American Indian Casino Operations and Firm Long-Run Employment and Sales

Joseph Aguilar-Bohorquez[a] Randall Akee[b] Elton Mykerezi[a]

[a]**University of Minnesota**
[b]Harvard Kennedy School

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Main takeaway: Casino openings increase total reservation sales and employment as well as outcomes for the average establishment. Gains also extend to establishments observed before casino entry.

Casino development may affect reservation economies beyond the casino

Why this question matters

- American Indian reservations face long-standing barriers to private-sector development.
- The Indian Gaming Regulatory Act (1988), or IGRA, created a framework for tribally owned casino operations.

Research question

Do casino openings produce sustained expansion in reservation business activity, including among pre-existing establishments and outside visitor-facing sectors?

Tribal gaming gross gaming revenue

$46.2B

FY 2025

Contribution

We link casino opening years, establishment outcomes, and reservation boundaries to study long-run local business responses.

Source: National Indian Gaming Commission, FY 2025 release (July 21, 2026).

Reservation averages and totals capture different margins

Data

Casino opening years, NETS establishment records, geocoded locations, and reservation boundaries. Sales are in 2019 dollars.

Average and total outcomes

$$\overline{Y}_{rt} = \frac{1}{N_{rt}} \sum_{i=1}^{N_{rt}} Y_{irt}$$ Average observed establishment

$$Y_{rt}^{\text{total}} = \sum_{i=1}^{N_{rt}} Y_{irt}$$ Reservation-wide total

Totals capture changes in establishment scale and in the number of observed establishments.

Three analysis samples

1. All establishments.
2. Establishments first observed before casino opening.
3. Excluding NAICS 71–72.

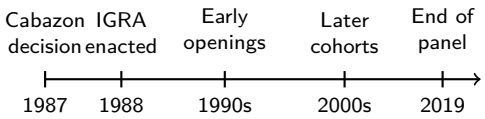
257 reservations

Reservations treated before the panel began are excluded.

Eight outcomes in each sample

Mean and total sales and employment, each estimated in levels and logs.

Staggered casino openings create the comparison



Treatment and revised sample

- Treatment begins in the first year a tribal casino operates on the reservation and remains on afterward.
- Reservations already treated when the panel begins are removed because their untreated pre-period is unobserved.

Estimator

Callaway & Sant'Anna (2021) group-time effects for staggered adoption.

Counterfactual comparison

For each opening cohort g, compare outcome changes with never-treated reservations over the same periods.

Implementation

- Doubly robust improved estimator and never-treated controls.
- Reservation-level inference with dynamic and overall aggregation.

Specifications answer complementary questions

Unconditional log: preferred

- Estimates the proportional effect relative to the no-casino trajectory.
- Supports comparison across reservations with very different economic scale.
- Requires parallel counterfactual trends in the log outcome.

Unconditional level: comparison

- Estimates the absolute effect in 2019 dollars or employees.
- Requires parallel counterfactual changes in outcome levels.

Conditional log and level

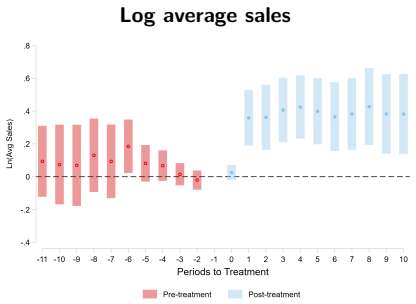
- Retain the corresponding proportional or absolute interpretation.
- Condition on the outcome-specific 1990–1991 change and exclude the 1991 treatment cohort.

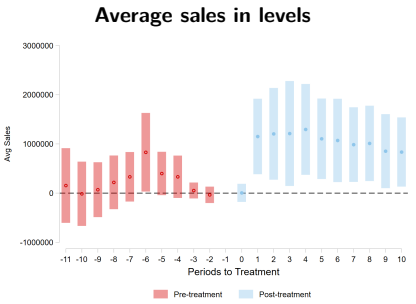
Balanced event window: -5 to $+5$

- Re-estimates log and level event studies over a common window, reducing composition changes at distant event times.

Shared counterfactual: Logs express the difference proportionally; levels express it in dollars or employees.

Average sales increase in proportional and absolute terms

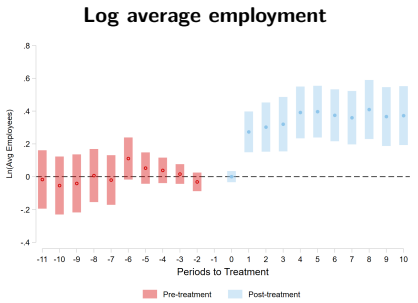


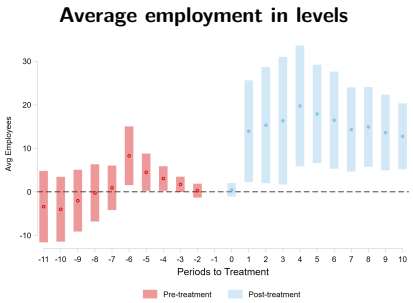


Takeaway

Both specifications show higher average establishment sales after casino opening. The log estimate gives the proportional effect; the level estimate gives the effect in 2019 dollars per observed establishment.

Average employment increases in proportional and absolute terms

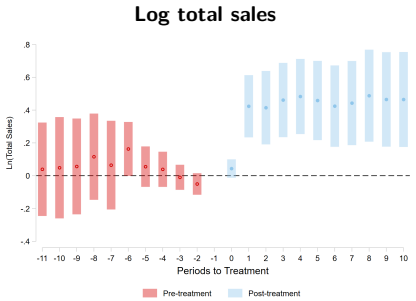


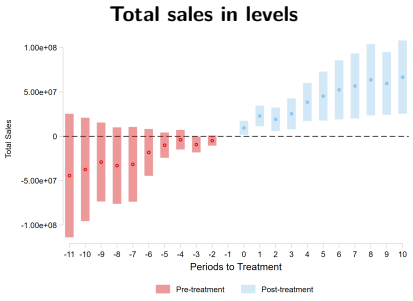


Takeaway

Average employment rises after casino opening in both functional forms. The level estimate reports additional employees per observed establishment, while the log estimate reports a proportional difference from the counterfactual.

Total reservation sales rise after casino opening

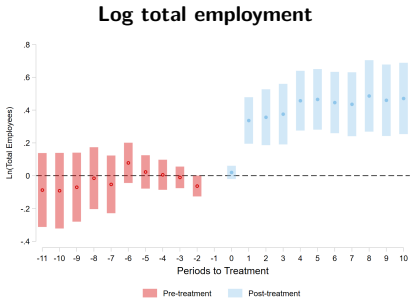


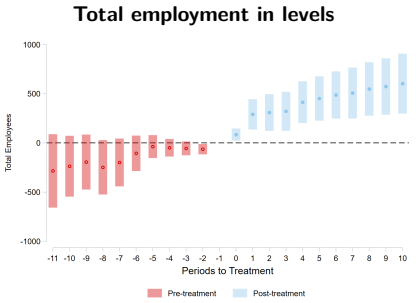


Takeaway

The total-sales results show a reservation-wide increase rather than only a change in the size of the average observed establishment. Log and level estimates point to the same conclusion.

Total reservation employment rises after casino opening



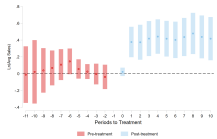


Takeaway

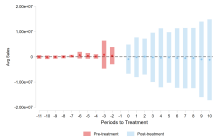
The total-employment results indicate an expansion in reservation employment across observed establishments. The increase is visible in both proportional and absolute terms.

Conditional average outcomes: level sales are imprecise

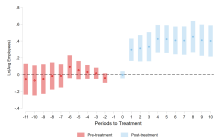
Sales: log conditional



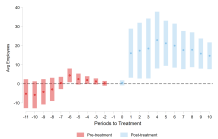
Sales: level conditional



Employment: log conditional



Employment: level conditional

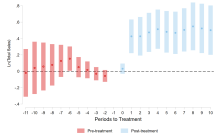


Robustness

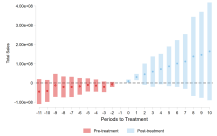
Conditioning on the outcome-specific 1990–1991 change preserves the positive pattern for log average sales and for employment in logs and levels. Average sales in levels are close to zero and imprecisely estimated. The conditional sample excludes the 1991 treatment cohort.

Conditional total outcomes: level sales are less precise

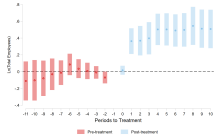
Sales: log conditional



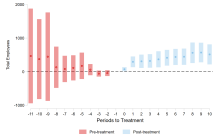
Sales: level conditional



Employment: log conditional



Employment: level conditional

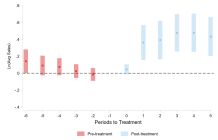


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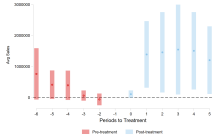
Conditional estimates remain positive for total sales and employment. The evidence is clearer in logs and for total employment in levels, while total-sales level estimates have wide confidence intervals that frequently include zero.

Balanced-window average outcomes remain positive

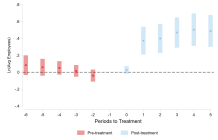
Sales: log, balanced -5 to $+5$



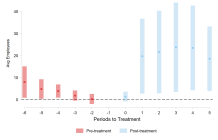
Sales: level, balanced -5 to $+5$



Employment: log, balanced -5 to $+5$



Employment: level, balanced -5 to $+5$

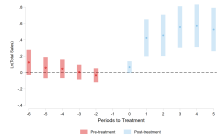


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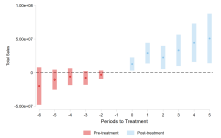
Across the balanced -5 to $+5$ window, average sales and employment remain positive in logs and levels.

Balanced-window total outcomes remain positive

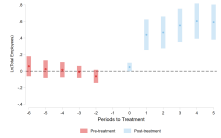
Sales: log, balanced -5 to $+5$



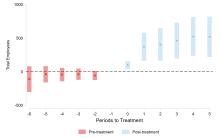
Sales: level, balanced -5 to $+5$



Employment: log, balanced -5 to $+5$



Employment: level, balanced -5 to $+5$

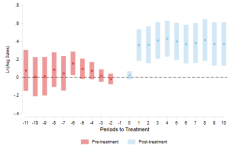


Robustness

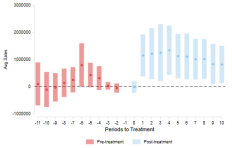
Across the balanced -5 to $+5$ window, total sales and employment remain positive in logs and levels. The balanced window addresses changes in event-time composition, although it does not eliminate every nonzero pre-treatment coefficient.

Pre-existing establishments: average outcomes

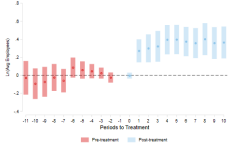
Sales: log



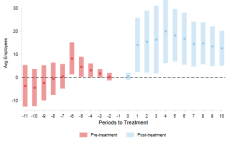
Sales: level



Employment: log



Employment: level

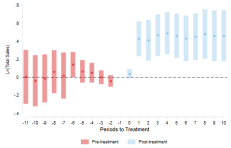


Interpretation

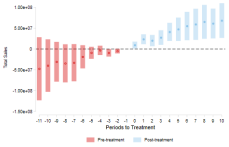
Average sales and employment also rise among establishments first observed before casino opening. These estimates are not from a continuously balanced within-establishment panel.

Pre-existing establishments: total outcomes

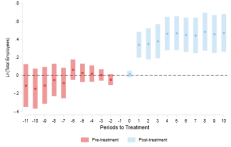
Sales: log



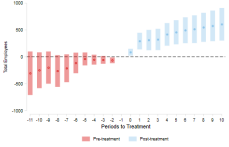
Sales: level



Employment: log



Employment: level

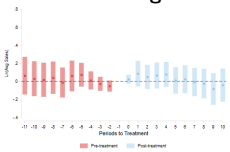


Interpretation

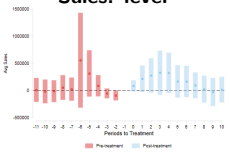
Aggregate sales and employment also increase among establishments first observed before casino opening. The result therefore appears in both the average and total outcomes for the pre-existing-establishment sample.

Excluding NAICS 71–72: average outcomes

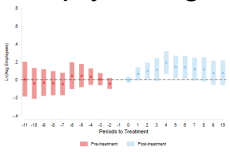
Sales: log



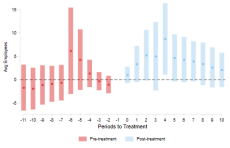
Sales: level



Employment: log



Employment: level

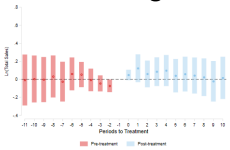


Interpretation

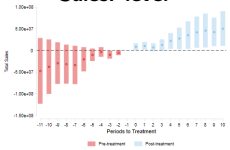
This sample removes casinos and other establishments in arts, entertainment, recreation, accommodation, and food services. Average sales effects become small and imprecise. Employment estimates remain positive in most post-treatment periods, but the evidence is less precise, especially in levels.

Excluding NAICS 71–72: total outcomes

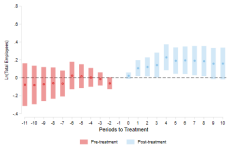
Sales: log



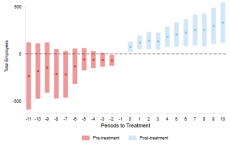
Sales: level



Employment: log



Employment: level



Interpretation

After excluding NAICS 71–72, total employment remains positive in logs and levels, with clearer precision in levels. Total-sales point estimates are mostly positive but less precisely estimated. Directly excluding casinos alone remains a separate extension.

Casino openings expand reservation business activity

Main takeaways

1. Main unconditional specifications: casino openings increase average and total sales and employment relative to the no-casino trajectory.
2. Log and level estimates agree in the main specification. Balanced-window estimates preserve the findings, while conditional level-sales estimates are less precise.
3. Gains extend to pre-existing establishments. Outside NAICS 71–72, employment effects remain positive, while sales effects are smaller and less precise.

Interpretation

Total outcomes show that aggregate reservation sales and employment increase. They do not reveal whether the expansion is broadly distributed across establishments or concentrated in a smaller number of firms.

Questions?

Joseph Aguilar-Bohorquez

aguil213@umn.edu

josephaguilarbohorquez.github.io

Backup slides

Backup: identifying assumptions by functional form

Log outcomes

$$E[\Delta \log Y_{rt}(0) \mid G_r = g] = E[\Delta \log Y_{rt}(0) \mid G_r = \infty].$$

This identifies proportional differences under parallel counterfactual changes in the log outcome.

Level outcomes

$$E[\Delta Y_{rt}(0) \mid G_r = g] = E[\Delta Y_{rt}(0) \mid G_r = \infty].$$

This identifies absolute differences under parallel counterfactual changes in outcome levels.

Robustness specifications

Conditional models impose the corresponding restriction after conditioning on the outcome-specific 1990–1991 change. Balanced models use the common -5 to $+5$ event-time window.

Here, Y_{rt} can denote a reservation-year average or total. See Roth and Sant'Anna (2023) on functional-form sensitivity.

Backup: treatment timing

Cohort structure

- The revised sample contains 257 reservations.
- Casino openings are concentrated in the 1990s and early 2000s.
- Never-treated reservations provide the comparison group.

Why this matters

- Treatment timing varies across reservations.
- Effects may differ across cohorts and event times.
- Callaway–Sant'Anna avoids inappropriate comparisons between earlier- and later-treated reservations.

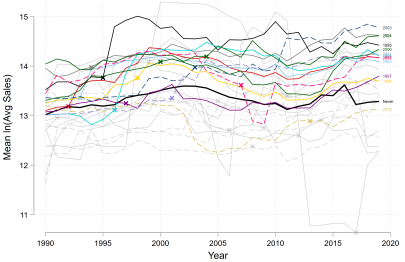
Analysis window

1990–2019

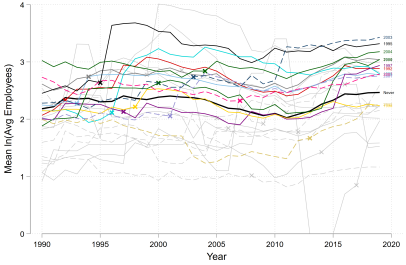
Pre-panel treated reservations excluded

Backup: raw cohort trends in log mean outcomes

Sales



Employment



Diagnostic

The highlighted treated cohorts broadly track never-treated reservations before casino openings in the preferred log functional form.

Backup: baseline balance in logs, ever-treated vs. never-treated

	Mean		Diff.	SMD	p-value	Obs.	
	ET	NT				ET	NT
Baseline log sales (1990)	13.186	13.019	0.167	0.133	0.304	131	108
Baseline log emp. (1990)	2.154	2.183	-0.029	-0.027	0.838	131	108
Emp. share: Retail (1990)	0.103	0.098	0.005	0.025	0.848	131	108
Emp. share: Hospitality (1990)	0.148	0.163	-0.015	-0.055	0.670	131	108
Emp. share: Manufacturing (1990)	0.084	0.045	0.040	0.255	0.055	131	108
Poverty rate (1990)	0.332	0.320	0.011	0.065	0.639	114	94
Pretrend in log emp. (1991–1990)	0.005	0.034	-0.029	-0.148	0.255	128	108
Pretrend in log sales (1991–1990)	0.071	0.090	-0.019	-0.055	0.679	128	108

Draft warning: replace all values with the revised 257-reservation sample. ET denotes ever-treated and NT never-treated reservations. The 1991 treatment cohort is excluded from the 1990–1991 pretrend rows.

Backup: baseline balance in levels, ever-treated vs. never-treated

	Mean		Diff.	SMD	p-value	Obs.	
	ET	NT				ET	NT
Mean sales (1990)	1,200,397	1,197,089	3,308	0.001	0.993	131	108
Mean employment (1990)	17.704	21.060	-3.355	-0.076	0.554	131	108
Emp. share: Retail (1990)	0.103	0.098	0.005	0.025	0.848	131	108
Emp. share: Hospitality (1990)	0.148	0.163	-0.015	-0.055	0.670	131	108
Emp. share: Manufacturing (1990)	0.084	0.045	0.040	0.255	0.055	131	108
Poverty rate (1990)	0.332	0.320	0.011	0.065	0.639	114	94
Employment change (1991–1990)	-0.226	1.617	-1.844	-0.202	0.121	128	108
Sales change (1991–1990)	-78,269	239,701	-317,970	-0.248	0.063	128	108

Draft warning: replace all values with the revised 257-reservation sample. Sales are in 2019 dollars. The 1991 treatment cohort is excluded from the 1990–1991 change rows.

Backup: early-treated balance in logs

	Mean		Diff.	SMD	p-value	Obs.	
	ET	NT				ET	NT
Baseline log sales (1990)	13.295	13.019	0.277	0.213	0.177	67	108
Baseline log emp. (1990)	2.277	2.183	0.095	0.086	0.579	67	108
Emp. share: Retail (1990)	0.096	0.098	-0.003	-0.014	0.927	67	108
Emp. share: Hospitality (1990)	0.155	0.163	-0.008	-0.031	0.846	67	108
Emp. share: Manufacturing (1990)	0.083	0.045	0.039	0.251	0.095	67	108
Poverty rate (1990)	0.341	0.320	0.021	0.120	0.473	57	94
Pretrend in log emp. (1991–1990)	0.011	0.034	-0.023	-0.114	0.473	64	108
Pretrend in log sales (1991–1990)	0.027	0.090	-0.063	-0.206	0.194	64	108

Draft warning: replace all values with the revised 257-reservation sample. Early-treated reservations open casinos in 1991–1996. The 1991 cohort is excluded from the pretrend rows.

Backup: construction of the pre-existing-establishment sample

Sample rule

- In treated reservations, remove establishments whose first observed year is the casino-opening year or later.
- In never-treated reservations, retain all observed establishments.
- An establishment need not operate in $g-1$ and need not appear continuously.

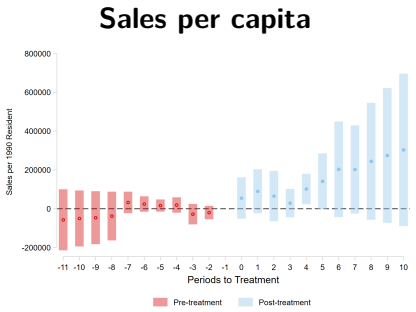
Interpretation

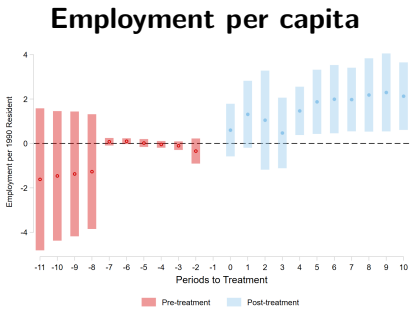
The outcome uses establishments first observed before casino entry. Establishments contribute only in years in which they are observed, so exits and missing records can change composition.

What this sample accomplishes

It removes the direct contribution of establishments first observed at or after casino entry. It does not identify a pure within-establishment growth effect.

Backup: preliminary per-capita outcomes



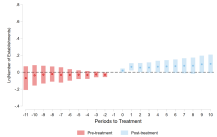


Preliminary analysis

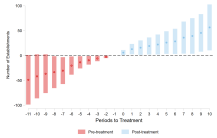
These are first-pass estimates. The per-capita construction loses substantially more reservations than the main analysis, so we are checking the population merge, coverage, and missing-data rules before drawing conclusions.

Backup: preliminary number of establishment outcomes

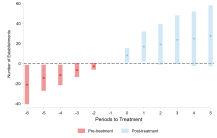
Log number of establishments



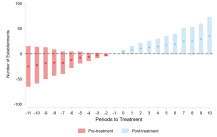
Number of establishments in levels



Number of establishments: balanced -5 to $+5$



Number of establishments: level conditional



Preliminary analysis

Establishment counts seem to increase after casino opening across specifications, suggesting that the establishment-count margin contributes to higher totals. We are still validating this.

Backup: extensions in progress

Current revision priorities

- Complete and validate the number of establishments as an outcome, then use it to distinguish changes in establishment counts from changes in establishment size.
- Identify casino establishments directly and remove only casinos, rather than excluding all of NAICS 71–72.
- Estimate spatial spillovers around reservation boundaries and casino locations.
- Study heterogeneity by reservation characteristics and casino characteristics.
- Diagnose reservation loss in the preliminary per-capita outcomes.

Purpose

These extensions will clarify whether the expansion reflects establishment entry, incumbent growth, direct casino activity, or broader changes in nearby economic activity.