Two Consumption Models For United States Casino Areas Utilizing Competition And Site Attribute Variables

David Michael Pearlman

Abstract

In this study, multiple regression techniques were used to build two consumption models to better understand supply and demand influences on casino revenues. The initial model contained 15 independent variables and explained 97% of the variance in revenues. However, due to assumption violations, assessing the relative role of each independent variable proved to be problematic. Subsequently, a Reduced Variable Model was developed which explained 83% of the variance, and included six independent variables. As stand-alone prediction tools, the models do not yield useful revenue estimates, due to their large standard errors of the estimate, however, they do explain relative influences of both supply and demand measures on consumption (casino revenues). Several refinements were identified to improve the models' value as revenue prediction tools. The study's findings provide information which has led to a better understanding of casino revenues. The findings should also aid in identifying favorable regions nationally for new casino developments, as well as serve as a basis for subsequent gaming research. **KEY WORDS:** *casinos, revenue estimation, feasibility analysis*

Introduction

According to Long (1995), the use of gaming as a tourist attraction and economic development tool is quickly emerging and seen as a viable option for many U.S. states and communities seeking to increase their share of the traveler market. Over the past five years casino gambling has become a major tourism development strategy (Perdue, Long & Kang, 1995). However, many feel the use of gaming is controversial (Pizam and Pokela, 1985), typically causing significant economic, environmental and social changes in host communities (Eadington, 1986).

David Pearlman, Institute for Tourism Research, University of South Carolina.

According to Dimanche (1995), there is a lack of good data to assess the potential impact of gambling developments on host communities. Additionally, Dimanche (1995) stated that communities were putting themselves in difficult situations because they fail to recognize the importance of research and planning before adopting gambling as an economic development tool. Casino development is occurring with many marketing related questions being left unanswered. Today, many feasibility study revenue estimation models and location analyses are less than comprehensive, often including only population measures. We do not know well enough what makes one casino successful and another unsuccessful; what makes one casino area better than another; or more specifically, which variables are the most important indicators of market potential (casino revenues).

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The facts are that casino revenues are up dramatically, but so are the risks and costs of opening the wrong casino in the wrong location at the wrong time (Edmonds, 1996). More precise and comprehensive information is clearly needed if new casino developments are to be successful. Several issues document the need for research: 1) many basic, marketing-related questions have not been answered; 2) the failure of several casinos due to inaccurate visitor and revenue projections; 3) the increasing competition among casino operations; 4) the reliance on crude estimation models by all parties associated with casino developments; and, 5) the cost and complexity (primary data collection) of conducting sound feasibility and location analyses. These factors document the need for a less costly, more precise and robust model for understanding the influences of supply and demand measures on the consumption of casino gaming opportunities.

The purpose of this study was to develop a scientifically based consumption model, using only secondary data, to better understand supply and demand influences on revenues among United States casino areas. Specific research objectives included: 1) the development of a consumption model for U.S. casino areas using historic data, and 2) the identification of statistically significant independent variables which explain variance in casino revenues and each variable's relative importance.

Literature Review

Gaming Research and Gaming As a Tool for Economic Development

In recent years, a substantial body of literature has started to develop regarding the relationships among casinos, gambling, tourism and economic development. According to Boger (1994:25), "states' budgetary shortfalls were the primary catalyst for legislators legalizing gaming activities in the 1980s and 1990s." Eadington (1995a:52) documented "a common justification among legislatures, governors, tribal leaders and other proponents in that casinos are seen as magnets for tourists and that casinos serve as a catalyst for direct and related investments while also serving as a source for jobs, tax revenues and the fulfillment of broad economic development goals." The potential role casino development has as a strategy for economic rejuvenation of an urban destination is now well recognized (Allen, Hafer, Long, & Perdue, 1993; Christiansen and Cummings, 1995; Eadington, 1995b and Eadington, 1996).

There is an irony arising from too many communities trying to capture economic benefits from legal gaming. According to Eadington (1995a), the only true injections gaming can bring to a local or regional economy occur when gaming is effectively exported to outsiders. If all of a casino's customers are from local market regions, there will be a resultant import substitution. Wide-spread proliferation will almost certainly ensure that very few jurisdictions will be able to garner significant economic benefits from casinos (Eadington, 1996). However, the argument that gaming must attract tourist dollars to impact local economies is only half true. Economic development to host communities can occur by retaining gaming dollars which residents would spend outside the local economy. Bringing one dollar into an economy is the equivalent of keeping one dollar from leaving that economy. Curbing this outflow or leakage of residents' gaming dollars is also a method of economic development (Holecek, Singh, Pearlman, Forsberg, & Twardzik, 1996). Again, local economies can be expanded by bringing in new dollars or by reducing exportation of resident gaming dollars.

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Economic development councils must be clear on the realities they are confronting when considering casinos in specific locations. Development professionals need to be realistic about the ability of casinos in any particular locale to stimulate people to visit and gamble. Only objective market research will permit a realistic view of casinos as an economic development tool.

Marketing Research

According to Chisnall (1981), decision making is a prime responsibility of management. With the complex conditions of modern business, managers are at the mercy of information which is made available to them, and it is on this information they are likely to base their decisions. The lack of answers to these questions has encouraged managers to look critically at the functional value of research for addressing a wide array of management problems. During the past decade, increasing competition in practically every industry has compelled companies to place greater emphasis on efficient methods for the production and marketing of their products or services. Particular interest has centered on marketing research because it has proven invaluable to many companies in developing marketing strategy and tactics (Chisnall, 1981).

Feasibility studies are a common product of market research (Beals, 1990). DeLuca (1986) blames overbuilding in the hotel industry on inaccurate feasibility studies. Feasibility studies often include a section on site selection. Fesenmaier and Roehl (1986) used location analysis to evaluate the potential for campground development in Texas. They stated that location was inextricably tied to development success and in order to effectively locate a facility, the planner must first define, mathematically, the "optimal" location (Fesenmaier and Roehl, 1986). These researchers described a two-step methodology in order to identify the best location for new facilities. First, a study is conducted at the aggregate level to identify regions which show potential for future development. Then based on these results, the second step involves a more extensive evaluation of possible locations within the respective regions. Similar to the Fesenmaier and Roehl (1986) study, this research represents the first step in identifying potential regions for casino development by understanding consumption of casino gaming areas nationally.

Also included in feasibility studies is site estimation, which is the process of quantifying market size. Marketing tactics are directly related to the results of this estimation process. Many travel models have been developed to investigate which variables specifically influence the number of site visitors and the amount of revenues. The more common models include: gravity and spatial interaction models, destination choice models, trip distribution models and consumption models. Wu (1995) noted that structural regression models were the most often utilized consumption models.

Structural regression models relate recreation participation to a set of independent variables, such as population characteristics, competition, recreation opportunities and other interaction variables. Consumption is the interaction between demand and supply factors. Clawson and Knetsch (1966:116) suggest that when "...we picture recreation consumption as a function of both supply and demand, then the changes in use observed over time, as well as between regions, become more meaningful." This research examined the consumption of United States casino areas. A number of recreation and tourism studies have utilized regression models to estimate (and explain) participation or visits (Cicchetti, Fisher, & Smith, 1973; Young and Smith, 1979; Archer, 1980; Fesenmaier, 1985).

Many feasibility studies prepared for travel product developments (Certec, 1992 and 1993; Constan, 1993; Urban Systems, 1995 and 1996; and Pearlman and Forsberg, 1995) have not utilized the more sophisticated prediction models due to their difficulty in utilization. The following discussion of location analysis and site estimation models will include: 1) the analog model, 2) the concentric ring model, 3) the gravity model, and 4) the regression model. These models are presented in order of sophistication with the simplest model presented first. Briefly, the analog model involves identifying a very similar product serving a very similar market and assuming attendance or revenues at the existing product will equal that of the newly proposed product. Some subjective adjustments are then usually made to account for differences in key demand variables, such as population differences between the two sites and the supply of regional attractions. This model is fairly subjective, while the concentric ring model and the gravity model are more objective. These two models involve mathematical calculations to arrive at visitation estimates. Both population and travel distance are key variables in these two models. The concentric ring model is a simplified form of the gravity model, due to its use of categorical level data (i.e., population within 50 miles, or population between 100 and 150 miles from a site), while the gravity model uses continuous level data (i.e., population at 48.2 miles) to calculate visits. The concentric ring model assumes that competitor sites are identical while the gravity model acknowledges competitor site differences (i.e., "measures of attractiveness"). For example, if Site A differs significantly from Site B, the more attractive site can skew visitation to the more attractive site regardless of distance. Lastly, the regression model is usually a mathematical formula that postulates that the dependent variable is a linear function of one or more independent variables (i.e., casino revenues are a function of population, facility attractiveness and competition). The concentric ring, gravity, and regression models tend to relate to each other and overlap to varying degrees. Specifically, all of these models include some emphasis on the distance variable; however, each differs in the amount of complexity it can accommodate. Each model has its advantages and disadvantages in its application. This research used regression analysis to build a consumption (revenue estimation) model. As the theoretical model in Figure 1 reveals, revenues are hypothesized to be a function of seven conceptual variables.

Conceptual Variables

1. Market Region
2. Demographics-Age/Income
3. Facility Characteristics
4. Political Environment
5. Existing Tourism Activity
6. Ease of Access
7. Casino Gaming Competition

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Revenues

Casino Revenues

Revenue (Consumption) Is a Function of Seven Conceptual Variables

Figure 1. Casino Revenue Prediction Model

Methods

The analysis of literature revealed a major problem with forecasting revenues among casino feasibility studies. It can be safely stated that no single concept provides a total explanation of casino revenue variance, rather it would appear that a combination of variables underlie observed differences. Specifically, the accuracy and precision of revenue predictions within feasibility studies are problem areas documented in the literature (Beals and Troy, 1982; DeLuca, 1986; and Beals, 1990). Additionally, due to inaccurate location choices by casino developers relying on crude models, this research represents the first step in identifying viable potential regions for casino development by understanding consumption of casino gaming areas nationally. Since revenue estimates are used by developers, planners, investors, policy makers and decision makers, both fiscal and project success depend upon accurate and precise estimates of revenues and visits.

The Site and Research Units of Analysis

Currently, 27 states offer some type of legalized casino gaming: land based casinos, riverboat casinos, limited-stakes casinos and Indian reservation casinos. Excluding Indian reservation casinos, ten states in the U.S. legally permit casino gambling. Indian reservation casinos were not included in this analysis due to the lack of complete, verifiable revenue and facility characteristic data. Currently, no governmental agencies monitor revenue data among Indian reservation casinos, and due to the lack of complete and reliable data, all Indian operated facilities were excluded from this research. Casino area consumption (revenues) in the ten states was examined.

Due to the unavailability of individual casino characteristic and revenue data, a clustering of sites was sometimes necessary, and the term "casino cluster" or "casino area" was developed to describe the unit of analysis employed in this research. The label "casino cluster" is a term that represents the smallest geographic unit of verifiable revenue data that could be matched to a specific casino or casino area. This matching of revenues with facility characteristics was the basis for each casino cluster or area. This designated casino area could be either 1) an individual casino, 2) an agglomeration of casinos within a city's limits, or 3) an agglomeration of casinos within an entire county. Among the ten states that offer legalized casino gambling, great variance in the level of detailed revenue and facility data existed; however, after all data were collected and analyzed, 53 casino areas were identified for statistical analysis. For each area or case, complete revenue data as well as casino area characteristic data were compiled. Table 1 contains a listing of the ten gaming states' gross revenues included in the study as well as the number of derived casino clusters.

Table 1
1995 Gross Revenues and Number of Casino Clusters Derived By State

State	# of Casino Clusters	Statewide Gross Revenues[1]
Nevada	4	$ 7,382.4
New Jersey	1	4,790.6
Illinois	9	2,298.3
Louisiana	12	1,875.5
Mississippi	9	1,757.0
Missouri	7	718.6
Colorado	3	640.3
Iowa	6	580.9
Indiana	1	408.0
South Dakota	1	244.3
Total	53	$20,695.9

Note: [1] = These data do not include ocean going cruise ships or Indian reservation casinos.

Source: International Gaming & Wagering Business, July 1, 1996

Seven Concepts and Data Requirements

The theoretical model developed for this research was based on an assessment of the published literature. This assessment led to the conclusion that casino gaming consumption (revenues) is a function of seven concepts; furthermore, consumption is a function of both supply and demand measures. To operate these conceptual variables required creating multiple measures for six of the concepts and a composite measure for the remaining one. The specific data requirements for each variable are presented in Table 2. Operational definitions for these concepts are presented following this table.

Table 2
Conceptual and Operational Variables

	Conceptual Variables	Operational Variables
1.	*Market Region*	
	Local	18+ Age Population Within 50 Miles
	Intermediate	18+ Age Population Between 51 and 100 Miles
	Tourist	18+ Age Population Between 101 and 150 Miles
2.	*Demographics*	
	Age	Mean Age for Local Market Region
		Mean Age for Intermediate Market Region
		Mean Age for Tourist Market Region
	Income	Mean Income for Local Market Region
		Mean Income for Intermediate Market Region
		Mean Income for Tourist Market Region
3.	*Facility Characteristics*	
	Mechanical Devices	Mechanical Devices per Person For Local Market Region
		Mechanical Devices per Person For Intermediate Market Region
		Mechanical Devices per Person For Tourist Market Region
	Table Games	Table Games per Person For Local Market Region
		Table Games per Person For Intermediate Market Region
		Table Games per Person For Tourist Market Region
4.	*Political Environment*	
	Tax Rate %	Tax Rates Imposed by States on Casino Revenues
	Wagering Limits	Presence of Wagering Limits (Dummy Variable)
5.	*Existing Tourism Activity*	Level of Tourism Activity Which Is a Derived Score Based on Weighted Employees per Capita from Three SIC Classification Sectors:
		(SIC #7000) Hotels & Lodging
		(SIC #5800) Eating & Drinking
		(SIC #7900) Amusements & Recreation
6.	*Ease of Access*	Miles to Closest Commercial Airport
		Miles to Closest City with Population 100K+
		Miles to Closest State/Interstate Highway
7.	*Casino Competition*	Miles to the Closest Competitor Casino Cluster
		Miles from Las Vegas
		Number of Indian Reservation Casinos Within 150 Mile Radius
		Number of Competitor Casino Clusters Within 150 Mile Radius

Operational aspects of Model Variables

Market Region

This section documents three individual variables: 1) local market region (within 50 miles of the site), 2) intermediate market region (between 51 and 100 miles), and 3) tourist market region (between 101 and 150 miles). These three variables represent geographic delimited markets defined by concentric bands (distance zones) from the site. Since the population estimates, at this point, included all residents, these figures needed to be reduced to represent only potential casino gamblers. In the United States, the legal age to gamble is 21 years of age. Unfortunately, no data sources were identified that permitted the derivation of populations figures of individuals aged 21 and above; however, Sales & Marketing Management's *1995 Survey of Buying Power* did contain percentages of the population by age groupings using the following divisions: 18-24, 25-34, 35-49 and 50 & over. Since age 18 is closer to age 21, than age 21 is to age 25, the segment of the population aged 18 and over were included in the population estimates. This age was selected even though the legal age for casino gambling is older than age 18. Validating this selection, Johnson and Bowen (1994) examined the explanatory value of aged 20 and aged 25 individuals and found that the younger age segment explained more variance in casino revenues. This procedure for calculating potential casino visitors was implemented for each of the three market regions, for all 53 cases.

Demographics

Mean Age for Market Regions (Local, Intermediate, Tourist) - Specifically, three geo-demographic, age-related variables were developed for model inclusion. The procedure for estimating mean age is as follows. First, a list of counties and populations was generated for each of the three market regions for the 53 casino areas. Next, the associated median age for each of these counties was collected from the *1995 Survey of Buying Power*. The median was used rather than the mean because this measure of central tendency describes the typical county resident's age. With this information, a population weighted age figure was derived. To calculate the market region's mean age, the population weighted age figure was divided by the number of counties included in the market region. This procedure was implemented 159 times to produce an average age for each market region for each of the 53 cases. To explain this process, a brief example will be presented. First, list all of the counties within the market region being calculated. Second, list these counties' populations and median ages. Third, multiply the population by the median age and sum the newly created, weighed age measures. Finally, divide this figure by the total population within the market region. This newly calculated figure represents the market region's mean age.

Mean Income for Market Regions (Local, Intermediate, Tourist) - The procedure for estimating mean income was almost identical to the mean age variable. First, a list of counties and populations was generated for each of the three market regions for the 53 study cases. Next, the median income for each of these counties was collected from the *1995 Survey of Buying Power*. With this information, a population weighted, mean income figure was derived. To calculate the market region's mean income, the population weighted income figure was divided by the total population for the market region.

Facility Characteristics

Mechanical Devices and Table Games per Person within Market Regions (Local, Intermediate, Tourist) - This represented six individual variables. Three consisted of the total number of mechanical devices per person within each of the three market regions, and three were for the total number of table games per person within each of the three market regions. The literature noted that these variables were refined (controlling for population differences) facility characteristic measures (Marquette Advisors, 1996).

Political Environment

Tax Rate Percentage - Johnson and Bowen (1994), and Marquette Advisors (1996) suggested that political influences affected casino revenues. To date, no research has measured their impact. Tax rate on revenues was selected as a political influence variable. The state tax rates ranged from 5 percent to 24 percent of gross revenues.

Wagering Limits (Dummy Variable) - Thin and Hsu (1994), Johnson and Bowen (1994), and Marquette Advisors (1996) documented the influence of limits on casino performance, so this dummy variable was included in model construction. Different forms of limits were revealed during data collection, including wagering limits and loss limits. Due to the lack of uniform data, only a dummy variable could be included in the model for either the presence of limits or not.

Existing Tourism Activity

Tourism Activity Index Number - This variable was created and served as a surrogate measure of the current level of tourism activity within the county where a casino cluster is located. Long, Perdue, & Allen, (1990) and Marquette Advisors (1996) documented the effect of existing tourism activity on casino performance. Bond and McDonald (1978:14) stated that "... no clear yardstick of economic performance exists to measure tourism." This is due to the fact that the tourism industry has many aspects. This fact consequently presents problems when measuring tourism activity for any specific area.

Specifically, the total number of employees for three Standard Industrial Classification (SIC) sectors were compiled for the development of the tourism activity index measure. They included: eating and drinking establishments (SIC #5800), hotels and lodging establishments (SIC #7000), and amusement and recreational establishments (SIC #7900). The tourism activity index variable was computed by adding a weighted proportion of the three SIC employment figures. The weighting scheme was developed with the aid of the Director of Economic Research for the United States Travel Data Center (Evans, 1997). The formula used to develop the tourism activity index variable is found in Figure 2.

$$\textbf{Tourism Index Score} = \frac{(0.88 * H)+(0.27 * E)+(0.13 * A)}{\text{CountyPopulation}}$$

Note:	SIC Codes	Statistic
	#7000	H = Hotels and Lodging Employees
	#5800	E = Eating and Drinking Employees
	#7900	A = Amusement and Recreation Employees

Figure2. Tourism Activity Index Formula

Ease of Access

This concept relates to "how easy or difficult accessibility to casino gambling is." Several researchers have documented the importance of ease of access in assessing casino performance (Long, Clark, & Liston, 1994; Johnson and Bowen, 1994; and Cosby, 1996), but none of these studies measured how it specifically affects performance. To operate this concept, three variables were developed and are presented below.

1) easehwy = number of miles to the closest state/interstate highway
2) easecity = number of miles to the closest city with a population of 100,000 or more
3) easeair = number of miles to the closest commercial airport

Casino Gaming Competition

Competition may have positive or negative effects on casino revenues. On one hand, competition due to multiple casinos in an area can result in an "agglomeration effect," which may draw new dollars into the area due to its increased attractiveness. This agglomeration effect can increase revenues for most, if not all, of the casinos in the region. On the other hand, competition (increased regional attractiveness) might not bring in enough new dollars to offset increases in casino numbers, consequently forcing average revenue to decline for most, if not all, of the competitors. In this study, competition was limited to "only other casino gambling operations" and does not consider other travel products or amusements as competition. State lotteries are another type of gambling competition, but they were not included in this study. Limited legalized gaming (e.g., California's card rooms and Oregon's video lottery terminals) represents an area of direct competition, and was also not included. These limitations of the study could not be avoided under the time and resource constraints of this research. This research represented casino gaming competition by creating the following four individual variables.

1) Comp 1 = number of miles to the closest competitor casino cluster
2) Comp 2 = number of miles from Las Vegas
3) Comp 3 = number of Indian reservation casinos within a 150 mile radius
4) Comp 4 = number of competitor casino clusters within a 150 mile radius

Regression Analysis

The dependent variable in this study was the annual revenues for the casino area for the 1995 fiscal year. Model development began with the 25 independent variables hypothesized to explain the variance in casino revenues. Multiple regression routines using the Statistical Package for Social Science (SPSS) were applied to the data. This research adopted an alpha level of 0.05 to dictate which variables were included in the final solution.

Study And Model Limitations

Prior to discussing the results of this research, it is important to recognize a few limitations. First, the data collected and analyzed in this study represent a single snapshot of American casinos' (excluding Indian reservation casinos) characteristics of residents of the associated market regions, for the year 1995. Second, these models were built with a relatively small sample size (53 cases) and with limited performance data; therefore, utilization of these models should be based on a thorough awareness of their limitations. Third, the issue regarding the aggregation of individual casinos into clusters is another important limitation of this research. Since this aggregation was based on the availability of detailed revenue and facility characteristic data (convenience) rather than a scientific procedure, non-equal units of analysis exist. Another aspect of using aggregated data is that models that use aggregated data produce higher coefficients than models built using non-aggregated data (Spotts, 1995). Fourth, another limitation centers on the fact that a few states passed wagering and riverboat sailing legislation midyear. If these legislative changes resulted in changes in the markets, annual casino revenues would have been impacted, but no measure was obtainable to assess these policy changes, although they were most likely minimal. Additional limitations of the study may involve other factors that may or may not exist among the cases examined. Finally, seasonal differences influence casino visitation; however, no variables concerning climatic issues were included in this research.

As the number of mechanical devices per person within a casino area increases, casino revenues should increase.

Analysis of Results

After cleaning the data by deleting the two casino areas with multiple univariate outliers (Las Vegas and Laughlin, Nevada), 51 cases remained. Next, three cases were subsequently removed to test the models' predictive accuracy. These remaining 48 cases or casino areas were used in the regression analysis. Both hierarchical and stepwise multiple regression were employed to build the models. Both the raw data and a log transformed version of the data were assessed to yield the most robust model, and findings revealed that the non-transformed data generated better results. This section will begin with the descriptive statistics for the dependent variable and the significant independent variables. Next, the findings for the regression analysis will be presented and finally, the results of the model testing exercise are discussed.

Descriptive Statistics for Key Variables

Descriptive statistics are designed to describe samples of research units in terms of variables or combinations of variables. Descriptive statistics can also be used to describe relationships among variables and can include means, medians, and standard deviations. This section includes data for the dependent variable and the fifteen independent variables found to be significant (a=.05). Significance was determined by the t values and associated significance levels obtained from the Initial Casino Revenue Prediction Model. Selected statistics for the key variables are presented in Table 3.

Table 3
Select Statistics for Dependent and Significant Independent Variables

Variables	Mean	Median	Std. Deviation	Minimum	Maximum
Casino Cluster Revenues	245,721,158.85	87,196,078.82	625,314,209.40	9,691,583	3,340,939,000
Median Age 50 Miles	33.7426	33.9000	2.4319	26.33	39.40
Median Age 100 Miles	33.7056	33.9800	1.4041	30.28	36.17
Median Income 50 Miles	28,641.579	28,638.600	6,674.005	16,249.5	40,633.5
Median Income 100 Miles	25,712.381	24,368.200	5,010.292	18,822.7	39,439.9
Median Income 150 Miles	25,060.417	24,444.800	4,237.349	18,689.8	38,007.4
# Miles to Closest Airport	20.9734	10.0000	26.6283	1.00	116.00
# Miles to Closest State Highway	8.1809	3.0000	10.6195	1.00	45.00
Tourism Activity Index Measure	.0274219	.0131606	.0429142	.00633	.23286
# Miles to Closest Casino Competition	40.8117	6.9000	72.3435	.25	421.1
# Miles to Las Vegas	1,563.889	1,626.300	391.887	441.7	2,565.6
# Casinos within 150 Mile Radius	9.45	9.00	7.58	0	41
# Slots to 50 Mile Population Ratio	.010281042	.002094036	.035439524	.0001684	.2344449
# Slots to 100 Mile Population Ratio	.006118591	.001053648	.022536384	.0001856	.1424926
# Slots to 150 Mile Population Ratio	.001696369	.000487981	.003339582	.0000479	.0186575
# of Table Games to 50 Mile Population Ratio	.000435720	.000101132	.001254703	.0000100	.0077061

Initial Casino Revenue Prediction Model

One of the primary objectives of this research was to develop a model that could be used to predict levels of consumption among national casino areas. With an adjusted R^2 of .973, the Initial Casino Revenue Prediction Model explained over 97 percent of the variance in casino revenues. Tolerance values are presented to reveal the multi-collinear problems associated with this model. Norusis (1993) defines tolerance as a statistic used to determine how much the independent variables are linearly related to one another (multi-collinear). Tolerance is the proportion of a variable's variance not accounted for by other independent variables in the equation. A variable with very low tolerance contributes little information to a model, and can cause computational problems. The unstandardized regression coefficients (B) and the intercept, standardized regression coefficients (b), the R, R^2, the adjusted R^2 and tolerance measures are presented in Table 4.

Table 4
Initial Casino Revenue Prediction Model
(Dependent Variable = Annual Gross Revenues)

Independent Variable	B	Beta	Tolerance
Age 50	-60,455,068.802	-.235	.217
Age 100	157,747,068.773	.354	.206
Inc50	-12,034.939	-.128	.206
Inc100	28,670.691	.230	.050
Inc150	447.196	.003	.078
Comp1	-1,232,640.321	-.143	.273
Comp2	1,236,782.700	.775	.292
Comp4	-22,661,844.015	-.275	.310
Easeair	-2,129,592.686	-.091	.271
Easehwy	10,168,420.354	.173	.239
Index	8,017,986,682.804	.550	.186
Slot50	37,111,877,645.835	2.103	.005
Slot100	-2,380,762,618.902	-.086	.038
Slot150	77,450,227,187.117	.414	.126
Table50	-756,600,437,011.360	-1.518	.007
Constant	-5,531,928,478.654		.000

N=47
Multiple R=.991
R Square=.982
Adjusted R Square=.973
Standard Error=102,333,810.63

Note: Age50=Mean Age for Local Market Region
Age100=Mean Age for Intermediate Market Region
Inc50=Mean Household Income for Local Market region
Inc100=Mean Household Income for Intermediate Market Region
Inc150=Mean Household Income for Tourist Market Region
Comp1=Number of Miles to Closest Competitor
Comp2=Distance from Las Vegas
Comp4=Number of Competitor Casinos Within 150 Mile Radius
Index=Tourism Activity Index Number
Easeair=Miles to Closest Commercial Airport
Easehwy=Miles to Closest State/Interstate Highway
Slot50=Number of Mechanical Devices per Person for Local Market Region
Slot100=Number of Mechanical Devices per Person for Intermediate Market Region
Slot150=Number of Mechanical Devices per Person for Tourist Market Region
Table50=Number of Tables Games per Person for Local Market Region

The model presented in Table 4 contains five of the seven concepts hypothesized to influence the consumption of casino area products. The signs of the independent variables were as expected for nine of the fifteen variables, but again, due to the regression assumption violations, no substantial discussion of these findings will follow. Valid revenue predictions from this Initial Casino Revenue Prediction Model can be produced. Berry and Feldmen (1985) stated that if the goal of regression is prediction, the multi-collinear element is less problematic. However, due to the substantial multi-collinear element present in this model, a clear understanding of the relative influence of the independent variables on the dependent variable is problematic. The second primary objective of this study was to obtain a clear understanding of each independent variable's relative influence on casino revenues. As a result of the first model's multi-collinear factor, a second model (Reduced Variable Casino Revenue Prediction Model) was developed to meet this research objective.

Reduced Variable Casino Revenue Prediction Model

One of the objectives of this research was to identify and rank the significant variables which explain the variance in the consumption of casino areas. Multicollinear factors occur when two or more variables in a matrix are correlated and when they show a similar pattern of correlation with other variables. The Reduced Variable Model developed out of the assessment of tolerance measures and the subjective elimination of the least significant variables until only those which contribute meaningfully to the explanation of the dependent variable remain. Tabachnick and Fidell (1983:83) noted that this was "perhaps the simplest and best method of cleaning offending variables... because no information is lost by deleting them." Riddell (1970:405) stated that this procedure yields a "robust parsimonious solution."

The Initial Revenue Prediction Model revealed one multi-variate outlying case (Davenport, Iowa). Davenport, Iowa had a Mahalanobis Distance (a measure of how much a case's values on the independent variables differ from the average of all cases) value of 3.542 with a leverage value of .902, so due to this case's influence on the solution it was removed from the data set. The remaining 47 cases were re-run and another multi-variate outlying case was identified. Cripple Creek, Colorado was the outlying case identified; however, an analysis of the Mahalanobis Distance value and its leverage value revealed that this case did not exhibit undue influence (Mahalanobis Distance value = 3.106 and leverage value = .202) and was preserved. These remaining 47 cases constituted the final data set used to build the Reduced Variable Model. Unstandardized regression coefficients (B) and the intercept, standardized regression coefficients (b), the R, R^2, and the adjusted R^2 are presented in Table 5.

Table 5
Reduced Variable Casino Revenue Prediction Model
(Dependent Variable = Annual Gross Revenues)

Independent Variable	B	Beta	T	Sig T
Inc150	30,022.39	.203	2.794	.008
Comp1	-2,575,890.87	-.298	-4.075	.000
Comp2	1,060,412.70	.666	8.051	.000
Comp4	-24,581,370.85	-.298	-3.381	.002
Index	7,541,849,496.10	.529	6.633	.000
Slot100	25,856,779,902.02	.932	9.629	.000
Constant	-2,207,121,663.05		-7.061	.000

N=47
Multiple R=.99218
R Square=.85042
Adjusted R Square=.82798
Standard Error=259,351,167.49

Note: Inc150=Mean Household Income for Tourist Market Region
Comp1=Number of Miles to Closest Competitor
Comp2=Distance from Las Vegas
Comp4=Number of Competitor Casinos Within 150 Mile Radius
Index=Tourism Activity Index Number
Slot100=Number of Mechanical Devices per Person for Intermediate Market Region

The findings for the Reduced Variable Model were as expected, and included six variables which explained approximately 83 percent of the variation in casino revenues. Analysis of the residuals revealed that the mean value of the error terms was zero, and that the error terms variance was constant. Since the assumptions of regression were met, this model is relatively clean and should yield meaningful information. Through an examination of the variable's beta weights, the relative importance of each of the independent variables was achieved, and are listed below in descending order, from most influential to least influential:

1) the number of mechanical devices per person for the intermediate market region (a band from 51 to 100 miles from the site),
2) distance from Las Vegas,
3) level of tourism activity within the county of the casino,
4) distance from the closest competitor casino,
5) number of competitor casinos within a 150 mile radius and
6) the mean income for the tourist market region (a band from 101 to 150 miles from the site).

Four of the seven hypothesized concepts were found to explain the observed variance in casino revenues: 1) facility characteristics, 2) casino gaming competition, 3) existing tourism activity, and 4) demographics.

The single most influential independent variable was *slot100,* which is a blend of both casino and market attributes. This supply measure represents the level of casino gaming opportunities available. Interpretation of the sign indicates that as the number of mechanical devices per person within a casino area **increases**, casino revenues should **increase**. Specifically, this variable represented the number of mechanical devices per adult found in the intermediate market region (a band between 51 and 100 miles from site). It is believed that this region emerged as the most significant because it represents the outer range of the "true casino market." Most gaming excursions are day trips and typical visitors are willing to travel 1.5 hours or 100 miles one-way (Holecek et al., 1996). The other facility characteristic variables were found to be good predictors of casino revenues; however, *slot100* was found to be the most robust and was all that could be maintained in the model without creating multi-collinear effects. This finding assumes that this relationship is truly linear, implying that simply by increasing the number of mechanical devices, revenues will follow suit, but this relationship is most probably curvilinear and a point of diminishing revenues most likely exists. Subsequent research should seek to identify the number of mechanical devices per person beyond which revenues no longer increase (market saturation).

The next concept represented in the Reduced Variable Model consisted of three competition related variables. Distance from Las Vegas (*comp2*) emerged as the second most influential variable in explaining variance in revenues. In agreement with Malamute (1973), as distance from Las Vegas **increases**, other casinos' revenues should **increase**. One implication of this finding might be that if travel costs to Las Vegas are relatively low, regional competitor casino areas will suffer revenue losses. "There is only one Las Vegas." Las Vegas has a strong appeal to casino visitors due to its attractiveness (increased scale).

The next competition variable measured the distance to the closest competitor casino (*comp1*). In agreement with Johnson and Bowen (1994), this analysis found that as the number of miles **increases** between casinos, casino revenues **decrease**.

This finding might be explained by the "agglomeration effect." This effect, in essence, represents a total measure of attractiveness for a given casino area. Many casino visitors seek excitement and variety and if a location has several gaming opportunities (low miles between casinos) gamers will more than likely travel to the more attractive location due to its increased scale or variety of gaming opportunities. This in turn should increase gaming revenues for the region and individual casinos alike. Casino areas that are isolated have less drawing power and consequently lower revenues. The last competition variable included in the Reduced Variable Model was the total number of competitor facilities found within a 150 mile radius (*comp4*). The analysis revealed that as the number of competitors **increase**, casino revenues **decrease**. The findings for *comp1* and *comp4* suggest that competitive forces can be positive or negative for individual casino revenues. These findings indicate an area for further inquiry.

For this research, an index variable was developed which served as a surrogate for existing tourism activity. This variable (*index*) represented the third concept included in the Reduced Variable Model. Findings revealed that as a location's level of existing tourism activity **increases,** casino revenues **increase**. This finding is in agreement with casino marketing literature (Marquette Advisors, 1996, and Urban Systems, 1996).

The last variable included in the Reduced Variable Model came from the demographic concept; more specifically, the average annual household income for the tourist market region (*inc150*). This variable represented the mean income for a geographic band between 101 and 150 miles from the site. Also as expected, as regional income **increases,** casino revenues **increase.** As in the case of the physical characteristic variables, all of the other demographic variables were good predictors of casino revenues; however, *inc150* was found to be the most robust after addressing multi-collinear issues.

Substitution of these (B) coefficients in the Reduced Variable Casino Revenue Prediction Model results in the following equation:

$$\text{Casino Revenues} = -2{,}207{,}121{,}663.05 - 2{,}575{,}890.87\,(\text{Comp1}) + 1{,}060{,}412.70\,(\text{Comp2}) - 24{,}581{,}370.85\,(\text{Comp4}) + 7{,}541{,}849{,}496.1\,(\text{Index}) + 25{,}856{,}779{,}902\,(\text{Slot100}) + 30{,}022.39\,(\text{Inc150})$$

The preceding equation is a generalized description of the manner in which the six hypothesized independent variables are related to the distribution of casino cluster revenues when considered simultaneously. Since it is a generalization, its value in description and prediction depends upon how accurately it "fits" the actual distribution of revenues. In order to obtain a measure of its "fit," it is necessary to consider the regression coefficients.

Berry and Feldman (1985) stated that the meaning of the R coefficient is similar to that of Y, in that it is a numerical description of the linear association between the dependent variable and all the independent variables included in its computations. F for this regression equation was significantly different from zero (6, 40) = 37.9017, p = .0000; therefore an association exists between the variation in casino revenues and the variation in the six independent variables. The adjusted R square value of .82798 indicates that 82.8 percent of the dependent variable (casino revenues) is accounted for by the regression equation (hypothesized) distribution.

Model Testing Exercise

Besides testing hypotheses, linear regression results can also be used for purposes of predicting the values of a dependent variable for particular values of the independent variables. The primary objective of this research was to develop an understanding of the consumption of national casino areas. Prior to any model building, three test cases were removed from the sample and their revenues were estimated using the Reduced Variable Casino Revenue Prediction Model.

In estimating population values for the parameters, confidence limits for the unstandardized regression coefficients can be calculated on the basis of information available. The standard error of the regression coefficient is a measure of the amount of variability that would be present among different b's estimated from samples drawn from the same population (Schroeder, Sjoquist & Stephan, 1986). The measure of the standard error allows one to make inferences about how sensitive the estimate of B is to changes in the sample composition without taking another sample. Because a large standard error casts doubt on the estimate, the magnitude of the test value depends on the size of the standard error. Lewis-Beck (1980) described the prediction error for Y, stating that the difference between the observed and the estimated value of the dependent variable equals the prediction for that case; and that, the variation of these prediction errors around the regression line is called the standard error of the estimate. This is the estimated standard deviation of the actual Y from the predicted Y. Therefore, the standard error of the estimated Y provides a measure of average error in predicting Y. Further, it can be used to construct a confidence interval for Y, at a given X value. Thus, utilizing the knowledge that the value given by the t distribution approximates two for a sample of almost any size, we can produce the following 95 percent confidence interval for Y (estimate Y ± 2 standard errors of the estimate of Y).

The test for the model's precision involved the prediction of casino revenues for the three test sites. Due to the large standard errors produced, this research used a 68 percent confidence interval for testing the regression model's predictive ability, meaning that 68 percent of the time, the actual casino revenues would likely be within plus or minus one standard error of the predicted casino revenues. A 95 percent confidence interval was not adopted because the range produced would have been so large, it would have been meaningless. The Reduced Variable Model consisted of six independent variables and explained approximately 83 percent of the variance in casino revenues. The standard error of the estimate was large, over $250 million ($259,351,167.49). Two of the three test cases predicted casino revenues were within one standard error of the estimate; however, due to the large critical region, this model should not be used as a prediction tool. In fact, Tabachnick and Fidell (1983:113) said that "...if the confidence interval contains zero, one cannot reject the null hypothesis that the population regression coefficient is zero." Craig, Ghosh & McLafferty, (1984) explained that despite the useful insights regression models have provided, the literature notes many difficulties in calibrating models measuring individual site performance. They mention problems due to statistical overfitting, using too many independent variables, multi-collinear issues and the use of proxy variables and measurement error. Most of these problems are present to some degree in this model, and in combination, render it of little value as a predictive tool.

Implications And Recommendations

The following section lists implications and related recommendations regarding this study. This section contains many data refinements that should prove helpful in a better understanding and prediction of casino area consumption (revenues).

● Results of this study suggest that secondary data alone are not sufficient (too high standard errors of the estimate) when predicting casino revenues and that some primary data are needed. These may include a more comprehensive measure of individual casino attractiveness and measures of individual casino marketing efforts and effectiveness.

● One major limitation of this study which needs to be reiterated involves Indian reservation casinos. This study was not able to collect any site specific revenue or facility characteristic data for this growing segment of casino gaming activity. This data shortcoming documents a major deficiency with this research. Indian reservation casinos are a newly emerging segment and if accurate levels of consumption of casino areas are to be calculated, both revenue and facility characteristic measures are needed. Nevertheless, among the casino gaming competition variables included in this research, distance to Indian reservation casinos was included.

● The Reduced Variable Model identified six significant variables which explained 82.8 percent of the variance in casino revenues. These findings suggest that consumption might be maximized through spatial analysis aimed at identifying future development locations with: 1) high mechanical device to population ratios, 2) higher than average rates of tourism activity, 3) higher mean incomes among the intermediate market region, 4) maximum distance from Las Vegas, and 5) competitor casinos close by stimulating an "agglomeration effect" and thus increasing the destination's attractiveness.

Location analysis utilizing these indicators of consumption should offer a cost-effective method for evaluating where future casino development may be warranted.

● The inconclusive findings regarding the effects of competition need to be restated. This research found that some competition positively affects casino revenues, but this research also found that too many competitors can negatively affect casino revenues. These findings lead to a few recommendations. First, a qualitative study is suggested to better understand the "agglomeration effect" and to aid in gaining a deeper understanding behind competitive forces on casino revenues. By investigating and measuring these significant variables, managers can make informed decisions regarding the marketing and management of casino operations.

● Findings of this research did not yield a clear enough understanding of the agglomeration effect: "When is it a positive force? When is it a negative force? What causes the difference?" Due to the unclear influence of competition on casino revenues, more research is needed.

● A tourism index measure was developed for this research. This surrogate variable is a composite of employment figures derived from three Standard Industrial Classification sectors. A weighted combination of lodging, food & beverage and amusement employees per capita was used to calculate this single surrogate measure representing existing tourism activity. The weighting scheme served to reduce these employment figures to isolate only those jobs attributable to tourism activity. The index permitted a ranking based on existing tourism base (activity) at the county level. Findings documented a positive correlation (significant at a=.05) between existing tourism activity and travel product revenues (casino); therefore, this newly created index variable might be adapted and incorporated into numerous studies where tourism activity is hypothesized to influence travel product performance.

Summary And Conclusions

In summary, this research did produce two casino consumption models. As stand-alone prediction tools, the models developed in this study do not yield useful revenue estimates due to their large standard errors of the estimate; however, they do explain relative influences of both supply and demand measures on consumption (casino revenues) of national casino areas. Numerous techniques were tried to reduce the errors of measurement between the two models. For example, the data set was split into more homogenous casino types (small- and large-scale operations, and urban and rural operations), but these pursuits did not effectively reduce measurement errors. Possibly, this homogenization of casino types is a step in the right direction towards a more precise model. However, due to the small sample sizes resulting from this procedure, only a limited number of independent variables could be included in model development.

Many industries and developments do appear to succeed without good forecasting. But the opportunity cost of not forecasting carefully may be high, as problems may result from over- or underestimation of demand, or poor timing of site development. If the forecast is seriously overstated, unacceptably high levels of investment can result. Also, financial commitment to such investment is often made many years before the scheduled opening of the development, making the need for accurate forecasting even more important. Furthermore, high promotional costs and unrecoverable losses due to low visitation will result if demand forecasts are unduly optimistic. More seriously, the development may never realize its full potential which may have been attained had the development been properly sized.

Aside from government decisions, many private sector decisions, location selections, and operational decisions depend strongly on accurate forecasts. In addition to forecasting demand, forecasting consumption is often desired. Forecasting consumption is useful in making certain operational level decisions. Similarly, the extent of cash borrowing and development scale depend on revenue expectations. In attempting to provide information useful to decision makers, estimated levels of consumption are often generated. Frequently this information is used as a guide to planning and policy formation. Although forecasting is always a demanding task, numerous factors make forecasting of revenues especially difficult.

Two general recommendations for future forecasting of casino area consumption include the following: 1) model refinement, to include more comparable measures of the dependent variable, and the development and inclusion of measures of managerial effectiveness, and 2) the integration of additional prediction tools leading to a more comprehensive approach. After completing this study using the selected tool (multiple regression analysis), probably a better, more integrated approach should be implemented. Other than modeling exercises, an expert opinion based system in conjunction with this study's findings should be investigated for future casino revenue forecasting studies. Additionally, Delphi or focus group methods might be included to add a qualitative dimension to obtain an informed perspective regarding casino competitive forces and casino attractiveness. These integrative methods have been implemented in other arenas and should be adopted by more travel and tourism researchers.

Finally, this study's findings provided a base of information which has led to a better understanding of casino area consumption at the aggregate level, which should aid in more informed decision making in evaluating the potential for casino development throughout the country, as well as serve as a basis for subsequent gaming research.

References

Allen, L. R., Hafer, H. R., Long, P.T., & Perdue, R.R. (1993). Rural residents' attitudes toward recreation and tourism development. *Journal of Travel Research, 31*(4), 27-33.

Archer, B. (1980). Forecasting demand - quantitative and intuitive techniques. *International Journal of Tourism Management, 1* (March), 5-12.

Beals, P., & Troy, D.A. (1982). Hotel feasibility analysis, Part I. *The Cornell Hotel and Restaurant Administration Quarterly, 23*(1), 11-17.

Beals, P.A. (1990). *A critical evaluation of lodging-industry feasibility reports.* Unpublished doctoral dissertation. Cornell University,Ithaca, NY.

Berry, W.D., & Feldman, S. (1985). *Multiple regression in practice.* Beverly Hills, CA: Sage Publications.

Boger, C.A. (1994). The effects of native American gaming on other tourist businesses. *Gaming Research & Review Journal,1*(2), 25-36.

Bond, M.E., & McDonald, B. (1978). Tourism barometers: The Arizona case. *Journal of Travel Research, 17*(3), 14-17.

Certec (1992). *Economic impact of the National Corvette Museum.* Unpublished report. Frankfort, KY.

Certec (1993). *Projected business development generated by the National Corvette Museum.* Unpublished report. Frankfort, KY.

Chisnall, P. (1981). *Marketing research: Analysis and measurement, 2nd edition.* NewYork: McGraw-Hill.

Christiansen and Cummings (1995). *Iowa statewide casino market analysis: Working papers.* Unpublished Report. New York, NY.

Cicchetti, C.J., Fisher, A., & Smith, K.V. (1973). Economic models and planning outdoor recreation. *Operations Research, 21*(5), 1104-1113.

Clawson, M., & Knetsch, J.L. (1966). *Economics of outdoor recreation.* Baltimore, MD: Johns Hopkins Press.

Constan, L. (1993, May). Speech. New frontiers in gaming market research. *Proceedings 9th International Conference on Gambling and Risk Taking.* Las Vegas, NV.

Cosby, A.G. (1996). *The proximity factor: results from the 1995 United States survey of gaming and gambling.* Unpublished manuscript. The Gaming Research Group. Mississippi State University.

Craig, S. C., Ghosh, A., & McLafferty, S. (1984). Models of the retail location process: A review. *Journal of Retailing, 60* (1), 5-36.

DeLuca, M. (1986, July 21). Careful research or educated guesses? *Hotel and Motel Management, 201*(10), 29,32.

Dimanche, F. (1995). What's at stake for gaming communities? *Proceedings of the 26th Annual Travel and Tourism Research Association,* 134-136.

Eadington, W. R. (1986). Impact of casino gambling on the community: Comment on Pizam and Pokela. *Annals of Tourism Research, 13,* 279-285.

Eadington, W. R. (1995a). Economic development and the introduction of casinos: myths and realities. *Proceedings National Association of Gaming Studies, 6,* 38-69.

Eadington, W. R. (1995b). World trends in casino industries. *World Casino Industry Review,* 75-77.

Eadington, W. R. (1996). The legalization of casinos: policy objectives, regulatory alternatives and cost/benefit considerations. *Journal of Travel Research, 34*(3), 3-8.

Edmonds, P. (1996, January 17). Gambling's backers find it isn't a sure bet. *USA Today.* pp. C-1, 3.

Evans, B. (1997, March). [Interview with Bill Evans, Director of Economic Research of United States Travel Data Center]. U.S. Travel Data Center. Washington, DC.

Fesenmaier, D. R. (1985). Modeling variation in destination patronage for outdoor recreation activity. *Journal of Travel Research, 26*(2), 17-23.

Fesenmaier, D.R., & Roehl, W.S. (1986). Locational analysis in campground development decisions. *Journal of Travel Research, 24*(3), 18-22.

Holecek, D., Singh, A., Pearlman, D., Forsberg, P., & Twardzik, L. (1996). *Profile of casino visitors' tastes and preferences, market size estimation and analysis of tourist visitation and recreation trends for Michigan's Upper Peninsula.* Non-published report by Travel Tourism and Recreation Resource Center at Michigan State University. East Lansing, MI.

Johnson, L., & Bowen, J. (1994). Riverboat site selection. *Gaming Research & Review Journal, 1*(2), 79-93.

Lewis-Beck, M.S. (1980). *Applied regression: An introduction.* Beverly Hills, CA: Sage Publications.

Long, P. T. (1995). Casino gaming in the United States: 1994 Status and implications. *Tourism Management, 16*(3), 189-197.

Long, P.T., Clark, J., & Liston, D. (1994). *Win, lose or draw? Gambling with America's small towns.* College of Business and Administration, University of Colorado at Boulder. Boulder, CO: The Aspen Institute.

Long, P.T., Perdue, R.R., & Allen, L. (1990). Rural resident tourism perceptions and attitudes by community level of tourism. *Journal of Travel Research, 28*(3), 3-9.

Malamute, B. (1973). Gravity model calibration of tourist travel to Las Vegas. *Journal of Leisure Research, 5*(3), 23-33.

Marquette Advisors (1996). *Casino gaming in emerging markets: Industry background and development parameters.* Unpublished report. Minneapolis, MN: Author.

Norusis, M.J. (1993). *SPSS for windows: Base system user's guide.* Chicago, IL.

Pearlman, D., & Forsberg, P. (1995). Great Lakes Aquarium & Research Center: Market assessment & economic analysis. Non-published report by Michigan Travel, Tourism, and Recreation Resource Center.

Perdue, R.R., Long, P.T., & Kang, Y.S. (1995). Resident support for gambling as a tourism development strategy. *Journal of Travel Research, 34*(2), 3-11.

Pizam, A., & Pokela, J. (1985). Perceived impacts of casino gambling on a community. *Annals of Tourism Research, 12,* 147-165.

Riddell, B. (1970). On structuring a migration model. *International Journal of Theoretical Geography, 2*(4), 403-409.

Sales & Marketing Management (1995). *1995 Survey of buying power.* New York: Bill Communications.

Schroeder, L.D., Sjoquist, D.L., & Stephan, P.E. (1986). *Understanding regression analysis: An introductory guide.* Beverly Hills, CA: Sage Publications.

Spotts, D. (1995, December Conversation). Agglomeration effects on multiple regression analysis findings. Michigan State University. East Lansing, MI.

Tabachnick, B.G., & Fidell, L.S. (1983). *Using multivariate statistics.* New York: Harper and Row.

Thin, T.O., & Hsu, C.H. (1994). Opinions on riverboat casinos and the perceived impacts on community quality by quad cities' residents. *Gaming Research & Review Journal, 1*(2), 1-14.

Urban Systems (1995). *Gaming market and economic impact assessment.* Unpublished report. New Orleans, LA: Author.

Urban Systems (1996). *Gaming market assessment - Bridgeport, Connecticut.* Unpublished report. New Orleans, LA: Author.

Wu, T.C. (1995). *A system of models for estimating recreational boating use in Michigan counties.* Unpublished doctoral dissertation. Michigan State University, East Lansing, MI.

Young, C.W., & Smith, R.V. (1979). Aggregated and disaggregated outdoor recreation participation models. *Leisure Science, 2*(2), 143-154.