

Cross-State Substitution: Estimating the effect of the 2003 Illinois gaming tax restructuring on Indiana riverboat gaming volume in the Chicagoland region

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Abstract

This paper analyzes the effect of the 2003 Illinois gaming tax increase on Indiana riverboat gaming demand. The four riverboats located in Indiana's Northeast corner are examined. Slot machine coin-in from January 2000 to December 2006 is chosen to represent gaming demand. Multiple regression analysis is used to model both the tax increase and account for seasonality in the data. The findings reveal that a segment of Indiana riverboat operators experienced an increase in gaming demand when the tax increases took effect. The findings suggest that legislators should acknowledge and evaluate the negative economic pressures that tax increases have on their own state's commercial gaming operators and recognize the benefits tax increase bring to the gaming industry in competing states.

Keywords: *riverboat gaming, gaming taxes, Indiana riverboat, commercial gaming, cross-state substitution*

INTRODUCTION

The occurrence of gaming taxes are generally accepted by the various stakeholders of commercial gaming as an unavoidable cost of doing business. In an economic environment that is at the minimum difficult and at the maximum impossible to enter, state gaming taxes are debated by commercial gaming stakeholders primarily with respect to their rate and not their existence. The restricted access to operate legal commercial gaming is partially due to the restricted nature of licensure. The variance in the degree of difficulty a potential commercial gaming entity faces depends largely on state and local laws.

The commercial gaming market in the Midwestern United States can be characterized by two primary trends since gaming was legalized in the early nineties: states have through

deregulation improved their operators' abilities to compete for local and most importantly interstate business. The price operators have paid for decreased deregulation has been a steady increase in state gaming taxes. The purpose of this research is to quantify the effect of one of these gaming tax increases on interstate gaming demand/wagering volume which in this article is represented by coin-in. By quantifying the effect of an increase in a gaming tax this research will provide evidence in support of or in contrast to both firm management theory, profit maximization theory and provide insight into Pigovian tax theory. The stakeholders to commercial gaming frequently argue that commercial gaming is believed to exist outside of the accepted rules of economic theory or that commercial gaming is not vulnerable to traditional economic pressures.

LITERATURE REVIEW

Introduction

In an attempt to draw parallels to other situations that mirror the increase in gaming taxes in Illinois, research that addresses hotel occupancy taxes and the 1986 Tax Reform Act on Real Estate proves instructive. Gaming research focusing on deregulation repercussions and general gaming forecasting is also discussed. These particular examples not only inform the understanding of likely effects of inherent changes to taxation rates but also provide insight into various applicable methodologies that could provide valuable analysis into the Illinois gaming tax restructuring and its influence in competing commercial gaming states. In addition, this review will investigate both tax theory and profit maximization/firm theory to better understand the implication of these tax increases. Insight into both taxation and firm theory might explain or predict the impact of tax changes on commercial gaming.

Pigovian Tax Theory

Attributed to Pigou (1920) economists have recognized that indirect taxation can be utilized to counteract injustices inherent in the allocation of certain resources. A tax can be levied which in theory will counteract or confront the entity in question. A tax or price on the generator of a perceived negative externality should reflect the impact that the generator inflicts by their production of a product or service on others (Sandmo, 1975).

Pigovian taxation has also been referred to as "sin taxes" or taxes that attempt to adjust negative externalities of a business or markets activity. Gaming has of course been an industry that has been subject to this form or theory of taxation. The adoption of Pigovian taxation is alleged to bring various counterproductive repercussions. For example: lowering of profits and related job and investment loss, creates moral hazard for policy makers who simultaneously rely on the pigovian tax revenue while professing to curb the related behavior or consumption.

A distinction should be drawn between Pigovian taxation and what is frequently termed "sin taxes". While Pigovian taxation inherently and fairly professes to retrieve funds commensurate with the damage in industry inflicts, the use of sin taxes in practice rarely is reflective of any attempt to accurately measure damage or harm. In the case of commercial gaming, attempts to quantify the costs and benefits have been largely disappointing due to the

complexity of the task. Commercial gaming's current tax environment is to some degree the result of gambling's history as a "vice" and the related historical perceptions (Meich, 2008)

Firm and Profit Maximization Theory

Profit maximization is the concept that describes what is generally accepted as one of the primary objectives of a firm. Profit is defined as the measure of total revenue of a firm minus its total costs. Hence, profit maximization describes identifying a level of output where the difference between total costs and revenues is the greatest (Becker, 2005). While evidence suggests that individuals in a firm do not always pursue profit maximizing behaviors, instead direct their actions to maximize sales, employees, equipment beyond profit maximization ideals (Alchian, 1965). It is noteworthy that the literature does not account for the behavior of management or owners of firms faced with disincentives such as a stepped tax structure that rewards reducing revenues.

Occupancy Taxes

Hiemstra and Ismail studied the use of occupancy tax rates in various municipalities. The authors point out that policymakers adopt occupancy taxes in an erroneous attempt to produce revenues from individuals who are non-constituents and thereby eliminating the impact of the tax burden on the legislators future election success. When the researchers analyzed the elasticity of demand which was represented by occupancy rates, they found that a 9.8% room tax resulted in a 3% decrease in occupancy (Hiemstra & Ismail, 1992; Hiemstra & Ismail, 1993). Legislators mistakenly view the enactment of the occupancy taxes as having little or no economic and political consequences. Hiemstra & Ismail demonstrate with empirical evidence that the tax increase has a negative influence on demand. Many stakeholders of the gaming industry allege that legislators view commercial gaming as being unaffected by comparable increases of gaming tax rates or the implementation of new gaming tax policies such as admission taxes.

1986 Tax Reform Act

The 1986 Tax Reform Act is widely considered the most influential modification of the tax code in recent history. Real estate is recognized as the industry most impacted by the changes and the subject of a multitude of resulting research. The tax code reform primarily affected real estate investment through changes in depreciation scheduling. However, additionally; flow through tax losses were minimized and finally loss offset limitations were put in place (Sanger, Sirmans, & Turnbull, 1990).

In 1990, Sanger et al. employed intervention analysis (which was described as an intervention in a time series) for their research. The authors defended their approach by pointing out that the tax reform represented an event that altered the stochastic process. The researchers chose the investment returns of Real Estate Investment Trusts (REITS) as their study's dependent variable. REITS are financial entities that invest in real estate and related assets with the intention of earning a return for their investors (*US securities & exchange commission*.2004). Much like the approach this study will adopt, Sanger et al. chose to model the tax reform intervention with a dummy variable while accounting for seasonal effects. The researchers

discovered that the real estate market appraised the implementation of the new tax code to the financial detriment of real estate owners (Sanger et al., 1990).

Smith and Woodward (1996) attempted to understand the effects of the 1986 Tax Reform Act. Their study evaluated the effects of the above mentioned tax reform on the value of apartments. Utilizing a time-series cross-sectional panel data design to examine their data the researchers discovered that a couple of obstacles threaten the quality of their results. The authors needed to control for the influence of overbuilding in their analysis. Additionally, the researchers acknowledged and checked for the potential influence of autocorrelation. Appropriate measures suggested that autocorrelation was a factor so the researchers adopted the Parks method of analysis to deal with the problem. Much like in the previous Sanger study, a dummy variable was used to represent the implementation of the new tax code, and an additional dummy variable was created to represent and control for overbuilding. The researchers concluded that the 1986 Tax Reform Act had a statistically significant negative impact on the value of apartments (Smith & Woodward, 1996).

Gaming Forecasting

The following is an attempt to provide an overview of gaming related research involving changes in both regulation and related tax policy. The literature provided should build a better understanding of gaming tax policy, changes to the regulatory environment affecting commercial gaming, and the evolution of commercial gaming in the Midwestern, United States.

Deregulation

Multiple researchers have investigated how deregulation has impacted gaming volume. These studies are valuable to this research because they provide some framework for determining how this analysis should attempt to investigate how a tax rate change impacts gaming demand. Methodologically there are obvious similarities between how one might assess a regulatory change and a gaming tax rate increase. Despite the reality that the effect on demand might be inverted, regulatory easing and tax rate increases both are events involving a single inflection point introduced into a time series analysis. Of more practical note, acts of deregulation and gaming tax rate increases have often occurred simultaneously in a type of quid pro quo.

Deregulation in Atlantic City

In 1998, Nichols analyzed the 1991 deregulation of the commercial gaming industry in Atlantic City. Using an ARIMA model (a Box Jenkins autoregressive moving average), the researcher assessed the impact of regulatory changes that resulted in increased operating hours and increases in slot machine proliferation on gaming win. Incidentally, the author addressed the dilemma involved when attempting to operationalize gaming demand or gaming volume using casino win. Casino win, synonymous with gambler losses, is also referred to as gross gaming revenue. Gross gaming revenue is a problematic measure of gaming volume because it includes monies that are the result of casino complimentary (comps); therefore when adding up gross

gaming revenues the casino is counting winnings of its own cash. Nichols argued that after adjusting for comp ratio (which he calculated as 8.5% of win) casino win was the preferable dependent variable since it did not include non-gaming revenues that impacted general revenue options such as EBITDA (Nichols, 1998b).

Shonkwiler (1993) chose a structural time series methodology to examine the effect of Atlantic City commercial gaming casinos on gaming volume in Nevada. The Shonkwiler research exemplifies the inclusion of an extraneous event and its impact on time series data. This study theoretically closely parallels the research presented in this study since tax changes in one state are assessed with regard to their impact in a different state. The researcher advocates his methodological approach by presenting the efficacy of structural time series modeling of linear trends with the potential for seasonality. The author found that the legalization of commercial gaming in Atlantic City reduced Nevada gaming revenues by somewhere between 10 and 12 percent (Shonkwiler, 1993).

Deregulation and Taxation Policy: Midwestern Riverboats

United States Midwestern riverboat market deregulation was examined by Nichols (1998a). In a response to the 1994 Illinois' introduction of less regulated riverboat gambling, Iowa revamped their 1991 original strict inaugural regulations and eliminated mandated sailing, loss limits and space restrictions in response to 1994 Illinois' introduction of less regulated riverboat gambling in 1994. Casino win, total admissions and win per admission were used as dependent variables for regression analysis to control for the effect of day of the week, seasonality, location, and per capita income while attempting to evaluate the impact of deregulation. The results indicated that deregulation had a significant impact on cross-border substitution, by having increased the three dependent variables: win, win per admission, and admission (Nichols, 1998). Nichols work with Iowa and Illinois riverboat deregulation has obvious similarities to this study's investigation into the impact of gaming taxation rate changes in Illinois and the resulting influence on demand in the neighboring state of Indiana.

A significant reduction in complimentary play, food, and lodging due to the 2003 Illinois tax restructuring was predicted by gaming analyst Falcone (Falcone, 2003b). Casino operators cannot easily pass cost of business increases on to their customers. Therefore, operators resort to saving on marketing expenses or reducing labor expenses. The restricted options for addressing increased expenses to some extent distinguish gaming from other consumer goods and service industries. A possible other solution to counter this pressure, is for operators to tighten the hold or par of their slot machines which will eventually negatively impact their gaming demand because of increased price of play. Ultimately, the burden of tax increases rests on operators and it decreases invested capital, development projects, reduces employees, and the limits marketing and/or complimentary expenses (Falcone, 2003a).

Measuring Demand

Researchers have relied on numerous variables as mentioned throughout this review of related literature for the purpose of forecasting or quantifying gaming volume. This study uses slot machine coin-in as the indicator of gaming demand or volume. The decision to rely on coin-

in is based on a number of factors. The first and foremost reason is that all alternative measures of gaming demand are not very realistic. It becomes extremely difficult for the operators to quantify the amount wagered on table games (Eisendrath et al., 2008). In contrast table drop which is sometimes used as a measure of demand just indicates the amount converted to chips and does not tell the correct amount wagered. Kilby et al. (2004) mentioned that revenue figures can fluctuate with short-term luck and volatility on both the player and casino's part. Thus, coin-in emerges as the most appropriate measure of gaming volume (Eisendrath et al., 2008; Lucas, Dunn, & Kharitonova, 2006).

Secondly, the coin-in contribution is predominant to the overall commercial casino revenue sources, hence this research relies on coin-in to represent gaming demand. Researchers who analyzed the Las Vegas, Nevada market have opted for coin-in as the preferential proxy for gaming demand. Their decision was justified partially due to the significant impact of coin-in towards overall revenues. Nearly 50 percent of gaming win revenues in the Las Vegas market result from slot win (Eisendrath et al., 2008). Whereas, slot machines or electronic gaming devices (EGDs) account for approximately 90 percent of Indiana adjusted gaming revenues (Indiana Gaming Board, 2005).

Hypothesis, data and methodology

The main hypothesis of this study is that the 2003 Illinois gaming tax restructuring will positively impact Indiana Chicagoland gaming demand as represented by the coin-in dependent variable. The expression "2003 70% tax and overall tax restructuring" describes the predictor dummy or independent variable for the tax change.

Main Hypothesis

The null hypothesis states that there is no difference in Indiana Chicagoland coin-in after the Illinois tax restructuring. The null is expressed by the equation:

$$H_0: \text{Coefficient of "2003 70\% tax and overall tax restructuring"} = 0$$

The research hypothesis which predicts that there will be a difference in Indiana Chicagoland coin-in is expressed by the equation:

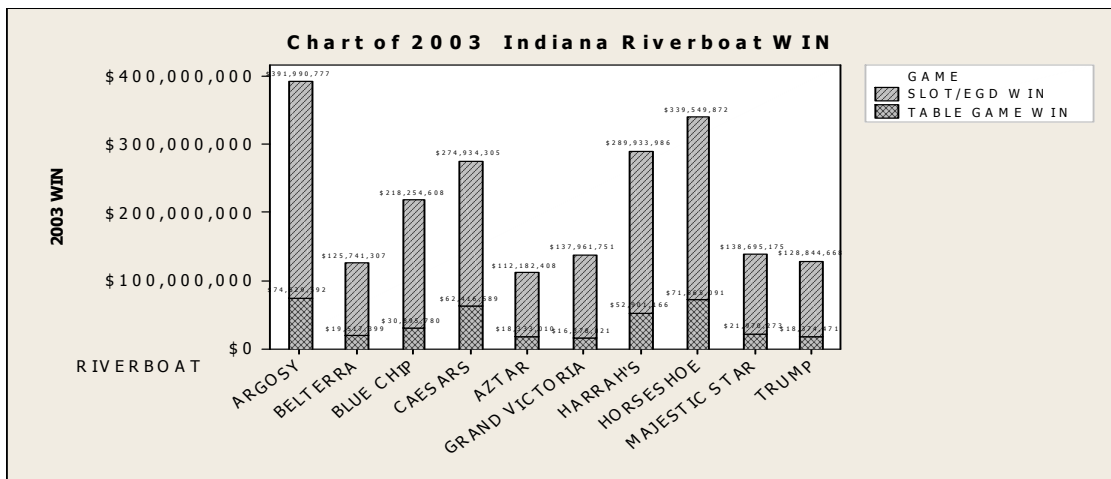
$$H_1: \text{Coefficient of "2003 70\% tax and overall tax restructuring"} \neq 0$$

Data Collection

The secondary data examined in this study was retrieved from the Indiana Gaming Commission Monthly Reports (IGB, 2000-2006). The data provided in the IGB Monthly Reports is a collection of various results from all Indiana commercial docksites. This data is available to the public via request or can be directly accessed through the IGB website. Since this investigation was primarily interested in the effect of the 2003 Illinois gaming tax restructuring on cross-state gaming demand, a decision was made to focus on the docksites or operators with the closest proximity to the Chicago area in the state of Indiana. Four commercial

gaming operations met this criteria and the coin-in dependent variable for each month is a total of each of these four commercial gaming operations coin-in. This research will examine the coin-in of the four Chicagoland Indiana riverboats over 84 months; January 2000 to December 2006. All Indiana docksites report coin-in on a monthly basis to the Indiana Gaming Commission. Coin-in is relied upon as the preferable proxy for gaming demand due to the dominant contribution of slots play to overall gaming revenue and also due to its reliability. Figure 1 illustrates a detailed breakdown of the relative importance of Slot (EGD) win contribution based on docksite (win is chosen in this instance for comparison purposes due to the imperfection of using drop to quantify table game demand).

Figure 1
Indiana Docksites Win: Comparison of Table Games and Slot Machines.



Linear Regression Model

Because the data to be examined is a times series, trend and seasonality are addressed in the regression model. The time variable is accounted for as follows: the first month is assigned “1”, the second month “2”, and continuing this pattern through the last month which is assigned “84”. This variable will reveal the presence of trend in the data set. Trend refers to the downward or upward movement of a time series over an extended period of time. When time series data is modeled, a variable that indicates an upward trend generally reflects changes in market growth, changes in total population, or long-term adjustments in per capita income (Bowerman, O'Connell, & Koehler, 2005).

Seasonal variations or seasonality in the time series data set reflect peaks and valleys in the data that occur within the confines of a calendar year. This research first uses dummy variables to assess the presence of seasonality. Dummy variables representing the months February through December are added to the regression model. Only 11 months are represented by the dummy variables since the twelfth month is accounted for by the equations constant term.

Reflecting the interest in whether the 2003 Illinois tax restructuring impacted the Indiana Chicagoland docksites, the following regression model was tested:

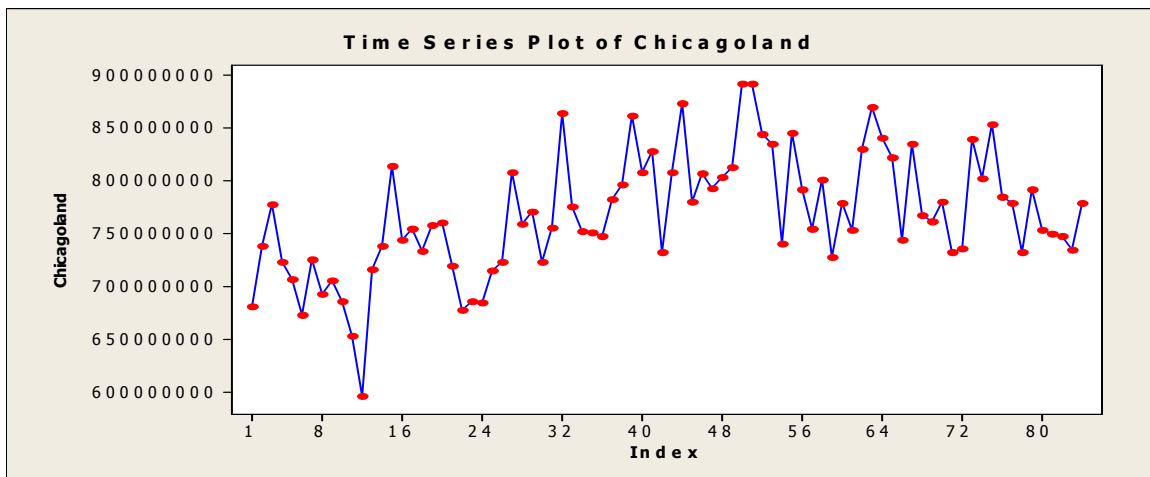
$$Y_t = \beta_0 + \beta_1 t + \beta_2 \text{Feb} + \beta_3 \text{Mar} + \beta_4 \text{Apr} + \beta_5 \text{May} + \beta_6 \text{June} + \beta_7 \text{July} + \beta_8 \text{Aug} + \beta_9 \text{Sept} + \beta_{10} \text{Oct} + \beta_{11} \text{Nov} + \beta_{12} \text{Dec} + \beta_{13} 70\% \text{tax} + e_t$$

Y_t describes the four Indiana Chicagoland riverboat's coin-in in dollars. The "t" variable tests for the presence of trend in the data set. The months February through December are modeled with seasonal dummy variables. For example: Feb = {1 if period t is February, 0 otherwise}. A dummy variable is used for period that reflects the 70% tax level and the overall 2003 Illinois tax restructuring = {1 if period with tax hike, 0 otherwise}.

Results

The assumptions of the regression model are that the error terms are independent and normally distributed with mean 0 and a common unknown variance sigma squared. Researchers often find that hospitality and gaming data regression results commonly violate these assumptions. A primary reason for this violation is the seasonal nature of the hospitality and gaming industry. To identify the potential violation of the assumption of independence, the time series's regression residuals are tested for autocorrelation. The results of the autocorrelation tests on this regression were that autocorrelation was not a component of the model. Trend was a component to the data and was quadratic in nature. It was best modeled by combining a standardized t variable with a squared standardized t variable.

Figure 2
Times Series Representation of Indiana Chicagoland Riverboat Coin-in



Numerous monthly dummy variables assessing seasonality were discarded from the final regression equation due to statistical insignificance when held to the .05 significance threshold. As an example, the October dummy variable was removed from the regression equation based on the inability to reject $H_0=0$ ($p=.283$). Following the same criteria; February, April, May, July, August, September, and October were all eliminated from the regression model.

All remaining coefficients were found to be statistically significant at the .05 level and thus rejecting all corresponding null hypotheses. Most noteworthy was the finding that the 2003 Illinois Tax Restructuring (70% Illinois Tax Change) variable was found to be statistically significant ($p < .001$) on Indiana Chicagoland riverboat demand. Variance inflation factors (VIF) were incorporated to test for multicollinearity. VIF results all registered at 1.5 or below which suggests that multicollinearity is not an issue with the regression model.

After examining the sample autocorrelation function (ACF) (see figure 3), the lack of significant spikes suggest the absence of influence of autocorrelation in the error terms. Therefore, it was determined that Box Jenkins modeling was unnecessary.

Figure 3
Sample Autocorrelation Function

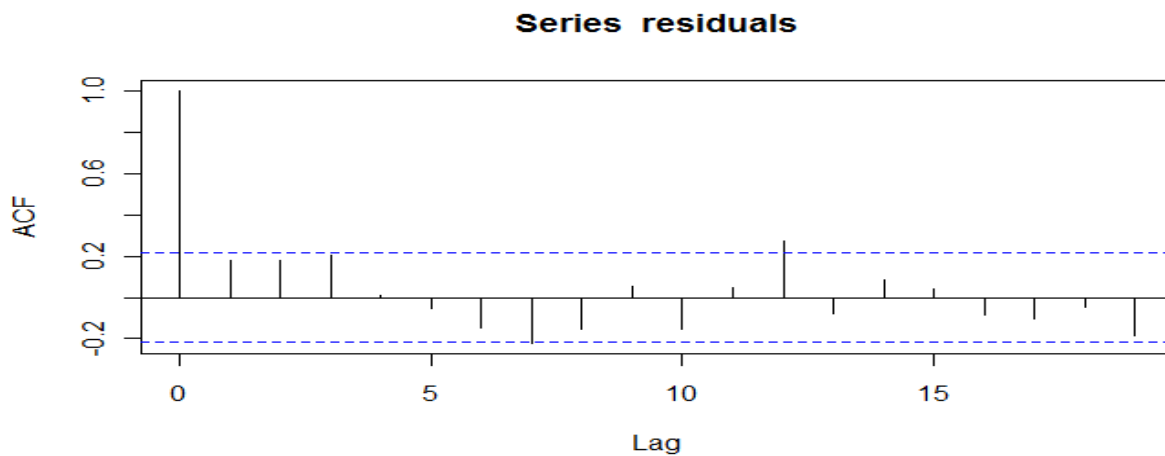


Table 1
Regression Results

Variable	Coefficient	T value	VIF
Constant	786992105	102.47**	--
T Std	25062029	6.60**	1.2
T Std^2	-20176369	-4.45**	1.3
March	68955386	5.41**	1.0
June	-48430463	-3.80**	1.0
November	-53167359	-4.16**	1.0
December	-47155074	--3.69**	1.0
70% Illinois Tax Restructuring	24566054	2.64*	1.5

*Significant at alpha = .05; **Significant at alpha = .01. R-Square: 71.5%, Overall F Statistic: 27.24***

The final regression

Indiana Chicagoland coin-in = 786992105 + 25062029 t_std - 20176369 tstd2 + 68955386 DMar- 48430463 DJun - 53167359 DNov - 47155074 DDec+ 24566054 + 70% Illinois Tax Change + e_t

Discussion of results

The regression model confirms that the 2003 Illinois Tax Restructuring had a positive effect on Indiana gaming demand. Trend was a component in the final model. Previous tax increases, increased competition with surrounding states, and the increase in price for the final Illinois docksite license which hindered the sale of the last license all contribute to explain the overall lack of change in coin-in trend. The month of March was a significant positive seasonal component in the final regression model. This is possibly due to climate factors inherent in Midwestern United States spring weather. It should be remembered that Indiana is a Midwestern state where weather plays a factor in most activities. This may explain why the March carries a positive influence on gaming demand. June, November and December all had negative influences on coin-in. The downturn in June may be associated with the end of the school year and families might vacation around non-gaming activities while November and December are associated with the onset of colder weather and decreased activities.

Conclusions and recommendation for future research

By examining the relationship between the 2003 Illinois tax restructuring and Indiana coin-in, this research indicates that increases in gaming taxation had a significant positive effect on Indiana gaming demand. The results of the study support the findings of research on occupancy taxes, real estate taxation, and sin taxes that have consistently found a negative correlation between demand and increased taxation and restrictions. Specifically, this study supports the research hypothesis predicting that increased gaming taxes will have a negative impact on gaming demand.

This study appears to support aforementioned taxation theory and firm theory. Taxation theory predicts negative repercussions inherent when policymakers fail to accurately assess the external damages inherent in the creation and sale of a product or the offering of a service and administer an unfounded tax. This study's findings suggest that this approach may drive business to competing tax authorities that levy respectively lower costs on competing industries.

Despite frequent editorial supposition estimating the impact of increases in gaming taxes on the commercial gaming industry, there exists no prior empirical study examining this issue the knowledge of this researcher. Previous research has addressed changes in commercial gaming restrictions with similar results. Commercial gaming's stakeholders have frequently advocated the economic penalties inherent in inflated gaming taxation but have been unable to reference academically rigorous research supporting or refuting their position.

The findings of this research must be considered with regard to its inherent limitations. The external validity of these results is somewhat limited given that this research only analyzes a single tax increase in a single Midwestern state. The usage of coin-in, while ostensibly the best measure of gaming demand, does not constitute the entire revenue equation. Therefore, understanding the table game contribution to revenue will strengthen the understanding of the correlation between gaming taxation and gaming demand.

Although slot revenue comprises the greatest proportion of Indiana total gaming revenue, table play nevertheless fulfills an important function in the overall revenue mix. In addition, it is unclear whether table players are more or less impacted by expense alterations in conjunction to tax changes. Therefore understanding this market segment is critical and slot demand should not be assumed to reflect generalized gaming demand which includes table games. Future research into this topic could prove beneficial. The ability to measure table game play should improve as casino based table game systems become more efficient and more widely adopted.

Much speculation has been cast upon the adjustments managers of commercial gaming operations invoke when pressured by increased gaming taxes. Future research attempting to uncover whether and to what degree marketing expenditures, capital improvement, and employee retention/hiring rates are curtailed would be useful.

Further analysis of the impact of other states gaming tax changes and the effect on gaming demand would contribute to a comprehensive understanding of the relationship between gaming taxes and gaming demand. It is conceivable that other Midwestern states with limited gaming licenses are either more or less tolerant to gaming tax increases than less restricted states such as Nevada or Mississippi. In addition, research designed to understand how gaming tax restructuring affects gaming demand in neighboring states might serve to illuminate the interstate balance among commercial gaming states. If additional research indicates that gaming-related tax increases move gaming demand and tax receipts from the legislator's own state to their neighbor as this research suggests, state governments may become increasingly cautionary before making drastic changes.

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