Estimating the Effect of the 2003 Gaming Tax Restructuring on Riverboat Gaming Volume

*Mikael Ahlgren**
Michael C. Dalbor
Ashok Singh

Abstract

This paper analyzes the effect of the 2003 Illinois gaming tax increase on gaming demand. To model gaming demand, slot machine coin-in is chosen for the period January 2000 to December 2006. Multiple regression analysis is used to model both the tax increase and account for seasonality in the data. A Box Jenkins model was employed to address correlation of error terms. The findings reveal that Illinois experienced a decrease in gaming demand when the tax increases took effect. The findings indicate that legislators should acknowledge and evaluate the negative economic pressures tax increases have on the gaming industry.

Keywords: gaming tax, gaming tax increase, Illinois gaming tax, riverboat gaming, gaming demand

Introduction

The effects of changes in gaming taxes are widely debated among the various stakeholders of commercial gaming. The commercial gaming industry and its proponents accept the general incidence of gaming taxes in part as an acceptable cost of doing business in an industry that in many cases is difficult if not impossible to enter. 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 Midwestern United States commercial gaming market has experienced two trends since it opened in the early nineties: states have consistently deregulated and increased the rate of gaming taxes. Deregulation has been implemented to better position operators to compete for local and interstate gaming business. The second trend has been the consistent increase in the various states' percentage draw from gaming revenues. These monies are paid in the form of gaming taxes and have often occurred in conjunction with deregulation. In the case of the Midwestern riverboat states, state governments have deregulated the industry by removing restrictions such as the requirement that riverboats actually leave a docksite, the removal or the increase of betting or loss limits, and the increase of allowable riverboat gaming square footage.

The purpose of this research is to quantify the effect of one of these gaming tax increases on gaming demand/wagering volume which in this study is represented by coin-in. Coin-in is a gaming term describing the total amount of monies inserted into a slot machine. Coin-in and the term "handle" are interchangeable terms used both in the gaming literature and by the state commissions that report gaming volumes. Recent literature almost exclusively has adopted the use of coin-in as the descriptor of gaming demand or wagering volume. In contrast, table drop, a term occasionally

Mikael Ahlgren
*Corresponding Author
Ph.D. Student
University of Nevada
Las Vegas
4505 Maryland Parkway
Las Vegas, NV 89154
Telephone: (702) 895-5860
E-mail: mikeahlgren@cox.net

Michael C. Dalbor, Ph.D.
Professor
University of Nevada
Las Vegas
4505 Maryland Parkway
Las Vegas, NV 89154
Telephone: (702) 895-3848
Fax: (702) 895-4870
E-mail: michael.dalbor@unlv.edu

Ashok Singh, Ph.D.
Professor
University of Nevada
Las Vegas
4505 Maryland Parkway
Las Vegas, NV 89154
Telephone: (702) 895-3620
Fax: (702) 895-4872
E-mail: ashok.singh@unlv.edu

used by researchers to represent gaming volume, only describes the amount a player purchases at a table and not the amount wagered (Kilby, Fox, & Lucas, 2004). It is entirely conceivable a casino patron could purchase a million dollars in chips and put none of them at risk. Coin-in by contrast represents actual monies wagered and therefore, functions as a more accurate representation of demand (Eisendrath, Bernhard, Lucas, & Murphy, 2008).

Illinois riverboats saw their highest tier gaming tax rate reach 70 percent on July 1, 2003. The rate had grown steadily from the original flat rate of 20 percent of adjusted gross revenue that the Illinois legislature had deemed suitable when commercial gaming was initially introduced in 1991 (Illinois Gaming Board, 2005). The outcry from commercial gaming and its benefactors to both this particular increase and the general trend of inflating gaming taxes was considerable. Christensen (2005) warns that gaming taxes that rise above the 20 percent threshold begin to sway the industry from a focus on economic development, related job creation, and capital investment. Christensen also cautions that rates that climb above the 35 percent level prohibit economic viability of riverboat or racino operations in all but the most significantly undersupplied markets such as the Chicago area in Illinois (Christiansen, 2005).

Journalists Jamie Mckee and Marc Falcone predict that Illinois' attempt to capture increased revenues by increasing gaming taxes would have the opposite effect. The tax increase trend had already restricted operators' innovations and additions that had been previously planned to maintain competitiveness with operators in surrounding states like Indiana, Missouri, and Iowa (McKee, 2003). Falcone, who is also a gaming analyst with Deutsche Bank, foretells that the three boats in the Illinois marketplace that had the potential to hit the 70 percent gaming tax threshold would actively attempt to manage their operations to reduce revenues (Falcone, 2003). He also foretells that all operators will engage in layoffs, restrict comps, rely on fewer table games, and close ancillary facilities such as restaurants and hotels (Falcone, 2003b). It is noteworthy to mention that if Falcone is correct in his prediction, the gaming tax scenario provides gaming managers a motivation contrary to the universal capitalist goal of maximizing profits.

In an effort to examine the impact of the 2003 tax restructuring this paper is organized in the following manner. The next section will provide some perspective by giving a brief overview of gaming taxes in general as well as gaming taxes specific to Illinois. This will be followed by a review of existing literature on implementation of other similar tax increases on various industries including hospitality. The literature review will also address the content, related research, and the particular methodologies chosen by various researchers to analyze data with similarities to the data reflecting the Illinois gaming tax increase. The next section will discuss the data and methodology appropriate to analyze the changes in gaming demand related to the gaming tax changes. This is followed by the results and conclusions and implications of the study.

Background on gaming in Illinois and the Midwestern United States

In February 1990, Illinois became the second U.S. state to legalize riverboat gambling when the Riverboat Gambling Act was enacted. Neighboring state Iowa preceded Illinois when legalizing riverboat gambling in July of 1989 (American Gaming Association, 2006). Illinois' legislation authorized the Illinois Gaming Board to license up to ten casino operators. The first riverboat, in Alton, opened September 11, 1991. The communities of Alton, Aurora, East Dubuque, East St. Louis, Elgin, Joliet, Metropolis, Peoria, and Rock Island were all granted licenses by 1996 (Illinois Gaming Board, 2005).

Midwest Riverboat Gaming

Illinois and the three commercial gaming states on its border, Iowa, Indiana, and Missouri, have all followed the "New Jersey" model to the extent that they are limited by both number of facilities and location (The national gambling impact study commission final report, 1999). The "New Jersey" model is characterized by the use of gambling for

the purpose of directing economic development to a restricted number of communities, in this case along particular waterways. The "New Jersey" model tends to base decisions on the potential negatives and actively differentiates the gaming industry from other industry, justifying a more encompassing role for government. This model utilizes commercial gaming to create enterprise zones which contribute benefits; such as, capital investment, public sector revenue, jobs and increased tourism to a predetermined number of locations. This approach to legal commercial gaming lends itself to relatively stricter controls on the industry.

The state of Illinois authorizes each licensed riverboat gambling operation to offer up to 1,200 gaming positions. These positions may be a combination of table games and electronic devices. The Riverboat Gambling Act was amended in 1999 to allow riverboats to be permanently moored at docksites, thus ending the requirement that operators must conduct cruises on waterways. The Gambling Act further requires that patrons of gambling areas of the boats be 21 years of age. Wagering in the casinos must be conducted by cashless means, including; chips, tokens or vouchers.

Gaming taxes generally fall into three main categories: wagering taxes, fees, and/ or admissions taxes. Wagering taxes are collected by all U.S. states that host commercial casinos (American Gaming Association, 2006). Despite some minute differences in how particular states define the tax base, all states use some form of gross gambling receipts minus payouts, or adjusted gross receipts (AGR) (Anderson, 2005).

Fees are an additional source of revenue for many commercial gaming states. Riverboat states often charge a licensing fee, which in the case of Iowa is assessed based on capacity. In contrast, Mississippi assesses their state's licensing fee as a percentage of AGR (Anderson, 2005). Admission taxes are the third source of revenue for both states and local government units, and are typical in riverboat states. In these states, each gambler is required to pay a fee when entering or boarding the facility (Anderson, 2005). Admission taxes range from a set dollar amount to a graduated tax assessment. For example, some states vary the charge with respect to size of facility or past visitor volume (American Gaming Association, 2006). Table 1 illustrates the changes to Gaming taxation in Illinois and its neighbor state Indiana from years 2000 to 2005.

Table 1. A comparison of 2000-2005 Illinois and Indiana riverboat tax rates.

State	2000	2001	2002	2003	2004	2005
IL	Graduated Tax Rate from 20% to 35% of gross gaming revenue, $2 per patron admission tax	Graduated Tax Rate from 15% to 35% of gross gaming revenue, $2 per patron admission tax	Graduated Tax Rate from 15% to 50%(Maximum tax rate through June 2002 – 35%) of gross gaming revenue, $3 per patron admission tax	Graduated Tax Rate from 15% to 70% of gross gaming revenue, $3-$5 per patron admission tax	Graduated Tax Rate from 15% to 70% of gross gaming revenue, $3-$5 per patron admission tax	Graduated Tax Rate from 15% to 50% of gross gaming revenue, $2-$3 per patron admission tax
IN	20% tax on gross gaming revenue	20% tax rate on gross gaming revenue, $3 per patron admission tax	Graduated tax rate from 15% to 35% (Maximum tax rate through June 2002 – 20%) of gross gaming revenue, $3 per patron admission tax	Graduated tax rate from 15% to 35% of gross gaming revenue, $3 per patron admission tax	Graduated tax rate from 15% to 35% of gross gaming revenue, $3 per patron admission tax	Graduated Tax Rate of 15% to 35% of gross gaming revenue, $3 per patron admission tax

Note: Gaming Taxation Rates were retrieved from American Gaming Association State of the States 2000-2006. Retrieved April 12, 2007 from http://www.americangaming.org/survey/index.cfm

It is significant to note that all gaming taxes illustrated in Table 1 are in addition to and not in lieu of regular business income and real estate taxes. Gaming taxes are often characterized as being paid for the privilege of operating gaming facilities (Christiansen, 2005).

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Illinois Gaming Tax Rates

By means of the Riverboat Gambling Act, the State of Illinois assesses taxes on riverboat gambling operations by both an admission tax and a wagering tax. Table 2 illustrates in greater detail the changes in the graduated gaming taxes in Illinois from July 2001 to July 2005.

Table 2. Detailed Overview of Illinois Gaming Tax Rates.

Panel A.

July 1, 2002 – June 30, 2003 Adjusted Gross Revenue Tax Rates						
15% up to $25 Million	22.5% over $25 Million up to $50 Million	27.5% over $50 Million up to $75 Million	32.5% over $75 Million up to $100 Million	37.5% over $100 Million up to $150 Million	45% over $150 Million up to $200 Million	50% over $200 Million

Panel B.

July 1, 2003 – June 30, 2005 Adjusted Gross Revenue Tax Rates						
15% up to $25 Million	27.5% over $25 Million up to $37.5 Million	32.5% over $37.5 Million up to $50 Million	37.5% over $50 Million up to $75 Million	45% over $75 Million up to $100 Million	50% over $100 Million up to $200 Million	70% over $200 Million

Notes. Admission tax rate: $3, $4 or $5 Per Admission-Dependent upon previous calendar year admission total (Less than 1 million = $3, 1 million to 2.3 million = $4, greater than 2.3 million = $5) Local share = $1, All over $1 = State share

AGR Tax: Progressive Tax Rate (indicated above) on calendar YTD AGR level (Gross Gaming Receipts minus Patron Win) Local Share = 5% of AGR at all levels, State Share = remainder of progressive percentage. Common School Fund receives the increased AGR Taxes (increase of 7/1/2003 AGR Rates over 7/1/2002 rates).

The new rates were applied to the calendar YTD AGR levels on the July 1, 2003 game date.

Panel C.

July 1, 2005 Adjusted Gross Revenue Tax Rates						
15% up to $25 Million	22.5% over $25 up to $50 Million	27.5% over $50 up to $75 Million	32.5% over $75 up to $100 Million	37.5% over $100 up to $150 Million	45% over $150 up to $200 Million	50% over $200 Million

Note. Information retrieved from Illinois Gaming Board annual report 2005. Retrieved March 10, 2007 from http://www.igb.state.il.us/annualreport/

The initial tax increase outlined in the previous table that was approved by the Illinois Legislature on June 3, 2002, had a profound negative impact on the gaming market. The evidence of this is provided by the decline in gaming stocks as illustrated in Table 3. For comparison purposes, it should be noted that the Dow Jones Industrial Average declined by 2.2 percent on that date.

Table 3. Performance of selected gaming company stocks for June 3, 2002.

Company	Percentage change in closing price from May 31, to June 3, 2002*
Mandalay Resort Group	-6.4%
Harrah's Entertainment	-7.7%
Boyd Gaming	-14.4%
Hollywood Casinos	-20%

Note: Prices are reported from the Michael Pollock's Gaming Industry Observer in the report, Examining impacts on Atlantic City of proposed tax increases, VLT competition, Report retrieved from the files of the American Gaming Association, 1299 Pennsylvania Ave., NW Suite 1175, Washington, D.C. 2004.

*May 31, 2002 was a Friday and June 3, 2002 was the following Monday. Therefore the percentage change represents a one day change to the value of the stocks presented.

The enactment of the gaming tax had other effects as well. MGM Mirage, who did not have any gaming interest in Illinois, withdrew a bid of $615 million to acquire a casino license in a Chicago suburb. A conference call from Harrah's management to investors revealed the cancellation of plans to build a $40 million hotel to enhance the Metropolis riverboat. MGM Mirage released a statement announcing their intention to focus their efforts on jurisdictions that provide a "stable and reasonable tax environment" (Pollock, Morowitz, & Gushin).

Literature Review

In an attempt to draw parallels to other situations that mirror the increase in gaming taxes in Illinois, research that addresses hotel occupancy taxes rates and the federal 1986 Tax Reform Act on Real Estate proves instructive. Comparisons to the Tax Reform Act and changes in hotel occupancy tax rates are valid because changes in tax laws ultimately translate into changes in human behavior. Whether the tax is federal, state or local does not change the inherent relationship between tax changes and human behavior.

It is important to note that the premise being investigated is not only whether there is a direct relationship between increases in gaming taxes and player behavior but whether there exists an indirect correlation. Both scenarios are possible in the case of the Illinois tax rate increase. Attendance fees were increased and directly paid by the players during the period examined in this research so some effects of the tax increase were directly transferred to the customer. However, the full implication of the changes in gaming taxes is more complex and indirect in nature. Changes in gaming tax rates may cause commercial casino operators to behave differently. For example, if operators are presented with a tax scenario that encourages the limitation of adjusted gross revenues in order to avoid reaching levels that invoke the payment of higher gaming tax rates, then these operators may act to limit revenues by means such as scaling back promotions, changes in operation hours, and changing preferred customer policies. These operator changes have the potential to result in changes in player behavior or demand.

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 suitably applicable methodologies that could provide valuable analysis into the Illinois gaming tax restructuring.

Occupancy Taxes

Hiemstra and Ismail (1992) examine the enactment of occupancy taxes by municipalities. They assert that legislators erroneously choose these means of generating revenues because occupancy taxes primarily affect travelers who are non-constituents. However, the researchers show by analyzing the elasticity of demand (occupancy) that

changes in occupancy tax rates resulted in an impact on occupancy rates. A 9.8% room tax resulted in a 3% drop in occupancy (Hiemstra & Ismail, 1992; Hiemstra & Ismail, 1993). The aforementioned scenario mirrors the allegations of gaming's stakeholders who suggest that legislators view commercial gaming as a bottomless source of income which is impermeable to classic economic pressures (Christiansen, 2005).

1986 Tax Reform Act

The 1986 Tax Reform Act was the most significant adaptation of the tax code since its formation in the 1950's. When the tax reform was analyzed, real estate, in particular, proved to occupy the mantle of most affected industries. The primary aspect of real estate investment impacted was depreciation scheduling; in addition, flow-through tax losses were reduced, and loss offset limitations were instituted (Sanger, Sirmans, & Turnbull, 1990).

Sanger (1990) utilizes intervention analysis (defined as an intervention in a time series) because an event, in this case the tax reform, represents a change in the stochastic process. The dependent variable in this study is the security returns of Real Estate Investment Trusts, known as REITS. These entities invest in real estate and real estate related assets with the purpose of generating a return for their investors (US Securities & Exchange Commission. 2004). Sanger employs dummy variables to model the tax intervention as well as account for seasonal effects. The study's results indicate that the market assesses the changes in the tax code to the disadvantage of real estate owners (Sanger et al., 1990).

Another study that seeks to understand the effects of the 1986 Tax Reform Act is undertaken by Smith and Woodward (1996). The researchers seek to evaluate 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 find that a couple of obstacles threaten the validity of their results. The degree of overbuilding needed to be controlled for in the examined regions. In addition, because of the nature of time-series analysis, the authors acknowledge the potential for autocorrelation. Tests prove autocorrelation is a factor and the researchers rely on the Parks method of analysis to address the issue.

Applying a dummy variable to represent the tax changes and controlling for the degree of overbuilding, the researchers conclude the 1986 Tax Reform Act had a statistically significant negative effect on apartment values (Smith & Woodward, 1996). These studies both inform the methodological approach adopted in this research into the Illinois gaming tax change as well as provide support to the implication that changes to taxation law translate into changes in human behavior.

Gaming Forecasting

A general overview of gaming research assessing regulation and tax changes is included to provide a more comprehensive understanding of gaming taxes, regulation changes, and gaming proliferation in the Midwest, United States.

Deregulation

A number of researchers have addressed how deregulation has affected gaming volume. Methodologically, these examinations of deregulation are often similar as well as pertinent to understanding how to approach a tax increase. Although the effect of deregulation and a tax increase might be opposed, they both share a main characteristic. In both events a single inflection point is introduced in the analysis of a time series (Eisendrath, 2005). In the Midwestern commercial gaming market, these acts of deregulation have often been tied to increases in gaming tax rates.

Deregulation in Atlantic City

Nichols' (1998) study looks at the 1991 deregulation of Atlantic City commercial

gaming, the researcher chooses a Box Jenkins autoregressive moving average or ARIMA model to conduct his analysis. Nichols measures the effect of an increase in operating hours and slot machine space on gaming win. The study acknowledges an inherent shortcoming of operationalizing the demand or volume variable as casino win. Casino win, also known as gambler's losses, is equal to gross gaming revenue. Gross gaming revenue is problematic as a measure because it includes money that is originally distributed by the casino in complimentary fashion ("comps"); therefore, the casino is winning back its own cash. Nichols quantifies the comp ratio as 8.5% of total win. Nichols supports his choice of gaming win because, unlike EBITDA and general revenue related data for example, win does not include non-gaming revenues which distort the results (Nichols, 1998b). EBITDA basically describes net income with interest, taxes, depreciation, and amortization added back in. The EBITDA measure allows interested parties to compare companies and industries while excluding accounting individual financing and accounting decisions. However EBITDA is not a GAAP (General Accepted Accounting Principles) approved measure so companies have the choice to change the components of their calculation from one time period to the next (Investopedia, 2008).

Prior to Nichols' research, Shonkwiler (1993) relies on a structural time series model to evaluate the impact of Atlantic City commercial casinos on gaming volume in Nevada. This study addresses the impact of an extraneous event on time series data. Shonkwiler supports his methodological choice by promoting the value of structural time series for the modeling of linear (stochastic) trends and seasonality. Shonkwiler's research concludes that the introduction of Atlantic City casinos reduced Nevada gaming revenues by between 10 and 12 percent (Shonkwiler, 1993).

Deregulation of Midwestern Riverboats

Nichols (1998a) also addresses deregulation of the United States Midwestern riverboat market the same year he produced his study on Atlantic City. In a response to the 1994 Illinois' introduction of less regulated riverboat gambling, Iowa revamped their 1991 strict inaugural regulations and eliminated mandated sailing, loss limits and space restrictions. Choosing casino win, total admissions and win per admission as the dependent variables, Nichols uses 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. Nichols' results indicate that deregulation is an impetus to significant cross-border substitution as well 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 in Illinois.

Econometric models to determine demand

Thalheimer and Ali (2003) develop an econometric model to identify determinates of demand, particularly slot demand, for 24 Midwestern riverboats and racetracks/casinos. The researchers examine the effects of "traditional demand" variables as well as location and government restrictions. Thalheimer and Ali identify variables such as betting limits, access, win, and number of tables in an effort to explain changes in slot volume. Slot volume is divided by the market area population surrounding the riverboat or casino in an effort to control for the population effect. The model shows an extremely impressive degree of explanatory power (R squared = 0.937) thus concluding that population and its access to facility is positively related to slot demand while access to competing facilities has a negative impact. Lastly the model demonstrates that restrictive limits on gaming are also negatively related to slot demand (Thalheimer & Ali, 2003). Despite the similarities, it is noteworthy to point out that the Thalheimer and Ali (2003) research examines the impact of the independent variable such as access and limits at the single property level rather than gaming volume at the state level (Eisendrath, 2005).

In an effort to enhance the accuracy of Nevada's budgetary planning and with the

recognition of the significance that gaming taxes play in the Nevada state budget, Cargill and Eadington (1978) endeavor to construct a means of forecasting gaming revenues. By first assessing seasonal variations and patterns and then employing multiple regression equations to identify statistically significant correlations, the researchers finally choose the Box Jenkins method to provide the forecasting (Cargill & Eadington, 1978). The earlier stages of this often cited study of gaming reflects the methodology choice of this more narrow research into the repercussions of a single tax increase in Illinois. Like Cargill and Eadington, this study seeks to identify whether a particular tax increase has an effect on gaming volume. Unlike Cargill and Eadington, this study of the 2003 Illinois tax increase does not attempt to forecast the long term effects of the restructuring primarily because the change was not permanent.

The Illinois market

Turco and Riley (1996) look at the factors that are important to riverboat gamblers when choosing a facility and also investigate alternate activities a gambler might consider engaging in with their gaming budget. The researchers' concentrate their study on the Illinois market. Loyalty as reflected by favorite place to play is shown to be an important factor for gamers when choosing gambling venues (Turco & Riley, 1996). Based on Turco and Riley's investigation it is feasible to investigate an impact on gaming demand from a reduction of complimentary goods and services which are dispensed to gamers in an effort to build loyalty.

Bowen (1994) addresses the value of relationship marketing when he points out the connection between satisfaction and loyalty. His article describes the emergence of slot clubs and the use of targeted promotions to develop relationships with known players whose values are then tracked by the casino. Bowen identifies an Aurora, Illinois riverboat as an example of a facility that tracks and rates players. After assessing a player's worth, the casinos will choose to forgo parking revenue in exchange for what the operator believes will be a better relationship with their customer (Bowen, 1994).

Gaming analyst Falcone predicts a reduction in complimentary play, food, and lodging when describing the 2003 Illinois tax restructuring (Falcone, 2003b). To understand the pressure that falls onto marketing expenditures such as costs, it is important to understand that unlike products like tobacco and alcohol, casino operators do not provide a product with conventional price elasticity because of their relative difficulty in passing on increases in operator expenses to their customers. An operator could employ unpopular measures such as tightening the hold or par of their slot machines and thereby raise the price to play but this may lead to a decrease in demand. Typically, the burden of tax increases rests on operators and is expressed through lower rates of invested capital, decreased development projects, reduction in employees, and in the limitation of marketing and/or complimentary expenses (Falcone, 2003a).

Typically, the burden of tax increases rests on operators and is expressed through lower rates of invested capital, decreased development projects, reduction in employees, and in the limitation of marketing and/or complimentary expenses.

Measuring Demand

When forecasting or quantifying gaming volume, researchers have relied on numerous variables as mentioned throughout this review of related literature. This study will utilize 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. First, all the alternative measures of gaming demand are fundamentally problematic. The majority of operators do not and/or cannot quantify the amount wagered on table games (Eisendrath et al., 2008). The measure of table drop, as previously mentioned, reflects the amount converted to chips and does not represent the amount wagered. Revenue figures can vary with short-term luck and volatility on both the player and casino's part (Kilby et al., 2004). Therefore,

coin-in reflects the most accurate and least contaminated measure of gaming volume (Eisendrath et al., 2008; Lucas, Dunn, & Kharitonova, 2006).

The second reason this research relies on coin-in to represent gaming demand is the predominance of the coin-in contribution to the overall commercial casino revenue sources. Those who have researched the Las Vegas, Nevada, market have chosen coin-in as the preferential proxy for gaming demand and justified the decision partially due to the important contribution coin-in makes towards overall revenues. Slot win accounts for approximately 50 percent of gaming win in the Las Vegas market (Eisendrath et al., 2008). In contrast, slot machines or electronic gaming devices (EGDs) account for nearly 90 percent of Illinois adjusted gaming revenues (Illinois Gaming Board, 2005).

Hypothesis, data and methodology

It is hypothesized that the restructuring of the Illinois gaming tax in 2003 will show a negative impact on gaming demand as represented by the dependent coin-in response variable. The term "2003 70% tax and overall tax restructuring" represents the independent or predictor dummy variable for the tax change.

Main Hypothesis

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

H_0 : Coefficient of "2003 70% tax and overall tax restructuring" is equal or greater than 0.

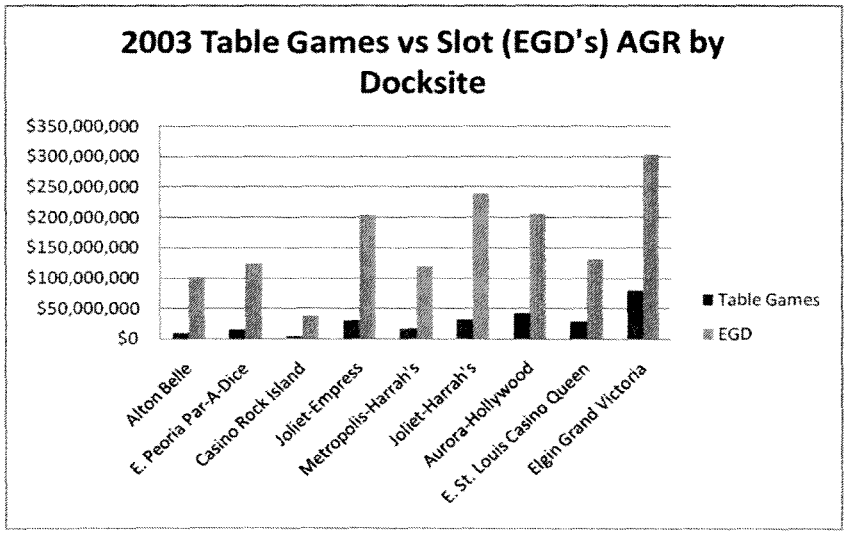
The research hypothesis which predicts that there will be a decrease in coin-in is expressed by the equation:

H_1 : Coefficient of "2003 70% tax and overall tax restructuring" is less than 0.

Data Collection

Secondary data for this study are compiled from Illinois Gaming Board Monthly Revenue Reports (IGB, 2000-2006), comprised of monthly commercial gaming information from January 2000 to December 2006. These public data are available from the Illinois Gaming Board website and via request from the same entity. Each Illinois docksite is required by their licensure to provide this information in a timely manner to the state office of the Illinois Gaming Board. The information is made public shortly thereafter. As previously discussed, this research will use the independent variable coin-in (Electronic Gaming Device Handle) as reported by the various docksites in Illinois for the 84 months covered. Coin-in is reported on a monthly basis by each docksite to

Figure 1. Illinois docksite AGR comparison of table games and slot machines.

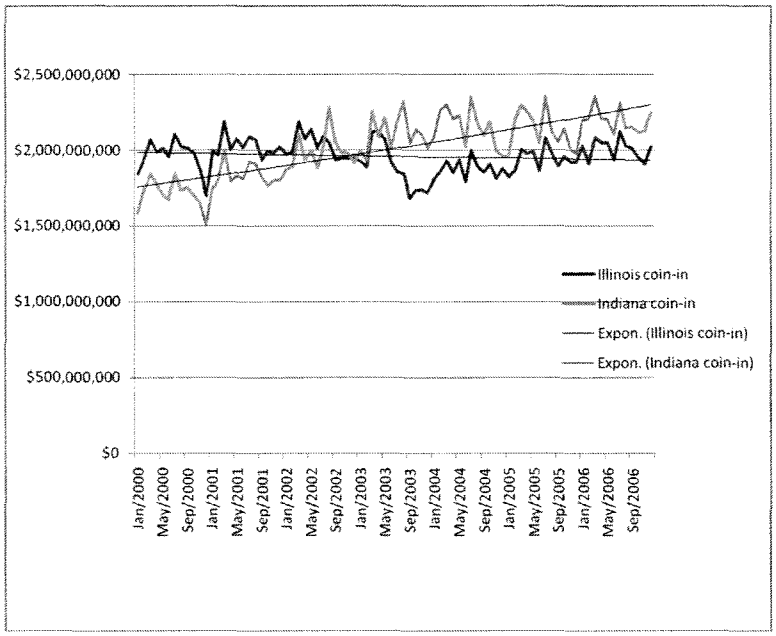


the Illinois Gaming Board. Coin-in has been chosen as the proxy for gaming demand due to its reliability and due to the dominant contribution of slots/EGDs to overall gaming revenue. Figure 1 illustrates a detailed breakdown of the relative importance of Slot (EGD) contribution to revenues based on docksite.

Coin-in has been chosen as the proxy for gaming demand due to its reliability and due to the dominant contribution of slots/ EGDs to overall gaming revenue.

Figure 2 offers an overview of Illinois coin-in with added exponential trendline. Indiana coin-in is included for the purpose of comparison.

Figure 2. Comparison of Illinois and Indiana (January 2000- December 2006) coin-in with exponential trendlines.



Linear Regression Model

The multiple linear regression model will include a time variable testing for trend. The time variable is assigned as follows: the first month is "1", second month "2" and so forth. Trend is characterized as the upward or downward movement of a time series over a period of time. When analyzing data from a particular industry, trend generally reflects factors such as changes in total population, market growth, or long-term changes in per capita income (Bowerman, O'Connell, & Koehler, 2005).

Seasonality or seasonal variations describe the time series flow of peaks and valleys that are completed within a calendar year. Seasonality will be assessed by the use of dummy variables representing the months February through December. When using dummy variables to test monthly data for seasonality, only 11 months are represented by variables. The twelfth month is represented by the constant term of the equation. This model has arbitrarily left January out of the equation.

Based upon our interest in the effect of the 70% tax rate, we will use the following multiple linear regression model:

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

Yt is the Illinois state coin-in in dollars. The "t" variable represents the trend component which as previously mentioned assesses whether there is long-term positive or negative movement in the data over time. The months February- December are treated as 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}.

An autocorrelation function plot and a partial autocorrelation plot of the regression residuals using Minitab 15 will be used to assess autocorrelation. If autocorrelation is revealed, a Box Jenkins model will be constructed to counteract the problem. Finally, the residuals will be re-plotted to ensure that the Box Jenkins model solves the issue.

Results

The assumption of this model is that error terms are independent and normally distributed with mean 0 and a common unknown variance sigma squared. With hospitality and gaming data this assumption of independence is often violated. In time series regression residuals are tested for autocorrelation. We conducted tests for autocorrelation and found that it was present in the first model. We also examined the data for trend and found no positive or negative trend over time in the data.

After examining the sample autocorrelation function (SAC) and the partial autocorrelation function (PACF), the spikes suggest the influence of autocorrelation in the error term of the first lag (1 month). An ARIMA or Box Jenkins model is adopted to resolve the issue of autocorrelation. Box Jenkins methodology can be used to provide a systematic approach to identifying an appropriate model for a time series. This technique can be used to forecast any type of time series. In addition. the Box Jenkins methodology can be used in conjunction with a dummy variable based time series regression in order to counteract correlated error terms (Bowerman et al., 2005). This research utilizes Box Jenkins methodology in the latter manner. Based on the spike at lag one of the autocorrelation chart, a non seasonal (0, 0, 1) ARIMA model was used. This model includes a lagged forecast error. The regression results are shown in Table 4 below.

Table 4. Regression results for regressing independent variables on Illinois coin-in (coin-in is termed "EGD handle on the Illinois commission website).

Variable	Coefficient	T value	P-values	VIF
Constant	1.95E	205.5***	0.000	--
March	1.74E	7.21***	0.000	1.05
April	1.00E	4.15***	0.000	1.05
May	1.29E	5.35***	0.000	1.05
July	1.58E	6.53***	0.000	1.06
August	.757E	3.13**	0.002	1.05
70% Tax Rate	-1.36E	-9.52***	0.000	1.01

**Significant at alpha = .05; ***Significant at alpha = .01.

Adjusted r-squared: 68.8%

Overall F Statistic: 31.49***

A number of the dummy variables representing the months proved to be statistically insignificant when measured at the .05 significance threshold. For example, the February dummy variable was eliminated based on the inability to reject $H_o = 0$ (p=.899). Based on the same standard; June, September, October, November, and December were all discarded from the regression equation.

All coefficients were found to be significant at the .05 level, thus rejecting all null hypotheses. Most significantly, the variable representing the Illinois 2003 70% tax and overall tax restructuring was found to be a statistically significant (p = .000) factor on gaming demand as represented by statewide coin-in. Variance inflation factors (VIF), which indicate potential multicollinearity, were also calculated. The results all show a VIF under 2, which is considered acceptable and indicates that multicollinearity is not an issue with the model.

The final regression equation is now modified to reflect the Box Jenkins.

Illinois coin-in = 1.95E+09 + 1.74E+08 DMar + 1.00E+08 DApr + 1.29E+08 DMay

+ 1.58E+08 DJul + 75702571 DAug - 1.36E+08 70% + e_t

Where $e_t = a_t + .2264 a_{t-1}$ where $a_{t-1} \sim N(0, \sigma^2)$

The notations in the final regression equation reflect the following. "E" is a scientific notation for an exponential. In the above example: 1.95E+09 is the same as 1.95 billion. The "e" in the equation represents the error term for the regression equation. The "a" signifies the error term from the Box Jenkins treatment.

Discussion of results

The regression model confirms that the 2003 Illinois Tax Restructuring had a negative effect on gaming demand. Trend was not 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 months of March, April, May, July, and August were all significant positive seasonal components in the final regression model. It should be remembered that Illinois is a Midwestern state where weather plays a factor in most activities. This may explain why the spring and summer months reveal a positive influence on gaming demand. It is conceivable that June does not reflect this increase since it is associated with the end of the school year and families might vacation around non-gaming activities.

Conclusions and recommendation for future research

By examining the relationship between the 2003 Illinois tax restructuring and coin-in, this research indicates that increases in gaming taxation had a significant negative effect on Illinois 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.

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 to the knowledge of this researcher. Previous research has addressed changes in commercial gaming restrictions with similar results. Commercial gaming's stakeholders have frequently warned of the economic penalties that result from inflated gaming taxation but have been unable to reference academically rigorous research supporting or refuting their position.

This research indicates that increases in gaming taxation had a significant negative effect on Illinois gaming demand.

The implication of this study is that casino operators should promote the similarity between the gaming industry and the rest of the economy. Along with this investigation of the 2003 Illinois gaming tax rate increase, casinos can identify multiple academic studies cited within that indicate casinos are subject to the same economic forces as other industries. Casinos do not appear to be immune from regulation or increased taxation.

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. In addition this study tests the impact of a single 70% tax rate in one Midwestern riverboat state. The results should therefore, without further research to

corroborate these findings, not be generalized. Further research into understanding what level of gaming taxation rates result in a significant negative impact on gaming demand and hence revenues would be beneficial.

Although slot revenue comprises the greatest proportion of Illinois 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 fruitful. 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 gaming-related tax increases move gaming demand and tax receipts from the legislator's own state to their neighbor, state governments may become increasingly cautionary before making drastic changes.

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