun.com/indiangaming/timeline.shtml

[41] "Indian Gaming Issue Before Voters Again; Supporters hope Prop. 1A will resolve debate." *The San Francisco Chronicle.* February7, 2000. P. A-15.

[42] SEC. 5.0 Revenue Distribution of the model compact addresses this issue. A Copy of model compact may be found at http://www.cgcc.ca.gov/tsc.doc

[43] Reservation service areas include some communities adjacent or contiguous to reservations that include tribal members.

Revenues from Indian-owned gaming are, however, very uneven across tribes. In a survey of 106 tribes, the GAO (1997) notes that 82 percent of tribes in their survey generated less than $20 million in revenues from gaming operations. At the other end of the spectrum, it is estimated that half of all revenues come from just 20 casinos (National Gambling Impact Study Commission Report ,1999, p. 6-2). Much of the discussion in the popular press, has generally focused on the operations of these larger establishments, especially the two facilities in Connecticut: Foxwoods run by the Mashantucket Pequots and Mohegan Sun run by the Mohegans.

The growth of Foxwoods has been the subject of two popular books: Kim Eisler's *Revenge of the Pequots* and Jeff Benedict's *Without Reservation.* The Pequots have been featured in long articles in many major newspapers such as the *New York Times, Wall Street Journal,* and *Boston Globe* and on such TV programs as *60 minutes*. The experiences of these two casinos are not typical compared to most Native American casino operations. First, the Mohegans and Pequots are relatively new tribes, receiving federal recognition in 1994[44] and 1983[45], respectively. Second, the size of their operations dwarfs those of most other Indian establishments. In Table 2, we report the median values of some important Indian-owned casino characteristics. The median tribe with a casino is small (800 members), has 450 slot machines with 27,000 square feet of gaming space, and has one million people that live within 100 square miles of the casino.[46]

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[44]The federal government formally recognized the Mohegan Nation on March 7, 1994. (http://www.mohegan.nsn.us/tribe/h100content.html accessed April 30, 2002)

[45]The Mashantucket Pequots gained federal recognition in October 1983 when President Reagan signed the Mashantucket Pequot Indian Land Claims Settlement Act (Eisler, 2001, p. 87).

[46]To calculate this number, we first generated a master list of zip codes for casinos. This procedure is described in detail in Section VI below. Second, we attached the longitude and latitude for the centroid of the zip code from an updated list purchased at http://www.zipinfo.com/products/z5ll/z5ll.htm. Next, we calculated the great circle distance from those zip codes with a casino to all zip codes, using the longitude and latitude of population centroids contained in the zip code file of the Gazetteer file system of the U.S. Census Bureau downloaded from http://www.census.gov/geo/www/gazetteer/places.html . With this match, we can then calculate the number of people who live in zip codes with population centroids within 100 miles of a zip code with a casino.

In contrast, Foxwoods is advertised to be the largest casino in the world with 315,000 square feet, almost 6,000 slot machines, and 13 million people living within 100 miles of the casino. To provide some basis for comparison, the largest casino in Las Vegas is the MGM Grand with 171,500 square feet of gaming space and 3,770 slot machines, whereas the largest casino in Atlantic City is the Trump Plaza with 2,900 slot machines and 138,305 square feet of gaming space.[47]

Tribal governments' interest in gaming as an industry is driven in part by the poor social and economic conditions on many reservations. In 1990, there were slightly less than two million Native Americans in the lower 48 states, about 500,000 of which live on reservations. Native Americans represent only about 60 percent of the population on reservations.[48] In Table 3, we report basic social and economic data from the 1990 Census for Native Americans living on reservations. To provide a basis for comparison, we also report characteristics for all Native Americans and for all U.S. citizens. Because the vast majority of reservations are located in rural areas, we also provide information for three of the poorest groups in America: whites, blacks, and Hispanics living in rural areas with less than 1,000 people. As these numbers indicate, Native Americans living on reservations are among the poorest and least educated of the groups listed. Compared to the United States as a whole, Native Americans on reservations have 60 percent lower incomes and nearly five times the poverty rate. Much of the lower income can be traced to lower labor force participation rates and higher unemployment rates among this group. Among adults aged 25 and older, Native Americans on trust land have twice the high school drop out rate and one fifth the college graduation rate of the rest of the United States. About one fifth of households on reservations do not have complete indoor plumbing or access to a vehicle; one sixth do not have complete kitchens; and over one-half do not have a telephone in the home.

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[47]These numbers are taken from http://www.gamblinganswers.com.

[48]*1990 Census of Population, Social and Economic Characteristics, United States*, and *1990 Census of Population, Social and Economic Characteristics, American Indian and Alaska Native Areas.*

Comparing Native Americans on trust land to others living in remote areas, Native Americans fare much worse than all groups for most of these measures. Only rural blacks have a lower median household income, but Native Americans on trust land have a larger fraction of people in poverty. Unemployment rates are nearly double those of other rural populations. More Native Americans have high school diplomas than other rural groups, but the percentage with a college degree is about 20 percent lower. In terms of household amenities, Native Americans on trust land fare worse on all measures.

III. The Impact of Casinos on Tribes: Previous Literature

Gaming has been hailed as the "new buffalo" by some and criticized as contributing to the demise of Native American culture by others. Indeed, some tribes have been very successful in operating casinos and generating large amounts of revenue. The obvious example here is Foxwoods; however, as described above, this is not a typical tribally-owned casino. Other tribes such as the Hualapai in Arizona and the Lummi Tribe in Washington State have opened casinos and been forced to close them for lack of business.[49,50] Again, these instances are rare.

The IGRA stipulates that tribal governments, not individuals, may operate gaming operations, and so the proceeds of the industry should go back to fund tribal government programs.[51] Specifically, "net revenues from any tribal gaming are not to be used for purposes other than to (1) fund tribal government operations or programs, (2) provide for the general welfare of the Indian tribe and its members, (3) promote tribal economic development, (4) donate to charitable organizations, or (5) help fund operations of local government agencies."(GAO (1997), p. 2). In some cases, tribes pay dividends

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[49]"Hualapai Casino Closes; It's the 1st in the State to Fail, but 16 Others Are Making Money." *The Arizona Republic.* October 21, 1995: A1.

[50] Sean Cavanagh. "Lummi Casino Shut; 238 Laid Off -- Tribes Struggle as Canadians Bet at Home." *The Seattle Times.* August 26, 1997: B1. Online. Lexis Nexis. 29 May 2002.

[51]25 US Code Section 2710(b)(2).

directly to members.[52] In most cases, the payoffs are small, but in a few cases the annual payments can reach tens of thousands of dollars.[53] Tribes with large annual payments to members represent a small portion of the tribal population in this country. Most of the benefits of gaming must, therefore, come from enhanced employment opportunities generated by the casinos and related businesses.

Anecdotal evidence suggests that casinos are having large employment effects. The National Gambling Impact Study Commission Report provides a few accounts that gaming is increasing employment on reservations. It reports that for the Mille Lacs Band of Ojibwe in Minnesota, unemployment decreased from 60 percent in 1991 to almost zero as of 1998. Similarly, for the Oneida Tribe of Wisconsin, unemployment decreased from almost 70 percent to less than five percent (National Gambling Impact Study Commission, 1999, p. 6-16). The increased employment is not necessarily in the casino itself. Some tribes have used revenues generated by the casinos to diversify their economic base, and as a result, employment opportunities have expanded. The Yavapai-Apache Nation, for example, has become the largest employer in the Verde Valley in Arizona. The tribe has its own construction and maintenance crews and its own Roads and Public Works Department.[54]

Although Indian-owned casinos have received a lot of attention in the popular press, few authors have examined the economic impact of Indian-owned gaming operations. Much of the literature has examined the impact of gambling on public finance and the local community. The National Gambling Impact Study Commission (NGISC) was formed by Congress and tasked with conducting "a comprehensive legal and factual study of the social and economic implications of gambling in the United

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[52]The National Indian Gaming Association reports that only about one quarter of gaming tribes (47) make per capita distributions to members. (*National Indian Gaming Association Library & Resource Center Homepage*).

[53]The Shakopee Mdewakanton Sioux Community, for example, reportedly makes annual per capita payments in excess of $900,000 (Doyle).

[54]From the Public Relations Department of the Yavapai-Apache Nation, December 1999

States."[55] To ensure complete coverage of tribally-owned gaming, the Commission established a Subcommittee on Indian Gambling. The Commission's final report was released in June 1999, and it devotes one chapter exclusively to Indian-owned establishments. Because the data for this portion of the report was primarily derived from site visits and testimony, the results are anecdotal rather than analytic. But the conclusion of the Commission's report is that the impact of tribal casinos is positive.

A later chapter of the NGISC's Final Report includes new research by Gerstein *et al* (1999) of the National Opinion Research Center (NORC) that examines the social and economic impact of a variety of gaming operations. The authors constructed a panel data set containing published economic and social indicators between 1980 and 1997 for 100 communities, 40 of which had casinos open in the time period. Five communities already had casinos in 1980.

In models that control for community fixed effects, Gerstein *et al* find no statistically significant effect of casinos on bankruptcy filings, crime, and infant mortality, but they find most measures of economic activity increase after a casino opens. Gerstein *et al* find that per capita casino spending rises 237 percent, unemployment rates decrease 12 percent, income maintenance dollars, unemployment insurance, and other transfers decline, and they find a 43 percent increase in earnings in hotels and lodging and a 22 percent increase in earnings in recreation and amusement industries. All of these economic results are statistically significant.

Taylor, Kreps, and Wang (1998) extend the NORC analysis to look specifically at the impact of Native American-owned casinos on surrounding non-Indian communities. The NORC data set, however, only contains data for 24 communities with tribally owned casinos. Taylor *et al* find that total income and net earnings increase in non-Indian communities when an Indian casino is opened nearby. They also find that there is a decline in income associated with income maintenance programs and from transfer payments that is much larger in communities with Indian casinos than in communities with other types of

[55]National Gambling Impact Study Commission Act, Sec 4(a)(1)

casinos. Local government earnings decline for casinos generally, but for communities with Indian casinos, there is a rise in government earnings. Looking at social outcomes, Taylor *et al* find that in communities in which an Indian casino is opened, there is a net decline in auto theft and robbery. In contrast, the Gerstein *et al* analysis found no significant impact of casinos on crime variables. Taylor *et al* argue that the statistically insignificant results in Gerstein *et al* "may be driven by the fact that aggregation of Indian and non-Indian casinos would mask an underlying difference of effects on crime; [they] find a statically significant and positive effect for non-Indian casinos." (1999, p. 27). They also point to potential differences in communities that see the introduction of Indian casinos versus non-Indian casinos. Generally, Indian-owned casinos tend to be in more rural and poorer markets (Taylor *et al* (1998), p. 28).

A 1997 General Accounting Office (GAO) study provides a snapshot of the Indian gaming industry and summarizes the federal tax treatment of Indian tribes and tribal members. Tribes are required to file annual financial statements with the National Indian Gaming Commission (NIGC).[56] Financial statements for 178 facilities (of 281 facilities operated by 184 tribes as of December 31, 1996) reported $4.5 billion in revenues from gaming and over $300 million from related activities. The GAO reports that median revenues for a class III gaming establishment were $12.7 million, and for a class II establishment, median revenues were $2.5 million. Of the 126 tribes included in the analysis, 106 reported receiving $1.6 billion in transfers. An additional $91 million was received by some tribes for taxes, rents, and cost reimbursement. Ten tribes accounted for more than half of the transfers. Twenty tribes reported no transfers. The GAO was not able to determine whether the transfers were received by the tribe or by tribal members or how the funds were used.

[56]These reports have been ruled to be protected from release under the Freedom of Information Act, and so they are not publicly available; however, the NIGC provided the GAO with financial statements for 1995.

IV. Econometric Model

In this section, we describe in detail the statistical model that will be used in this analysis. As we outline below, our primary data set includes information for all tribes in the lower 48 states for the years 1983, 1989, 1991, 1993, 1995, 1997, and 1999.[57] During this time, many tribes opened casinos, but some did not. To estimate the impact of gaming on reservations, we use a "difference-in-difference" estimator. In this model, we compare the outcomes of tribes before and after they open casinos (the treatment group) with the outcomes over the same period in tribes that did not open casinos (the comparison group). Because the full impact of the casino may take years to appear, we allow the effect of the intervention to change over time.

The exact empirical specification is as follows. Define the outcome of interest for tribe i in year t as the variable Y_{it}. The basic econometric model is therefore

$$(1) \qquad Y_{it} = X_{it}\$ + YRS01_{it}\ "_1 + YRS23_{it}\ "_2 + YRS4+_{it}\ "_3 + u_i + 8_t + ,_{it}$$

where X are the county-specific demographic characteristics, u_i is a tribe fixed effect, 8_t are year effects, and $,_{it}$ is a idiosyncratic error. The variable YRS01, YRS23, and YRS4 are simple indicators that measure the time since a tribe opened a casino. YRS01 equals one in the year a casino opened and the first full year of operation, YRS23 equals one in the second and third full years of operation, and YRS4+ equals one in the fourth or more full year of operation. We could have entered separate indicators for each year (0 to 4+), but because our data are observed only every two years, we would have few observations that equal one for every variable. To increase the precision of the estimated treatment effects, we pooled the treatment effect variables across years.

[57]We do not have a complete time series of data for Alaska Natives. Prior to 1995, data are available only by agency.

The coding for when a tribe opened a casino is not straightforward. In practice, we want to estimate the impact of casinos that opened up after the Cabazon decision in 1987. Most casinos opened after a tribe signed a compact with a state. In this case, the year casino operation began is clear; compacts were only signed in the post-Cabazon period. If a tribe opened more than one casino, we use the date the first casino opened. However, many tribes grew impatient with the slow pace of some negotiations, and they forced the state's hand by either opening up a casino or adding casino-style games to existing bingo or other Class II establishments. As described above, this course was popular in California and New Mexico. Once a compact was signed, tribes then expanded operations. In these instances, we consider the date a tribe added Class III games to its casino the opening date. For example, the Acoma and Isleta Pueblos of New Mexico opened Class III style operations in 1987 and 1994, respectively, but the tribes did not sign compacts with the state until 1995, and operations grew considerably afterwards. We consider the early dates the official opening of the casino. The expansion of operations that occur after a compact was signed is therefore just a natural growth of the initial casino, and the impact should be picked up in the parameters θ_1 through θ_3. There were, however, a small number of Class III-type casinos that were in operation long before the passage of the IGRA. The Bay Mills Reservation in Michigan and Ho-Chunk Nation of Wisconsin both had Class III type establishments as early as 1983. There were a number of small casinos at California Rancherias in the 1970s and 1980s as well. Because we primarily use data from the 1989-1999 period, these casinos were in existence by the start of our sample, and therefore, their impact should be captured by the tribe fixed-effect. However, most of these operations were expanded considerably after the tribes signed a compact. As a result, we define the compact signing a "new" casino and consider this as the opening date. So when the Bay Mills Reservation and Ho-Chunk Nation signed compacts in 1993 and 1992 respectively, these are events that would not have happened in the absence of the IGRA so we consider this to be a new opening and adjust the three "years after opening" indicators accordingly.

The tribe fixed-effects are critical in this context for two reasons. First, most of the variation in outcomes will be between tribes and not within a tribe over time, so the fixed-effects help explain variation in the dependent variable. Second, and more importantly, the fixed-effects help control for the potential nonrandom selection of tribes into gaming.

Many of the casinos are concentrated in a small number of states like Michigan, Minnesota, Arizona, Washington, New Mexico, and Wisconsin. The economies of these states were particularly robust during the 1990s. For example, average annual unemployment rate fell by two percentage points between the 1986-1988 and 1998-2000 time periods for the nation as a whole. In the six states listed above, the unemployment rate fell by an average of 2.82 percentage points over this period, and all six states had declines in excess of two percentage points. If a rising tide lifts all boats, then some of the growth in outcomes that happened on reservations in these states would have occurred anyway. To control for these local economic cofactors, we add economic variables measured in the county where the tribe's reservation or trust land is located.[58]

Finally, we note that we have deleted data from Oklahoma in the primary regressions. There are more tribal members living in Oklahoma than any other state, with 35 percent of all tribal members in the lower 48 states in 1999. But in Oklahoma, Class III gaming is limited to pari-mutuel betting; most tribes run bingo halls, and no tribe has a compact allowing Las Vegas-style casino.[59] Oklahoma also has only one reservation. Instead, most tribal members live in tribal service areas that may sometimes overlap. Because our focus is on the impact of casinos rather than bingo parlors on reservation life, our decision to exclude data from Oklahoma is not crucial -- including them in our sample would simply change the

[58]For tribes located in only one county, the choice of county is clear. For tribes located in multiple counties, we select the county with the largest Native American population on trust land per the 1990 Census.

[59]Some tribes in Oklahoma offer electronic bingo machines which look like slot machines but some courts have determined are not slot machines. As a result, such machines are categorized as Class II gaming. ("Unregulated Bingo Game Leading Blackfeet to Gambling." The Associated Press State and Local Wire. Online. Lexis /Nexis. May 11, 2002.

collection of tribes in the comparison group. These tribes did, however, receive some "treatment," namely, the opening of bingo operations after the passage of the IGRA. Later in the paper, we examine the impact of these bingo parlors on Oklahoma tribes separately.

V. Data

To examine the impact of tribally-owned casinos, we need three basic types of information. First, we need information about economic outcomes on or near reservations. Second, we need information on where and when casinos opened. Third, we need information about the counties in which casinos are located. No one source has all this information. In this section, we describe the data for this analysis.

A. Data on Economic Outcomes

The Bureau of Indian Affairs (BIA) publishes basic population and labor force statistics for every federally recognized tribe biennially. These data include tribal enrollment, total Indian resident service population,[60] limited age distribution information,[61] the number of people not available for work, total labor force, the number employed, the number and percent unemployed, and the number and percent employed but below poverty guidelines.[62] Data are currently available for 1983, 1989, and odd numbered years in the 1990's.[63] Data are provided for each tribal group; a tribe may be located at two separate

[60]The Service Population is the tribe's estimate of all American Indians and Alaska Natives, members and non-members, who were living "on-or-near" the tribe's reservation during the calendar year and who were eligible for BIA funded services. Typically, Indians included in this number live within a reasonable distance of the reservation.

[61]Data are available on population under age 16, aged 16 to 64, and aged over 65.

[62]Each tribe, using the Department of Health and Human Service's (HHS) Poverty Guidelines, estimated the number of their employed work force who were below the poverty guideline. The percentage was derived by dividing this figure by the total number employed. Prior to 1997, the BIA reported the number of employed earning above the HHS poverty guidelines. The earlier data were adjusted to be consistent with post-1997 data.

[63]Data are available for 1985, but after an interlibrary loan request, a trip to the U.S. Department of Interior Library, and repeated calls to the BIA, we failed to find a copy of the document.

locations, and data are provided for each location separately.[64] These data are collected under a requirement of the Indian Employment, Training, and Related Services Demonstration Act of 1992[65] and are provided by representatives of each tribe. In 1999, there were 556 federally recognized tribes with an aggregate enrollment of almost 1.7 million (*Indian Labor Force Report, 1999,* p. i.).

In Table 4, we report some summary data for tribes in the lower 48 states in 1983, 1991 and 1999. As the results demonstrate, the average tribe has increased from 1,997 members in 1983 to 2,771 in 1999. Although the percentage of adults employed has increased by almost 30 percent over this period, the fraction of adults working in 1999 is small relative to the rest of the United States. The fraction of tribal members who are employed but poor has decreased since 1983 by 15 percent.

It is important to recognize the limitations of these data. The data are self-reported by tribes through a simple survey instrument. If a tribe does not respond to the survey, the Tribal Operations Officer at the BIA compiles the data. Self-reporting raises some concerns about data consistency. For example, some tribes report information for only those members who live on reservations while others report information for the tribe's Indian "service population" which includes tribe members who live outside a reservation.[66] Similarly, tribes differ in their definitions of who is eligible for tribal membership with most tribes requiring members be at least one-quarter Indian. So long as tribal service areas and eligible populations are defined consistently over time within a tribe, the fact that there are differences in reporting procedures should not pose a problem in our empirical work.

The self-reported nature of the data raises concerns about its accuracy. However, most evidence

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[64]For example, in each report, there are nine observations for the Navajo Nation: the Chinle Navajo in Arizona, the Eastern Navajo in New Mexico, the Fort Defiance Navajo from Arizona and New Mexico, the Shiprock Navajo from Arizona, New Mexico and Utah, and the Western Navajo from Arizona and Utah.

[65]Public Law 102-477

[66]Includes tribal members on or near the reservation who are eligible for BIA funded services. It excludes members who are away serving in the Armed Forces or attending a post secondary institution. (*Indian Labor Force Report, 1999*. P. ii)

suggests the data reflect the underlying characteristics of the tribal population. For example, the BIA indicates that about half of Indians and other Native Americans live on or near reservations.[67] Comparing the BIA data with information from the 1990 Census, we find that the self-reported BIA population figures for 1989 are approximately half the total number of people in the Census who self report being Native American.[68] We also compared population and employment data from the BIA for 1989 with similar data from the 1990 Census. Specifically, using data from Summary Tape File 3, we match Census data, which are available by reservation, to BIA data by tribe for 1989.[69] As Figure 2 shows, when we compare the natural log of population data from both sources, there is a strong correlation between data sets. The same is true for the natural log of employment, reported in Figure 3. The data match less well for the employment to population ratio, as Figure 4 shows, but most of the observations lie along or near the 45-degree line.

B. Data on Tribally-Owned Casinos

There is no single source of data documenting the age and size of Indian-owned casinos. We were, however, able to construct a master-list of Indian-owned casinos and descriptive information about each casino from a number of sources. This exercise was aided greatly by the Internet and by the fact that there are many web sites that describe casinos for gamblers.[70]

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[67] *The United States Department of the Interior Budget Justification and Annual Performance Place Fiscal Year 2001: Bureau of Indian Affairs.* P. BIA-7.

[68] It should be noted that, in the Census, race is self-reported, whereas to be included in the BIA numbers, you must be a registered tribal member, which generally means having one-quarter or more Native American blood, and having that certified.

[69] This required matching reservation and tribe names between the BIA and Census data sets. This was a manual process, and in some cases it required additional research to be able to make a match. In some cases, reservation names had changed or one data set was more disaggregated than the other was.

[70] See, for example, http://www.gamblinganswers.com or http://www.casinocity.com/

Gaming Tribes. We obtained a complete list of tribes with gaming compacts from the BIA web site, which allowed us to compile a partial list of gaming tribes and provided a starting point for the endeavor.[71] The National Indian Gaming Commission's web site provides a second list of gaming tribes, and it includes gaming tribes, both with and without compacts.[72] It also includes the names of the tribal casino in many cases. We cross-checked this list with casino lists from Internet sites such as Gambling Answers and Casino City.com.[73,74]

Opening Dates. Determining the date on which a casino opened in not a simple task. A complete list of when compacts were signed is available on the Bureau of Indian Affairs web site. Unfortunately, as we discuss above, there is not a one-to-one correspondence between when compacts are signed and when tribes begin to operate casinos. Some tribes operate casinos with no compact in place (e.g., the Seminole Tribe in Florida). Others begin operating a casino and then negotiate a compact with the state. Still others do not begin to operate full-scale casinos until after they have signed a compact with a state. Finally, certain tribes have signed compacts in place, but do not operate a casino at all.

Compiling a list of casino opening dates involved several steps. In many cases, a search of popular press articles or even casino web sites was sufficient to provide an opening date. In other cases, we had to call individual tribes or casinos to inquire as to when a casino had begun operation.

C. County-Level Characteristics

To control for economic characteristics near a tribe, we include a number of time-varying county-

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[71]This list is available at http://www.doi.gov/bia/gaming/complist/gamingcmptindex.htm (As of May 6, 2002, this site is not accessible.)

[72] Http://www.nigc.gov

[73]Gambling Answers maintains a database of casinos in the United States that contains the address and telephone number of the casino, square footage, number of slot machines, number of gaming tables, and number of bingo seats.

[74]See, for example, http://www.gamblinganswers.com/c/273.cfm (accessed May 6, 2002).

level variables. These fall into two categories: economic variables and population measures. We obtained the economic variables from the Bureau of Economic Analysis (BEA). These include county-level estimates of per capita income, the total number of jobs covered by unemployment insurance programs, and the average annual wage of covered jobs. These data are downloadable from the BEA as part of their Regional Economic Information System (REIS).[75] We obtained population data from the U.S. Bureau of the Census,[76] for 1990-1999 and from University Consortium for Political and Social Research (ICPSR)[77] for the 1980-1999 period. Dividing covered jobs by adults in the county, we construct a measure of jobs per adult. We deflate per capita income and wages on covered jobs by the Consumer Price Index to convert them into constant 2000 dollars.

Using county-level data requires that we know the counties in which tribes are located. The 1990 Census publication *General Population Characteristics: American Indian and Alaska Native Areas* provides population data by reservation, and within each reservation provides the counties in which that population is located. The majority of tribes are located in only one county, and so there is no question as to their location. For tribes that are located in multiple counties, we selected the county with the largest Native American population as the county for the given tribe.

VI. Empirical Results

In Table 5, we report basic results for the model described above. We use five outcomes: the natural logs of tribal population and employment, the ratio of employment to adults, the fraction unemployed, and the percent working but poor. In our conversations with tribes that run gaming operations, one of the first impacts of gaming is to encourage return migration to the tribe. Because we

[75] http://www.bea.doc.gov/bea/regional/reis/ or available on the REIS CD.

[76] http://www.census.gov/population/www/estimates/countypop.html.

[77] Revised estimates of the population of counties by age, sex, and race [United States]: 1980-1989, ICPSR 6031.

do in fact find that employment is increasing in tribes, examining variables such as the employment to population ratio may not capture the full change in economic activity since both the numerator and denominator of the variable is changing over time. As a result, we examine the change in natural log of employment as well.

Looking at the results in Table 5, we see a monotonic increase in population and employment, and the employment-to-population ratio, plus a monotonic decline in the unemployment rate and the fraction working but poor through the first four years after a casino opened. Four or more years after a casino opens, we find that population on reservations increases by 12 percent, employment by 26 percent, while the employment-to-adults ratio has increased by 4.8 percentage points, a 12 percent hike over the sample average values for 1989. Over the same period, the unemployment rate has fallen by about 10 percent or 4.4 percentage points while the fraction working but poor has dropped by 5.5 percentage points, 14 percent over 1989 sample means.

To shed some light on who is returning to the tribe, we run a set of regressions using the natural log of population for different segments of the population: under 16, those aged 16 to 64, and those 65 and over. Four years after a casino has opened, there is essentially no change in the population over the age of 65, but the population under age 16 and those 16-64 have increased by increases by 18 and 15 percent respectively. These last two results are statistically significant.

All of these results would overstate the impact of tribal-owned casinos if tribes with faster than average economic growth in the 1980s were the most likely to adopt gaming. Likewise, the results would be biased downwards if tribes with poorer economic prospects were the ones most likely to adopt gambling. Neither of these instances appears to be the case. We performed two types of tests to analyze this question. First, we re-ran our basic model from equation (1) adding in two dummy variables that equal one in the first and second, and third and fourth years before a tribe open, respectively. If tribes that opened casinos were the ones who were growing faster anyway, we would expect these coefficients

to be statistically significant and positive in the log employment, log population, and employment to populations models, but negative in the other models. The results presented in Table 5 can be thought of as the restricted version of these models where we set the two lead coefficients to zero. In the final row of Table 5, we report the p-value on the F-test for the null hypothesis that the leads are both equal to zero. In all cases, the p-values are exceedingly high showing that there was no statistically significant movement in the economic variables prior to a casino opening.

Prior levels or changes in economic conditions also do not predict which tribes will adopt gaming. In Table 6, we report the results of probit models where we examine the covariates that predict whether a tribe opened a new casino by 1995 or 2000. In these models, we include as covariates the level of tribal economic activity in 1991 (log employment, employment to population, etc.) or the change in economic activity between 1983 and 1989. For these models, we delete tribes in states where, because of state law, a Class III casino could not be opened. In the tables, we report the marginal effects which are the changes in the probability a casino will open given a change in the covariate. In these probit models, none of these economic variables were statistically significant when entered individually or as a group. The only variable that was routinely statistically significant in these probit models as a measure of the population living within 50 miles of tribal headquarters. Tribes with fewer people living near the casino are less likely to open a casino by either 1995 or 2000.

In Table 7, we examine whether the results in Table 5 are sensitive when we alter the basic model. Each row of the table represents a different set of models, and the coefficient reported is the estimate for the coefficient on four or more years after a casino opens. For comparison purposes, we report in the first row the basic results from Table 5.

As we noted above, many of the tribally-owned casinos are located in a handful of states and the economies in these states were particularly robust during the 1990s. In the basic model, we control for local labor market conditions by adding some covariates to the model that describe the economies in the

county. If casinos are more likely to be located in states whose economies are increasingly improving during the 1990s, then we may overstate the economic improvements associated with a casino opening. Subsequently, in the second row of Table 7, we add state-specific year-effects as controls to the model. In these models, most of the coefficients are smaller than in the first row of the table, but the magnitudes are still striking. The lone exception to this point is the coefficient in the unemployment regression that drops to a small and statistically imprecise value.

We noted above that the BIA data are available for 1983, then not again until 1989 and from then on, it has been collected every two years. Because of the gap between the first and second surveys, our basic models included only data from 1989 and on. In the third row of Table 7, we add information from the 1983 survey. In the fourth row, we add the 1983 data and state-specific time effects. The results from these models are virtually identical to those in Table 5.

In the fifth row, we weight the basic model by tribal population, which means the regressions are estimating the impact of gaming on a randomly selected tribal member throughout the country. The results from this model are substantially the same in the employment to population ratio and unemployment rate models, but generate a smaller and statistically imprecise coefficient in the working but poor model. Because the weighting over-weights the impacts from larger tribes, these results suggest that the economic impact of tribally-owned casinos may be very different for small tribes. We will return to this point in a moment.

Finally, in the last row of the table, we add data from 1983, include state-specific time effects as covariates, and weight the data by population. In these models, four or more years after a casino has opened, we find that the employment per adult ratio has increased by nine percentage points and the fraction working but poor has declined by 15 percentage points. In sum, the basic results in table 5 are fairly robust to the set of covariates we use, the time period of analysis, and whether we use population weights.

In Table 8, we examine the heterogeneity in the impact of casino-style gaming based on tribe characteristics. In this case, we consider two sets of results. Tribes with casinos vary considerably in size, ranging from a handful of members to those in the thousands. The employment benefits of a casino may best be captured by a large tribe who have lots of members to employ. One theme we have detected in popular press reports about casinos is the notion that only tribes who are lucky enough to have a casino near a large population center are succeeding. For example, in a Boston Globe report about Indian casinos, one reporter noted "The result: Untold riches for a few, smaller tribes, annual revenues of $100 million or more for a couple of dozen additional tribes near major urban centers, and continued poverty for the vast majority of Indians spread out across rural America."[78] Therefore, a second set of regressions considers whether the impact of the casinos varies based on the population within 50 miles of a casino.

The results from both sets of regressions are reported in Table 8. In this table, we only report the coefficient on the dummy variable for four or more years after a casino opens. In the top half of the table, we run separate regressions for tribes whose 1989 populations were less than 250, 250 to 1,250 and more than 1,250, and in the bottom half, we consider markets sizes within 50 miles of tribal headquarters of less than 75,000 people, 75,0000 to 500,000 and more than 500,000. Each coefficient in the table represents a different regression.

All tribal population groups show a rise in employment and population, but the results are only statistically significant for the two largest population groups – although the coefficients in the less than 250 group for these two regressions are qualitatively important. The impacts of casinos on almost all economic variables are much larger for the biggest tribes. Those tribes with more than 1,250 members who open a casino see a statistically significant 10 percentage point increase in the employment to population ratio and an equal-sized drop in the unemployment rate. In contrast, for this group, we see no statistically significant drop in the fraction of working poor. Employment growth is not as large in

[78]Michael Rezendes. "Tribal Gamble: The Lure and Peril of Indian Gaming. Few Tribes Share Casino Windfall." *The Boston Globe.* December 11, 2000. (http://www.boston.com/globe/nation/packages/gaming/part2.htm)

medium-sized tribes, but it is still substantial. These tribes have experienced a tremendous drop in the fraction of working poor, but the employment growth is about equal to the population growth, so we find no statistically significant drop in the employment to adults ratio. In general, these results suggest that for the outcomes we consider, larger tribes seem to be much more able to exploit the benefits of casino gaming.

In the bottom half of the table, we consider results based on market size for gaming, that is, the fraction of people living within 50 miles of a casino. Employment growth four years after a casino opens is large in all market sizes, but the largest gain is actually in the more rural markets. Because there is little change in population for tribes located in more urban areas, the largest gain in the employment to adult ratio is in this group. Still, tribes in very remote areas are experiencing a four percentage point increase in the employment to adult ratio and a 21 percentage point drop in the fraction of working poor. This last result represents about a 50 percent decline in this variable.

In Table 9, we examine results for Oklahoma. As we noted above, 35 percent of tribal members in the lower 48 states live in Oklahoma, making this the state with the largest collection of tribal members. Tribes in Oklahoma primarily run bingo parlors with pari mutual betting being the only Class III gaming operation. In these models, we examine the impact of bingo parlors in Oklahoma, using tribes that did not open bingo parlors as a control. We use the same basic specification as in Table 5, including as covariates tribe and year fixed effects plus county-level covariates. As Table 9 shows, there is no significant change in tribal population, and qualitatively the change is very small. There are however, large changes in employment (a 33 percent increase four or more years after opening) but the results are not statistically significant. Sample sizes, however, are very small, around 170 for each outcome, and so a lack of statistical significance is not surprising. There is a small positive change in the ratio of employment to adult population. Both the unemployment rate and the percent of tribal members working but poor are decreasing, but with the exception of one coefficient, none of these results are statistically

significant. Unfortunately, we can say nothing precise about the impacts of bingo parlors in Oklahoma. Four years after a casinos, we find a 33 percent increase in employment and a 10 percentage point drop in the fraction working but poor, but neither of these results are statistically significant.

VII. The Impact of Casinos on the Surrounding Community

Although Class III gaming on reservations is designed to primarily benefit tribal members, there are potential benefits and costs of Indian-owned casinos to surrounding communities. Some surveys suggest that three-quarters of the people employed by Indian-owned casinos are not tribal members, and so a casino may be a new source of employment for those in the surrounding areas. At the same time, the casino may divert customers from existing businesses to the detriment of the local economy. Likewise, many observers have concerns that casinos may generate some social problems for the local community such as higher crime and bankruptcy rates. In this section, we examine these issues in detail. In all cases, we examine outcomes at the county level. It would be useful to examine some of these outcomes at a smaller level of aggregation but high quality, sub-county data for a number of outcomes do not exist at the necessary frequency to perform this analysis.

For all outcomes, we will use the same basic econometric model. In this case, we will examine the changes in outcomes in counties that received Indian-owned casinos during a particular time period and compare the changes in outcomes over time with counties that did not have new casinos. These latter counties form a control group that should eliminate any secular changes in outcomes from the analysis. Not all counties, however, are eligible to be included in the control group. Although a county may not have an Indian-owned casino within its borders, the county may still be impacted by a nearby casino. We therefore define a second "treatment" group of counties that have a population centroid that is within 50

miles of an Indian-owned casino.[79] Available data suggest the 50 mile distance is a reasonable cutoff. As we note in Table 3, most tribally-owned casinos are small operations and as a result, these casinos are not "destinations," but rather they service a local clientele. A survey of patrons at Illinois riverboat casinos indicates that 85 percent of the patrons lived with 50 miles of the casino and 98 percent spent less than a day and spent no time in hotels.[80] A survey of gamblers inside a Kansas City casino found that 88 percent live within 45 minutes of the casino. Another survey of casinos located on the Missouri River across from the Kansas border found that 94 percent of the license plates on cars in the casino parking lot had either Missouri or Kansas license plates.[81]

If Y_{cst} represents an outcome of interest for county c in state s in year t, the equation we estimate is of the form:

$$(2) \qquad Y_{cst} = X_{cst}\$ + G_{j=1 \text{ to } 4}(\text{Yearown}(j)_{cst} \text{ " } 1_j) + G_{j=1 \text{ to } 4}(\text{Year50}(j)_{cst} \text{ " } 2_j) + u_{cs} + 8_{st} + \text{ , }_{it}$$

where X is a vector of time-varying county characteristics, u is a county-specific fixed effect, 8_{st} is a state-specific year effect, and , is a heteroskedastic error. The impact of the casinos on the local and nearby counties is captured by a series of dummy variables. The variable "Year own(j)" equals one if an Indian-owned casino has been in operation within the county for at least j years. We include five dummy variables measuring the first year a casino is in existence (j=0), at least one year since the casino opened, with the last dummy variable (j=4) equaling one in four or more years after a casino opened. An additional series of five dummy variables is included in the equation that equal one if the population

[79]To construct this measure, we first identified the zip code of each casino. Next, we used data from that contains longitude and latitude for geographic centers for zip codes and assigned this value to the casino. Next, we used data from the Bureau of the Census that identifies coordinates of 1990 population centroids of counties. We then calculated the great circle distance between any county and all casinos outside their county.

[80] Better Government Association (1996).

[81]Anne Lamoy, "Kansans Leave Case at Casinos," *Kansas City Star*, September 23, 1995, p.C1.

centroid in county c is within 50 miles of an Indian-owned casino in another county. We also include a series of state-specific time effects (θ) to capture shocks to all counties within a state in a given year. For example, one outcome we consider is personal bankruptcies. Throughout the period of analysis, there have been extensive changes in state bankruptcy laws that could possibly alter bankruptcy rates. The state-specific year effects are designed to capture these changes. In all models, we weight observations by either county population or the number of adults, depending on the outcome.

We also run a series of regressions in which we include a series of dummy variables representing the number of years before a casino opens. Specifically, we include dummy variables for one through four years before opening. This will allow us to see if the changes we are seeing after a casino opens are, in fact, occurring before the casino opens.

The sample period we use for each outcome changes depending on data availability. In all cases, we have at least 10 years of data at the county level. Because our focus is exclusively on the impact of Indian-owned casinos, we will delete any state from the analysis that allows for casino-style gaming. This will delete data for states with no Indian-owned casinos (New Jersey, Delaware, Illinois, Indiana, Missouri, and West Virginia) plus some states with both Indian and non-Indian establishments (Colorado, Iowa, Mississippi, Nevada, and South Dakota). We also delete data for Oklahoma because the state does not allow traditional Class III gaming.

A. Data on Outcomes

There are four sets of outcomes we will consider: general measures of economic activity, bankruptcy, crime, and mortality.

General Economic Activity

In the previous section, we examine the impact on the employment of tribal members. In that model, we control for general economic activity in a county where a casino opens. In this case, we consider whether this activity itself is impacted by the casino. The presence of an Indian-owned casino may improve economic activity by providing a new source of employment. In many cases, most of the people employed by casinos are not Native Americans. Studies in Minnesota and California find that 73 and 90 percent of casino employees are non-Indians.[82] The casino may also foster related businesses such as hotels, restaurants, gas stations, and other entertainment in areas near casinos (Taylor *et al* (2000), p. 7). At the extreme, the casino can dramatically change the local economy. A study by the University of Connecticut estimates that the Foxwoods casino employs 13,000 people directly; another 30,000 were generated in other industries as a result of the casino.[83]

In this section, we use two outcomes in total. The first is the employment to adult population ratio. Jobs are measured as the total number of jobs for which unemployment insurance is paid in a county. This count is generated from the ES202 data collected by the Department of Labor, and the numbers are constructed from a census of all jobs that pay unemployment insurance to state programs. Since most jobs are covered by unemployment insurance, this is a broad measure of economic activity, but it is not ideal. The original unit of analysis is the worker/firm match, and therefore, workers with two jobs are counted twice. We then divide this measure of jobs by the total number of adults in the county. We also look at the natural log of total employment.

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[82] (accessed May 9, 2002) citing two studies: Economic Benefits of Indian Gaming in the State of Minnesota, January 1997, prepared by The Hospitality Group of Marquette Advisors and The Economic and Fiscal Benefits of Indian Gaming in California, July 1998, prepared by Analysis Group/Economic, Inc.

[83] Lyn Bixby, "Gamblers Seek Protection: Study Finds Higher Rate of Bankruptcy," *Hartford Courant*, June 14, 2000, p. A4 (accessed May 9, 2002).

Bankruptcies

Critics of policies that allow more casinos to open often argue that casinos increase the number of problem gamblers. Gerstein *et al* (1999) estimates that there are 2.5 million adult pathological gamblers and another three million problem gamblers[84] and that living within 50 miles of a casino doubles the chance a person will be a pathological or problem gambler (pp. viii and ix). A recent study suggests that one-third of gamblers have filed or are in the process of filing for bankruptcy.[85] To provide some frame of reference, there were about 1.5 million bankruptcy filings in 2001, about one filing for every one hundred thousand adults in the country.[86]

Between 1982 and 1998, the personal bankruptcy rate, defined as bankruptcies per one thousand adults, increased by a factor of 3.9 (U.S. Treasury Department, 1999). Over this same time period, we see in Table 1 that real expenditures on gambling increased by a factor of 3.3. This type of statistic has lead some to conclude that gambling is a chief cause of the surge in personal bankruptcy filings (SMR Research, 1997). There is, however, conflicting evidence on the exact impact of gaming on bankruptcies. In their analysis of 100 communities with gaming, Gerstein *et al* (1999) cannot conclude that bankruptcy rates are higher in counties with casinos (p. 70). Reviewing the same data, the U.S. Treasury Department (1999) also concludes that there is little evidence showing that bankruptcies increase in locales after casinos open (p. 92). In a systematic study of eight communities that recently adopted gaming which were paired with similar communities that did not have new casinos, Nichols, Stitt and Giacopassi (2000)

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[84]The American Psychiatric Association classifies pathological gambling as an impulse disorder and describes 10 criteria to guide diagnoses. The nationwide survey fielded for the National Gambling Study Impact Commission was designed to measure whether respondent's met these diagnoses. A person who met 5 or more of the criteria was considered a pathological gambler and someone who met 3 or 4 of the criteria was considered at risk of becoming pathological.

[85]Bixby, Lyn. "Gamblers Seek Protection: Study Finds Higher Rate of Bankruptcy." *Hartford Courant.* June 14, 2000: A4.

[86]"Record Breaking Bankruptcy Filings Reported in Calendar Year 2001." found at http://www.uscourts.gov/ttb/mar02ttb/breaking.html (accessed May 9, 2002).

found an increase in filings in seven communities. Our work will most closely follow that of Nichols, Stitt and Giacopassi in that we will use a difference-in-difference type methodology. However, we examine nearly all counties that had new class III gaming operations after 1989 rather than just a limited set.

Data on the number of personal Chapter 7, 11, and 13 bankruptcies filings per county are reported by the U.S. Bankruptcy Courts on a quarterly basis. Individuals typically file for bankruptcy in their county of residence or, if they have a business, where they work. Chapter 7 is what most people think of as a bankruptcy, and it is by far the most common type of formal personal bankruptcy action. Under Chapter 7, assets are liquidated, and creditors are paid. Chapter 7 eliminates unsecured debts, but some secured debts (e.g., homes and cars) are retained. Those with a steady income and an ability to meet monthly expenses can file for Chapter 13 that reorganizes debts. Chapter 13 has the advantage that it protects some assets that would be lost in Chapter 7, but it is only available to those who can show an ability to repay debts under an approved plan. Chapter 11 filings are rare and typically small business owners. We aggregate all three types of filings together and construct a personal bankruptcy rate.

Historical county-level data on bankruptcy are available from the SMR Research Corporation.[87] Filings for the previous four quarters are reported quarterly from the fourth quarter 1989. The data report Chapter 7 filings separately, but Chapter 11 and 13 filings are aggregated into one field. We use the four-quarter total from March of each year 1989 through 1999.

Crime

The potential for increased crime generated by a new casino is a persistent concern among local governments and citizens in discussions about gaming. A number of authors (Chang, 1996; Friedman, Hakim, and Weinblatt, 1989; Gerstein *et al*, 1999; Grinols and Mustard, 2001; Grinols and Omorov,

[87] http://www.smrresearch.com/countybkr.htm

1996; and Ochrym, 1990) have examined this issue in a number of case studies, and the bulk of the evidence seems to suggest crime increases in a community after a casino opens. Most of the articles examine the impact of non-tribally owned casinos. In the most detailed study to date, Grinols and Mustard (2001) 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. Our specification is very similar to this work with one notable exceptions -- our inclusion of county effects and state-specific time trends.

Grinols and Mustard (2001) provide an excellent discussion of the possible ways casinos can alter local crime rates. Casinos could decrease criminal activity if crime is negatively related to employment and casinos improve job prospects. Much of the focus has, however, been on the positive association between casinos and crime. One concern is that casinos increase problem gambling and gamblers turn to property crime to feed their habit. Another concern suggests that crime increases because the casino attracts people with a greater propensity to commit a crime. Another theory suggests that criminal activity increases after a casino opens simply because more people are clustered in a small area, and criminals go there because of the opportunities to commit crime. Finally, it is also possible that the clustering of people with cash on hand has increased expected returns to crime.

Data on crimes reported to law enforcement agencies are filed monthly with the Federal Bureau of Investigation (FBI) under the Uniform Crime Reports (UCR) program. These data are used by the FBI to construct state and national estimates of criminal activity. The raw data from these reports have been provided to the Inter-University Consortium for Political and Social Research (ICPSR), which then aggregates the data to the county level and produces annual county-level estimates of reported crime in eight broad categories: murder, rape, assault, robbery, burglary, larceny, arson, and motor vehicle theft. These data are available for the years 1977 to 1998 from ICPSR. In our analysis, we use data from the 1985 to 1998 period.

County-level UCR data are problematic for a number of reasons. First, there is inconsistent reporting across jurisdictions. Within any county, there are a number of separate law enforcement agencies. In many cases, parts of a county, whole counties, and entire states do not report data to the FBI. Among those that report, data may only be reported for a few months. To deal with the incomplete reporting, researchers at ICPSR, in consultation with the Bureau of Justice Statistics, have used imputation procedures to fill in missing data. Before 1994, sub-county agencies reporting data six to eleven months were re-scaled by (12/months reported) to obtain annual estimates. Those reporting fewer than six months were deleted from the analysis. Starting in 1994, a different imputation method was used to re-scale incomplete data. For those jurisdictions reporting three to eleven months of data, data were re-scaled by the factor (12/months reported). For those reporting less than three months of data, a different procedure was used. Within each state and year, jurisdictions reporting twelve months of data were grouped into nine categories based on population. Crime in jurisdictions with less than three months of data was assumed to be equal to the state average for their population group. In all years, the UCR data from ICPSR indicate the county population served by jurisdictions reporting crime data. In 1986 and 1990 to 1993, the files also indicate the population with six or more months of data. Starting in 1994, the files include a "coverage" variable that measures the fraction of the population without imputed data for the year.

In our analysis, we delete county/year cells for which a large fraction of data is imputed. First, we delete any county where the population reporting any data is less than 80 percent of the Census report of population. Second, we delete data from the 1994 to 1998 period with a coverage factor less than 80 percent and data from the 1986 and 1990 to 1993 period where 80 percent of the reporting population reported six or more months of data. Because we have no indication of monthly reporting in the 1985 and 1987 to 1989 period, we delete observations in those years if the county had more than one "bad" reporting year in the 1986 and 1990 to 1998 period.

Mortality

There is some concern among opponents of casino gambling that gambling may increase substance abuse and suicidal thoughts and so could increase mortality rates. To date, the literature has failed to show such a link, although popular press accounts often link gambling and deaths.[88] While some would argue a positive relationship between mortality rates and gambling, the opposite is also a possibility. To the extent that gambling increases employment opportunities and increases the income of those employed, one may witness a decrease in mortality as a result of the improved economic well being.

There is a well-established link between income and mortality, dating back to Kitagawa and Hauser (1973) and extensively reviewed in Feinstein (1993) and Smith (1999). There is also a large literature finding deleterious impacts of unemployment beginning with the seminal work of Brenner (1973, 1975, 1979). Others have pointed out flaws in Brenner's analysis (Gravelle, Hutchinson, and Stern (1981); Stern, (1983); Wagstaff (1985)), and work correcting those problems has been unable to replicate Brenner's results (Forbes and McGregor (1984) and Joyce and Mocan (1993)). In these more recent studies, higher unemployment has been correlated with improved health outcomes.

To examine this issue, we constructed a county level data set of number of deaths by county of residence for 1979 through 1998. Compressed Mortality/Population Data are available from the Center for Disease Control.[89] Counts and rates of death can be obtained by cause of death, state, county, age, race, sex, and year.

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[88]Gambling Mortality." *The Wager: Weekly Addiction Gambling Education Report*. 5(41). October 18, 2000. www.thewager.org/Backindex/vol5pdf/wager541.pdf

[89] See http://wonder.cdc.gov/

B. Results

In Table 10, we report results where we use employment to population, bankruptcy rates, and the mortality rate as the outcome of interest. For each regression, we present two columns of results. First, we present results for counties that experienced a casino opening and in the next column, the results for counties that experienced an opening within 50 miles of its population centroid. For each regression, we report the number of counties that experienced a new Indian-owned casino, the median of the dependent variable in the year a casino opened in that county, plus some additional information about the sample and regression diagnostics.

Results for economic activity are presented in the first two columns of the table. Using data from the 1985 to 1999 period, we have information from 2,222 counties for a total of 33,337 observations. Of these counties 112 had a new casino open and 494 had a casino open within 50 miles. Mean jobs per adult for the treatment counties in the year a casino open are very similar to the sample means for the dependent variable. The use of county and state specific year effects produces an excellent fit for the model with an r-squared of 0.964. We see monotonic economic progress for counties that receive a casino in the year a casino opens. By the fourth year, we estimate a statistically significant increase in the jobs/adult ratio of 0.021 which about 3.8 percent of the median value in counties in the year a casino opens. Of counties with a casino, the fraction of Native Americans is still rather small, so the bulk of the job increase is therefore associated with an increase in non-Indian employment. We also see a small increase in the jobs to adults ratio of 0.005 for counties within 50 miles of a casino by four years after opening which is about one percent of the median value in the year a casino opens. For each model, we ran a separate regression that included four "lead" dummy variables that equaled one in the first four years before a casino opened. In the tables, we report the results from the restricted version of this model where these leads are all set to zero. For each model, we report the p-value on the F-test for the null hypothesis that the leads are all zero. As was the case for the tribe-specific economic outcomes, we find

no evidence that the employment to adult ratio was trending in counties that experienced exposure to a new Indian-owned casino. The p-value on the F-test that the eight lead coefficients (four each for the counties with a casino and counties within 50 miles of a casino) are jointly zero is rather high.

In the next two columns of Table 10, we report results using the personal bankruptcy rate, defined as bankruptcies per one thousand people, as a dependent variable. There are data at the county level for the 1989 to 1999 period, representing 2,222 counties and a total of 24,453 observations. In these models, we see a steady increase in bankruptcies in the first fours years after a casino opens in both home counties and counties within 50 miles of a casino. These results are quite large. Four years after a casino opens, bankruptcy rates are up 10 percent in counties with a casino and seven percent in counties within 50 miles of a casino. These results indicate that although access to gambling does increase bankruptcies by a large amount, the rise of casino-style gambling can explain only a small fraction of the increase in aggregate bankruptcies in the United States over the past 15 years. Unfortunately in these models, the p-value on the F-test that the leads are all jointly zero is 0.015. This is driven exclusively by larger coefficients on the lead dummy variables in the counties within 50 miles. When we only include the four leads for counties with a casino and test the hypothesis that these leads are all zero, the p-value on these tests equals 0.79. These results suggest that bankruptcy rates were not trending in counties before a casino opened within its borders, but there appears to be some trend in counties within 50 miles of a casino.

In the final two columns of Table 10, we report results from models using the mortality rate as the dependent variable. In both counties with a casino and counties within 50 miles of a casino, we see statistically insignificant declines in mortality for the first three years after a casino opens. By four or more years after a casino opens, however, mortality has fallen by 22 per 100,000 in a county with a casino and an amount half that in counties near a casino. These results are 2.3 and one percent of sample medians in counties that experience a casino opening, respectively. These results can be driven by changes in economic activity, but this is probably not the whole story. Above, we showed that four years

after a casino opens in a county, employment to adults ratio increases by 3.8 percent and here, we find mortality falls by 2.3, so for the mortality change to be drive solely by a change in jobs, the implied mortality/jobs elasticity must be -0.60.

In Table 11, we report data for criminal activity. The results show little consistent change in property crimes per 100,000 until the fourth year after a casino opens. Four or more years after opening, property crimes increase by 174 per 100,000 people in counties with Indian-owned casinos which is about 4.4 percent of the median value for counties in the year a casino opened. There is no statistically significant impact of casinos on property crime in counties within 50 miles of a casino. It appears, however, that all of the increase in property crime is from an increase in auto thefts and larceny. In the final two columns of the table, we report the results using these two outcomes alone, and we find that the increase in property crime is more than explained by auto thefts and larceny alone. The lack of an impact of casinos on property crime in counties within 50 miles and the fact that all of the increase in property crime is explained by auto thefts and larceny suggests that the greater concentration of people into small geographic areas generated by the casino opening is the most likely reason for the crime increase. However, the slow build-up in criminal activity (for larceny and auto thefts) over the first four years a casino is opened is also consistent with the hypothesis that casinos encourage pathological gambling and these people eventually turn to crime to feed a habit.

In the middle two columns of Table 11, we only find a statistically significant increase in violent crime four or more years after a casino opens. In a county with a casino, the change in violent crime is small in magnitude relative to the impact on property crime, but it represents almost nine percent of the median value of violent crime in the year a casino opens. In all of these regressions, the p-value on the F-test that the leads are jointly zero are very large, indicating that we cannot reject the null that there was no systematic movement in crime rates before a casino opened in a county or within 50 miles of a county.

Our results of the impact of casinos on criminal activity are similar to those in Grinols and Mustard (2001). However, the estimated impacts we find are much smaller than in their work. This is primarily due to our set of controls. Although Grinols and Mustard include more county-level covariates in their work, our inclusion of county effects and state-specific year effects greatly reduces the coefficients on the casino opening dummy variables below that found in Grinols and Mustard.

VIII. Conclusion

Since the passage of the IGRA in 1988, half of the Indians on or near reservations now belong to tribes that have opened Vegas-style casinos. These casinos appear to have changed the economic climate on reservations considerably. Four or more years after a casino is opened, population increased by 11.5 percent, employment rose by 26 percent, the employment to population ratio increased by 12 percent, and the fraction unemployment and working but poor fell by 14 percent. The economic benefits of the gaming appear to extend off the reservation as well. Counties with or near a casino experience an increase in the employment to population ratio and a decline in mortality. The benefits do come at some cost. Auto thefts, larceny, violent crime, and bankruptcies are all up by about 10 percent four or more years after a casino opens in a county. Bankruptcies also increase in counties within 50 miles of a casino.

These results are instructive about some of the likely winners and losers from the rise of casino gaming on reservations. It is clear the largest beneficiaries are the tribes themselves. Contrary to press accounts, the improvement in job prospects associated with casino gaming is not limited to a handful of tribes in large urban areas. In contrast, we find that tribes in all geographic areas show increased employment but that the largest tribes seem to be better able to exploit the employment advantages of the casino. Many of the spillovers associated with the casinos, both positive and negative are also local. There is increased employment and lower mortality in counties with a casino, but there are also higher bankruptcies and more crime. Although those who declare bankruptcy are nearby residents, with the rise

of the credit card industry, the costs of bankruptcy will spread past the local area. Given the local nature of many of the costs and benefits and the unique legal structure that these sovereign nations have with state and local governments, it strikes us as reasonable the way the IGRA has stipulated when Class III gaming is legal, namely, in states that allow private gaming. Unfortunately, the current legal environment prevents local and state governments from internalizing any externality with a tax on gambling. Although some tribes do pay fees to state and local governments, this varies considerably from state to state.

The controversy surrounding casinos and the need to examine the impact of tribally-owned casinos will continue to grow over time as more tribes and states consider whether to open casinos. Most compacts in California were only recently signed. This year, in an effort to spur tourism in the state in the wake of the September 11 disaster, New York signed compacts that would allow six new tribally-owned casinos in the state.[90] In New Mexico, a segment of the Navajo Nation, the largest reservation in the country, has moved towards opening a casino.[91] Oklahoma, the state with the largest number of tribal members, is considering a bill that would legalize slots, allowing tribes the ability to run Las Vegas-style casinos. In July of 2001, a federal judge agreed with the owners of three race tracks that the state legislature in Arizona illegally gave the governor the ability to enter into compacts with tribes for games of chance that were illegal in the state. The governor has been ordered to not sign any new compacts. The original compacts in Arizona are set to expire in 2003, and the long-term status of gaming in Arizona is unclear. Tennessee, Nebraska, Arizona and Idaho will probably have gambling initiatives on their ballots come November, and lawmakers in at least 26 other states are expected to debate some form of gaming expansion next year.[92]

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[90]James C. McKinley. "Bill That Expands Gambling Is Approved by Legislature," *New York Times*, October 25, 2001, Section D, P. 5.

[91]Leslie Linthicum. "Tribe Has Casino Ceremony," *Albuquerque Journal,* January 9, 2002, P. B1.

[92]Matthew Mosk. "Tight Times for States Improve Gambling's Odds." *Washington Post.* August 5, 2002. P. A-1.

A full cost benefit analysis of tribal-owned casinos is beyond the scope of this paper. Grinols and Mustard (2001) perform such an analysis for casinos in general and find that the costs exceed the benefits. They calculate that the extreme upper bound on social benefits of a new casino is $75 per adult, that the costs associated with problem or pathological gamblers are $140-$221 per adult, and that a Pigouvian tax would collect 60 to 96 percent of a casino's profits. A key assumption in that paper was that there is a large increase in crime and problem gambling as a result of having a casino nearby. Our results are consistent with this assumption. We demonstrate a 10 percent increase in bankruptcies, auto theft and larceny rates, plus violent crime four or more years after a casino opens in a county.

Probably one of the most sobering results from our analysis is that there appears to have been an incredible pent-up demand for casino-style gaming in this country. The fast growth of Indian-owned casinos in all areas of the country, the large increases in employment generated from these casinos, and the fact that net revenues to Las Vegas increased during a time when new casino products such as riverboats and Indian-owned casinos flourished all suggests that new casinos are not just re-shuffling gamblers but rather expanding the number of gamblers.

Our paper does also not address the question of whether this is the most efficient policy to improve economic circumstances on reservations. After 130 years of reservation life, Native Americans on reservations were among the poorest people in this country, so the proceeding policies for economic independence were not working. Because the current program seems to be generating jobs does not necessarily mean that granting a reservations a monopoly in a particular industry is also a desirable policy.

Although we have uncovered a number of interesting developments concerning the social and economic impacts of tribal-owned casinos, these results do not answer a number of important questions. For example, casino profits are not taxable, and therefore, their presence in many states possibly diverts funds from a taxable activity (e.g. dining at restaurants, going to movies) and negatively impact state and

local public finance.[93] We also currently know little about the distribution of benefits – who gets the new jobs? With large re-migration back to tribes, it will be interesting to examine whether established or new residents are benefitting from the law. We can also not quantify the impacts of the casinos on incomes. These question must be tabled until detailed data from the 2000 Census long-form data becomes available.

[93]We have not looked at this issue, but it is the subject of Anders *et al* (1998).

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Figure 1
Rise in Native American Gaming Operations

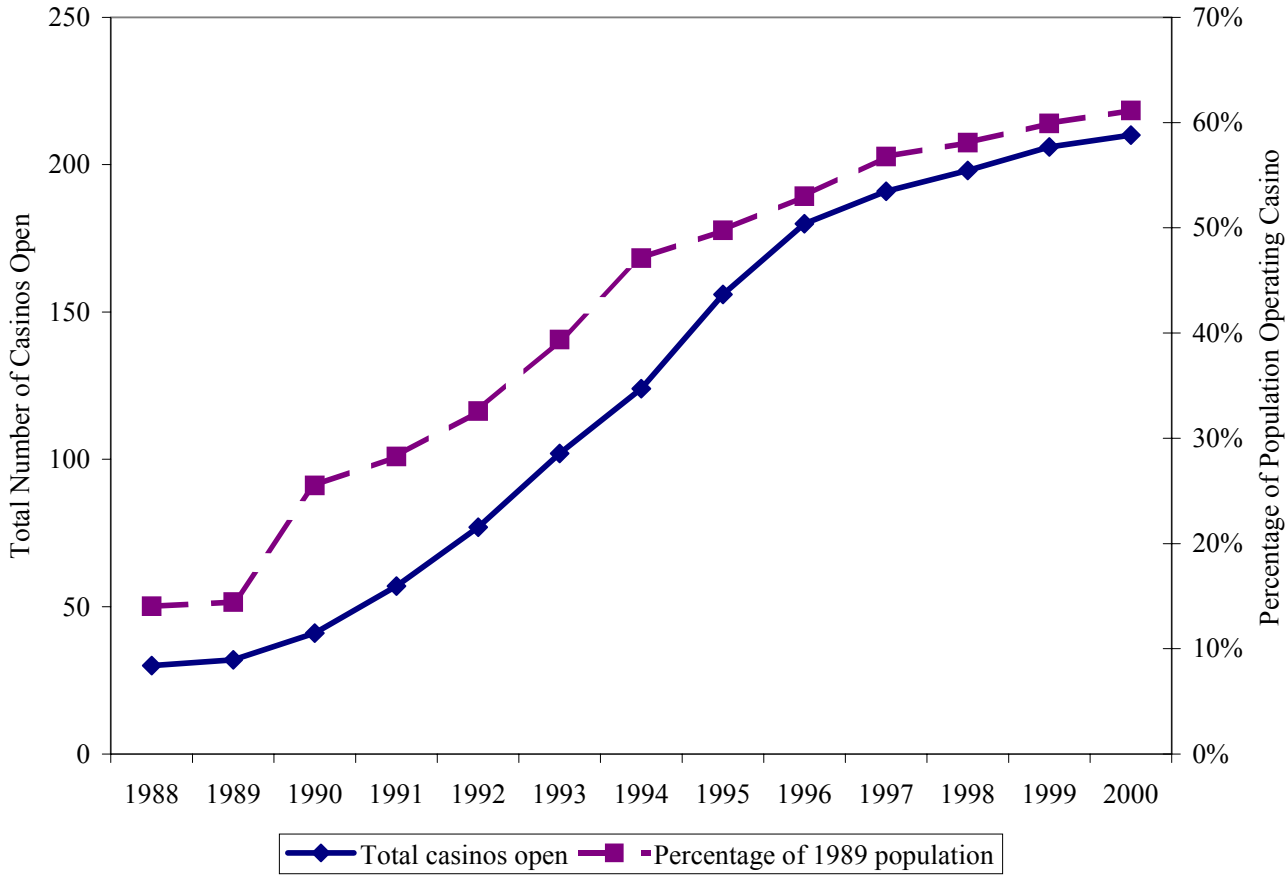

Figure 2
Log Population from Census and BIA Data

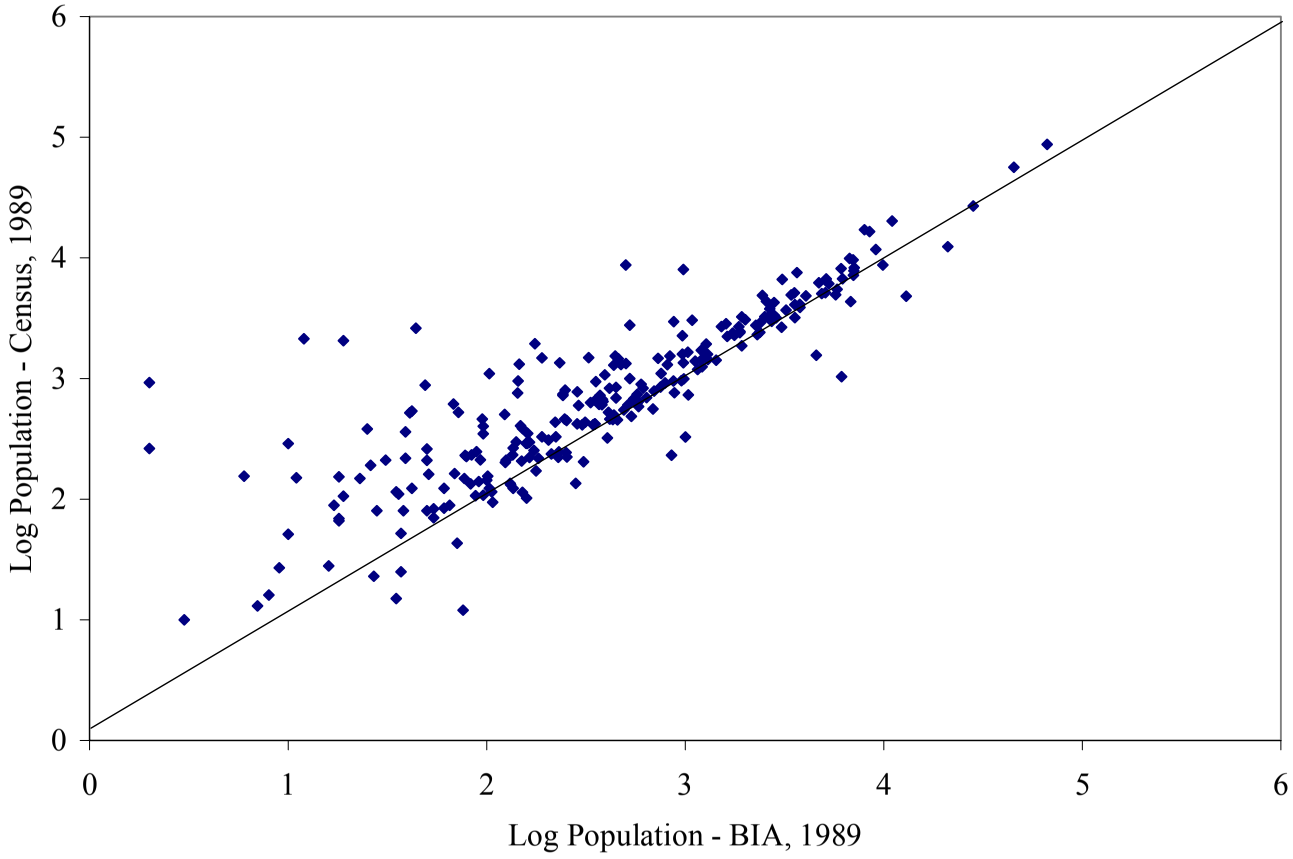

Figure 3
Log Employment from Census and BIA Data

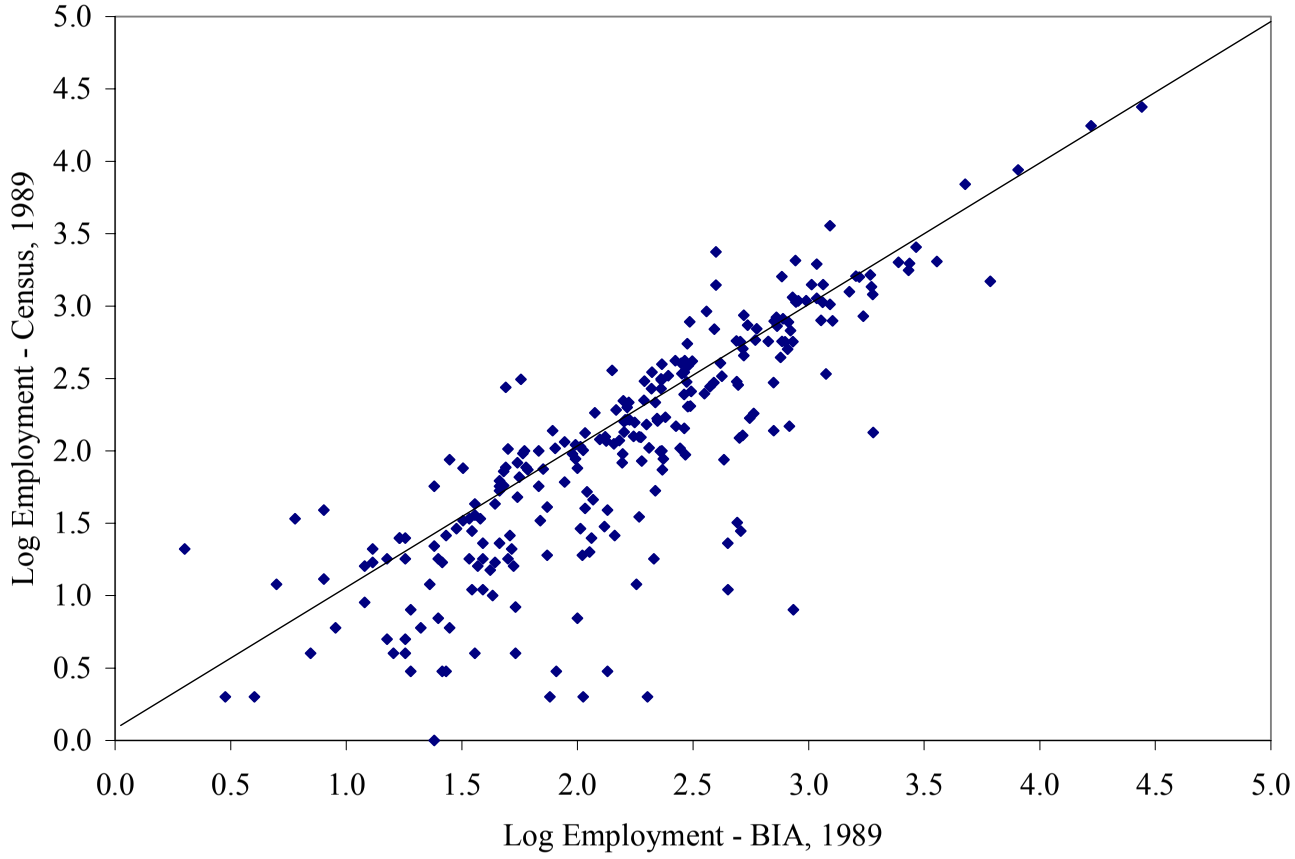

Figure 4
Employment to Population Ratios from Census and BIA Data

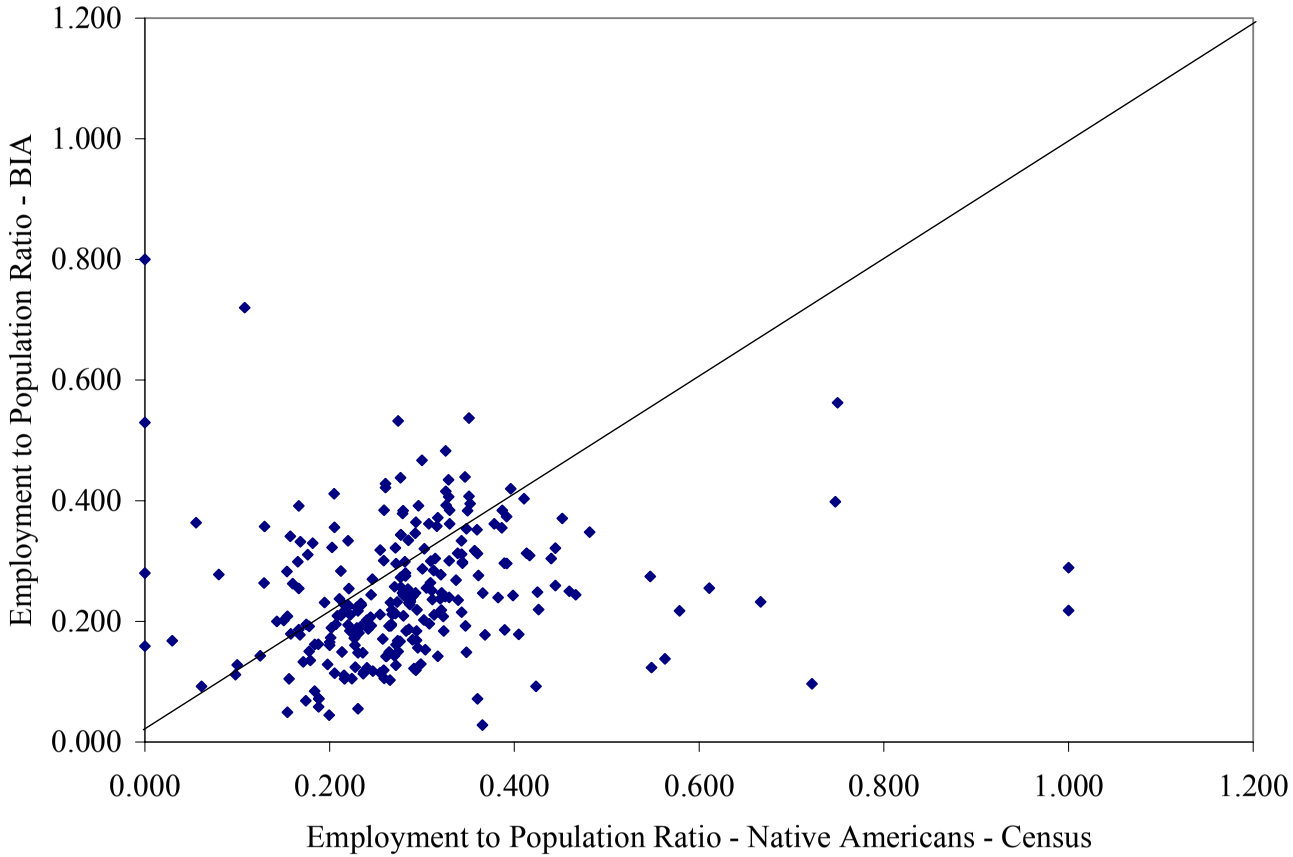

Table 1
Gambling Revenue by Industry, 1982 and 1992

	Revenues in Billions of constant 2000 dollars (Industry market share)	
Industry	1982	2000
Nevada/Atlantic City Casinos	$7.5 (40.3%)	$13.7 (22.2%)
Lotteries	$3.9 (20.8%)	$17.3 (28.1%)
Horse racing	$4.0 (21.6%)	$3.3 (5.4%)
Native American gambling	-----	$10.4 (17.0%)
Riverboat casinos	-----	$9.0 (14.6%)
Other gambling	$3.2 (17.2%)	$7.8 (12.7%)
Total	$18.6	$61.6

Source: Christiansen Capital Advisors

Table 2
Characteristics of Median and Connecticut Casinos

Characteristic	Median Casino	Foxwoods	Mohegan Sun
Tribal enrollment	800	355	664
Slots	450	5,700	3,000
Square feet of casino	27,000	315,000	176,000
Population within 100 miles (in millions)	1.0	13.1	14.9

Table 3
Social and Economic Characteristics of Native Americans on Trust Land, 1990 Census

	Native Americans			Areas < 1000 People		
Variable	All	On trust land	U.S.	White, non-Hispanic	Black	Hispanic
Median Household Income	$20,025	$12,459	$30,056	$21,591	$11,642	$16,755
% of people in poverty	20.9	47.3	10.0	14.3	42.6	33.1
% (16+) in labor force	65.5	51.1	65.3	58.7	52.8	61.7
% (16+) unemployed	9.3	25.6	6.3	6.3	14.2	10.5
% (25+) $ high school degree	65.5	53.8	75.2	69.6	43.6	44.7
% (25+) $college degree	9.3	3.9	20.3	10.4	4.7	5.0
% households without:						
Complete plumbing	6.0	20.2	1.1	0.9	6.6	2.2
Complete kitchens	5.4	17.5	1.1	0.7	4.3	1.4
A vehicle	17.1	22.4	11.5	8.4	15.4	10.4
A telephone	23.2	53.4	5.2	7.4	27.8	24.9

Notes: Income is in 1989 dollars.
Sources: 1990 Census of Population, Social and Economic Characteristics, United States.
1990 Census of Population, Social and Economic Characteristics, American Indian and Alaska Native Areas.
1990 Census of Population, Detailed Housing Characteristics, United States

Table 4
Sample Characteristics, BIA Data
1983-1999

Variable	1983	1991	1999
Mean Population	1,997	2,149	2,771
Mean Number Employed	400	484	640
Unemployment Rate	52.1%	45.3%	39.8%
Employed/Adults	37.1%	41.3%	48.0%
Fraction working but poor	38.2%	31.9%	32.5%
Fraction of 1989 pop. with a casino	5.7%	11.2%	51.2%
No. of tribes in sample	263	301	314

Sample means are weighted by tribal population

Table 5
Fixed-Effect Estimates, Impact of Casino Gaming on Native Americans
1989-1999

	ln(population)	ln(employ.)	Employment/ Adults	Unemploy. rate	Working but poor
0-1 Years after opening	0.0202 (0.0409)	0.0724 (0.0520)	0.0153 (0.0139)	-0.0186 (0.0205)	-0.0139 (0.0203)
2-3 Years after opening	0.0298 (0.0450)	0.1332 (0.0571)	0.0263 (0.0153)	-0.0207 (0.0226)	-0.0505 (0.0223)
4 or more years after opening	0.1151 (0.0502)	0.2629 (0.0637)	0.0482 (0.0170)	-0.0437 (0.0251)	-0.0546 (0.0249)
R^2	0.9595	0.9330	0.5623	0.5237	0.4262
P-value on f-test, leads are jointly 0	0.8363	0.9485	0.2970	0.2933	0.9732

Standard errors in parentheses. Model includes fixed tribe and year effects and county-level controls for jobs per adult, log real average wage per job, and log real per capita income.

Table 6
Marginal Effects for Probit Models, Tribes that Adopt Gaming by 1995 or 2000

Independent Variables	Open by 1995	Open by 2000
Log Population, 1991	0.121	-0.062
	(0.251)	(0.264)
Log Employment, 1991	-0.080	0.137
	(0.248)	(0.261)
Employment to Population, 1991	0.512	-0.349
	(1.067)	(1.124)
% Employed by Poor, 1991	0.063	0.031
	(0.157)	(0.165)
Population within 50 miles of	0.055	0.078
tribal headquarters	(0.032)	(0.033)
Population within 50-100 miles of	-0.006	0.019
tribal headquarters	(0.031)	(0.033)
County Employment to Pop, 1991	-0.062	0.101
	(0.240)	(0.195)
Log County Real Avg Wage, 1991	-0.266	-0.689
	(0.280)	(0.304)
Log County Real Per Cap Income, 1991	-0.283	-0.286
	(0.238)	(0.240)
Percent of Population Over 65	1.199	2.236
	(0.983)	(1.020)
Change in log pop (1989-83)	-0.135	-0.070
	(0.205)	(0.215)
Change in log emp (1989-83)	0.104	0.007
	(0.192)	(0.202)
Change in emp to pop (1989-83)	0.092	0.427
	(0.883)	(0.920)
Change in % emp but poor (1989-83)	0.006	-0.010
	(0.057)	(0.056)

Standard errors in parentheses. There are 291 observations and of these tribes, 42 percent had a casino by 1995 and 56 percent had one by 2000. We delete tribes in states that forbid Class III type casinos (Massachusetts, Maine, Rhode Island, South Carolina, Utah, and Oklahoma).

Table 7
Sensitivity of Basic Results to Changes in Specification,
Coefficient on 4 or More Years After Opening

Add to basic model	ln(Pop)	ln(emp)	Emp/adults	Unemp	% poor
--------	0.1151	0.2629	0.0482	-0.0437	-0.0546
	(0.0502)	(0.0637)	(0.0170)	(0.0251)	(0.0249)
State-specific time trends	0.0757	0.1632	0.0352	0.0006	-0.0863
	(0.0621)	(0.0783)	(0.0205)	(0.0308)	(0.0297)
1983 data	0.1222	0.3148	0.0635	-0.0494	-0.0443
	(0.0460)	(0.0586)	(0.0152)	(0.0225)	(0.0320)
1983 data and state-specific time trends	0.0711	0.2247	0.0568	-0.0183	-0.0991
	(0.0577)	(0.0731)	(0.0185)	(0.0279)	(0.0397)
Population weights	-----	-----	0.1104	-0.0649	-0.0289
			(0.0147)	(0.0219)	(0.0227)
1983 data, state specific time trends and population weights	-----	-----	0.0891	0.0313	-0.1533
			(0.0166)	(0.0239)	(0.0258)

Standard errors in parenthesis. Each entry represents a coefficient from a different regression. The results in the first row are repeated from Table 5.

Table 8
Heterogeneity in the Impact of Tribal-Owned Casinos,
Coefficient on 4 or More Years After Opening
by Size of Tribe and Size of Market

Group Definition	ln(pop)	ln(emp)	Emp/Adults	Unemp. Rate	Working but Poor	# tribes with Gambling	# of Obs.
			By tribe population in 1989				
<250	0.099	0.158	0.013	0.024	-0.049	37	627
	(0.126)	(0.141)	(0.037)	(0.055)	(0.053)		
250 to 1250	0.136	0.212	0.041	-0.047	-0.142	58	623
	(0.074)	(0.103)	(0.027)	(0.040)	(0.037)		
> 1250	0.214	0.577	0.109	-0.115	-0.045	67	595
	(0.057)	(0.088)	(0.026)	(0.038)	(0.042)		
			By the population living within 50 miles of tribal headquarters				
< 75,000	0.102	0.303	0.040	-0.020	-0.207	44	1135
	(0.093)	(0.111)	(0.027)	(0.040)	(0.041)		
75,000 - 500,000	0.059	0.240	0.042	-0.086	0.024	65	379
	(0.100)	(0.143)	(0.047)	(0.068)	(0.061)		
> 500,000	-0.025	0.145	0.106	-0.232	0.109	53	333
	(0.098)	(0.157)	(0.048)	(0.072)	(0.063)		

Standard errors in parentheses. Each row represents a separate regression. Model includes fixed tribe and year effects and county-level controls for jobs per adult, log real average wage per job, and log real per capita income.

Table 9

Fixed-Effect Estimates, Impact of Casino Gaming on Native Americans in Oklahoma
1989-1999

	ln(population)	ln(employ.)	Employment/ Adults	Unemploy. rate	Working but poor
0-1 Years after opening	0.0489 (0.1401)	0.0934 (0.2238)	-0.0079 (0.0490)	-0.0334 (0.0597)	0.0744 (0.0590)
2-3 Years after opening	0.0538 (0.1535)	0.2150 (0.2449)	0.0239 (0.0536)	-0.1614 (0.0653)	-0.0516 (0.0663)
4 or more years after opening	0.0306 (0.1977)	0.3310 (0.3156)	0.0214 (0.0691)	-0.0272 (0.0842)	-0.1013 (0.0852)
R^2	0.9709	0.9362	0.5466	0.6413	0.6934

Standard errors in parentheses. Model includes fixed tribe and year effects and county-level controls for jobs per adult, log real average wage per job, and log real per capita income.

Table 10
Impact of Native American Casinos on Employment, Bankruptcy, and Mortality

	Covered jobs/adult		Bankruptcies per 1000 adults		Mortality Rate per 100,000 people	
Variable	Counties with casinos	Counties< 50 miles from a casino	Counties with casinos	Counties< 50 miles from a casino	Counties with casinos	Counties< 50 miles from a casino
Year of opening	0.0103	0.0040	0.0273	-0.0195	-4.503	-0.128
	(0.0038)	(0.0019)	(0.1151)	(0.0573)	(11.258)	(5.548)
1 year after opening	0.0182	0.0052	0.1394	0.1286	11.560	-2.770
	(0.0040)	(0.0020)	(0.1195)	(0.0587)	(11.676)	(5.835)
2 years after opening	0.0184	0.0059	0.0891	0.1627	-7.084	-1.835
	(0.0041)	(0.0021)	(0.1228)	(0.0617)	(12.048)	(6.129)
3 years after opening	0.0200	0.0056	0.2235	0.1755	-17.194	-13.546
	(0.0043)	(0.0022)	(0.1269)	(0.0652)	(12.839)	(6.723)
4+ years after opening	0.0211	0.0048	0.3544	0.2167	-21.935	-9.509
	(0.0030)	(0.0017)	(0.1006)	(0.0567)	(9.767)	(5.519)
Counties with a new casino	112	494	106	471	103	470
Median of dep. variable in year of opening	0.5584	0.5061	3.699	3.133	920.6	980.6
P-value on f-test, 4 year leads are jointly 0	0.7380		0.0151		0.3247	
Years	1985-1999		1989-1999		1985-1998	
Counties in sample	2,222		2,222		2,195	
Observations	33,337		24,453		30,598	
Mean of dep. var.	0.5241		4.121		1006.7	
R^2	0.9637		0.8858		0.8636	

Standard errors in parentheses. Other covariates include county effects, state*year effects, fraction of adults aged 20-34, 35-44, 45-54, 55-64, the fraction of the population that is black, jobs per adult, log average wage per job and per capita income.

Table 11
Impact of Native American Casinos on Crime

	Property crime/ 100,000 people		Violent crime/ 100,000 people		Auto Theft + Larceny/ 100,000 people	
Variable	Counties with casinos	Counties< 50 miles from a casino	Counties with casinos	Counties< 50 miles from a casino	Counties with casinos	Counties< 50 miles from a casino
Year of opening	-25.6	0.8	7.4	6.3	10.0	26.9
	(63.3)	(32.2)	(15.2)	(7.7)	(48.6)	(24.7)
1 year after opening	-16.6	-3.9	14.4	14.2	27.4	4.4
	(66.1)	(33.6)	(15.9)	(8.1)	(50.8)	(25.8)
2 years after opening	107.6	33.2	16.3	8.2	133.2	29.1
	(66.8)	(35.6)	(16.1)	(8.5)	(51.3)	(27.3)
3 years after opening	79.4	-12.9	-2.2	11.0	119.8	17.6
	(71.3)	(39.5)	(17.1)	(9.5)	(54.7)	(30.3)
4+ years after opening	174.4	-22.1	25.1	16.4	207.7	16.3
	(54.5)	(32.5)	(13.1)	(7.8)	(41.9)	(25.0)
Counties with a new casino	91	394	91	394	91	394
Median of dep. variable in year of opening	3,895	2,901	279	195	2,903	2,119
P-value on f-test, 4 year leads are jointly 0	0.4233		0.7992		0.6192	
Years	1985-1998		1985-1998		1985-1999	
Counties in sample	2,186		2,186		2,186	
Observations	25,514		25,514		25,514	
Mean of dep. var.	3,058		332		2,214	
R^2	0.921		0.861		0.923	

Standard errors in parentheses. Other covariates include county effects, state*year effects, fraction of adults aged 20-34, 35-44, 45-54, 55-64, the fraction of the population that is black, jobs per adult, log average wage per job and per capita income.