Casino Establishment, Effects on Income and Unemployment: Evidence from New York State

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Abstract

Using New York State Public Use Microdata Areas (PUMAs) data from 2005 through 2011, I estimate the effects of casino establishment, and having casinos in surrounding PUMAs on per capita income and percentage unemployed. The main specification uses fixed effects to control for area specific time invariant unobserved heterogeneity. The primary result indicates that once unobserved time invariant heterogeneity is controlled for, there is no evidence that casino establishment, or of having casinos in the surrounding area has an effect on per capita income or percentage unemployed.

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1. Introduction

In 2014 the gaming industry supported 1.7 million jobs, and provided $38 billion in tax revenue across the United States.[1] This is a recent phenomenon; casino gambling was a significantly smaller industry two and a half decades ago, with only 3 states having casinos prior to 1990. There has been an almost 50% increase in commercial casino gaming revenues from 2001 to 2016, and nine new states started offering commercial casino gaming in that time span.[2] As the casino industry grows, the effects of casino establishment become increasingly important, due to possible effects on employment, incomes, and crime in particular. This study examines the impact of casino establishment on unemployment and per capita income in New York State.

Proponents of casino establishment typically point to the positive impact on economic indicators, such as increased employment or income. One theory is that while casino establishments create new jobs at the casino, they may also create additional jobs at other local establishments such as gas stations and restaurants as gamers visit. Local workers may receive higher wages if local businesses are making more money as well. Even if the casino replaces the local businesses, it is possible that more workers are required to run the casino, and they may receive higher wages.

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[1] This is according to the American Gaming Association.
[2] This is according to a report by the University of Nevada, Las Vegas Center for Gaming Research.
[3] It could be that the establishment of a casino leads to more crime due to gamblers losing money, and trying to illegally make money back.

Detractors often discuss negative societal impacts, such as increased drunk driving fatalities or increased crime.[3] A different possibility is that casino gambling acts as a substitute for purchasing other forms of entertainment, leading to local businesses not employing as many workers. In this case we might see no change in the unemployment or employment, however local businesses would be hurt. Also, if a casino replaces other businesses, but requires less labor, it is possible that local employment decreases. The casino may also pay lower wages than the displaced businesses, especially if it is the only place for low skilled workers to find employment.

Since we have different theories, empirical analysis may shed light on the effects of casino establishment. Past studies use difference-in-difference models, for example Wenz (2008), and Geisler and Nichols (2015), or a time series approach, for example Garrett (2004) typically when examining the effect of casino establishment on key economic indicators. The difference-in-difference model provides comparison between casino (treatment) and non-casino (control) counties. The time series approach compares projected data assuming a casino had not been established, to the actual data. This study takes a different approach by using panel data and employing a fixed effects model, which controls for time invariant unobserved heterogeneity. Looking at the effects of casino establishment on adjacent PUMAs may provide insight as to where casinos should be established, or whether they should be established at all. I find when controlling for time invariant unobserved heterogeneity we cannot tell the effects of having a casino.

2. Casino History and Literature Review

2.1 Casino History

Casino gaming in the United States initially grew very slowly. Nevada legalized casino gaming in 1931, followed by New Jersey 45 years later. In 1988 congress passed the Indian Gaming Regulatory Act, which allowed expansion of casino gambling. Prior to this, there were few places casino gambling was legal (Nevada, Atlantic City, and some Indian reservations). Since this legislation, there has been rapid growth in the casino gaming industry across the United States, including the "riverboat casinos", which were legalized between 1990 and 1993 (Wenz, 2008). Riverboat casinos are located on a riverboat facing the Mississippi River. This has grown into a large industry ($40 billion in 2001), and determining the impacts of establishing casinos going forward is an important topic (Garrett, 2004).

There are two main operators in the casino industry – the Native American owners, and private corporations. One of the biggest differences between the two groups is that Native American casinos cannot be taxed by state governments, but the private corporations can. Private casinos generate more revenue, and use more workers from the labor market relative to Native American casinos (Garrett, 2004).

Previous research used a wide variety of specifications. There were different results depending on whether the location had a Native American casino or a non-Native American casino, or whether it was a rural or urban area. The previous research found that urban areas receive less benefits than rural areas, possibly because in an urban area casino gaming is a relatively smaller industry compared to a rural area. Another potentially important factor is the skill level of the workers in the county where the casino is introduced. Casinos offer jobs that (mostly) do not require more than a high school diploma. If a casino opens in a county with a relatively skilled labor force, the labor may be mostly pulled from other counties. Even then, it is important to contemplate whether the new labor commutes, or takes up residence in the new county. If they commute, employment will remain the same, or possibly decrease for the host county, but could increase if the outside labor moves in. Researchers attempt to account for some of these factors.

2.2 Literature Review

The previous literature typically used panel data to look at the effects of casino establishment. However, different models and estimation techniques were used. Autoregressive moving average (ARMA) or autoregressive integrated moving average (ARIMA) models were used more in many of the initial studies, and difference-in-difference models are used in many of the recent studies. Different datasets are used, ranging from a few US counties, to all US counties, or counties in a few states. Even similar estimation techniques have provided different results, however most of the significant results show positive effects of having a casino. This section details a few of these studies.

Barron, Staten, and Wilshusen (2002) examine the impact of casino gambling on personal bankruptcy filing rates. They use annual data on county-level bankruptcy filing rates, with over 3000 United States counties from 1993 to 1999. The authors use some unique controls, such as debt usage, income interruptions, expense shocks, and filing stigma. They use random and fixed effects estimations to determine the effect of casino's net revenue per household (lagged one year) on bankruptcy filing rates. In both estimations, they find a positive and significant coefficient on the casino variable, meaning there is an increase in the number of personal bankruptcy filings in proximity to the casino county due to greater casino revenue. They find there was little to no effect on national bankruptcy filings. One potential problem with this paper is the use of casino net revenue per household as the independent variable of interest. This just measures how bankruptcy filing rates change as casinos make more or less money. Even if the coefficient were large in magnitude, what would be the policy implication? It would seem hard to force casinos to generate less revenue. The authors also find that the type of consumer (from the county versus a tourist) impacts the local economy differently. If a casino attracts more tourists, there are fewer costs and greater marginal benefits. This makes sense – if a casino requires people to lose money to make revenue, then casino counties that attract more tourists are more likely to not have to deal with the negative effects on local residents. However, if a casino attracts more local players, the negative effects on those residents remain in the county. The authors use this idea to explain why urban areas receive less benefits compared to rural areas. Rural areas attract more out of county customers, whereas urban areas attract more of a local crowd. The authors also note that there may be negative effects which are exported back to the counties in which tourists come from, but their model cannot identify these effects. The authors conclude with an important note, which is that it will be increasingly difficult going forward to measure the local effects of gambling. This is because internet gambling has been rapidly rising over the last decade, and any household with internet access is able to participate (legally or illegally).

Garrett (2004) examines the effect of establishing a casino on household and payroll employment. Using household and payroll employment allows him to separate the effects on the employment of the residents of a county, and the businesses in a county. This is an important distinction; when a casino opens, it is likely that the county will experience an increase in employment. If employment increases by the same amount as the labor force, unemployment will decrease. However, it is possible that fewer locals are employed after the casino opens. This could look like an overall increase in employment, while really the local residents are losing jobs. He looks at the employment in a county up until the time when the casino was established, and then forecasts employment up to the current time using different ARIMA models. He compares his estimations to the true path that employment took. He essentially argues that if the forecast is above the real employment level, the casino had a negative impact on employment for the county, and vice-versa. He only uses 6 counties with quarterly data between 1986 and 2001. This may be an issue, because it could be that the counties he chose are not representative of the average county in the United States. This could be due to several characteristics, including how predominant of an industry casino gaming is in the county, as well as how many surrounding counties have casinos in them. Garrett finds gains to employment in three out of the four rural counties, and the gains were larger if casino gaming was a predominant industry. In the urban counties, it was more difficult to determine the effects; some were positive and some were negative.

Walker and Jackson (2007) examine the relationship between real casino revenues and real per capita income at the state level. They use annual data from 1991 to 2005, over which period there were many casino openings. They use a Granger-causality test they had previously developed to determine the effects. They find that real casino revenue does not Granger cause real per capita income. However, the null hypothesis for their Granger test is that real casino revenue does not Granger cause real per capita income, so really they are finding no evidence of an effect. Walker and Jackson (1998) found the opposite result. They cite a few possible reasons for this. They previously used a different dataset and used quarterly data instead of annual data, but this could bias the results in either direction. One alternative explanation they have is that the expansionary effects of casino gambling on average diminished over time due to competition. The authors conclude by stating that casino gambling should not be expected to lead to any long-term growth at the state level for the average state, but certain states (especially states with less competition) very likely attained significant economic growth from casino gambling. One other important note made by the authors is that even if there are some negative effects, or lack of positive effects from casino openings, consumer surplus still probably rises. This is because casino gambling is a substitute for other forms of entertainment, which puts downward pressure on prices, generating a higher consumer surplus.

Wenz (2008) used both key economic indicators and societal factors when conducting his research. He looks at the effect of establishing new casinos on employment, population, and housing starts, but also on the quality of life. He also examines differences between Native American and non-Native American counties. He looks at casinos established between 1990 and 2000 across the United States. Quality of life is measured as the implicit willingness to pay taken from the United States census, and he also constructs his own model for quality of life using the median price of a house in a given county. He uses difference-in-difference propensity score matching to estimate the models. This basically creates a counterfactual for the treatment group by matching observations from the treatment group with observations from the control group that have similar characteristics, and maybe were, or would have continued to be on the same path. This is useful because it controls for the non-random selection of the treatment. He uses different matching techniques as robustness checks. Wenz finds an increase in population, employment, and number of housing units in counties with Native American casinos. However, the effects for non-Native counties are insignificant, and the quality of life measures in Native and non-Native counties are insignificant. He concludes by noting the importance of establishing a counterfactual when trying to look at the effects of casino establishment, because which counties become casino counties is likely not random.

Geisler and Nichols (2015) focus on unemployment, real per capita income, and labor force participation. They examine riverboat casinos being established in counties from 1991 through 1995, and they try to determine the effects of establishing a casino on the surrounding counties as well as the host county. In most cases this allows them to see the trend a county was on before a casino was established, and see how the casino affected the county after establishment. They use difference-in-difference and spatial Durbin models to find their results. The difference-in-difference model is useful because it makes it easy to compare casino and non-casino counties (treated vs. non-treated), and they can look at how gains or losses to employment and income dissipate with more surrounding casino counties. The main weakness is that the treatment group may not have been randomly assigned; in the past casinos were forced to be set up near rivers, and even now there could be some other reason that casinos choose to locate in certain places. However, Geisler and Nichols argue this is close enough to random, especially because all the states legalized riverboat gambling in the given timeframe, and they were all forced to locate their casinos on the river, so it is a natural experiment. The spatial Durbin model accounts for spatial lags of the independent and dependent variables, which helps correct for the non-randomness of the treatment. The main weakness of this model is that it requires a balanced panel with no islands (counties without neighbors), so fewer observations are available. Estimating both models produced similar results; the authors found positive impacts on host counties for all three indicators, and they were statistically significant in rural counties. They found that greater competition led to diminished benefits to the host counties. They also found that non-casino neighbors experienced some positive spillover in real per capita income. The authors conclude that the location of casino establishment should be one of the main considerations for policy makers in order to maximize social welfare.

3. Data

Data for controls in my models (demographics, and education level), and dependent variables (per capita income, and percentage unemployed) all come from the American Community Survey (ACS). The ACS is an annual survey that provides data on the people of the United States' social, economic, housing, and demographic characteristics. The data I use is measured at the Public Use Microdata Area (PUMA) level. A PUMA is an area that contains approximately 100,000 people. Because of this, 55 out of 143 PUMAs are in New York City. The demographic data consists of age, ethnicity, and gender. The casino data I use was created through various internet searches of New York State casino locations, the dates of their openings, and in some cases closings. Over the time period used for analysis, one casino closed, and three opened. About half of the casinos used in this dataset are "racinos", which are combined racetracks and casinos. Based off the locations and dates of casino openings, I create two variables that account for how many casinos are in PUMAs one or two tiers out. A PUMA one tier out implies it directly borders the home PUMA. A PUMA two tiers out implies it directly borders any of the one tier out PUMAs. Picture 1 illustrates this. Both of these variables are not dummy variables, so their value can be greater than 1. I also control for whether the casino is a Native American casino. My sample consists of 143 PUMAs over 7 years. 15 different PUMAs contained a casino for at least one year from 2005-2011, and no PUMA contained two casinos at any point.

Table 1 shows descriptive statistics for all dependent and independent variables. Note that the mean of the Casino Open variable does not imply that 9.5% of PUMAs have a casino, even though it is a dummy variable, because not every casino was open for all 7 years of the sample. The maximum number of casinos one and two tiers out are 4 and 5 respectively, which could mean that some of the casinos chose to locate near each other. Only one casino is located in New York City, and two are in PUMAs directly bordering New York City. Not many of the casinos in the sample are Native American, so the coefficient on this variable is going to be driven by only a few PUMAs. Also, there are children surveyed in the ACS, so it is understandable that the average percentage of people in a PUMA who have not finished high school is around 30%. For the percentage of people who finished high school and have some college, the highest possible education level is a bachelor's degree.

4. Empirical Method

This section first details the baseline OLS models that I use. Then, I describe the fixed effects model, and finally my model of interest.

4.1 Baseline Model (OLS)

I estimate 3 equations to examine the effect of casino establishment, and having more casinos one or two tiers out has on per capita income and percentage unemployed. First, I estimate using OLS without controls, and robust standard errors to correct for heteroskedasticity:

$$Y_{i,t} = ß_0 + ß_1 CasinoOpen_{i,t} + ß_2 TierOne_{i,t} + ß_3 TierTwo_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is per capita income or percentage unemployed in PUMA *i* in year *t*, $ß_0$ is a constant, $ß_1$, $ß_2$, and $ß_3$ estimable coefficients, and $\varepsilon_{i,t}$ is a stochastic error term. *CasinoOpen* is a dummy variable that receives a 1 if a casino was open in PUMA *i* in year *t*, and *TierOne* and *TierTwo* receive a 0-5 depending on how many casinos are in each tier in PUMA *i* in year *t*. Picture 1 shows an example of this. Next, I estimate using OLS with controls and robust standard errors:

$$Y_{i,t} = \delta_0 + \delta_1 CasinoOpen_{i,t} + \delta_2 TierOne_{i,t} + \delta_3 TierTwo_{i,t} + \boldsymbol{\delta_4 X_i'} + \tau_t + \eta_{i,t} \quad (2)$$

where $\boldsymbol{X'}$ is a vector of controls, such as demographic characteristics, education level, and a dummy variable that receives a 1 if a casino is Native American, and δ_4 is a vector of estimable coefficients. τ_t is a vector of time dummies, with 2005 being the reference group, and $\eta_{i,t}$ is a stochastic error term. Time dummies control for shocks that are specific to each year. In this case, they help control for the effects of the Great Recession in particular.

4.2 Fixed Effects Model

Fixed effects models allow us to control for time invariant unobservable factors specific to each PUMA, and somewhat control for unobservable factors that vary little over time. This is useful because reliable data cannot be found for some things that do not vary over time. Without controlling for these time invariant unobserved factors, the regression coefficients could be biased in either direction. An example of something that does not vary over time (or likely not much) is an area's ability to create jobs. A place that is already good at creating jobs may introduce a casino because they know it will create more jobs, creating a downward bias on the casino open coefficient in the unemployment OLS regression. On the other hand, a place that typically has trouble attracting jobs could add a casino to bring in jobs, creating an upward bias in the casino open coefficient in the unemployment regression. A place that typically creates high paying jobs may have a higher per capita income, and casinos may decide to locate in these areas because people have more money to gamble with. This would create an upward bias on the casino open variable in the per capita income OLS regression. It is also possible that a place typically creates low paying jobs, and thus has a lower per capita income. Casinos may want to locate in these areas if they believe people working low income jobs are more susceptible to gambling addiction. This would create a downward bias on the casino open variable in the per capita income OLS regression. Fixed effects eliminates (or at least somewhat mitigates) these biases.

I estimate the fixed effects model using the within estimator, and standard errors clustered at the PUMA level:

$$Y_{i,t} = \psi_0 + \psi_1 CasinoOpen_{i,t} + \psi_2 TierOne_{i,t} + \psi_3 TierTwo_{i,t} + \boldsymbol{\psi_4 X_i'} + \tau_t + \alpha_i + \mu_{i,t} \quad (3)$$

where α_i is the fixed effect, and $\mu_{i,t}$ is a stochastic error term. This allows me to control for time invariant unobservable factors specific to each PUMA.

One important concern is that the main independent variables may not vary enough for the fixed effects estimation to be reliable. To see whether this is true, I calculate the within coefficient of variation for the main independent variables, and for the controls that are statistically significant in each of the fixed effects estimations. I present the results of this test in section 5.3.

5. Results

This section details the main result, whether the estimates for the controls are as expected, and examples of the viability of fixed effects. The control estimates turn out as expected. OLS shows some significant effects from the main independent variables, however when fixed effects is employed all significant effects from the main independent variables disappear. I argue that there is enough variation in the data over time for me to use fixed effects.

5.1 Main Results

The results for each estimation for per capita income are shown in table 2. As shown in the first column of table 2, using OLS without controls shows that having a casino open in a PUMA is associated with a decrease in per capita income by $5386. Having more casinos in PUMAs one and two tiers is associated with a decrease in per capita income by $3782, and $647 respectively. All these results are significant at the 10% level or lower. However, for the OLS estimation with controls, we find no evidence that having a casino open affects per capita income. These results also indicate that having casinos in PUMAs one and two tiers out is associated with a decrease in per capita income by $1160 and $956 respectively; both these results are significant at the 1% level. However, once fixed effects are employed, all 3 of these results are insignificant. This indicates that when time invariant unobserved heterogeneity is controlled for, we find no evidence that having a casino or having more surrounding casinos affect per capita income, whereas the OLS models are primarily associated with negative effects. In addition, the fixed effects coefficients for casino open, and for number of casinos one tier out are lower in magnitude than the OLS estimates. These results should cause some skepticism of reports claiming that casinos will raise incomes in an area.

Table 3 shows the results for each estimation for percentage of the workforce unemployed. We observe that, for the OLS regression without controls, we find no evidence that having a casino open in a PUMA affects percentage unemployed. However, having more casinos in PUMAs one and two tiers out is associated with a decrease in the percentage unemployed by 0.25 percentage points and 0.49 percentage points respectively; both these results are statistically significant at the 5% level or lower. When controls are added, the results indicate that having a casino open in a PUMA is associated with a decrease in the percentage unemployed by 0.38 percentage points. This result is significant at the 10% level. However, there is no evidence that having casinos in PUMAs one or two tiers out affects the percentage unemployed. The fixed effects estimation indicates that there is no evidence that having a casino in a PUMA, or having casinos one or two tiers out affects the percentage unemployed. While OLS estimates show some significant downward effects on the unemployment rate, fixed effects indicates there is no evidence that casino establishment, or having additional surrounding casinos, affects the unemployment rate. Again, this should cause skepticism when reports arguing for casino construction claim to help employment.

5.2 Controls

Now I examine whether or not the signs and statistical significances of the controls are as expected. Looking at the estimates for the controls where per capita income is the dependent variable (in Table 2), all the coefficients have the expected sign. A higher mean age should result in higher per capita incomes. Given that there is a wage gap between men and women in the United States, it is expected that the coefficient on percentage female is negative. The coefficients on percentage Black, Native American, and other are always negative in these estimations, which is expected since the reference group is percentage white. The coefficient on percentage not finished high school is negative as expected, however it is surprising that this result is not significant with the reference group being those who finished high school and have some college (up to a bachelor's degree). The coefficient for percentage master's degree or higher is positive as expected, and is significant in both regressions. All the year dummy variables are compared to 2005, so it is expected that all coefficients are negative and significant, due to the Great Recession.

For the model where percentage unemployed is the dependent variable, we see that almost all the coefficients on percentage ethnicity variables are positive, implying that PUMAs with higher percentages of these ethnicities compared to the percentage of white people have higher unemployment, which is expected. Both the coefficients on the education variables turn out as expected; those who did not finish high school have higher unemployment rates than those who finished high school and some college, and those who have master's degrees or higher have lower unemployment rates than those who finished high school and some college. As for the coefficients on the year dummy variables, 2006, 2007, and 2008 all show lower unemployment rates than 2005, which could be due to an increase in discouraged workers with the economy turning down, or more people working in the black markets. The coefficients for 2009, 2010, and 2011 all show higher rates of unemployment than 2005, which could be because people started to look for jobs again, but many were unable to get them.

5.3 Data Variability

One potential concern is that the data may not vary enough over time for the fixed effect to be uncorrelated with the main independent variables. To see if there is enough variability, I calculate the within coefficient of variation for the three main independent variables, and then for controls that have statistically significant coefficients in the fixed effects estimations. These values are displayed in Table 4. Parameter estimates may be insignificant if the variables do not vary much over time, making them correlated with the fixed effect. Variables that are significant in the fixed effects estimations likely do vary enough over time to be uncorrelated with the fixed effect. If the within coefficient of variation is larger for the main independent variables than for the controls with statistically significant coefficients, then I argue there is enough variation in the data to use fixed effects. We can see that the within coefficient of variation for all three main independent variables is higher than for four out of five of the controls that have statistically significant estimates. I argue there is enough variability in the data over time to justify using fixed effects.

6. Conclusion

I estimate per capita incomes and unemployment percentages in New York State PUMAs from 2005-2011 using a unique dataset containing casino opening dates and number of surrounding casinos, and demographic and education controls. When controlling for time invariant unobserved heterogeneity through fixed effects, I find no evidence that having a casino open in your area, or having bordering casinos impacts per capita income or percentage unemployed. Looking at the results of the within coefficients of variation, I present evidence that there is enough variation in the main independent variables for them not to correlate too much with the fixed effect (causing them to be insignificant) for both fixed effects regressions.

These results differ from some of the previous literature, and agree with others. Geisler and Nichols (2015) looked at riverboat casinos, and found that casino establishment had a positive impact on the unemployment rate and real per capita income, however this study finds no evidence of this. They also found that having more casinos in surrounding counties diminished the positive effects of casino establishment, whereas this study finds no evidence of this either. However, Wenz (2008) found no evidence that establishing a casino affected employment in non-Native American counties, which is similar to the findings of this study. This dataset only accounts for New York State, which could explain the differences in results, especially because around half of the casinos in the state are racinos, which may not be typical in other states.

The theories on the effects of casino establishment listed in section 1 cannot be proved or disproved by these results. As a result of these findings, I argue that towns and cities should be more skeptical of reports claiming that a casino opening will raise employment and incomes, and should take a look at other literature before deciding to establish a casino. Also, accounting for the utility gained by consumers is an important consideration. Further research could look at potential endogeneity issues with casino location, adding in controls that others have not accounted for, or analyzing the effects of internet gambling, particularly in the form of daily or season long sports betting, as this is becoming increasingly popular, and could have different effects than casino gambling. Another aspect to look into is the long-term effects of casino establishment; this may be different from the short-term. Using different models and estimation techniques may also provide more convincing results, such as applying a fixed effects model to a different estimation technique.

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Tables and Pictures

Table 1. Descriptive Statistics

Variable	N	Mean	Standard Deviation	Min	Max
Per Capita Income	1001	32,046.3	15,792.28	9,677.888	109,425.2
Percent unemployed	1001	7.646	3.278	1.695	22.255
Casino Open	1001	0.095	0.293	0	1
Number of Casinos One Tier out	1001	0.458	0.783	0	4
Number of Casinos Two Tiers out	1001	0.884	1.060	0	5
Native American Casino	1001	0.034	0.181	0	1
Mean Age	1001	39.806	2.96	30.511	49.014
% Female	1001	52.365	2.203	46.858	60.095
% White	1001	71.838	26.707	1.719	99.021
% Black	1001	14.464	20.000	0.156	94.004
% Native American	1001	0.217	0.328	0	2.727
% Asian	1001	6.663	8.615	0.059	50.049
% Other	1001	6.817	10.272	0	54.112
% Not Finished High School	1001	30.055	8.015	6.008	62.341
% Finished High School Some College	1001	56.393	6.343	32.195	67.850
% Master's or Higher	1001	13.552	6.319	4.745	41.799

The casino data is created through internet searches, and the demographic and education data comes from the American Community Survey.

Table 2. OLS and Fixed Effects estimates for PCI

	OLS, no controls	OLS, with controls	Fixed Effects
Casino Open	-5,386.432***	906.831	-519.103
	(847.614)	(740.329)	(899.681)
Number of Casinos One Tier out	-3,782.004***	-1,159.519***	-56.924
	(386.109)	(241.769)	(448.845)
Number of Casinos Two Tiers out	-646.844*	-956.224***	-1,084.01
	(384.788)	(179.224)	(709.703)
Native American Casino	-	-469.948	-1,126.563
		(753.517)	(1,251.567)
Mean Age	-	466.425***	354.999***
		(130.821)	(92.081)
Percent Female	-	-431.713***	-48.033
		(144.377)	(66.919)
Percent Black$_{\alpha}$	-	-6.888	-151.158***
		(14.998)	(45.572)
Percent Native American$_{\alpha}$	-	-1,955.379***	-279.617
		(549.942)	(232.449)
Percent Asian$_{\alpha}$	-	-119.180***	-83.243
		(22.558)	(52.702)
Percent Other$_{\alpha}$	-	-10.030	-89.631***
		(35.228)	(32.626)
Percent Not Finished High School$_{\delta}$	-	-186.662	-6.119
		(83.345)	(56.173)
Percent Master's or Higher$_{\delta}$	-	2,006.74***	444.605***
		(67.362)	(68.986)
Year 2006	-	-5,630.464***	-5,846.853***
		(709.497)	(263.466)
Year 2007	-	-4,331.140***	-3,960.454***
		(737.822)	(283.463)
Year 2008	-	-3,854.343***	-3,056.689***
		(754.055)	(312.852)
Year 2009	-	-4,366.207***	-3,237.795***
		(745.708)	(336.266)
Year 2010	-	-5,217.770***	-3,796.632***
		(752.432)	(361.217)
Year 2011	-	-5,789.000***	-4,058.793***
		(799.141)	(418.081)
Intercept	34,859.82***	21,363.05**	22,496.04***
	(790.902)	(10,549.550)	(5,921.277)
R-Squared	0.053	0.855	0.585
N	1001	1001	1001

Numbers in parentheses are robust standard errors for the OLS estimations, and clustered at the PUMA level standard errors for the Fixed Effects estimation.
*** Significant at the 1% level using a two-tailed test.
** Significant at the 5% level using a two-tailed test.
* Significant at the 10% level using a two-tailed test.
α Reference group is percent white.
δ Reference group is percent finished high school or some college.

Note: the r-squared from the fixed effects estimation is the squared correlation between the predicted per capita incomes and actual per capita incomes.
Note: The fixed effect R-squared would be higher with the dummy variable regression.

Table 3. OLS and Fixed Effects estimates for percent unemployed

	OLS, no controls	OLS, with controls	Fixed Effects
Casino Open	-0.111	-0.381*	-0.620
	(0.285)	(0.199)	(0.686)
Number of Casinos One Tier out	-0.251**	0.099	-0.001
	(0.105)	(0.077)	(0.344)
Number of Casinos Two Tiers out	-0.494***	-0.016	0.108
	(0.083)	(0.053)	(0.260)
Native American Casino	-	0.884***	0.878
		(0.287)	(0.811)
Mean Age	-	0.048	-0.003
		(0.029)	(0.049)
Percent Female	-	0.036	-0.056
		(0.040)	(0.039)
Percent Black$_{\alpha}$	-	0.064***	0.010
		(0.005)	(0.037)
Percent Native American$_{\alpha}$	-	0.595***	0.265
		(0.166)	(0.219)
Percent Asian$_{\alpha}$	-	0.019***	0.003
		(0.007)	(0.034)
Percent Other$_{\alpha}$	-	0.074***	-0.020
		(0.010)	(0.026)
Percent Not Finished High School$_{\delta}$	-	0.099***	0.081**
		(0.019)	(0.040)
Percent Master's or Higher$_{\delta}$	-	-0.035***	-0.149***
		(0.014)	(0.047)
Year 2006	-	-0.659***	-0.653***
		(0.190)	(0.148)
Year 2007	-	-1.017***	-0.973***
		(0.177)	(0.161)
Year 2008	-	-1.169***	-1.188***
		(0.187)	(0.180)
Year 2009	-	1.859***	1.824***
		(0.199)	(0.187)
Year 2010	-	2.791***	2.791***
		(0.208)	(0.220)
Year 2011	-	2.513***	2.566***
		(0.226)	(0.256)
Intercept	8.208***	-0.989	9.484***
	(0.151)	(2.299)	(3.242)
R-Squared	0.036	0.747	0.455
N	1001	1001	1001

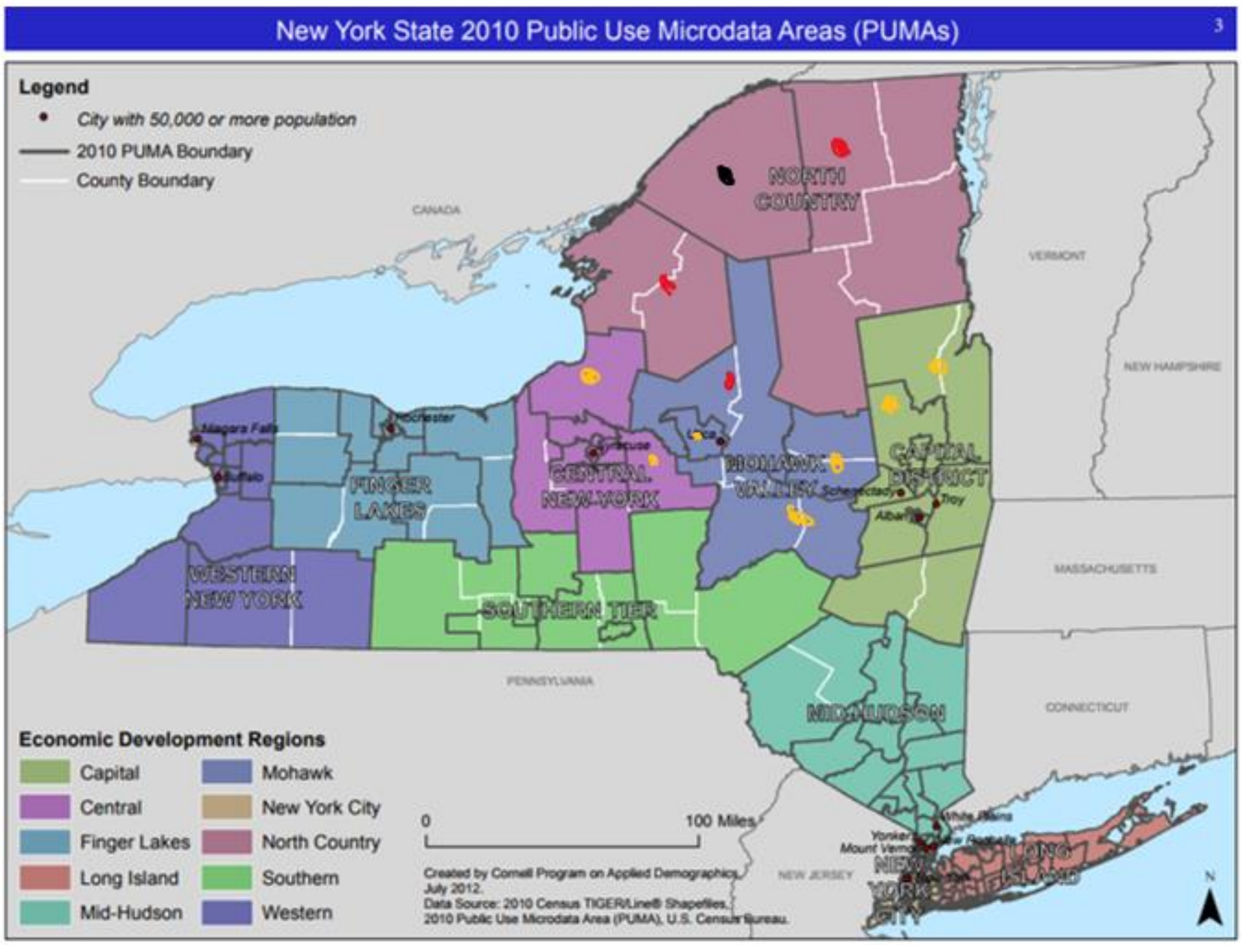
Numbers in parentheses are robust standard errors for the OLS estimations, and clustered at the PUMA level standard errors for the Fixed Effects estimation.
*** Significant at the 1% level using a two-tailed test.
** Significant at the 5% level using a two-tailed test.
* Significant at the 10% level using a two-tailed test.
α Reference group is percent white.
δ Reference group is percent finished high school or some college.

Note: the r-squared from the fixed effects estimation is the squared correlation between the predicted unemployment percentages and the actual unemployment percentages.
Note: The fixed effect R-squared would be higher with the dummy variable regression.

Table 4. Within coefficients of variation

Variables	Within coefficient of variation
Casino Open	0.666
Number of casinos one tier out	0.253
Number of casinos two tiers out	0.183
Mean age	0.025
% Black	0.112
% Other	0.316
% Not finished high school	0.062
% Masters or higher	0.079

Picture 1. Map of NYS PUMAs, and illustration of one and two tier out PUMAs.



The black dot represents a host PUMA. The black lines divide PUMAs. Red dots represent PUMAs one tier out from the host PUMA, and yellow dots represent PUMAs two tiers out from the host PUMA. In this case, the host PUMA has 3 PUMAs one tier out, and 7 PUMAs two tiers out.