

Cross-border Competition and the Recession Effect on Atlantic City's Gaming Volumes

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Abstract

Atlantic City casinos were hit by both the 2007-2009 recession and the addition of legalized gaming in Pennsylvania at about the same time. Results of this study show a significant decrease of \$422.9 million in monthly slot coin-in for Atlantic City casinos when Parx and Harrah's, the first two Pennsylvania casinos, opened. When Sands, SugarHouse, and Valley Forge opened in Pennsylvania during the following year, there was no additional significant effect to Atlantic City casinos' slot coin-in. Atlantic City casinos also had a significant decrease in table games drop of \$34.1 million monthly when table games started in Pennsylvania. The recession had no significant effect on either slots or table games volume once the effect of the new casinos in Pennsylvania was accounted for. To counteract decreased volumes, casino management needs to understand how much gaming volume they are losing to competition and to the recession.

Key words: recession, cross-border competition, Atlantic City, gaming volume, Pennsylvania

Introduction

Atlantic City, the second oldest and third largest gaming market in the U.S., struggled with slow growth and decreased revenue even before the Great Recession that started in late 2007. While the U.S. gaming market as a whole saw an increase in gaming revenue in 2007 even with the recession late in the year, Atlantic City casinos saw a decrease (American Gaming Association, 2013b; New Jersey Casino Control Commission, 2008). This year was the first period with a year over year decrease and the market has experienced a continual decline since (New Jersey Casino Control Commission, 2008). Since late 2006, Atlantic City casinos have faced overlapping economic issues: Pennsylvania's first casino opening in December 2006 and the Great Recession that began in December 2007.

The majority of Atlantic City gaming customers live within 75 miles of the city (Eadington, 2011), which means the markets that would be in direct competition for Atlantic City customers would be Delaware, some casinos in Pennsylvania, and one property in Maryland. Pennsylvania was the only market that had a change in their gaming market during the recession period. Maryland did not open their first casino until late 2010. While Delaware did not add new casinos the existing ones did increase the number of slot machines for the period right before the recession although Atlantic City was still seeing a year over year increase at this time (UNLV Center for Gaming Research, 2014), so Delaware was not having a negative effect on the visitors to Atlantic City. Like Atlantic City, Delaware has also seen a major decrease in gaming revenue since the Great Recession and Pennsylvania's legalization of gaming (UNLV Center for Gaming Research, 2014). Since the only change in the gaming region at the time was

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Pennsylvania, this is the only market that is considered in this study.

Despite the increasing attention to the Great Recession and the legalization of gaming, research on the effect of these two issues on casino gaming volumes is scarce. Even less research has explored the effect on one portion of a region when another portion of the region increases gaming availability. Therefore, the purpose of this study is to quantify how much of the decline in Atlantic City gaming volume is due to the economic recession and how much is due to the legalization of gaming in Pennsylvania. Identifying the potential factors of this decline is paramount since management strategies to each circumstance should be different. Determining the effect of the recession, distinct from interstate competition, will assist casino management in investigating how much, if any, each new competitor casino contributes to the region's decline in gaming volume. This information will thereby help casino executives make well-informed business decisions. Furthermore, since the present study is among the first to investigate the effect of the Great Recession and the legalization of gambling in Pennsylvania simultaneously on the gaming volume in Atlantic City, it fills a critical void.

Literature Review

The Great Recession of 2007-2009

From 1992 until 2007, the U.S. gaming industry has rapidly grown from \$9.6 billion to \$37.5 billion in annual gross revenue, approximately a 10% average annual increase (American Gaming Association, 2002; American Gaming Association, 2013b). Despite multiple national recessions, prior to 2008 the gaming industry had historically been deemed as recession-proof (Linn, 2008). For instance, during the recession of 2001, the commercial casino industry experienced a 4.9% increase in overall gaming revenues whereas other industries suffered from decreased economic activity (American Gaming Association, 2002). Keith Schwer, director of the Center for Business and Economic Research at the University of Nevada, Las Vegas, stated that during these more "shallow recessions", customers may continue to gamble as a means of relief and the hope of striking it rich (Linn, 2008). However, the Great Recession of 2007-2009 shattered the notion of a recession-proof industry (Palenik, 2011). Annual gross gaming revenue dropped to \$36.22 billion in 2008 and decreased again to \$34.28 billion in 2009 (American Gaming Association, 2013b). Even though the U.S. commercial casino industry is recovering from the severe impact of the recession with growth for three consecutive years, total gaming revenue of \$37.34 billion in 2012 still lags behind prerecession levels of \$37.52 billion (American Gaming Association, 2013b).

Though total commercial casino gaming revenue has increased coming out of the recession, not all individual U.S. markets are experiencing the same changes with 7 of the 22 states with commercial casinos experiencing decreases in 2012 (American Gaming Association, 2013a). Atlantic City is an example of one market that has yet to recover. Some markets recovered more quickly than the entire U.S. For instance, gaming volume and revenue in Iowa riverboats rebounded in 2011, after 2 years of decreases, and exceeded pre-recession levels (Iowa Racing and Gaming Commission, n.d.). In the only known research which studied the effect of the Great Recession on gaming, Zheng, Farrish, Lee, and Yu (2013) found conflicting results on different gaming volume indicators in Iowa. In Iowa, the number of customers entering the casino is tracked. Zheng et al. (2013) found there was no significant decrease in customers during the recession. The authors also found that slot coin-in was not significantly effected by the recession but there was a significant decrease in table games drop. The decrease in table games drop, though significant, only accounts for under 0.12% of total gaming revenue in the state.

The Casino Industry in Atlantic City, New Jersey

As of 2012, 48 states in the U.S. operated some form of legalized gaming including, but not limited to, commercial casinos, lotteries, and tribal gaming. Hawaii and Utah

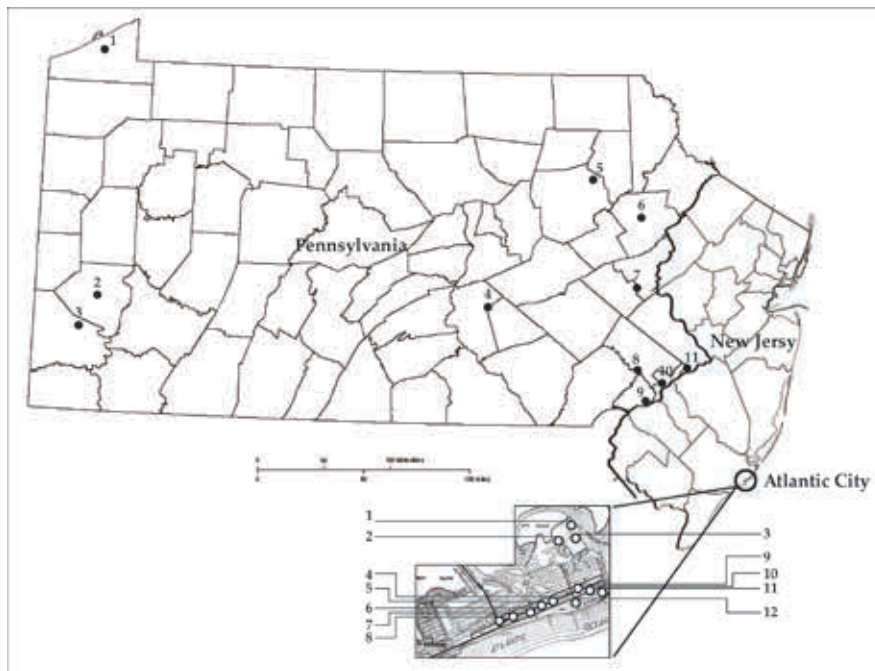
have not yet legalized gaming (Greenlees, 2008). Casinos have dramatically expanded in many U.S. regions, including the U.S. Mid-Atlantic area, which encompasses Delaware, Maryland, New Jersey, Pennsylvania, and New York. Since 1995, the region has seen the opening of 18 casino facilities (Condliffe, 2012; Dadayan & Ward, 2009). These expansions put a halt to the monopoly Atlantic City had for decades (Condliffe, 2012). In 2011, with 12 casino properties, Atlantic City was the second oldest and largest, by annual revenue terms, commercial casino location in the U.S. following Las Vegas (American Gaming Association, 2012). In 2011, Atlantic City had the second highest commercial casino revenue of all U.S. markets with \$3.3 billion, while Pennsylvania ranked third with \$3.02 billion despite only five years of casino operations (American Gaming Association, 2012). However, in 2012, Atlantic City dropped to the third behind Las Vegas and Pennsylvania (Southwick, 2013).

In examining the change in gaming revenues in all U.S. markets for 2004-2007 and 2007-2009, Eadington (2011) discovered that Atlantic City had the smallest increase in revenue (2.4%) compared to 12 states that had land-based commercial casino operations from 2004 to 2007. Additionally, from 2007 to 2009 Atlantic City had one of the largest decreases in gross gaming revenue of 19.9%, second only to Illinois' decrease of 27.9%, and experienced another 7% decrease in 2010 (American Gaming Association, 2012).

Like most U.S. gaming markets, besides Las Vegas, Atlantic City primarily has a domestic customer base (Eadington, 2011). The majority of customers come from within a 300-mile radius and more than 90% of gaming revenues and visitation is generated from visitors who reside within a 75-mile radius of the city (Eadington, 2011). From a customer's perspective, Atlantic City casinos operate under similar regulations to those in Pennsylvania in terms of types of games and hours of operations (New Jersey Casino Control Commission, 2014; Pennsylvania Gaming Control Board, 2013). Consequently, fierce competition for domestic customers exists between Atlantic City and adjacent states. More specifically, Atlantic City has faced increased cross-border competition since Pennsylvania's first casino opened in November 2006.

The Legalization of Gaming in Pennsylvania

The Pennsylvania market has historically been a critical source of revenue for New Jersey casinos due to its proximity to Atlantic City. However, in 2004 Pennsylvania legalized slot machines to reclaim residents from their adjacent competitor, Atlantic City. The first slots casino, Mohegan Sun at Pocono Downs, opened in November 2006 and as of 2012 Pennsylvania had 11 of the 14 approved licenses operating (Pennsylvania Gaming Control Board, 2013). Due to the increasing intense competition for gaming revenue, Pennsylvania started offering table games in 2010 (Condliffe, 2012). Out of the 11 properties, 5 are within 125 miles of Atlantic City. Figure 1 displays a map of casino locations in Pennsylvania and New Jersey as of November 2012.



Map Key

Map Number	Atlantic City	Pennsylvania
1.	Harrah's Resort Atlantic City	Presque Isle Downs Casino
2.	Borgata Hotel Casino & Spa	The Rivers Casino
3.	Golden Nugget Hotel Casino	The Meadows Racetrack & Casino
4.	Bally's Atlantic City	Hollywood Casino at Penn National
5.	Caesars Atlantic City	Mohegan Sun at Pocono Downs
6.	Trump Plaza Hotel Casino	Mount Airy Resort and Casino
7.	Tropicana Casino and Resort	Sands Casino Resort Bethlehem
8.	The Atlantic Club Casino Hotel	Valley Forge Casino Resort
9.	Trump Taj Mahal Casino Resort	Harrah's Philadelphia Casino & Racetrack
10.	Showboat Atlantic City	SugarHouse Casino
11.	Revel	Parx Casino/Philadelphia Park Racetrack
12.	Resorts Casino Hotel	

Source: New Jersey Casino Control Commission (2014), Pennsylvania Gaming Control Board (2013), and Google (2012)

Figure 1. Map of casino locations in Atlantic City and Pennsylvania as of November 2012

The Effect of Cross-Border Competition on Gaming Revenues

Research into cross-border competition has extensively been conducted on cigarette and alcohol consumption and revealed significant negative results (Baltagi & Levin, 1986; Lewitt, Coate, & Crossman, 1981; Saba, Beard, Ekelund, & Ressler, 1995; Saffer & Grossman, 1987). However, less attention has been paid to commercial gaming and the studies analyzed other aspects, such as the effect of new games on incumbent games or the relationship between different forms of gaming. For instance, Miers (1996) examined the impact of the British lottery on other types of gaming in England and found horserace betting and bingo decreased with the onset of the lottery. By examining all U.S. regions, Walker and Jackson (2008, 2011) found a positive relationship between tribal gaming, horseracing, and commercial casinos, indicating that as one sector grew so did the others.

Thalheimer and Ali (2008) examined slot machines at casinos in Iowa, Illinois, and Missouri, from 1991-1998. The authors introduced a variable of "ease of access" and found that when access to competing casinos increased, the demand at a particular casino decreased. Thalheimer and Ali (2008) further found that slot machine win and total win significantly decreased with competition from other riverboats and racinos. The competitors in this study included cross-border casinos in Indiana and Missouri and intrastate casinos within Iowa. Walker and Jackson (2008) also found a negative impact of neighboring state casinos on adjacent state commercial casino revenues.

Nichols (1998) studied the effect that regulation changes in a neighboring region have on gaming revenue and found that casinos with cross-border competitors produced \$1.3 million more in gaming revenue when Iowa deregulated gaming. Before deregulation, they produced \$585,000 less. Eadington, Wells, and Gossi (2010) found that a 10% increase in the capacity of Northern California tribal casinos caused an approximately 2.3% decline in demand in the Reno-Sparks market in Northern Nevada. By contrast, Walker and Nesbit (2014) found that the cannibalization on an existing casino in Missouri was outweighed by the additional increase in overall demand in the entire market, a phenomenon they coined the *agglomeration effect*. These conflicting results may be explained by the *factory effect* and *restaurant effect*, which describe the export base theory of economic growth (Walker, 1999). The factory effect occurs when casinos draw their customers from outside their physical location while the restaurant effect occurs when casinos generate revenue from mainly their local market. Most casinos in Las Vegas, in which gaming services are provided to visitors outside the region, are similar to factories. Common terminology for this in gaming is a *destination market*. On the other hand, casinos in most other regions outside Las Vegas are similar to restaurants, as firms in these regions take business from others within the area (Walker, 1999). Gaming firms in this type of region are generally considered to be operating in a *locals market*.

Only three known studies have been conducted on the effect of legalized casinos in Pennsylvania on Atlantic City casinos. McGowan (2009) examined the change in total gaming revenue in Pennsylvania and New Jersey from 2000 to 2007. He found that total gaming revenue in the region increased \$57.1 million per month after the introduction of slot machines. When only including the two casinos closest to Atlantic City, the region still had an increase of \$15.3 million per month in total revenue. When analyzing the effect of Pennsylvania on only Atlantic City, McGowan forecasted Atlantic City casino revenues and compared them to actual results. He found, on average, Atlantic City casinos performed 2.2% worse than forecasted. He also indicated that New Jersey earned \$27.5 million less in gaming revenues and potentially more of a loss in non-gaming revenues due to the addition of Pennsylvania slots.

A more recent study by Condliffe (2012) analyzed the effect of Pennsylvania slot machines and table games on the New Jersey, Pennsylvania, and Delaware regions combined. Results showed a significant decrease in the region's total gaming revenue, of \$1,262 per additional slot machine in Pennsylvania. When taking into account the addition of table games, the decrease was only \$973 per slot machine, but still significant. The addition of table games did not have a significant effect on total gaming revenue in the region. A second model was analyzed that restricted the region to primarily Southeast Pennsylvania, Delaware, and New Jersey. Southeast Pennsylvania only included three out of the ten casinos in the state during the study period. Condliffe (2012) still found a significant negative relationship between slot machines and total gaming revenue in the region. Each additional slot machine in Southeast Pennsylvania decreased total gaming revenue in the region by \$10,820. An economic indicator was also included to account for changes other than the legalization of gaming in neighboring states. After taking into account this economic indicator, there was still a significant negative relationship of \$5,264 between the number of slot machines and total gaming revenue. The economic activity was also significant but positive.

While Condliffe (2012) and McGowan (2009) studied the effect that Pennsylvania

legalization had on overall adjacent states, Repetti (2013) analyzed the effect on the Atlantic City market specifically. This study used Pennsylvania as a control variable instead of the variable of main concern and found that the opening of casinos in Pennsylvania had a significant negative effect on Atlantic City casino revenue and profit. Atlantic City casinos saw a significant decrease in gross and net revenue of \$16.9 million per quarter and a significant decrease in gross operating profit of \$12.4 million per quarter upon the opening of Pennsylvania casinos. Like Condliffe (2012) and McGowan (2009)'s studies, this study was concerned with revenue, not gaming volume.

As explained, few studies have examined and quantified the impact that a change in one state's legalization of casinos has on another state, or how a change in legalization impacts gaming of the same type in another state (Nichols, 1998). In addition, no extensive studies have examined the effect of regulatory changes of one state's gaming on another state for a long time period (Nichols, 1998). More importantly, with the findings by Walker and Jackson (2008) and Walker and Nesbit (2014) and the steady increase in overall gaming (American Gaming Association, 2013b), casino management cannot simply look at the decrease in an established region or an increase in a new region to determine the effect of the new market. The American Gaming Association (2012) found that in 2011, 27% of the population gambled in a casino as compared to 25% in 2010. The increase in gaming volumes is attributed not only to people playing more, but also to more people playing. Atlantic City cannot simply evaluate the increase in Pennsylvania gaming and assume that 100% was pulled from current Atlantic City players. Part of the increase may have been due to Atlantic City customers, but some volume may have come from new customers. Part of the decrease in Atlantic City gaming volumes may also have occurred due to the Great Recession and not just caused by legalization in nearby Pennsylvania.

Hypotheses

Previous literature supports a significant negative relationship between total Atlantic City slot coin-in and table games drop and the increased cross-border competition from Pennsylvania. Since five casinos opened on four different dates, this accounts for hypotheses 1- 4, listed below. Each casino opening was tested separately to determine the effect of each opening individually and not the average. The single prior study conducted on the recession showed that the Great Recession significantly affected table games volume (Zheng et al., 2013). Atlantic City is a different player market than Iowa, where Zheng et al.'s (2013) study was conducted, since the majority of visitors are within 75 miles and not the 25 mile radius (and thus shorter travel distance) in the Iowa analysis. Combined with the fact that gaming volumes throughout the U.S. decreased during the recession, this may support that a recession decreases gaming volumes. Therefore, the following alternative hypotheses, all one-tailed tests, were proposed. Hypotheses one to five pertain to slot coin-in and hypotheses six to nine pertain to table games drop.

- H1: The opening of Parx Casino and Harrah's Philadelphia Casino & Racetrack will decrease Atlantic City slot coin-in.
- H2: The opening of Sands Casino Resort Bethlehem will decrease Atlantic City slot coin-in.
- H3: The opening of SugarHouse Casino will decrease Atlantic City slot coin-in.
- H4: The opening of Valley Forge Casino will decrease Atlantic City slot coin-in.
- H5: An economic recession will decrease Atlantic City slot coin-in.
- H6: The start of table games in Pennsylvania will decrease Atlantic City table games drop.
- H7: The opening of SugarHouse Casino will decrease Atlantic City table games drop.
- H8: The opening of Valley Forge Casino will decrease Atlantic City table games drop.
- H9: An economic recession will decrease Atlantic City table games drop.

Data and Methodology

Sample

Monthly data for January 2001 through September 2012 was retrieved from the State of New Jersey's Division of Gaming Enforcement website and through direct contact with the Division. This information is publicly available for all Atlantic City casinos. There were a total of 141 data points. In October 2012, Hurricane Sandy struck Atlantic City. Although the damage to the casino corridor was not significant and casinos opened within 5 days, many local customers were affected by the hurricane and news reports lead many to believe the entire Atlantic City area was destroyed and devastated (Faust, 2012). Due to the effects of Hurricane Sandy, data was only analyzed through September 2012 to not skew the results of this study.

Data

The data was analyzed with two regression models. The dependent variable in the first model was total Atlantic City slot coin-in and the second model used a dependent variable of total Atlantic City table games drop. Two different models were run because Pennsylvania approved slot machines and table games at different times. The first casino with slot machines in Pennsylvania opened December 20, 2006, while table games were first opened on July 8, 2010. Due to the timing differences, a single model could not be used. In addition, table games drop only accounted for approximately 17% of total gaming volume in Atlantic City over the 12 year period evaluated and by combining slot coin-in and table games drop some effects may be masked.

Borgata Hotel Casino & Spa opened on July 2, 2003, and a control dummy variable was included to account for potential changes in Atlantic City gaming volumes due to the opening of this new resort. Revel fully opened on May 24, 2012, and since there were only four months of full data available to analyze, this was not included as a dummy variable. Revel data was included in the total Atlantic City volume numbers but a separate dummy variable was not analyzed due to the limited time period in the time series.

Unlike Condliffe's (2012) study, this study followed McGowan (2009) and Repetti (2013) in investigating the introduction of gaming and not number of machines. In most casinos, slot machine occupancy is generally no more than 50%, so adding 50% more machines than is being used will skew this number because results are being analyzed on machines that are only partially used. Five casinos within 150 miles of Atlantic City opened between 2006 and 2012. The study used a diameter of 150 miles, as 90% of gaming revenues in Atlantic City come from customers within 75 miles of the city (Eadington, 2011). By adding the radius around the customers and extending the distance from Atlantic City to 150 miles, this study took into account all casinos that are potentially the same distance from the majority of Atlantic City customers. Parx Casino opened on December 20, 2006, 76 miles from Atlantic City, and Harrah's Philadelphia Casino & Racetrack opened on January 23, 2007, 71 miles from Atlantic City. With only one month between the two casino openings, these were coded together as one. Sands Casino Resort Bethlehem opened May 22, 2009, and is located 122 miles from Atlantic City. SugarHouse Casino, 62 miles from Atlantic City, opened on September 23, 2010. The fifth casino, Valley Forge, opened on March 30, 2012 and is located 82 miles away. These five properties were the only casinos in the entire region that opened during the time period studied that were within 150 miles of Atlantic City.

When Pennsylvania first legalized gaming, only slot machines were approved and the approval and opening of table games did not occur until three and a half years later. Parx Casino, Harrah's Philadelphia Casino & Racetrack, and Sands Casino Resort Bethlehem all started table games around July 8, 2010. For Model 2, a dummy variable for the start of table games replaced the dummy variable for the opening of these three casinos.

The National Bureau of Economic Research (2012) indicated that the Great Recession started in December 2007 and ended June 2009. A dummy variable for the recession was included as an independent variable for these months. Dummy variables were also

included for each month to account for potential timing differences and were considered control variables only.

Model

The regression equation used in this study was:

$$Y = \beta_0 + \beta_1(\text{Trend}) + \beta_2(\text{Borgata}) + \beta_3(\text{First2}) + \beta_4(\text{Sands}) + \beta_5(\text{TG}) + \beta_6(\text{Sugar}) + \beta_7(\text{Valley}) + \beta_8(\text{Rec}) + \sum_{\beta_9}^{\beta_{13}} (\text{Month}) + \varepsilon$$

Where:

Y =	Total Atlantic City slot coin-in (Model 1) and total Atlantic City table games drop (Model 2) in millions
Trend =	Trend variable
Borgata =	Control dummy variable coded for the opening of Borgata Hotel Casino and Resort and coded as “1” for July 2003 and after
First 2 =	Dummy variable for the opening of Parx Casino and Harrah’s Philadelphia Casino & Racetrack and coded as “1” for January 2007 and after (Model 1 only)
Sands =	Dummy variable for the opening of Sands Casino Resort Bethlehem and coded as “1” for June 2009 and after (Model 1 only)
TG =	Dummy variable for the opening of table games at Parx Casino, Harrah’s Philadelphia Casino & Racetrack, and Sands Casino Resort Bethlehem and coded as “1” for July 2010 and after (Model 2 only)
Sugar =	Dummy variable for the opening of SugarHouse Casino and coded as “1” for October 2010 and after (Model 1 only)
Valley =	Dummy variable for the opening of Valley Forge Casino Resort and coded as “1” for April 2012 and after
Rec =	Dummy variable coded as “1” for the economic recession (December 2007 – June 2009) and “0” otherwise
Month =	Control dummy variable for each month February – December
ε =	Error term

The data was screened and revealed a trend over time and seasonality in the data, so a time series regression was employed.

Results

Data Screening

The graphs in Figures 2 and 3 were examined to determine if the structure of the data varied by time and if a time series model needed to be employed. Time series analysis is a specific form of regression (ARIMA) that is often employed when using data points over time and is needed when the adjacent observation points are dependent on each other (Box, Jenkins, & Reinsel, 2008). The autocorrelation effect that occurs in these types of data sets can be corrected by adding autoregressive and moving average terms. Autoregressive (AR) terms represent the current data point based on prior periods. Moving average (MA) terms represent the current data point based on the random shock (i.e., white noise error terms) of the prior periods.

Based on both graphs it appeared that the data had both seasonality and a trend over time, meaning a time series ARIMA model must be employed. The seasonality was adjusted for by including monthly dummy variables already discussed in the model. The change in slope caused by the constant increase from 2001 to approximately 2007 and the consistent decrease after signifies that the trend is quadratic. This change in slope though occurred at the same time as the recession and the legalization of gaming in Pennsylvania. The model was run with standardized trend, squared standardized

trend, and cubed standardized trend variables to account for this change in slope but the standardized trend and cubed variables were not significant so they were removed.

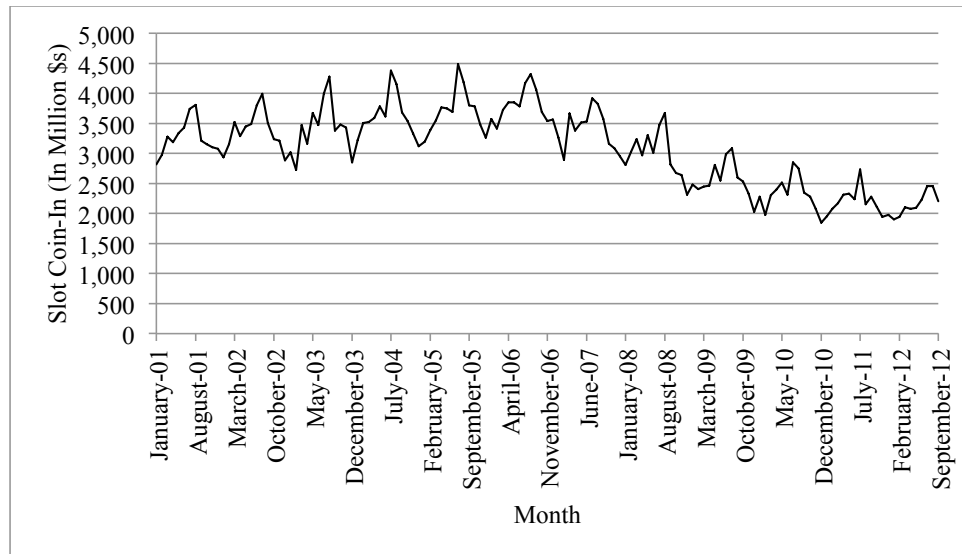


Figure 2. Monthly total Atlantic City slot coin-in for January 2001 – September 2012.

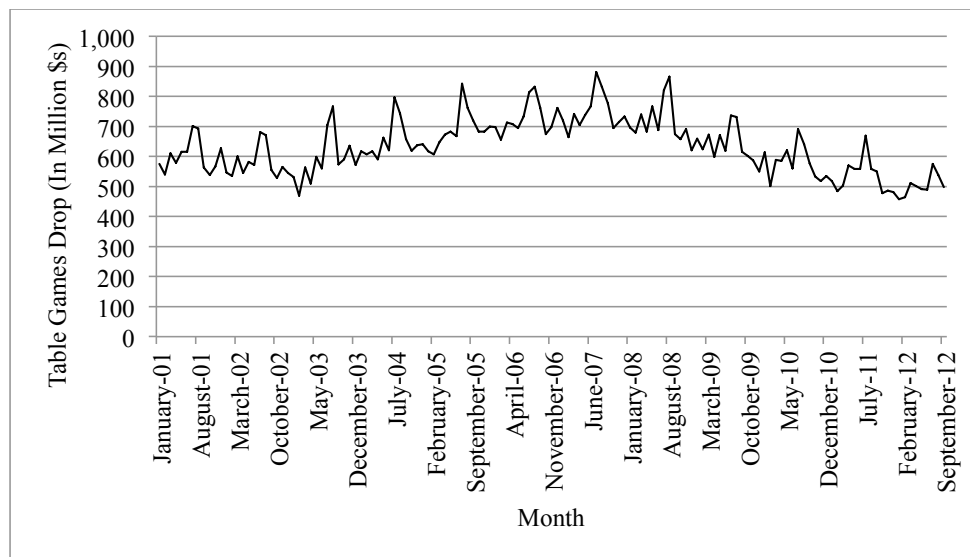


Figure 3. Monthly total Atlantic City table games drop for January 2001 – September 2012.

Descriptive statistics for the entire Atlantic City market for all continuous variables is shown in Table 1.

Table 1
Descriptive Statistics

	N	Min	Max	Mean	Std. Dev.
Slot Coin-In*	141	\$1,847.06	\$4,492.46	\$3,085.09	\$648.089
Table Games Drop*	141	\$457.16	\$880.29	\$632.52	\$93.39

*In Millions

Model Assumptions

The assumption of independence was examined by reviewing ACF and PACF graphs for 36 lags on the final models. Once the appropriate autoregressive terms (AR) were added, the associated p-values of the Ljung-Box test showed there were no instances of problematic serial correlation in either model. Scatterplots of the predicted values of each dependent variable and the standardized residuals provided no evidence of nonlinearity or homoscedasticity. Histograms of the standardized residuals and normal probability plots were analyzed for each model and there was no indication of a departure from a normal distribution.

Variance inflation factors (VIF) were run for each model and no values for either model were above 4.29. The VIFs for each independent variable are given in Tables 2 and 3. Since the most common cutoff to indicate multicollinearity is a VIF greater than 10, there was no indication of multicollinearity for these models (Hair, Black, Babin, Anderson, Tatham, 2010).

Slot Coin-In Model

All control variables that were not significant in the first time series model were deleted and the model was rerun and only the final model was analyzed. Monthly variables for February, November, and December were deleted from the model since they were not significant. The Borgata control variable was also not significant and hence deleted. Table 2 shows the regression results for the slot coin-in model.

Table 2
Regression Coefficients for Slot Coin-In

	VIFs	B	Std. Error	t	Sig.
Constant		3,255.32	270.67	12.027	.000*
March	1.16	350.96	39.44	8.899	.000*
April	1.17	272.28	38.29	7.111	.000*
May	1.17	430.51	39.32	10.949	.000*
June	1.18	387.42	44.27	8.751	.000*
July	1.18	843.40	42.99	19.619	.000*
August	1.18	777.54	39.87	19.502	.000*
September	1.18	413.64	41.53	9.960	.000*
October	1.15	237.30	41.17	5.764	.000*
Standardized Trend ²	1.85	-239.09	92.30	-2.591	.005*
First 2 Casinos ^a	3.94	-422.90	98.93	-4.275	.000**
Sands ^a	4.29	-97.27	118.18	-0.823	.103
Sugar ^a	2.73	49.85	100.61	0.496	1.000
Valley ^a	1.43	-73.20	99.91	-0.733	.116
Recession ^a	2.15	-85.79	79.18	-1.084	.070
AR(1)		0.08	0.07	1.143	.118
AR(2)		0.32	0.07	4.571	.000*
AR(3)		0.56	0.08	7.000	.000*

Notes: All coefficients are in millions; (a) one-tailed test
* $p < .005$ two-tailed test; ** $p < .005$ one-tailed test

When Parx Casino and Harrah's Philadelphia Casino & Racetrack opened monthly coin-in for Atlantic City slots significantly decreased \$422.9 million. The opening of Sands Casino Resort Bethlehem, SugarHouse Casino, and Valley Forge Casino Resort did not have significant effects on total monthly slot coin-in for Atlantic City. These results support alternative hypothesis 1 but reject alternative hypotheses 2-4. The national economic recession from 2007-2009 did not have a significant effect on Atlantic City slot coin-in after taking into account the other key variables, which rejects hypothesis 5.

Table Games Model

All control variables that were not significant in the first time series model were deleted and the table games model was rerun and only the final model was analyzed. Monthly dummy variables for March, April, June, September, October, November, and December were deleted from the model. The Borgata control variable was also deleted from the final model since it was not significant. The dummy variable for the opening of SugarHouse was not included in this model because there was only a 3-month difference between the start of table games in Pennsylvania and the opening of SugarHouse. Including SugarHouse in the model caused serious multicollinearity issues due to this short time difference, and the variable was not significant. The results were not significantly different without SugarHouse included in the model. Table 3 displays the regression results for the table games drop model.

Table 3
Regression Coefficients for Table Games Drop

	VIFs	B	Std. Error	t	Sig.
Constant		666.73	30.31	21.998	.000*
February	1.04	-39.98	7.65	-5.230	.000*
May	1.04	31.46	8.46	3.719	.000*
July	1.04	142.89	7.19	19.875	.000*
August	1.04	118.22	7.71	15.329	.000*
Standardized Trend ²	1.61	-46.87	15.05	-3.114	.000*
Table Games ^a	1.54	-34.12	19.08	-1.788	.018**
Valley ^a	1.33	-7.20	19.05	-0.378	.176
Recession ^a	1.11	2.80	13.43	0.209	1.000
AR(1)		0.04	0.07	0.585	.279
AR(2)		0.32	0.07	4.591	.000*
AR(3)		0.55	0.08	7.288	.000*

Notes: All coefficients are in millions; (a) one-tailed test
* $p < .005$ two-tailed test; ** $p < .05$ one-tailed test

Parx Casino, Harrah's Philadelphia Casino & Racetrack, and Sands Casino Resort Bethlehem opened table games in July 2010. At this point, monthly table games drop in Atlantic City significantly decreased by \$34.1 million, which supports hypothesis 6. The opening of Valley Forge Casino Resort, which opened with table games, did not significantly affect monthly table games drop, which does not support hypothesis 7. Similar to the effect on slot coin-in, hypothesis 9 was rejected since the U.S. economic recession from 2007-2009 did not have a significant effect on Atlantic City table games drop after taking into account the other key variables.

Discussion

Both the slot coin-in and table games drop models produced a significant decrease in Atlantic City gaming volumes at the onset of legalized gaming in Pennsylvania (from casinos within 150 miles of Atlantic City), but no additional effect when new casinos opened. During the time period analyzed, average slot hold percentage was 8.4%, so a decrease in coin-in of \$422.9 million equals approximately \$35.5 million a month in slot revenue. For table games, the average hold percentage was 15.8%, so a decrease of \$34.1 million equates to a decrease of \$5.4 million a month in table games revenue. These results support McGowan's (2009) findings although this study evaluated each casino opening individually and not legalization as a whole. This study further builds on McGowan (2009) though and shows that the significant effect of a new market legalizing gaming is at the onset and not with additional licenses.

The first two casinos to open in Pennsylvania within the region of Atlantic City customers were 2 of the 3 largest casinos in the study. Sands Casino Resort Bethlehem, with approximately 3,000 machines, has around the same number of slot machines as Harrah's Philadelphia Casino and Racetrack and about 500 machines fewer than Parx Casino. The fact that the first two casinos to open with slot machines were the largest could be a reason that the results show the same as McGowan (2009) in that the start of slot machines was the only significant factor of all openings. These casinos are also two of the closest casinos to Atlantic City. SugarHouse is the closest casino but only has about half the slot machines, which may be a factor as to why it did not significantly affect Atlantic City. Valley Forge is even smaller, with only 600 machines. Parx Casino, Harrah's Philadelphia Casino and Racetrack, and Sands Casino Resort Bethlehem also make up the largest number of tables games, with each casino having between 125 and 180 tables with the other two casinos only having about 50 each. These three large casinos were all included in the legalization of table games since they had all opened tables games at the same time. These results may help management determine if they should fight additional legalization of casinos since lobbying against the addition of new casinos may not produce the most beneficial return.

The recession was not significant, which supports Zheng et al. (2013) finding that the recession did not significantly affect Iowa gaming. This was a very interesting finding of this study, since the American Gaming Association (2013b) indicated that gaming revenue for commercial casinos in the U.S. decreased during the recession. Gaming revenue in Nevada also decreased during the recession and is not expected to fully rebound until 2014 (Green, 2010). This slow rebound could be a factor as to why the results were not significant. The recession was only coded as the dates of the economic recession and if gaming is rebounding more slowly than the general economy, the results could be affected. Eisendrath, Bernhard, Lucas, and Murphy (2008), while evaluating the effect of September 11, 2001, on Las Vegas Strip gaming volumes, found that while most recovery occurred by January 2002, lingering effects were felt until March 2003. This may be an indication that when gaming is affected by a recession or other economic factor, it may recover at a different pace than the rest of the economy. It is also possible that the effect of legalized Pennsylvania gaming was so large that it covered the recession effect or other factors took place at the same time as the recession. This is only the second study on recession's effects on gaming. Although the recession effect was not significant at the .005 level, it should not be overlooked that it is significant at the .007 level for slot coin-in.

While results of this study were similar to McGowan (2009), Condliffe (2012), and Repetti (2013), it builds on the gaps in those studies. McGowan (2009) and Condliffe (2012) tested the significant effect on the region as a whole, including Atlantic City, Pennsylvania, and Delaware, but did not test the effect on Atlantic City alone. Although Repetti (2013) did analyze Atlantic City only, all three studied revenue, not gaming volume and in gaming, revenue can fluctuate based on casino "luck", good or bad. Slot coin-in and table games drop, used in this study, are better indicators of gaming volume.

Management in Atlantic City casinos need to address this decline in gaming volume sooner rather than later. In 2012, Pennsylvania surpassed Atlantic City as the second largest gaming market in the United States and Atlantic City saw declines in gaming volume for the sixth straight year (Southwick, 2013). With Maryland's recent legalization of table games and an increase in number of gaming facilities, management needs to be aware of the possible defection of more customers. Since this study showed business volumes decreased due to the legalization of gaming in Pennsylvania and not the recession, managers of Atlantic City casinos need to find ways to entice those customers back, such as new promotions, offering entertainment, or better restaurants or hotels than those in Pennsylvania casinos. Atlantic City as a whole is looking at city-wide initiatives to bring customers back to Atlantic City for non-gaming activities and could even consider legalizing gaming in other parts of New Jersey that would be closer to some of the Pennsylvania residents. New Jersey has enacted an online gaming initiative and although it is too early to know if the legalization had a significant impact on gaming volumes, Pennsylvania gaming volumes have been on a decrease since the start of online gaming on November 21, 2013 (Olanoff, 2014). The Pennsylvania Gaming Control Board will not say the reason for the decline but do state that it is most likely a combination of the online gaming in New Jersey, new casinos in Ohio, and bad weather.

Other jurisdictions could also consider the results of this study to see how increased cross-border competition could affect them. Cross-border competition is an issue not only between Atlantic City and Pennsylvania, but also between other bordering states such as Maryland, Delaware, New York, and Connecticut. Since the first casino opening in Perryville, Maryland in 2010, the state approved a second casino property in Berlin, Maryland in 2011 to try and reclaim gaming revenues from adjacent states such as Pennsylvania and Delaware (American Gaming Association, 2012; Condliffe, 2012; McGowan, 2009). More importantly, as competition for casino customers intensifies and states attempt to expand their gaming offerings to entice customers, casinos in neighboring states often spend large amounts of money to stop the spread of legalized gaming and increased competition. For instance, when Ohio included a ballot question for their first casino in 2008, Penn National Gaming spent \$38 million against the measure while Lakes Entertainment, Inc. gave \$25.7 million in support (Pacella, 2012). As of October 2012, Penn National Gaming also contributed nearly \$29.1 million to try and stop the expansion of gaming in Maryland (Pacella, 2012; Wagner, 2012).

As more jurisdictions look at legalizing gaming or increasing the number of gaming licenses to help their budget deficits, results of this study can assist state governments in making those decisions. Overall, U.S. gaming is increasing, but 2012 saw an increase of less than 5% (American Gaming Association, 2013b). With the small increase in gaming revenue, jurisdictions need to carefully evaluate the potential benefit of new casinos. They also need to carefully consider what effects could occur as nearby jurisdictions add or increase competing casinos.

Limitations and Future Research

Like any research, this study is not void of limitations. First, this study was only concerned with Atlantic City. Not all jurisdictions will be affected the same as Atlantic City was affected by Pennsylvania. Each gaming market not only has a different customer mix, such as table and slot players, but also attracts their customers from different locations. Atlantic City attracts 90% of their customers from within 75 miles of the city, so the legalization of new gaming in surrounding markets may have a more significant impact than on markets that are further apart, such as Las Vegas.

Also, this study did not take into account non-gaming revenue. While the majority of revenue in Atlantic City is gaming revenue, fewer customers also means less non-gaming revenue being generated. A further study could convert gaming volume to revenue based on the average hold percentages used in this study, and then include all other non-gaming revenue. This may be a better indicator of the full effect of the recession and competition

from Pennsylvania.

A future study could also be conducted with a different recession period to see if the results differ. A potential change in dates could be to use the American Gaming Association's U.S. gaming revenue trends and correspond the recession dates with the decrease in U.S. gaming, although these are only annual dates. Another potential inquiry could examine unemployment and economic factors for Atlantic City and Pennsylvania and determine when the region went into and came out of a recession, rather than looking at the national dates.

References

- American Gaming Association. (2002). *2002 state of the states*. Retrieved from <http://www.americangaming.org/sites/default/files/uploads/docs/sos/aga-sos-2002.pdf>
- American Gaming Association. (2012). *2012 state of the states*. Retrieved from <http://www.americangaming.org/industry-resources/research/state-states>
- American Gaming Association. (2013a). *2013 state of the states*. Retrieved from http://www.americangaming.org/sites/default/files/uploads/docs/aga_sos2013_fnl.pdf
- American Gaming Association. (2013b). *Gaming revenue: 10-Year trend*. Retrieved from <http://www.americangaming.org/industry-resources/research/fact-sheets/gaming-revenue-10-year-trends>
- Baltagi, B. H., & Levin, D. (1986). Estimating dynamic demand for cigarettes using panel data: The effects of bootlegging, taxation, and advertising reconsidered. *Review of Economics and Statistics*, 68, 48-55.
- Box, G. E. P., Jenkins, G. M., & Reinsel, G. C. (2008). *Time Series Analysis: Forecasting and Control* (4th ed.). Hoboken, New Jersey: John Wiley & Sons.
- Condliffe, S. (2012). Pennsylvania casinos' cannibalization of regional gambling revenues. *UNLV Gaming Research & Review Journal*, 16(1), 45-58.
- Dadayan, L., & Ward, R. B. (2009, September 21). For the first time, a smaller jackpot: Trends in state revenues from gambling. Retrieved from The Nelson A. Rockefeller Institute of Government: http://www.rockinst.org/pdf/government_finance/2009-09-21-No_More_Jackpot.pdf
- Eadington, W. R., Wells, R. H., & Gossi, D. (2010). Estimating the impact of California tribal gaming on demand for casino gaming in Nevada. *UNLV Gaming Research & Review Journal*, 14(2), 33-45.
- Eadington, W. R. (2011). After the great recession: The future of casino gaming in America and Europe. *Economic Affairs*, 31(1), 27-33.
- Eisendrath, D., Bernhard, B. J., Lucas, A. F., & Murphy, D. J. (2008). Fear and Managing in Las Vegas: An analysis of the effects of September 11, 2001 on Las Vegas Strip gaming volumes. *Cornell Hospitality Quarterly*, 49, 145-62.
- Faust, C. G. (2012, December 5). Atlantic City boardwalk back in business after Sandy. *USA Today*. Retrieved from <http://www.usatoday.com/story/travel/destinations/2012/12/03/atlantic-city-boardwalk-business-sandy/1743903/>
- Google. (2013). *Atlantic City casino map*. Retrieved from <https://maps.google.com/maps?hl=en&ie=UTF-8&q=atlantic+city+casino+map&fb=1&gl=us&hq=casino&hnear=0x89c0dd576e5cc721:0x4a6fcb43e9675262,Atlantic+City,+NJ&ei=dTTkUPLHB8vy2gWakYCACQ&sqi=2&ved=0CMMBEMgT>
- Green, S. (2010, December 6). Analysts expect gaming revenue at pre-recession levels in 2014. *Las Vegas Sun*. Retrieved from <http://www.lasvegassun.com/news/2010/dec/06/analysts-expect-gaming-revenue-pre-recession-level/>

- Greenlees, E. M. (2008). *Casino Accounting and Financial Management* (2nd ed.). Reno, NV: University of Nevada Press.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.
- Iowa Racing and Gaming Commission. (n.d.). *Annual reports*. Retrieved from <http://www.iowa.gov/irgc/annualreports.htm>
- Lewitt, E., Coate, D., & Crossman, M. (1981). The effects of government regulation on teenage smoking. *The Journal of Law and Economics*, 24, 545-69.
- Linn, A. (2008, November 17). Recession-proof? Maybe not this time. *NBCNews.com*. Retrieved from http://www.nbcnews.com/id/27756228/ns/business-stocks_and_economy/t/recession-proof-maybe-not-time/#.U7RwGKivwaE
- McGowan, R. (2009). The competition for gambling revenue: Pennsylvania v. New Jersey. *Gaming Law Review and Economics*, 13(2), 145-55.
- Miers, D. (1996). The implementation and effects of Great Britain's national lottery. *Journal of Gambling Studies*, 12, 343-73.
- National Bureau of Economic Research. (2012). *US business cycle expansions and contractions*. Retrieved from <http://www.nber.org/cycles>
- New Jersey Casino Control Commission. (2014). *Atlantic City casino information*. Retrieved from <http://www.state.nj.us/casinos/home/info/index.html>
- New Jersey Casino Control Commission. (2008, January 10). *CCC announces 2007 casino revenue*. Retrieved from http://www.state.nj.us/casinos/news/archive/pdf/200712_revenue.pdf
- Nichols, M. W. (1998). Deregulation and cross-border substitution in Iowa's riverboat gambling industry. *Journal of Gambling Studies*, 14, 151-72.
- O'Donnell, J. M., Lee, S., & Roehl, W. S. (2012). Do economies of scale exist in the Atlantic City casino industry? *International Journal of Contemporary Hospitality Management*, 24(1), 62-80.
- Olanoff, L. (2014, March 21). Pennsylvania casino revenue on the decline but officials unsure if N.J. online gambling is a factor. *The Express-Times*. Retrieved from http://www.lehighvalleylive.com/breaking-news/index.ssf/2014/03/pennsylvania_casinos_on_declin.html
- Pacella, R. (2012, October 25). MD. Casino opponent Penn National has fought against ballot issues before, and won. *CNS Maryland*. Retrieved from <http://cnsmaryland.org/2012/10/25/md-casino-opponent-penn-national-has-fought-against-ballot-issues-before-and-won/>
- Palenik, M. L. (2011, January 3). PwC's global gaming industry outlook to 2014. *Casino Enterprise Management*. Retrieved from <http://www.casinoenterprisemanagement.com/articles/january-2011/pwc's-global-gaming-industry-outlook-2014>
- Pennsylvania Gaming Control Board (2013). *2012-2013 annual report*. Retrieved from http://gamingcontrolboard.pa.gov/files/communications/2012-2013_PGCB_Annual_Report.pdf
- Repetti, T. (2013). The finance and marketing dilemma: Do promotional allowances actually increase revenue and profits for Atlantic City casinos? *UNLV Gaming Research & Review Journal*, 17(1) 1-12.
- Saba, P., Beard, R., Ekelund, R. B., & Ressler, R. W. (1995). The demand for cigarette smuggling. *Economic Inquiry*, 33, 189-202.

- Saffer, H., & Grossman, M. (1987). Beer taxes, the legal drinking age, and youth motor vehicle fatalities. *Journal of Legal Studies*, 16, 351-75.
- Southwick, R. (2013, January 17). Pennsylvania passes Atlantic City in casino revenue. *The Patriot News*. Retrieved from http://www.pennlive.com/midstate/index.ssf/2013/01/pennsylvania_passes_atlantic_c.html
- Thalheimer, R., & Ali, M. M. (2008). Table games, slot machines and casino revenue. *Applied Economics*, 40, 2395-404.
- UNLV Center for Gaming Research (2014). *Delaware gaming summary*. Retrieved from http://gaming.unlv.edu/abstract/de_main.html
- Walker, D. M. (1999). Legalized casino gambling and the export base theory of economic growth. *Gaming Law Review*, 3(2-3), 157-63.
- Walker, D. M., & Jackson, J. D. (2008). Do U.S. gambling industries cannibalize each other? *Public Finance Review*, 36, 308-33.
- Walker, D. M., & Jackson, J. D. (2011). The effect of legalized gambling on state government revenues. *Contemporary Economic Policy*, 29(1), 101-14.
- Walker, D. M., & Nesbit, T. M. (2014). Casino revenue sensitivity to competing casinos: A spatial analysis of Missouri. *Growth and Change*, 45(1), 21-40.
- Wagner, J. (2012, September 4). Penn National ponies up \$5.5 million to defeat Maryland gambling plan. *The Washington Post*. Retrieved from http://www.washingtonpost.com/blogs/maryland-politics/post/penn-national-ponies-up-55-million-to-defeat-maryland-gambling-plan/2012/09/04/e4750fa6-f698-11e1-8398-0327ab83ab91_blog.html
- Zheng, T., Farrish, J., Lee, M., & Yu, H. (2013). Is the gaming industry still recession-proof? A time series with intervention analysis of gaming volume in Iowa. *International Journal of Contemporary Hospitality Management*, 25(7), 1135-52.