Do Job, Age, and Place of Residence Matter for Gaming Activity? A Study of the Mid-Colorado River Communities

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Abstract

A household survey in the mid-Colorado River communities of Laughlin, Nevada and Bullhead City, Arizona examined local residents' gaming activities. A censored regression analysis distinguished between factors affecting gaming participation versus expenditures. Results suggest that gaming behavior can often be predicted with knowledge of individuals' residence, workplace, and other household demographic characteristics. Both local government agencies and casino managers can use the results to make better-informed decisions.

Keywords: gaming behavior, household demographics, Tobit model

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Introduction

Legalized casino gaming is a rapidly expanding segment of the total tourism industry. Until the late 1980's, legalized gaming was allowed only in Nevada and New Jersey, but has since expanded into several states and Native American reservations. Nationally, gross gaming revenue increased from $16.0 billion in 1995 to $30.29 billion in 2006 (American Gaming Association, 2007). PricewaterhouseCoopers (2007) forecasts that the national gaming industry will increase from $47.3 billion in 2004 to $80.0 billion in 2011. Globally, given the growth in casino gaming in Macao, gaming revenues are forecasted to increase from $102 billion in 2006 to $144 billion in 2011, a 7.2 percent compound annual increase (PricewaterhouseCoopers, 2007).

Responding to national and international gaming growth, state and local governments continue to target legalized casino gaming for economic development and fiscal revenue enhancements. Numerous studies evaluated the regional development potential and economic impacts of casino operations and casino employee expenditures (Borden et al., 1996; Leven et al., 1998; Rephann et al., 1997; Felsenstein et al., 1999; Eadington, 1995; Goodman, 1994; Walker, 1997). Other studies focused on the socioeconomic impacts of legalized casino developments on Native American reservations and adjacent areas (Deller & Chen, 1994; Gazel et al., 1995; Lake & Deller, 1996). Several studies linked individuals' socioeconomic and demographic characteristics with their gaming behavior (Hira & Monson, 2000; Jacques et al., 2000; Layton & Worthington, 1999). The impacts of gaming addiction have also been researched (Politzer et al., 1981; Shaffer et al., 1997; Grinols & Mustard, 2001) as well as gaming addiction by casino employees (Wexler & Wexler, 2004; Wu & Wong, 2007;

Nower, 2003). Often overlooked in these studies is a comparison of expenditure patterns by casino employees relative to other residents.

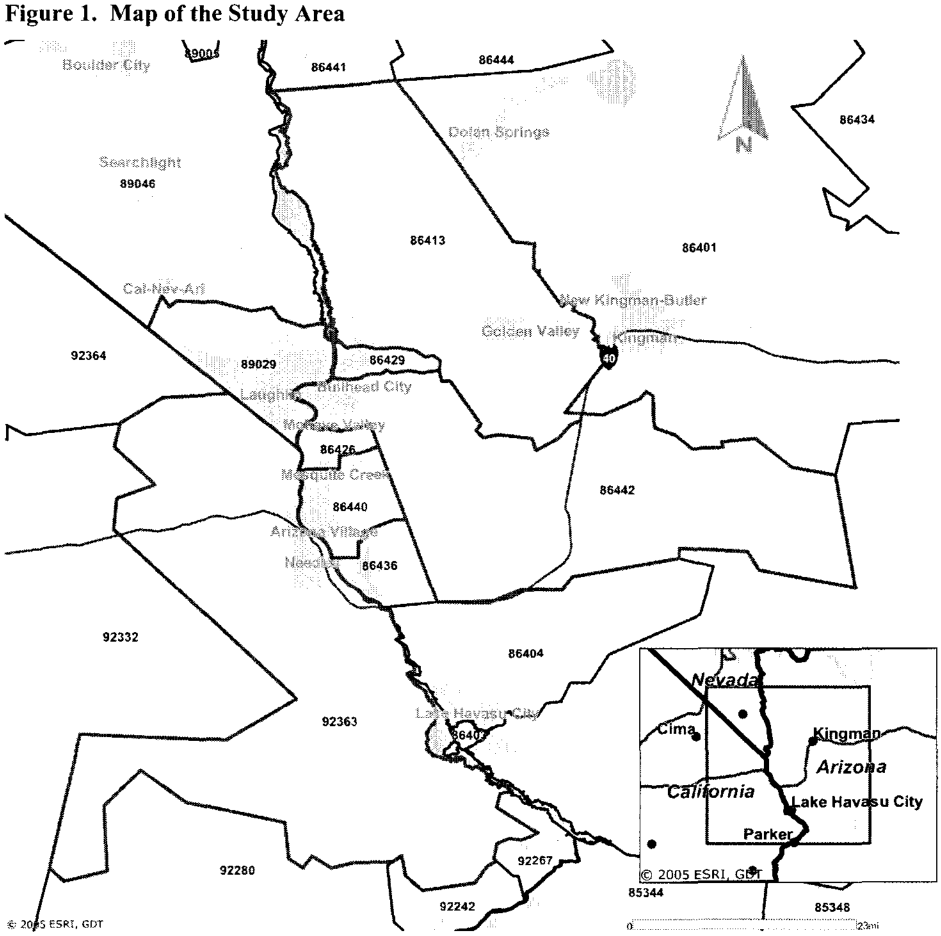
The objective of the present study is to identify gaming expenditure patterns associated with household characteristics such as occupation, age, and place of residence in a gaming community. The analysis is based on a household survey in the mid-Colorado River region. A description of the study area is followed by an explanation of the household survey, a summary of the data collected, and details about the two-step Tobit regression procedure used in the analysis. Finally, the results and practical implications are discussed.

Although the communities are in two states and separated by the Colorado River, they are socially and economically linked.

Study Area

Communities in the mid-Colorado River Region include Laughlin, Nevada, and the Arizona communities of Bullhead City, Fort Mohave, Mohave Valley, and Golden Valley. The region's population of almost 90,000 is heavily dependent on tourism in the form of gaming and outdoor water recreation. Although the communities are in two states and separated by the Colorado River, they are socially and economically linked. Figure 1 displays a map of the study area. Laughlin's economic base is built around gaming tourism, including nine full-service casinos. Approximately 25 percent of casino employees live in Nevada and 75 percent live in Arizona. The economic base for the Arizona communities is largely built around retail and service sectors that support local residents and tourism.

Figure 1. Map of the Study Area



Gaming revenues in Laughlin increased from $95.7 million in 1984 to $615.1 million in 2006, or a 542.7 percent increase in twenty-two years (Nevada State Gaming Control Board, 1984 and 2006). In 1966, California Edison purchased property to build a coal-fired electric power plant named the Mohave Generating Station that employed 5,000 people and greatly impacted the communities of Laughlin and Bullhead City. Laughlin is surrounded by public lands, so most of the nearby population lives in Bullhead City, where the population grew from 4,000 in 1970 to 10,000 in 2007. The expanding casino gaming industry in Laughlin and the Mohave coal-fired power plant were the two export-based industries providing local economic growth and stability. However, air pollution concerns forced the Mohave Generating Station to close in 2006. Public concern about the economic impacts of the closure motivated the development of a household-level survey of expenditure patterns, to better ascertain who would be most affected, and to more clearly predict impacts on the Laughlin/Bullhead City area.

Data

Data were collected in August, 2005 in communities within the mid-Colorado River Study Area, including Laughlin in Clark County of Nevada, Needles in San Bernardino County in California, and the Arizona communities of Bullhead City, Fort Mohave, Mohave Valley, and Golden Valley. The region was chosen to better understand the social and economic dynamics among communities in a regional, gaming-based economy. The gaming industry, located in Nevada, is the largest employer in the region (Borden, Grumbles, & Lopez, 2005). Most of the related retail and service employment is located in Arizona and California.

The first section of the questionnaire collected information on respondents' demographic and socioeconomic characteristics, including place of work and place of residency, to better understand household commuting patterns. The second section asked respondents to recall their household expenditure in the preceding twelve months on the following categories: housing, utilities, food, general merchandise, professional and personal services, transportation, finance and insurance, medical, recreation, savings and retirement, and other expenses. Each expenditure category was further broken down into sub-categories, and in particular, the category "recreation" contained three sub-levels: gaming, outdoor recreation, and indoor recreation (except gaming).

After weighting the pros and cons of alternative survey methods, the face-to-face approach was adopted to ensure an adequate response rate. Through in-person interviews, trained surveyors provided interactive help during the survey, intended to increase participation rates and to improve the completeness of responses. This approach is not without potential drawbacks. A major concern is implementation cost, especially in sparsely populated areas such as the region in this study. Another potential issue with face-to-face surveys is that the interviewer may influence responses. To reduce such bias, all surveyors attended a training session to standardize the language used during the survey, and to ensure consistent interpretation of survey questions if respondents asked for clarification.

To contain costs, a stratified survey strategy was chosen over a door-to-door approach, with strata defined by sectoral employment. After preliminary research on job characteristics in the study region, and discussion with local advisory committees and government agencies, the following economic sectors were identified as strata: retail, gaming, eating/drinking, utilities, government, education, health care, communications, publishing, banking, insurance, non-profit, and currently unemployed. Randomly selected adults in each stratum were interviewed to make up the sample.

Assistance from local employers was crucial in obtaining a high response rate. With support from local business organizations, survey personnel approached representative employers in each sector and asked for cooperation in recruiting survey respondents. The employers collected groups of voluntary participants for the survey, including the full range of entry-level to manager-level employees. The survey team then proposed in-person survey times. Since respondents already expressed interest in the survey, and shared similar employers within each stratum, most respondents were surveyed in a group environment, usually in a conference room. Most of the individual surveys were conducted with individuals who were not currently employed.

Although some preliminary work was required to implement this survey approach, with the cooperation of local organizations and businesses, this method dramatically reduced the time required for data collection. The survey administration stage required only about one week to complete. As expected, the survey response rate was high. Of the roughly 1,700 individuals contacted, the sample includes 807 respondents, representing a response rate close to 50 percent. Table 1 reports descriptive statistics of key demographic and socioeconomic characteristics of the sample.

Table 1. Descriptive Statistics of Household Characteristics

Variable	Definition	Mean	Std. Dev.
RLAUGH	dummy variable; resident of Laughlin	0.172	0.378
RBULL	dummy variable; resident of Bullhead City	0.569	0.496
WLAUGH	dummy variable; work in Laughlin	0.595	0.491
LIVEWRK	dummy variable; live in Bullhead City but work in Laughlin	0.311	0.463
SHORT	dummy variable; in current residence less than 5 years	0.237	0.425
LONG	dummy variable; in current residence more than 10 years	0.538	0.499
HSIZE	continuous variable; household size	2.542	1.162
AGE	continuous variable; age of the respondent	45.908	13.326
EDU	continuous variable; years of education	13.684	2.515
WHITE	dummy variable; whether respondent is white	0.813	0.390
FULL	dummy variable; whehter respondent has a full time job	0.891	0.312
SECJOB	dummy variable; whether respondent has a second job	0.124	0.330
HINCOME	continuous variable; household annual income	60930.600	43485.745
GAMEEXP	continuous variable; expenditure on gaming	758.260	1839.858
RECEXP	continuous variable; expenditure on recreation	1582.020	2401.967
N = 807			

To ensure anonymity, respondents' gender was censored in the sampling process. Of the 807 respondents, 17 percent resided in Laughlin (RLAUGH), while 57 percent lived in Bullhead City (RBULL). The remaining 26 percent lived in other communities within the study region. In contrast, 60 percent of the sample worked in Laughlin (WLAUGH), with 31 percent of the individuals who lived in Bullhead City being employed in Laughlin (LIVEWRK). These numbers indicate an economy based on commuting. This is consistent with the observed distribution of industry sectors; although tourists' facilities and major casinos were in Laughlin, Nevada,[1] the supporting retail and service sectors were concentrated in Bullhead City, Arizona and other communities in the region.

Regarding household characteristics, 24 percent of the sample had lived in their current home under 5 years (SHORT), while 54 percent had lived in their current residence for more than 10 years (LONG). The average household had 2.5 members, and the mean age of the sample was approximately 46 years. The moderately high average age reflects the mid-Colorado River region's attractiveness as a relocation destination for financially established families. The average education level was 14 years, 81 percent of the sample was white, and 89 percent had full time jobs. Further, 12 percent of the sample held a second job, and average annual household income was approximately $60,000. During the preceding year, respondents reported spending an average of $758 per month on gaming. Average monthly expenditure on all recreation, including gaming, was $1,582. The average portion of total recreation expenditures devoted to gaming was 36 percent. The responses indicate that gaming plays a major role in recreational and overall expenditures in the study area.

1. The state law of Arizona in general prohibits opening of casinos in the state except for those approved and located on Indian Reserves.

Table 2 further explores the importance of the gaming sector in the local economy. The first row shows that 251 respondents worked in the gaming industry, accounting for 31 percent of the sample. Regarding casino patronage, 277 individuals, or 34 percent of the sample, reported gaming expenditures. Almost all gaming expenditures, 96 percent, occurred in Laughlin, with the remaining 4 percent in other gaming markets such as Las Vegas. Thus, gaming is not only a major category in household expenditures in the study area; it is also a vital source of employment and income.

Table 2. Distribution of Individuals Working in the Gaming Industry, and Expenditures on Gaming

Residence	Working in Gaming Industry		Expenditures on Gaming	
	number of individuals	percentage	number of individuals	percentage
Total (N = 807)	251	31.1%	277	34.3%
	N = 251		N = 277	
Laughlin, NV	46	18.3%	63	22.7%
Needles, CA	4	1.6%	5	1.8%
Bullhead City, AZ	119	47.4%	125	45.1%
Fort Mohave, AZ	42	16.7%	55	19.9%
Mohave Valley, AZ	15	6.0%	12	4.3%
Golden Valley, AZ	11	4.4%	6	2.2%
Other	14	5.6%	11	4.0%
Total	251	100.0%	277	100.0%

The rest of Table 2 breaks down the number of gaming industry employees and customers in each city of the study area. Bullhead City alone contributes the most to both industry employees and customers, because the majority of sampled households lived in Bullhead City. Laughlin and Fort Mohave, respectively, were the second and third most frequently reported residences of both gaming employees and gaming customers.

Knowing household characteristics and patterns of employment and expenditure in the gaming industry aids understanding of the local economy's structure, and the factors that may induce growth and change. The next section describes an empirical analysis linking residents' characteristics and their gaming behavior.

Models

The goal of the analysis is to explain households' gaming expenditures. The dependent variable, gaming expenditure, is measured in dollars and is naturally non-negative. In other words, the dependent variable is censored from below, suggesting that a Tobit model is appropriate. Suppose the following equation explains gaming expenditure:

$$Y_i{*} = \mathbf{X}_\mathbf{i}\hat{\mathbf{a}} + \varepsilon_i \qquad (1)$$

$Y_i{*}$ is a latent variable representing desired gaming expenditure by individual *i*. This latent variable is allowed to have negative values, and the more negative the desired expenditure is, the less likely an individual is to spend money on gaming. $\mathbf{X}_\mathbf{i}$ is a matrix containing vectors of explanatory variables, $\hat{\mathbf{a}}$ is a vector of unknown coefficients to be estimated, and ε_i is assumed to be an iid noise term following a normal distribution: $\varepsilon_i \sim N\left(0, \sigma_\varepsilon^2\right)$ with unknown variance σ_ε^2 to be estimated.

The actual observed expenditure as reported by respondents of the survey is Y_i, and is only observed when the latent desired expenditure is greater than zero:

$$\begin{cases} Y_i = 0 & \text{when } Y_i{*} \leq 0 \\ Y_i = Y_i{*} = \mathbf{X}_\mathbf{i}\hat{\mathbf{a}} + \varepsilon_i & \text{when } Y_i{*} > 0 \end{cases} \qquad (2)$$

The above Tobit model assumes that a common set of factors $\mathbf{X}_\mathbf{i}$ determines both whether an individual would likely to game at all, and if so, how much the individual would spend. This may not be the true behavioral process underlying the decision. To relax this restriction, hurdle models have been proposed in the literature. Among these models, Cragg's model (Cragg, 1971) and Heckman's selection model (Heckman, 1979) are two popular alternatives.

Cragg's model allows the specification of a stand-alone decision process in which individuals decide whether to game or not. Only when their decision is yes would they next consider how much to spend. This separate decision process works as a hurdle that has to be cleared before observing a positive dependent variable. Specifically, suppose variable W represents the hurdle such that $W = 1$ denotes an individual with positive gaming expenditures, $W = 0$ suggests otherwise. Similarly, a latent variable, W^*, may determine the likelihood of observing either value of W. The latent model can be written as:

$$W_i^* = \mathbf{Z}_i\tilde{\mathbf{a}} + e_i\text{, where } e_i \sim N\left(0,\sigma_e^2\right) \qquad (3)$$

Vectors in the independent variable matrix $\mathbf{Z}_i$ help explain whether the individual would game or not, and may or may not be the same as in $\mathbf{X}_i$. The vector $\tilde{\mathbf{a}}$ denotes coefficients to be estimated. Given this specification, the decision to participate in gaming can be expressed as:

$$\begin{cases} W_i = 0 & \text{when } W_i^* \le 0 \\ W_i = 1 & \text{when } W_i^* > 0 \end{cases} \qquad (4)$$

Following the decision rule in (4), the switching relationship given in a standard Tobit model can be modified as:

$$\begin{cases} Y_i = 0 & \text{when } W_i = 0 \\ Y_i = Y_i^* = \mathbf{X}_i\hat{\mathbf{a}} + \varepsilon_i & \text{when } W_i = 1 \end{cases} \qquad (5)$$

Based on expression (5), the first line may be termed as the participation equation and the second line may be referred to as the level equation. Cragg's model treats the two equations as separate stages, and conditional on the probability that $W_i = 1$ $\left(i.e,\ \Phi(\mathbf{Z}_i\tilde{\mathbf{a}})\right)$, the level equation is a truncated regression.

A major benefit associated with Cragg's model is that it offers a convenient way to test for the specification of a Tobit model. If matrices $\mathbf{X}_i$ and $\mathbf{Z}_i$ are allowed to be identical, the correctness of the Tobit model can be tested by a Lagrange Multiplier (LM) test of whether $\hat{\mathbf{a}} = \tilde{\mathbf{a}}$. A potential problem associated with Cragg's model, however, is that it does not allow correlation between the two error terms in the participation equation and the level equation. Heckman's selection model overcomes this weakness by assuming a bivariate normal distribution (*BN*) for the two error terms in that $[\varepsilon_i, e_i] \sim BN\ [0,0,\sigma^2,\rho]$. In this specification, the two error terms are still mean-centered, but the two stages are jointly considered through the correlation coefficient ρ (to be estimated) in the bivariate distribution. Furthermore, variance of the error term in the participation equation is normalized to 1, allowing the variance of the level equation to be written without a subscript and therefore be a free parameter to be estimated.

Although the Heckman selection model considers the correlation (represented by the bivariate normal distribution parameter ρ) between the participation and level equations, the level equation is estimated as if it were an Ordinary Least Squares regression. Yen (2005a; 2005b) showed that there may be a significant gain in statistical fit if the level equation in a standard Heckman selection model also considers censoring. Accordingly, in this analysis, Yen's (2005a; 2005b) model that combines Cragg's specification and Heckman's selection model is employed.[2] The structural model is identical to that in expression (5) with the joint bivariate distribution; the only change is in the likelihood function due to the consideration of both censoring and selection.

If $\phi(\cdot)$, $\Phi(\cdot)$, and $\Psi(\cdot)$ respectively represent the density and distribution functions

2 Yen's specification considers a truncated regression in the level equation. It is modified here by using a censored regression.

of the standard normal distribution, and the distribution function of the standard bivariate distribution, the log-likelihood function for the combined model is:

$$L = \sum I_{i,1,+} \ln \left[\phi(Y_i - \mathbf{X}_i \hat{\mathbf{a}}) \Phi \left(\frac{\mathbf{Z}_i \tilde{\mathbf{a}} + \rho \left({Y_i - \mathbf{X}_i \hat{\mathbf{a}}} \big/ {\sigma} \right)}{\sqrt{1-\rho^2}} \right) \right] \quad (6)$$

$$+ \sum I_{i,1,0} \ln \left[\Psi \left(\frac{-\mathbf{X}_i \hat{\mathbf{a}}}{\sigma}, \mathbf{Z}_i \tilde{\mathbf{a}}, -\rho \right) \right] + \sum I_{i,0,0} \ln \left[1 - \Phi(\mathbf{Z}_i \tilde{\mathbf{a}}) \right]$$

$I_{i,1,+} = 1$ when $W_i = 1$ and $Y_i > 0$; $I_{i,1,+} = 0$ otherwise;
$I_{i,1,0} = 1$ when $W_i = 1$ and $Y_i = 0$; $I_{i,1,0} = 0$ otherwise;
$I_{i,0,0} = 1$ when $W_i = 0$ and $Y_i = 0$; $I_{i,0,0} = 0$ otherwise;
The first and third terms are the results of the conventional selection model and the second term is due to censoring in the level equation.

Coefficient estimates on individuals' demographic and socioeconomic variables in the decision either to game and/or how much to game do not directly show the magnitude of the impacts. Marginal effects are suitable for this purpose. Variables that are included in both $\mathbf{X}_i$ and $\mathbf{Z}_i$ affect the decision to game (through $\tilde{\mathbf{a}}$), the decision of how much to game conditional on participation ($\hat{\mathbf{a}}$ conditional on $\tilde{\mathbf{a}}$), and the amount to game unconditional on participation (overall impact). The formula to calculate these marginal effects is derived in the Appendix.

Results

Estimation results of the baseline Tobit model are reported in Table 3, using the same variable definitions presented in Table 1. The Tobit model, even without further model specification tests, shows significant impacts on gaming behavior from a number of household demographic and socioeconomic variables, such as location of residence, work location and occupation, age, and income[3]. This suggests that gaming behavior in the mid-Colorado River communities may indeed be explained by factors related to income, employment, and household conditions. In the initial stage of the estimation, both linear and quadratic terms of continuous variables were included to capture any nonlinear effects the variables may have on gaming behavior. Only household income showed significant second-order effects, so the quadratic income term is retained in the final model. This result follows theories of relative wealth and risk-taking as discussed by Friedman and Savage (1953), Gregory (1980), and Brunk (1981).

The Tobit model provided a basis for model specification tests. Following Lin and Schmidt (1984), a Lagrangian Multiplier test evaluated the adequacy of the Tobit model versus Cragg's hurdle model. Based on 16 degrees of freedom, a test score of 51.0 was obtained, strongly rejecting the Tobit model in favor of Cragg's model, which is itself one member of a more general group of hurdle models. The LM test result can be interpreted as favoring a hurdle model with explicit structural parameterization of the two related decision stages: whether to game and how much to spend.

The hurdle model using Heckman's selection model as a kernel, but specifying a Tobit model in the level equation, was thus estimated and the results presented in Table 4. Theoretically, the same vector of explanatory variables can be used in both equations and be identified. However, the combined model failed to converge due to the highly nonlinear form of the likelihood function. Bockstael et al. (1990) noted that even in a baseline Tobit

3 It should be noted that in any study using respondents' demographic variables as regressors, these variables tend to correlate, possibly causing a multicollinearity problem. For example, a 25-year-old is likely to be more educated than an 18-year-old, and a middle-aged individual is likely to have a higher household income than either very young or retired respondents. The correlation factors in this study were not so high as to suggest a severe multicollinearity problem.

model or in Cragg's hurdle model, collinear variables may induce convergence problems. The difficulty with combining continuous and discrete variables described by Amemiya (1973) may be exacerbated in this situation.

Table 3. Estimation Results of Tobit Model

Variable	Coefficient	Std. Err.
Constant	-6907.646***	1488.807
RLAUGH	846.805	517.225
RBULL	-958.891*	536.191
WLAUGH	-198.507	573.986
LIVEWRK	1434.860**	677.752
SHORT	98.163	463.160
LONG	-663.500*	395.426
HSIZE	-178.967	152.894
AGE	569.566***	134.376
EDU	57.706	65.530
WHITE	214.679	438.027
FULL	548.810	580.108
CASINO	1243.281***	419.554
SECJOB	451.185	490.194
HINCOME#	33.088***	9.031
HINCOME^2	0.077***	0.034
	3563.203***	164.270
LL	-3004.782	

*, **, and *** indicate significant at the 10%, 5%, and 1% significance levels respectively.
Based on per thousand dollar income.

Following Yen (2005a), two variables with the lowest t-ratios were dropped from the participation equation: WLAUGH (work in Laughlin) and SHORT (lived in current home for under 5 years). During estimation, the correlation coefficient ρ was allowed to be a free parameter, and although the resulting estimate of ρ was highly significant, it was beyond the [-1,1] range. Therefore, ρ was fixed at 1 in the final estimation. Using the calculated likelihood function value at convergence, Vuong's test (Vuong, 1989) significantly favored the combined selection model.

Table 4. Estimation Results of the Revised Selection Model

Variable	Participation Equation		Level Equation	
	Coefficient	Std. Err.	Coefficient	Std. Err.
Constant	-1945.759***	345.543	-6399.697***	1239.997
RLAUGH	210.977	160.473	791.827	519.358
RBULL	-242.072*	133.004	-904.678*	478.339
WLAUGH	-	-	-81.122	500.514
LIVEWRK	357.526**	142.593	1307.496**	631.375
SHORT	-	-	-168.107	402.715
LONG	-203.646**	89.748	-759.235**	385.213
HSIZE	-49.714	41.868	-180.344	144.678
AGE	155.448***	37.852	545.919***	135.263
EDU	15.776	18.273	55.086	64.232
WHITE	75.073	116.309	188.366	414.856
FULL	165.088	153.942	496.000	533.035
CASINO	324.105***	122.696	1158.660**	450.206
SECJOB	107.178	129.091	529.870	448.447
HINCOME#	9.381***	2.664	30.778***	11.176
HINCOME^2	-0.023**	0.011	-0.064	0.051
			3463.142***	93.656
	1	-		
LL	-1012.083			

*, **, and *** indicate significant at the 10%, 5%, and 1% significance levels respectively.
Based on per thousand dollar income.

The explanatory variables in the two equations generally exhibited consistent impacts. This implies that when a particular variable had a positive or negative impact on the gaming participation decision, the variable had the same direction of impact on the amount of gaming expenditures. The quadratic household income term was significant in the participation equation but not in the level equation, implying that income had a nonlinear impact on the probability of gaming, but a linear impact on the amount the gaming participants spend in casinos.

The direction and magnitude of impacts on the two decision stages are most clearly represented by the marginal effects. As shown by the calculation in the Appendix, marginal effects do not necessarily bear the same sign as the direct coefficient estimates. Table 5 presents the marginal effects of the common variables included in both equations. Standard deviations of these effects are calculated using the simulation approach outlined by Krinsky and Robb (1986) with 5,000 replications.

Table 5. Marginal Effects of Explanatory Variables

	Participation Equation		Level Equation		Unconditional on Participation	
	Marginal	Std. Dev.	Marginal#	Std. Dev.	Marginal#	Std. Dev.
Constant	-0.651***	0.084	-18.970*	9.798	-19.622**	9.860
RLAUGH	0.064	0.050	1.119	0.752	1.183	0.798
RBULL	-0.072	0.040	-1.276*	0.676	-1.348*	0.713
LIVEWRK	0.109**	0.045	1.883**	0.805	1.992**	0.841
LONG	-0.058**	0.026	-1.046**	0.491	-1.104**	0.513
HSIZE	-0.013	0.011	-0.237	0.185	-0.251	0.195
AGE	0.041***	0.010	0.108***	0.031	0.149***	0.032
EDU	0.004	0.005	0.102	0.112	0.106	0.117
WHITE	0.018	0.030	0.276	0.554	0.294	0.581
FULL	0.038	0.036	0.680	0.705	0.718	0.740
CASINO	0.098**	0.041	1.670***	0.595	1.768***	0.626
SECJOB	0.031	0.037	0.692	0.599	0.723	0.632
HINCOME	0.002***	0.001	0.060***	0.020	0.062***	0.021
HINCOME^2	-0.625E-5**	0.293E-5	-0.931E-4*	0.552E-4	-0.994E-4*	0.565E-4

*, **, and *** indicate significant at the 10%, 5%, and 1% significance levels respectively.
Units of the marginal effects are in thousand.

Based on the participation equation, whether respondents lived in Laughlin had no significant impacts on either the probability of gaming or the amount spent. Residents of Bullhead City (variable RBULL) also did not differ systematically in their probability of gaming. However, living in Bullhead City did have a marginally significant negative impact on the amount of gaming expenditure. The overall unconditional effect is also marginally significant. The result indicates that, compared to residents in other communities in the study area, Bullhead City residents on average spend $1,348 less per month on gaming. As driving distance to the casinos increases, thereby increasing the opportunity cost of gaming, we might expect to see lower gaming expenditures.

Respondents who live in Bullhead City but work in Laughlin offer a more focused story. Given the proximity of workplace and gaming facilities, these individuals were more likely to not only participate in gaming (given by the marginal effect in the participation equation) but also displayed larger expenditures on average, holding all else constant. Unconditional to participation, the average increase of gaming expenditure was more than $1,900 per month. This result again supports the argument that daily proximity to Laughlin's casinos, either through place of residence or employment, may affect the opportunity costs of gaming, and therefore affect gaming expenditures. Casino managers might use knowledge of such patterns to attract more out-of-town customers by explicitly reducing opportunity costs of travel. For example, managers might consider creating unique facilities suitable for the entire family in a casino complex, or offer coupons to defray travel costs.

Individuals who had lived in their current residence for more than 10 years were significantly less likely to game. On average, conditional on participation, these individuals spent $1,046 less per month on gaming expenditures than people who lived in their current residence less than 10 years. After accounting for their lower propensity to game, these individuals spent $1,104 less per month on gaming. Newer residents may have been more likely to settle in the area specifically because of the rapid expansion of gaming facilities.

Individuals' household size did not impact either the probability of participating or the amount spent in casinos. Respondents' age, however, had a strong positive impact on both decision stages as well as on the overall unconditional outcome. If it is assumed that the marginal effects calculated at each individual's current age as in Table 5 are stable over a reasonable range of ages, then the results show that on average with each additional year, individuals would be 4 percent more likely to visit a casino in the region.[4] In terms of expenditures, residents would spend $108/month more for each additional year of age. The interacting effects of increasing participation probability and expenditure level imply average gaming expenditure increases of $149/month for each additional year of age.

Several key demographic characteristics did not exhibit significant impacts, including education level, race, full time employment status, and holding a second job. Nevertheless, the nature of employment mattered. As shown in Table 5, if an individual worked in a casino, then holding all other factors constant, this individual would be almost 10 percent more likely to game. Casino workers were also likely to spend $1,670 more on average per month when they gamed. Accounting for positive effects from both decision stages, unconditionally, additional monthly gaming expenditures averaged $1,768. Currently, most casinos prohibit their employees from gaming at their own facility. Knowledge of how much these individuals would have spent otherwise may assist in weighing the benefits of such bans against the potential financial and management costs. Conversely, the negative impact of potential gaming addiction must be weighed by the casino industry.

Finally, both linear and quadratic income levels were significant at the 10 percent significance level in both decision stages and the overall unconditional outcome, with consistent signs across equations. The formula given in the Appendix suggests that marginal effects from the participation equation will also affect those in the level equation. Considering the direct estimation results presented in Table 4, the marginal effects show that the strong impacts from the participation equation overshadowed the insubstantial coefficient estimates in the level equation.

Given these results, the impacts of income on respondents' gaming decisions are nonlinear. The linear terms in the level equation and the overall unconditional outcome suggest that on average, individuals in the region would spend about 6 percent of their income on gaming. Since the quadratic term has a negative impact in both decision stages, the suggested likelihood of an individual to game and the amount of money spent in gaming would rise along with the individual's income level, but only to a certain point. Then the impact is reversed, with yet higher incomes producing lower likelihood of gaming and lower gaming expenditures. If one assumes that the marginal effects can be held constant over a range of incomes, the results in Table 5 suggest that the positive impact of income on probability of gaming reverses at an income level of $199,200. The turning point for gaming expenditures occurs at an income level of $321,900, and if the participation decision is allowed to interact with the amount spent, the turning point is at an annual income of $314,200. The observed shifts in risk attitudes toward gaming as income changes is consistent with risk-wealth theories proposed by Friedman and Savage (1948), Gregory (1980), and Brunk (1981).

4 Certainly this increase of 4 percent should be viewed relatively. For example, for an average 46-year-old individual who is 50 percent likely to visit a casino, then the above result indicates that the person will be 100 percent likely to visit a casino at the age of 59. This may not be true. Therefore we emphasize the definition of a marginal effect as the impact on the dependent variable of a small, instantaneous change in the explanatory variable.

Conclusion and Extensions

Legalized gaming casinos have become a rapidly growing segment of the national and international tourism industry. With such growth, numerous studies have been conducted to estimate potential economic and fiscal impacts of legalized casino development. Also, many studies have been completed to estimate social and economic costs of gaming addictions. However, no study has examined the differential expenditure patterns of gaming employees. Using recently collected data from a household survey implemented in the mid-Colorado River communities, this study not only compares gaming behavior between casino employees and non-employees, it also explains expenditure patterns and gaming behavior of the general residents of this area.

Through an economic model that accounts for the censored nature of the data, the analysis offers explanation of two aspects of gaming behavior: the decision to participate in gaming, and the total amount of money spent on gaming. In general, the results confirmed the expectation that individuals' living, working, and other household demographic characteristics have strong impacts on their gaming decisions. The key determining factors included whether they live close to the casinos, whether they work close to casinos, whether they work at a gaming establishment, how long they have been living in their current residence, age, and household income. Some factors, such as income, appear to have a nonlinear impact on individual's gaming behavior, consistent with the predictions of Friedman and Savage (1948), Gregory (1980), and Brunk (1981). These results show that gaming behavior should be interpreted in the overall context of community social characteristics.

Casino gaming has complicated social and economic impacts on local communities. Regional planners considering introducing gaming into their communities often need objective information from many aspects to weigh the benefits and costs of gaming. Areas that already have established gaming facilities like the region studied here also need this information to better understand and manage the industry. This analysis provides both qualitative and quantitative explanations of individuals' gaming behavior. One may infer what type of consumers the industry faces, and assess the probability and dollar value expenditure changes following shifting demographics and gaming regulations. The results of this study may be equally important to casino managers in efforts to better tailor their clientele services. They may also use the results to evaluate internal policies such as whether to allow employees to game at their own place of employment.

Several potentially useful extensions of the current study exist. Using more disaggregated data on gaming expenditures could offer casino-specific details on patronage, expenditures, and casino services used by customers. Such information would be helpful as casino managers consider cooperative and competitive interactions with other casinos, as well as selection of services within their own establishment. On the other hand, data at a more aggregated level could allow productive analysis of the tradeoffs between individuals' decisions among gaming, other indoor recreation, and outdoor recreational activities. Such analysis could inform local governments and city planners about potential economic impacts of gaming establishments, given the socio-economic characteristics of their communities.

Appendix. Calculation of the Marginal Effects

The marginal effect of a continuous variable x that is included in both $\mathbf{X}_i$ and $\mathbf{Z}_i$ can be calculated by differentiating the participation and level equations with respect to this variable. If β and γ are the coefficients associated with variable x in the participation equation and level equations respectively, the marginal effects are as follows:

Participation: $\phi(\mathbf{Z}_i\tilde{\mathbf{a}})\gamma$ (7.1)

Level conditional on participation: $\beta - \rho\sigma\lambda\gamma(\mathbf{Z}_i\tilde{\mathbf{a}} + \lambda)$ (7.2)

Unconditional: $\beta - \gamma(\rho\sigma\lambda(\mathbf{Z}_i\tilde{\mathbf{a}} + \lambda) - \phi(\mathbf{Z}_i\tilde{\mathbf{a}}))$ (7.3)

where $\lambda = \dfrac{\phi(\mathbf{Z}_i\tilde{\mathbf{a}})}{\Phi(\mathbf{Z}_i\tilde{\mathbf{a}})}$

The above approach however, does not apply to a discrete dummy variable. Marginal effects of a dummy variable in the three categories can be derived by taking the difference between the respective predicted dependent variables:

Participation: $\Phi(\mathbf{Z}_i\tilde{\mathbf{a}}) - \Phi(\mathbf{Z}_i\tilde{\mathbf{a}} - \gamma)$ (8.1)

Level conditional on participation: $\beta + \rho\sigma\,(\lambda - \lambda')$ (8.2)

Unconditional: $\Phi(\mathbf{Z}_i\tilde{\mathbf{a}}) - \Phi(\mathbf{Z}_i\tilde{\mathbf{a}} - \gamma) + \beta + \rho\sigma\,(\lambda - \lambda')$ (8.3)

where $\lambda' = \dfrac{\phi(\mathbf{Z}_i\tilde{\mathbf{a}} - \gamma)}{\Phi(\mathbf{Z}_i\tilde{\mathbf{a}} - \gamma)}$

It is noticeable that the unconditional marginal effect in either the continuous or the dummy variable case is the sum of the effects in the participation and level equation. It is also true that signs of marginal effects need not to be the same as those of the corresponding estimated coefficients in the level equation.

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