Economics Bulletin

What's the potential impact of casino tax increases on wagering handle: estimates of the price elasticity of demand for casino gaming.

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Abstract

This study estimates the price elasticity of demand for casino gaming. A demand model is estimated with data from a panel of 50 casinos operating in Illinois, Indiana, Iowa, and Missouri between 1991 and 2005. The model isolates the impact of changes in the casino win percentage or price on the wagering handle, controlling for the impact of other operating, economic, and regulatory determinants of the wagering handle. The model estimates suggest that the wagering handle in the short run is inelastic to price changes, and that in the long run the wagering handle is unit elastic if not somewhat inelastic.

Citation: Landers, Jim, (2008) "What's the potential impact of casino tax increases on wagering handle: estimates of the price elasticity of demand for casino gaming.." *Economics Bulletin*, Vol. 8, No. 6 pp. 1-15
Submitted: July 22, 2008. **Accepted:** August 25, 2008.
URL: http://economicsbulletin.vanderbilt.edu/2008/volume8/EB-08H00007A.pdf

1. Introduction

Prior to 1989, only two states had legalized full-fledged casino gambling – Nevada in 1931 and New Jersey in 1978. By 2006, gambling was being conducted on electronic gaming devices (EGDs) and on various table games such as poker, black jack, craps, and roulette at commercial casinos in no less than 17 other states besides New Jersey and Nevada.[1] Generally, state legislatures have legalized commercial gaming at casinos to generate revenue from excise taxes imposed on the casino owners as well as to promote local and regional economic development and tourism. The preliminary results generated by this study focus on the potential impact of increasing casino tax rates. Table I summarizes the FY 2006 revenue generated from casino taxes in the states where commercial casinos operated. The revenue data serves to highlight the increasing importance of casino taxes in a number of states.

The study estimates the elasticity of wagering at casinos by gamblers due to changes in the percentage of those wagers that are retained by the casino. This measure is equivalent to a price elasticity, where the total amount wagered by gamblers (referred to as the *handle*) represents the demand for casino gaming and the percentage of the handle retained by the casino (referred to as the *win percentage* or take-out rate) represents the price paid by the gambler to play the casino games. Suits (1979) suggested that the price elasticity of demand for gambling has significant implications for tax policies of states where gambling operations are regulated and utilized to generate tax revenue. Given the increasing dependence of states on casino excise taxes imposed on the wagering dollars retained by casinos (referred to as the *win*), Suits' observation appears to be gaining in relevance. If casino tax increases lead to corresponding increases in the win percentage, then the price elasticity of demand would provide important information to policy makers regarding the potential response by gamblers to tax rate increases and the potential revenue yield from these tax rate increases.

The price elasticity is estimated utilizing operating data from a panel of casinos located in Illinois, Indiana, Iowa, and Missouri. These four states impose two excise taxes on casino owners: (1) a wagering tax and (2) an admission tax. The wagering tax, which is imposed in some form by all states where casino gaming is allowed, is the predominant revenue raiser of the two casino taxes imposed by the states examined in this study. The wagering tax is imposed as a percentage of the win generated by a casino. Thus, the win percentage represents a gross price paid by the gambler with a portion remaining with the casino owner (the before tax price) and a portion transferred to the state as wagering tax. While Missouri continues to utilize a flat rate wagering tax, Illinois, Indiana, and Iowa have adopted graduated tax rate structures for their respective wagering taxes. Unlike the other states that permit casino gambling, Illinois, Indiana, and Missouri also each impose admission taxes on the casino owners.[2] The admission tax requires the casino owner to pay a fixed dollar amount per patron entering the casino. Nevertheless, an admission tax essentially represents an indirect tax on casino win, albeit where the tax rate varies as a percentage of the win generated from each casino patron.

[1] Approximately 28 states, including some with commercial casinos, contained tribal casinos not subject to state authorization or state gaming regulators.

[2] A locally adopted admission tax is allowed in Iowa, but no such tax is imposed by the state.

The remainder of this paper is divided into the following sections: (1) a brief review of pertinent empirical research estimating the demand for casino gaming, state lottery games, and pari-mutuel horse racing; (2) a description of the econometric model, sample data, and estimation methodology; (3) a discussion of the regression results; and (4) some concluding remarks.

2. Literature Review

Research estimating the demand for casino gaming, its determinants, and the price elasticity of demand for casino gaming is quite limited. In contrast, a larger literature exists that examines the price elasticity of demand for lottery games and pari-mutuel horse racing. Together, these studies provide a sufficient basis for estimating rather illustrative and robust demand equations for casino gaming.

Several studies have, with varying results, estimated the impact of the take-out rate on lottery sales. Vrooman (1976), Vasche (1985) and Mikesell (1987), for instance, fail to find statistical evidence of a relationship between the take-out rate and lottery sales. In contrast, DeBoer (1986) and Gulley and Scott (1993) estimate statistically significant relationships between take-out rate and lottery sales based on very different lottery samples.[3] DeBoer utilizes sales and take-out rate data from a panel of seven states operating lotteries from 1974 to 1983, while Gulley and Scott utilize weekly and biweekly drawings data from lotto games in four states for varying periods during the late-1980s and early-1990s. Estimates from these two studies are varied, with DeBoer estimating an elasticity equal to -1.19 and Gulley and Scott's four estimates ranging from -0.19 to -1.92.

The preponderance of studies evaluating the price elasticity of demand for pari-mutuel wagering generated statistically significant elasticity estimates. While Morgan & Vasche (1979, 1982) fail to find statistical evidence that the take-out rate affects the handle per patron at racetracks, they do find that the take-out rate has a statistically significant negative impact on racetrack attendance. As a result, increases in the take-out rate result in lower attendance and therefore aggregate declines in the pari-mutuel handle. Thalheimer and Ali (1995) also estimate a similar result. In contrast, Gruen (1976), Suits (1979), Pescatrice (1980), and Thalheimer and Ali (1992, 1995) generate statistically significant elasticity estimates on wagering handle ranging from -0.5 to -2.81. These estimates are generated utilizing varying data sets ranging from panels of state-level pari-mutuel data (Suits, 1979), panels of data for different race meetings or racetracks in a single state (Gruen, 1976; Pescatrice, 1980; and Thalheimer and Ali, 1995), and single track data (Thalheimer and Ali, 1992). What's more, some of these studies successfully test other demand determinants such as measures of racetrack operations, state economic measures, and indicators of a racetrack's local market structure.

Only a handful of studies investigate the potential determinants of wagering levels at casinos, with only one study generating a point estimate for the price elasticity. Nichols (1998a, 1998b) focuses on the impact of various state-imposed regulatory requirements on the win generated by casinos in Iowa and Atlantic City. The studies indicate that regulatory restrictions

[3] Cook and Clotfelter (1993) estimate a statistically significant direct relationship between lottery sales and lottery payout rates (the percentage of total sales paid out to winners).

such as betting and loss limits, cruising requirements for riverboat casinos, and casino and gaming area size restrictions result in lower win totals than would otherwise be realized in the absence of the restrictions. Nichols (1998a) also finds significant seasonal effects, with summer win totals generated by Iowa riverboat casinos significantly higher than win totals generated in the winter. Interestingly, while Nichols (1998b) controls for the impact of variation in income on win totals, the estimated impact is statistically inconclusive. More recently, Moss, Ryan, and Wagoner (2003) find that casino win exhibits a growth pattern over time consistent with Butler's S-shaped product life cycle curve. This growth pattern suggests that initial periods of high revenue growth tend to be followed by a marked leveling off of growth rates as markets mature. Unfortunately, none of these studies attempt to estimate the price elasticity of casino gaming.

Thalheimer and Ali (2003) generate an estimate of the price elasticity of wagering on EGDs at casinos in Illinois, Iowa, and Missouri from 1991 to 1998, developing a much more detailed model specification than the research highlighted above. Their demand model specifies measures of casino operations including the EGD win percentage, deregulatory policies, and market attributes such as customer access to the casino and income within the market area of the casino. The data analysis estimates the average price elasticity at about -0.99, and suggests that the price elasticity declined from about -1.5 in 1991 to about -0.9 in 1998. It also indicates a strong nonlinear income effect and suggests that regulatory restrictions like cruising requirements for riverboat casinos and market-specific factors such as customer access and income are important determinants of casino win.

3. Data and Econometric Methodology

The estimating equation for this study takes on the general form specified in below in (1):

$$Handle_{it} = \beta_0 + \beta_1 Win\%_{it} + \beta_2 Income_{it} + \beta_3 X_{it} + \varepsilon_{it} \tag{1}$$

where *Handle* is the per capita EGD handle in real dollars (base year = 1991) within the spatial market of a casino; *Win%* is the calendar year percentage of EGD handle that is retained by the casinos after winnings are paid from the handle amount to players; *Income* is the calendar year per capita personal income in real dollars (base year = 1991) within the spatial market of a casino; *X* comprises additional operating, economic, and regulatory policy determinants of wagering handle; and *i* and *t* are, respectively, casino and year indices. Summary statistics for the variables specified in estimating equation are presented in Table II.

Fixed effects panel regression procedures are employed to estimate the demand function utilizing an unbalanced panel of 50 casinos operating in Illinois, Indiana, Iowa and Missouri between 1991 and 2005. The cross-section observations correspond to casinos and, as a result, the data captures the temporal variation in wagering demand for each casino in the panel and the variation in wagering demand between casinos. This means the panel data provides substantially more variation in wagering demand than could be generated with a series corresponding to only one casino. The panel data also allows us to explain the differences between casinos that are not captured by the explanatory variables specified in the models. Aggregate year effects are also employed in the model specifications to account for the effects of cyclical and other general economic changes that are not captured by the explanatory variables specified in the models.

All model specifications are corrected for an AR(1) error structure.[4] Model specifications are estimated in logarithmic form. This ensures that the predicted values of *Handle* are nonnegative, and controls for the potential nonlinear relationships between *Handle* and *Income*. The double-log form also allows the estimated coefficients on the independent variables to be interpreted as elasticities.

To compute *Handle* for each casino, the spatial market of the casino is assumed to be contained within the counties having a centroid within 100 miles of the casino.[5] Annual EGD handle totals were computed from monthly totals reported by state gaming regulators in Illinois, Indiana, Iowa, and Missouri. Population is taken from the counties contained within the casino market. Annual county population estimates were obtained from the U.S. Census Bureau. EGD handle was selected to represent the demand for casino gaming because: (1) the handle for table games can be difficult to measure; and (2) the win percentage on EGDs can be readily altered by casino owners while win percentage for table games reflects traditional payout rates. This should not bias the estimation results since EGD win represents the overwhelming percentage of total win of the casinos in the four states being studied – ranging from 83% in Indiana to 91% in Iowa.

Win% is computed from monthly EGD handle and EGD win totals reported by state gaming regulators. *Win%* is expected to be inversely related to *Handle*. *Income* is also computed from the annual income and population in counties where the county centroid is within 100 miles of the casino. Annual county personal income estimates were obtained from the U. S. Bureau of Economic Analysis. *Income* is expected to be directly related to the *Handle*.

Other operating determinants specified in the estimating model include the number of days during the calendar year that a casino was open for operations (*Days*), and the monthly average number of EGDs and table games supplied by a casino during the calendar year (*EGDs* and *Table Games*). *Days* controls for casinos starting up or going out of business and operating for only a partial year during the period of analysis. *Days* and *EGDs* are each expected to be directly related to *Handle*. *Table Games*, on the other hand, may represent a substitute for *EGDs*. Thus, *Table Games* is expected to be inversely related to *Handle*. Data for these three operational measures was obtained from monthly financial reports of state gaming regulators.

The estimating model also includes two binary dummy variables describing important regulatory policy determinants of *Handle*. One regulatory dummy variable (*Cruising Requirement*) indicates whether a state employs a cruising requirement for riverboat casinos while the second regulatory dummy variable (*Loss Limit*) indicates whether a state imposes a daily loss limit for gamblers. Both regulatory determinants are expected to have a negative

[4] The Hausman (1978) model specification test was employed on all of the model specifications. In each case, the chi-square statistic was significant at the 1% level, indicating that the fixed effects model specification was superior to the random effects model specification. I also employed the Wooldridge (2002) test for first order autocorrelation in panel data models on all the model specifications. In each case, the F statistic is significant at the 1% level, indicating that the models have an AR(1) error structure. I correct for the AR(1) error structure by estimating the model specifications with STATA's xtregar procedure which estimates fixed effects linear models with an AR(1) error structure using Prais-Winsten estimation procedure.

[5] The 100 mile spatial market is consistent with findings on the spatial market of riverboat casinos by Illinois Gaming Board (1997), Thalhiemer and Ali (2003), Przybylski and Littlepage (1997).

impact on *Handle*. Both variables were developed from information in monthly and annual reports of state gaming regulators.

4. Estimation Results

Coefficient estimates for nine model specifications are reported in Table III. The estimating models fit the data relatively well, registering a within R-squared between 0.70 and 0.76. All of the variables except for *Table Games* are statistically significant at the 10% level or better. The operating, regulatory, and economic control variables (with the exception of *Table Games*) are statistically significant and provide intuitive and reasonable estimating results. *Days*, *EGDs, Cruising Requirement*, and *Loss Limit* are statistically significant at better than the 1% level in all model specifications. *Income* is also statistically significant at better than the 5% level in all the model specifications. The coefficient estimates on these control variables are robust, being statistically significant, exhibiting the expected sign, and exhibiting similar values over all model specifications.

The coefficient estimates suggest that the EGD handle generated by a casino is: (1) increasing in the number days the casino operates during the year; (2) increasing in the number of EGDs the casino supplies during the year; (3) increasing in the current income of individuals within the casino's spatial market; (4) is systematically lower for casinos operating in states where riverboat casinos must cruise to conduct gaming operations; and (5) is systematically lower for casinos operating in states that impose daily limits on losses that gamblers may incur.

Overall, the coefficient estimates on the control variables are fairly consistent with estimates from prior research. The following are a few comparisons to the estimates generated by Thalheimer and Ali (2003). The elasticities on operating days and EGDs generated by Thalheimer and Ali are 1.38 and 1.12, respectively. The elasticities generated by this study are consistently lower, and are statistically different from the values derived by Thalheimer and Ali.[6] The smaller elasticities may reflect the maturation of Midwest gaming markets and an increased level of competition that wasn't present in Thalheimer and Ali's sample. Thalheimer and Ali estimate the impact of the cruising requirement at -0.43 and the loss limit at -0.45. The estimates on the cruising requirement from this study are all substantially lower and are all statistically different than the value generated by Thalheimer and Ali. In contrast, the impact of loss limits are estimated at a higher level by this study, however, none of the estimates are statistically different from the value generated by Thalheimer and Ali. The coefficient differences may again be the function of the different panels employed in the two studies. The span of time for this study provides a much better comparison of operating differences under cruising requirements and dockside gaming regimes. The time frame for Thalheimer and Ali's study would only allow for a comparison to be made relative to Iowa which made the change in 1994. The time frame for this study would provide for that comparison and comparison to dockside gaming performance by Illinois, Indiana, and Missouri casinos, with Illinois eliminating the cruising requirement in 1999 and Indiana and Missouri doing so in 2002. Similarly, the sample for this study would include many more data points than Thalheimer and Ali's sample relating to casinos operating

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[6] The hypothesis test is based on the test statistic $t = \frac{\beta - (\omega)}{SE}$, where ω is the elasticity value estimated by Thalheimer and Ali (2003).

with and without loss limits, with Illinois and Indiana never employing loss limits, Iowa eliminating loss limits in 1994, and Missouri maintaining loss limits.

The estimated income elasticity ranges from about 1.8 to 1.9 in Models 4, 5, 7, and 9, with a lower income elasticity of about 1.4 generated by Model 6. The estimates appear to be consistent with prior research suggesting that wagering handle is highly responsive to income variation, whether the wagering is on lottery games, pari-mutuel racing, or casino gaming.[7] What's more, none of the elasticities are statistically different from 1, suggesting that on average handle is unit elastic to changes in income.

The different specifications in Models 1 through 5 generate robust estimates for the focal variable *Win%*. The coefficient estimates are statistically significant in these model specifications at better than the 1% level. In addition, the coefficient estimates exhibit the expected sign and similar values. The price elasticity ranges from a low of -.75 to a high of -.87, suggesting that a 10% increase in the price of playing EGDs leads to a 7.5% to 8.7% decline in the EGD handle. The price elasticity estimates are not statistically different from -1.0 at a 10% or lower confidence level.[8] This suggests that casino wagering is unit elastic, if not somewhat inelastic, to changes in the win percentage. In comparison, the average price elasticity estimated by Thalheimer and Ali (2003) with their more limited panel dataset, was -0.99.

Model 6 explores whether price changes have a larger impact on casino wagering in the long run versus the short run. Potentially, it may take time for players to adjust to changes in the win percentage such that their wagering patterns are more elastic over several time periods than in the initial period after the price change. Model 6 contains the current-year win percentage and one-, two-, and three-year lags of the win percentage to estimate both the short run and long run effect. The coefficients on the current-year win percentage and the one-year lag are both statistically significant and negative. This suggests that in the short run the handle is price inelastic though the long run estimate suggests unit elasticity. Thus, gamblers fail to adjust immediately to variation in the win percentage, with the adjustment process potentially carrying on for more than one year after the price change. Players may adjust somewhat slowly because the win percentage is not an advertised price like prices of typical goods and services. Moreover, the adjustment process may depend on amenities and marketing programs offered by the casino employing the price change as well as competing casinos. Thus, amenities and marketing programs at a casino that increases price may continue to make the casino attractive to players in the short run, but in the long run players may shift to competing casinos as they adjust their pricing, amenities, and marketing programs. The adjustment process also may depend a great deal on the distance players must travel in order to gamble at another casino. Small increases in the win percentage may not result in any marked decline in handle if most players have to travel a substantial distance to gamble at another casino.

[7] Thalheimer and Ali (2003) do not log transform the income variable in their estimating model, so no test is carried out of the difference between the income elasticity estimates generated by this study and an elasticity value generated by Thalheimer and Ali.

[8] The hypothesis test is based on the test statistic $t = \frac{\beta - (-1)}{SE}$.

Model 7, 8, and 9 investigate a few additional effects relating to the price elasticity. Model 7 investigates whether the price elasticity is time dependent and, thus, has varied from 1991 to 2005. The interaction of the time trend and win percentage variables in Model 7 is not statistically significant, thus, there appears to be no discernible change in the average price elasticity from 1991 to 2005. This result departs from estimates by Thalheimer and Ali (2003) suggesting that the average price elasticity in Illinois, Iowa, and Missouri declined from about -1.5 in 1991 to about -0.9 in 1998. Similar to Model 7, Model 8 investigates whether the price elasticity is income dependent. While the coefficient values appear to suggest that the price elasticity declines as player income increases, the interaction of income and win percentage is not statistically significant. Finally, Model 9 fails to suggest that the win percentage has any nonlinear effects on the wagering handle.

5. Concluding Remarks

In this paper, I employ fixed effects regression procedures to estimate the determinants of wagering on EGDs at casinos operating in Illinois, Indiana, Iowa, and Missouri between1991 to 2005. I estimate various specifications of the demand for wagering on EGDs. I also generate estimates of the elasticity of wagering on EGDs for changes in the win percentage – essentially the price elasticity of demand for gaming on these devices. Generally, the estimating results are intuitive, robust, and consistent with the pertinent, albeit small, literature on the subject. The regression results suggest that demand for gaming at casinos is affected by variations in the casino's own operating structure, regulatory requirements, player's income, and the win percentage imposed by the casino. Specifically, the regression results suggest that the price elasticity of demand for gaming is inelastic in the short run, and is roughly unitary elastic in the long run.

The elasticity estimates suggest that casino's may be in a position to raise the win percentage in response to casino tax increases. It also means that tax rate increases could potentially increase government revenue while not decreasing net gaming revenue to the casinos. This assumes that the casinos choose to pass the tax rate increase forward to players by increasing the win percentage on games to completely offset the tax rate increase. The extent and the method by which casino tax increases are absorbed by casinos or passed on to suppliers, employees, or patrons requires further research to delineate the true impact of the rate increases on the industry and on the wagering handle and casino attendance.

The findings of this study should be informative to forecasters, policy analysts, and policy makers as to the potential revenue impact of increases in casino taxes. Based on the elasticity estimates, it appears that at least small tax rate increases could potentially generate additional tax revenue and not have a severe impact on wagering handle. Thus, the base response might be small and predictable and revenue projections could be done relatively accurately. This assumes that casinos would respond to small rate increases solely by changing the win percentage and not making other operational changes.

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Table I: FY 2006 Gaming Tax Collections Relative to Total State Tax Collections, States with Casinos (dollar amounts in millions)

State	Gaming Taxes[7]	Share of Total State Taxes[7]
Nevada[1]	1,003.1	16.30%
Indiana[2]	803.2	5.89%
Illinois[2]	800.1	2.84%
Louisiana[1,2,3]	570.4	5.91%
West Virginia[3,4]	542.7	11.91%
New Jersey[1]	477.3	1.92%
Missouri[2]	421.8	4.14%
Michigan[1,5]	318.2	1.34%
Delaware[3,4]	315.0	11.01%
Mississippi[2]	273.6	4.57%
Iowa[2,3]	260.7	4.26%
Rhode Island[3,4,5]	245.7	8.96%
New York[3,4]	193.6	0.35%
Colorado[1]	106.1	1.25%
New Mexico[3]	38.8	0.76%
Oklahoma[3,5,6]	17.5	0.23%
South Dakota[1,5]	12.8	1.08%
Maine[3,5,6]	10.2	0.29%

[1]Landbased casinos.

[2]Riverboat casinos.

[3]Racetrack casinos.

[4]Racetrack casinos operate as lottery retailers, with the gaming tax computed as the racetrack casino win minus the lottery retailer commission paid to racetrack owner.

[5]Maine financials for November 2005 to June 2006. Oklahoma financials for October 2005 to June 2006. Michigan, Rhode Island, and South Dakota financials for FY 2005.

[6]Gaming tax amount is computed as the racetrack casino win minus amounts retained by racetrack owner for general purpose use.

[7]Gaming tax data obtained from annual financial reports of state gaming regulators and lottery agencies. State tax data obtained from the 2006 Annual Survey of State Government Tax Collection, U. S. Census Bureau.

Table II: Panel Summary Statistics

Variable[1]	Mean	Std. Dev.	Min	Max
Handle[2]	335.99	284.68	3.22	1,598.99
Days[2]	345.12	64.57	6.00	366.00
EGDs[2]	1,135.58	617.92	200.00	3,310.00
Table Games[2]	41.40	27.86	0.00	178.00
Win%[2]	6.99	1.25	4.71	12.14
Win% Squared	50.39	19.38	22.16	147.40
Cruising Requirement[3,4]	0.35	0.46	0.00	1.00
Loss Limit[3,4]	0.22	0.41	0.00	1.00
Income[5]	21,967.11	2,427.27	15,871.82	26,625.96
Time Trend	9.74	3.67	1.00	15.00

[1]n=465. Dollar amounts are real dollars (base year=1991).

[2]Data obtained from monthly financial reports: Illinois Gaming Board, http://www.igb.state.il.us; Indiana Gaming Commission, http://www.state.in.us/gaming; Iowa Gaming and Racing Board, http://www.iowa.gov/irgc/; Missouri Gaming Commission, http://www.mgc

[3]Data obtained from annual reports: Illinois Gaming Board, http://www.igb.state.il.us; Indiana Gaming Commission, http://www.state.in.us/gaming; Iowa Gaming and Racing Board, http://www.iowa.gov/irgc/; Missouri Gaming Commission, http://www.mgc.dps.mo.gov

[4]Binary dummy variable. Mean equals the percentage of sample observations with score equal to one.

[5]Data obtained from U. S. Bureau of Economic Analysis, State and Local Personal Income.

Table III: Regression Estimates

Variable	Model 1	Model 2	Model 3
Constant	-2.465779***	-1.788003***	-1.449593***
	(0.3369437)	*(0.3415046)*	*(0.3277336)*
LN(Days)	0.9656574***	0.9285181***	0.928518***
	(0.0359599)	*(0.036484)*	*(0.036484)*
LN(EGDs)	0.5534192***	0.5355861***	0.5355864***
	(0.1065088)	*(0.1028671)*	*(0.1028671)*
LN(Table Games)	0.0047174	0.0107691	0.0107691
	(0.0420782)	*(0.0403974)*	*(0.0403975)*
LN(Win%)	**-0.7540078*** **	**-0.8754113*** **	**-0.8754113*** **
	(0.1825624)	*(0.17861)*	*(0.17861)*
LN($Win\%_{t-1}$)	**-**	**-**	**-**
LN($Win\%_{t-2}$)	**-**	**-**	**-**
LN($Win\%_{t-3}$)	**-**	**-**	**-**
Win%	**-**	**-**	**-**
Win% Squared	**-**	**-**	**-**
Cruising Requirement	-	-0.1839969***	-0.183997***
		(0.0566787)	*(0.0566787)*
Loss Limit	-	-0.6179297***	-0.6179295***
		(0.2125193)	*(0.2125193)*
Time Trend	-		-0.0225486**
			(0.010375)
(Time Trend)*LN(Win%)	**-**	**-**	**-**
LN(Income)	-	-	-
LN(Income)*LN(Win%)	**-**	**-**	**-**
Within R-Squared	0.7334***	0.7461***	0.7461***

NOTES:

Dependent Variable = LN(Per Capita EGD Handle). Groups=50, Observations=414.

Entries are fixed-effects panel regression coefficients with standard errors in parentheses. All regression models include casino and year fixed effects. All dollar amounts are real dollars (base year=1991) and all percentages are measured on a 0 -100 sca

*.05<p<=.10; **.01<p<=.05; ***p<=.01.

Table III: Regression Estimates (Continued)

Variable	Model 4	Model 5	Model 6
Constant	-20.74335***	-19.41579***	-17.94522***
	(4.293482)	*(4.20456)*	*(2.410878)*
LN(Days)	0.9337485***	0.9337483***	1.227875***
	(0.0365292)	*(0.0365292)*	*(0.2676029)*
LN(EGDs)	0.5481851***	0.5481844***	0.5875367***
	(0.1026696)	*(0.1026696)*	*(0.0719595)*
LN(Table Games)	-0.0032298	-0.0032297	-0.0164296
	(0.0409476)	*(0.0409476)*	*(0.0185584)*
LN(Win%)	**-0.8707295*****	**-0.8707306*****	**-0.59467*****
	(0.1779422)	*(0.1779422)*	*(0.1348411)*
LN(Win%$_{t-1}$)	**-**	**-**	**-0.5138041*****
			(0.1321885)
LN(Win%$_{t-2}$)	**-**	**-**	**-0.0099853**
			(0.1098575)
LN(Win%$_{t-3}$)	**-**	**-**	**0.1541337**
			(0.0973546)
Win%	**-**	**-**	**-**
Win% Squared	**-**	**-**	
Cruising Requirement	-0.2003658***	-0.2003658***	-0.2330055***
	(0.0571207)	*(0.0571208)*	*(0.0316126)*
Loss Limit	-0.6216122***	-0.6216115***	-0.7153513**
	(0.2115903)	*(0.2115903)*	*(0.2877591)*
Time Trend	-	-0.0884444***	-0.0091707
		(0.0185407)	*(0.0078396)*
(Time Trend)*LN(Win%)	**-**	**-**	**-**
LN(Income)	1.879111**	1.879091*	1.435763***
	(1.024918)	*(1.024916)*	*(0.5233082)*
LN(Income)*LN(Win%)			**-**
Within R-Squared	0.7479***	0.7479***	0.7057***

NOTES:

Dependent Variable = LN(Per Capita EGD Handle). Groups=50, Observations=414.

Entries are fixed-effects panel regression coefficients with standard errors in parentheses. All regression models include casino and year fixed effects. All dollar amounts are real dollars (base year=1991) and all percentages are measured on a 0 -100 sca

*.05<p<=.10; **.01<p<=.05; ***p<=.01.

Table III: Regression Estimates (Continued)

Variable	Model 7	Model 8	Model 9
Constant	-19.08318***	-5.957588	-20.49137***
	(4.227141)	*(10.37355)*	*(4.164611)*
LN(Days)	0.9353964***	0.9354919***	0.935671***
	(0.036844)	*(0.0370167)*	*(0.0363304)*
LN(EGDs)	0.5484045***	0.5513903***	0.5409275***
	(0.1028024)	*(0.1027121)*	*(0.1028185)*
LN(Table Games)	-0.0023103	-0.0028883	-0.0046535
	(0.0409376)	*(0.0408533)*	*(0.0410805)*
LN(Win%)	**-1.068686*** **	**-8.941377**	**-**
	(0.3626586)	*(12.87367)*	
LN($Win\%_{t-1}$)	**-**	**-**	**-**
LN($Win\%_{t-2}$)	**-**	**-**	**-**
LN($Win\%_{t-3}$)	**-**	**-**	**-**
Win%	**-**	**-**	**-0.1541213**
			(0.142286)
Win% Squared			**0.0017164**
			(0.0097426)
Cruising Requirement	-0.200378***	-0.1971549***	-0.2017564***
	(0.0570293)	*(0.0572236)*	*(0.057338)*
Loss Limit	-0.6465964***	-0.6419865***	-0.6546411***
	(0.2141717)	*(0.2121298)*	*(0.2206406)*
Time Trend	-0.1551512*	-0.0475298***	-0.0459735***
	(0.0803789)	*(0.0168568)*	*(0.0167437)*
(Time Trend)*LN(Win%)	**0.0232493**	**-**	**-**
	(0.0374455)		
LN(Income)	1.914514*	0.4626729	1.859222*
	(1.027006)	*(2.481412)*	*(1.02525)*
LN(Income)*LN(Win%)	**-**	**0.8097809**	**-**
		(1.292079)	
Within R-Squared	0.7466***	0.7453***	0.7515***

NOTES:

Dependent Variable = LN(Per Capita EGD Handle). Groups=50, Observations=414.

Entries are fixed-effects panel regression coefficients with standard errors in parentheses. All regression models include casino and year fixed effects. All dollar amounts are real dollars (base year=1991) and all percentages are measured on a 0 -100 sca

*.05<p<=.10; **.01<p<=.05; ***p<=.01.