Estimating the Indirect Gaming Contribution of Bingo Rooms

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Abstract

Using data from two repeater market hotel casinos, the relationship between bingo and slot business volumes is explored. Contrary to conjecture supplied by industry executives, the results fail to demonstrate a statistically significant relationship between daily bingo headcount and coin-in. This result was found in three different analyses, including one attempt to estimate the impact of bingo headcount on low-denomination coin-in. This study advances the literature by challenging the assumption that bingo rooms produce substantial indirect slot profits. Given the minimal direct contribution to property cash flows, if any, the results suggest that bingo rooms are not always the highest and best use of valuable casino floor space.

Key Words: Bingo rooms, operations analysis, casino marketing, casino management, loss-leader promotion

The direct cash flow contribution of a bingo room to a casino property is not much of a mystery. Gaming properties produce monthly financial statements whereby the results of each department, including bingo, appear in income statement form. For given reporting periods, this statement shows the revenues and expenses directly related to the operation of the bingo room. However, there is something unique about bingo room income statements. Negative monthly win totals are not unusual. To the contrary, other casino games typically feature positive expected values, which are unaffected by business volume. Although it is possible for the table game department to incur a negative win for a given month, it is not likely. Such an event would almost certainly be the result of volatile high-roller action. However, many bingo rooms consistently post monthly losses to the game, by guaranteeing jackpots in excess of the take. Worse yet, the magnitude of this negative cash flow is increased by the bingo room's payroll and operating costs.

Herein lays the mystery of many bingo rooms. Specifically, why would casino executives permit consistent monthly losses? Even if a bingo room were marginally profitable, is it the best use of scarce casino floor space? Ultimately, is operating the bingo room a step toward optimizing property cash flows? These questions are not so easily answered, as US gaming executives often claim that bingo rooms are loss leaders designed to attract highly profitable slot play (Smith, 1997; Stutz, 2004; Suganuma, 2003; Tosh, 1998). The bingo room operating loss represents a direct contribution to property cash flows while any associated slot play would represent an indirect contribution. It is the indirect contribution of bingo rooms that remains unknown.

To better understand the loss-leader philosophy, consider the following quotes from

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industry executives. In Smith (1997), Don Marandino, former General Manager of Las Vegas' Sunset Station Hotel Casino, exclaimed, "If you're a local casino, [there are] a few essential components – buffet and bingo and video poker." Marandino also estimated that 80% to 90% of Las Vegas' bingo rooms were not profitable, including four Stations Casino bingo rooms that collectively lost approximately $2M in a single year. In Tosh (1998), Allen Karol, Director of Associated Gaming at Palace Station, stated, "In a casino atmosphere, you're not going to be a winner at bingo. Unquestionably, having a bingo operation does bring in additional people. They are there to play bingo, of course, but between sessions they play the slot machines, go out into the pit or stop in the food facilities."

By offering bingo at a loss or even as a break-even proposition, casino executives are subscribing to what could be referred to as a full-service model. The associated hypothesis holds that by offering bingo, the casino obtains slot and table games play that would be otherwise absent. However, the dollar-value of this associated play must be at least great enough to cover bingo operating losses and provide an acceptable return on the casino floor space occupied by the bingo room. Unfortunately, many forces simultaneously converge to influence daily casino volumes, making it difficult to isolate the indirect effect of bingo operations. Subscribers to the full-service notion would also hold that loss-leader restaurant and entertainment offerings would be part of any strategy to optimize property cash flows, as these amenities are also theorized to influence gaming volumes (Lucas & Brewer, 2001; Guier, 1999)

Some casinos provide bingo players with slot club cards which can be swiped in the bingo room as well as in slot machines. This system configuration allows executives to track slot play generated by bingo players. However, when the aggregate slot win total is insufficient, the result is quickly justified by noting that all bingo players do not use their tracking cards.

Transcending the issue of limited club card use, this study offers a model and process designed to objectively estimate the indirect contribution of bingo rooms, in terms of associated gaming volumes. These results add to the only published study to have indirectly addressed this concern (Lucas & Brewer, 2001). By taking a different approach to estimating bingo contributions, the results of this research can be used in concert with current techniques to better evaluate bingo operations. This modeling process could also be easily adapted to estimate the indirect contributions of restaurants, retail outlets, entertainment venues, or any other amenity thought to affect gaming volumes. Ultimately, this work will help move casino executives toward optimizing casino cash flows.

Delimitation

No attempt was made to estimate the indirect contribution of bingo operations to the table game department, as the only pit wagering volume captured by the donor properties was total drop. Total drop includes credit play, making it problematic for correlation-based estimation techniques (Lucas & Santos, 2003). Additionally, in any form, drop is only a gross volume metric, and it is flawed in this capacity. It does not represent the amount of money wagered by table game players, it represents only their buy-in. The casino is not guaranteed a chance to win the player's buy-in, it is only possible to win what is wagered by the players. See Kilby, Fox and Lucas (2004) for more on the mechanics of false drop. With the exception of the few properties that have automated table tracking systems, the amount wagered by untracked players remains unknown.

Literature Review

For the fiscal-year-ended July 30, 2005, Nevada bingo rooms reported an aggregate gross gaming win of $8.5M (Nevada Gaming Control Board, 2005). There were 45 properties that comprised this win figure. However, the following expenses are typically deducted from gross gaming win to produce a bingo department's operating profit/loss: Payroll and related benefits, complimentary costs, supplies, gaming taxes, advertising, and other operating costs. It very likely that the sum of these operating costs either exceeded the gross gaming win of these 45 bingo rooms, or reduced it to a marginal profit. There are certain Nevada repeater markets, such as North Las Vegas, that lost money to the game in Fiscal 2005. That is, the payouts exceeded the take (i.e., bingo sales) by $652k, in this regional market. This gross loss was increased by operating costs, creating a substantially greater net loss at the departmental level.

Overall, bingo has moved away from resort destinations, such as Las Vegas Strip properties, to smaller local and tribal casinos (Stutz, 2004). These properties primarily cater to a repeater clientele. If spend-per-hour is an indication of a person's gambling budget, bingo players are clearly more aligned with the lower price points of these local casinos. However, the game is changing, as the trade literature is replete with testimonials describing recent technological improvements (Paskevich, 2002; Plume, 2002; Stutz, 2004; Tosh, 1998). These same sources claim that the new technology has increased the pace of the game, the number of wagers made, and the magnitude of the jackpots. Electronic bingo systems have allowed companies such as Stations Casinos to link local properties together and offer progressive jackpots exceeding $250,000 (Suganuma, 2003). Taken together, these changes have given bingo the ability to regularly attract a more varied demographic, including younger players (Stutz, 2004; Suganuma, 2003; Tosh, 1998).

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Despite agreement in the trade literature regarding bingo's broader appeal and more attractive jackpots, the same articles include testimony from industry executives stating that it is the associated slot play that justifies the existence of bingo rooms (Paskevich, 2002; Plume, 2002; Tosh, 1998). However, there is no published empirical research to support this popular theory. In the absence of such support, this full-service theory must be thoroughly examined, at a minimum. Additionally, any incremental slot play would have to be sufficient to offset bingo losses or sufficiently complement marginal bingo profits. Ultimately, all games compete for casino floor space, via profit per square foot (Kilby, Fox & Lucas, 2004). See Kilby, Fox & Lucas for more on computing profit per square foot and sample calculations.

Finally, the history and role of bingo should not be discounted in any effort to understand management decisions related to the game. There may be cultural and emotional ties to bingo in some organizations. For example, the current Stations Casinos empire began with the acquisition of the Bingo Palace in 1976 (Smith, 1997). Similarly, many successful Indian gaming ventures grew out of bingo halls. Because of these roots, it is possible that founding executives consider bingo to be a necessary ingredient in their formula for success and do not objectively evaluate the game's current role and contribution to modern casino properties.

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Retail Literature

Walters & Rinne (1986) studied the effect of loss-leader and deep discount promotions on overall store sales, store traffic, and store profits. Although their research was conducted using data from grocery stores, their work is directly applicable to the current study in several ways. They began by addressing the existence of deal-prone customers, as defined by Blattberg, Buesing, Peacock, and Lieberman (1978). These customers are attracted to value, patronizing the store with the best deal. Walters and Rinne use the term "cherry picking" to describe a practice whereby customers buy only the loss-leader or discounted products and nothing more. For gaming executives, this would equate to bingo players that do not play slots. However, bingo is a permanent loss leader for many casinos, not a temporary offer, as is typically found in retail. As a result, the consequences of such a permanent loss-leader offer would be amplified.

Additionally, Walters and Rinne (1986) focused on the change in overall store business volumes and profits that resulted from promotional activity, and not just changes in category sales. For example, retailers are very concerned about the change in complementary products sales, stemming from loss-leader sales. That is, if hamburger buns are on sale, perhaps more hamburger, ketchup, and mustard will be sold at regular prices. Similarly, gaming executives are hoping that slot volume will increase, as a result of increases in bingo volume.

In all, Walters and Rinne (1986) examined 30 loss-leader promotions, across three different stores. The results produced evidence of a significant and positive relationship between the loss-leader variable and store traffic in only two of the 30 promotions. Consistent with the previous result, the loss-leader variable only significantly and positively impacted store profits in two of the 30 instances. Nine of the 30 promotions significantly and positively influenced store sales, but no loss-leader offer created a significant impact on the sales of non-promoted products (i.e., complementary goods). These findings should concern casino executives. That is, bingo rooms clearly produce casino traffic and bingo sales, but it is the production of profits and complementary business volume that is questionable. If bingo is a form of an extended loss-leader promotion, then the results of Walters and Rinne provide additional grounds for concern regarding the ability of bingo rooms to produce indirect gaming contributions.

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Srinivasan, Pauwels, Hanssens, and Dekimpe (2004) also failed to demonstrate significant and positive contributions to overall store sales, profits, and traffic, resulting from retailer promotions. Their study examined the long-term or permanent effects of price promotions in grocery stores. They found that 55 of the 63 promotions studied failed to produce a statistically significant impact on overall store sales. Similarly, 85% (53 out of 63) of the price promotions studied failed to produce a significant effect on overall store traffic. These results stemmed from a longitudinal examination of store revenues and store traffic volume, beyond that of the promotion period. Srinivasan et al., along with Walters and Rinne (1986) demonstrate that loss-leaders and price promotions do not always lead to increased store traffic, store sales, or store profits. In this regard, the results of the current study will provide a unique addition to the retail literature.

Indirect Effects of Casino Amenities

There is a paucity of published research specific to bingo operations, but several studies have estimated the indirect gaming contribution of various casino amenities. Similar to the loss-leader role of bingo, these amenities also often serve as attractions to lure or retain gamblers. For casino operators that cater to a repeat clientele, entertainment and food departments are not expected to produce much profit, if any at all. For example, substantial food department losses are often justified by the assumption that attractive food offers also generate incremental slot play (Lucas & Santos, 2003). This is the central tenet of the full service theory. That is, the casino would be better off by losing money in one operating department, due to the ability of that department/offering to attract players that would otherwise not visit the casino. The following paragraphs describe studies that have examined various components of this general theory.

Lucas and Santos (2003) studied the relationship between daily restaurant headcounts and the amount of money wagered in all slot machines (i.e., coin-in). They analyzed data from two Midwestern riverboats and one Las Vegas neighborhood casino. The restaurant operations were all marginally profitable, with profit margins ranging from 0.8% to 3.0% of total sales (cash and complimentary). The restaurants were not generating enough direct cash flow to justify their existence, unless a significant and positive effect on gaming volumes could be demonstrated. In this case, a one-unit increase in the restaurant headcounts of each of the three properties produced increases of $10.12, $15.61, and $26.39 in coin-in, across the three slot floors. However, this study did not determine whether this indirect effect was sufficient to produce an acceptable return on net assets. Further, the inclusion of cash and complimentary (comp) food covers in the expression of the headcount variable might have inflated the correlations between restaurant and gaming volumes. For example, some players receive and redeem food comps on the same day, clouding the assessment of the food outlet's true ability to attract gamblers.

Roehl (1996) analyzed the responses of Las Vegas area residents to survey items addressing their restaurant and entertainment patronage as well as their self-reported gaming volumes. Differences in reported annual gaming expenditures were found to be dependent on coffee shop and gourmet restaurant patronage as well as large- and small-scale show attendance. That is, those respondents that reported use of these amenities also reported significantly greater gaming expenditures than members of the base groups. The base group for the restaurant category comprised buffet patrons and those that did not dine in any casino restaurant. The entertainment base group included respondents that either did not attend any shows or attended lounge shows. This study provided support for the ability of certain amenities to attract a superior class of gambler. The final model explained 23.7% of the variance in self-reported gaming expenditures, with the help of variables describing the respondents' marital status, education, and sex.

Buffet patrons failed to report significantly greater gaming expenditures than nonusers; however, Roehl was careful to state the limitations of this finding. The author noted that this result alone did not suggest that a buffet should not be offered as an amenity. A buffet could still make a contribution to the property if its revenue exceeded its operating costs and/or if it attracted patrons that would otherwise not have visited the property. However, it could be argued that without evidence of an amenity's ability to attract or retain gamblers, marginal profit might not be sufficient to justify its existence. For those seeking to maximize a return on net assets, meager profit might appear particularly insufficient, especially without a correlation between the amenity and gaming volumes. These same issues are central to the evaluation of a bingo operation.

Dandurand and Ralenkotter (1985) was the first published study to refer to the direct and indirect contributions of a hotel casino amenity. In their case it was entertainment. In the early 1980's, many Las Vegas casino executives felt the escalating cost of headliners was too much to overcome. That is, they knew the detrimental effect that headliner fees were having on the entertainment profits, but were unsure of the degree to which headliner entertainment attracted casino play. Ultimately, most executives opted to manage the known costs of entertainment by introducing the more affordable in-house production shows. Initially, the move away from headliners was followed by a drop in entertainment patronage per trip.

In an effort to better understand the indirect contribution of entertainment-prone guests to the casino, Dandurand and Ralenkotter (1985) surveyed 2,000 Las Vegas visitors. Aside from identifying several significant classifying variables, they found significant and positive correlations between the number of shows attended per trip and trip length, as well as the reported gambling budget and trip length. After further analysis, the authors felt it was reasonable to conclude that increases in trip length were followed by increases in the number of shows attended and in the reported gambling budget. All data analyzed in their study were self-reported.

Lucas and Brewer (2001) advanced and tested a theoretical model designed to explain the day-to-day variation in the slot volume of a Las Vegas neighborhood casino. One of the predictor variables in their model was daily bingo headcount. At the time of the study, the bingo operation had produced an annual loss on its departmental income statement for five consecutive years. That is, the bingo operation not only failed to produce a direct contribution, but incurred a loss. Any indirect contribution would first need to overcome this operating loss to reach a breakeven state.

Using secondary data, Lucas and Brewer tested their model, which explained 87% of the variation in the property's aggregate daily coin-in. The bingo variable produced a significant and positive effect on daily coin-in. Ultimately, a one-unit increase in the bingo variable produced a $17-increase in daily slot win (revenue). Despite this positive and statistically significant indirect contribution, the authors called for further analysis to determine whether the bingo room remained the best use of scarce casino floor space. That is, there was concern that the indirect contribution was not sufficient to cover bingo operating losses and provide an acceptable return on the floor space. As the bingo operation was not the primary focus of Lucas and Brewer (2001), a profit-per-square-foot estimate was not computed.

Predicting Daily Casino Volumes

As this study seeks to estimate the impact of bingo players on slot volume, a review of other attempts to explain the variation in gaming volumes was appropriate. Several researchers have been successful, with regard to model specification, and their ability to predict daily casino volumes. Lucas (2004) explained 91% of variation in the daily cash drop of blackjack games in a Las Vegas Strip casino. The models advanced by Lucas and Santos (2003) to explain the variation in the daily coin-in for each of three casino properties, reported R^2 results of 86%, 94%, and 84%. These properties included a Las Vegas neighborhood casino and two Midwestern riverboats. Using a similar data set from the same Las Vegas neighborhood casino, Lucas and Brewer (2001) and Lucas and Bowen (2002) both explained 87% of the variance in daily coin-in, with different models.

While the specific ends of these studies differed, there are some common elements in the specification of these models. All four of the models noted in the previous paragraph analyzed time series data, relying heavily on the prediction power of seasonality variables. For example, day-of-the-week variables were employed in all of these models. Other common predictors included special events, holidays, and various forms of promotion variables. In most cases, variables such as hotel occupancy and restaurant headcount were omitted from the models. Obviously restaurant headcount was included in Lucas and Santos (2003), as this was the focus of their study. However, hotel occupancy, restaurant headcount, and day-of-the-week variables never appear in a model together. This is due to multicollinearity problems associated with concomitant business volumes (Lucas & Kilby, 2002). For example, on Saturday, restaurant volume and hotel occupancy reach their peaks. During the middle of the week, both of these business volumes decline.

These business volumes clearly rise and fall together across the days of the week, making the daily seasonality variables a proxy for their potential effects. The day-of-the-week variables have survived the elimination process because they have been stronger predictors of gaming volumes. This might be due to fact they also represent the amount of leisure time available to the casino patrons, who do not stay at the hotel or eat in the restaurants.

General Theoretical Model

Figure 1 resulted from the literature review of previous models designed to explain the variation in daily gaming volumes (Lucas & Brewer, 2001; Lucas & Bowen, 2002; Lucas & Santos, 2003; Lucas, 2004). Aggregate Daily Bingo Headcount represented bingo volume (Lucas & Brewer). The estimation of this effect was central to this study. The Promotions variable described activities such as cash mail (Lucas & Bowen; Lucas & Brewer; Lucas & Santos), drawing-based promotions (Lucas & Bowen), and slot club point offers. The type and frequency of promotional activities varies by property, hence the general description. Day-of-the-Week was a powerful predictor in Lucas & Brewer and present in all of the models that were reviewed. The Major Holiday variable was also present in all of the models. Special Events represented activities such as slot tournaments (Lucas & Brewer), concerts (Lucas), and invited player parties. Similar to promotions, special events vary substantially by property. The dependent variable, Aggregate Daily

Coin-in, represented the daily dollar value of all wagers accepted by the casino's slot machines. The operalization of the model variables will be further described in the Methodology section.

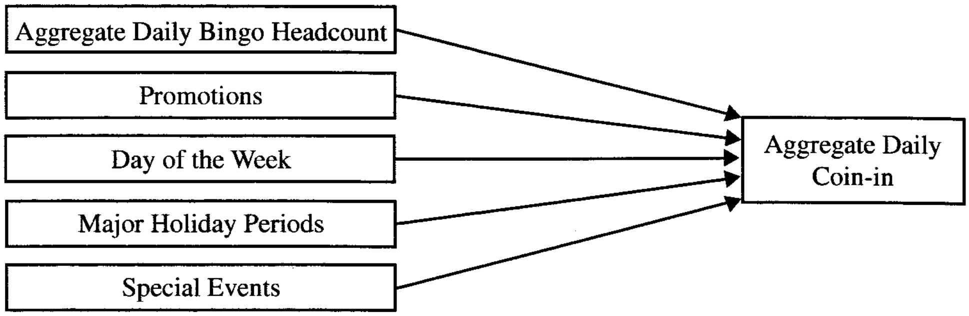

Figure 1. Theoretical model of influences on aggregate daily coin-in.

Hypotheses

Within the context of Figure 1, the following hypotheses express an exhaustive set of possible relationships between the slot volume variable (coin-in) and the bingo headcount variable (BHC). The first hypothesis is in a null form and holds that the regression coefficient (B) associated with BHC will not be significantly greater than zero. The second expression, the alternative hypothesis, states that the magnitude of BHC's regression coefficient will be significantly greater than zero.

H_0: $B_{BHC} \leq 0$
H_a: $B_{BHC} > 0$

Methodology

Data Sources

Two hotel casinos anonymously donated data for the purpose of testing the theoretical model advanced in this study. Both properties were described by their respective management teams as heavily reliant on a repeat clientele. However, the two properties also operated hotels to accommodate destination visitors. Both hotel casinos operated bingo rooms and relied on slot machines for the majority of their revenues, but one was located in Southern California and the other in Las Vegas. The Las Vegas property was not located on the Strip. The performance variables in both data sets (coin-in) were secondary data subject to internal and external audits. The Las Vegas data set included daily results across a 241-day period, beginning on March 1, 2002 and ending October 31, 2002. The Southern California data set spanned a 139-day period, from June 1, 2003 to October 17, 2003.

The Las Vegas property was described by its management as a break-even bingo operation. That is, the Bingo Department's annual income statement for 2002 was expected to show a profit or loss not materially different from zero. In 2001, the bingo operation posted a very modest profit, up slightly from the prior year's equally modest operating loss. However, in the late-1990's, the Las Vegas property's bingo department experienced annual operating losses in excess of $1M. The bingo operation in the Southern California hotel casino posted consistent annual operating losses. Due to the proprietary nature of these results and the donors' request for anonymity, no further financial details were available for publication.

Data Analysis

The data were screened in SPSS (version 11.0) and subsequently analyzed in EViews (version 3.1). The EViews software is designed to address the serial correlation of error terms that are often present in time series data. The hypotheses were tested via simultaneous multiple regression analysis, at the 0.05 alpha level.

Expression of Criterion Variables

Aggregate Daily Coin-In (ADCI) represented the dependent variable in both the Las Vegas and California data sets. ADCI expressed the dollar-amount of wagers made in all coin- or voucher-operated gaming devices. Although games such as video keno and video blackjack were present in both data sets, reel slots and video poker games dominated the slot floors of both donor properties.

Given the low price point of bingo, in terms of its minimum hourly wagering requirement, the California property provided ADCI for its low denomination slots as well. Low denomination slots were expressed as all devices with a wagering unit of less than $1.00. The availability of this data provided an opportunity to examine the effect of the bingo operation on slot machines that targeted lower-budget gamblers. This low denomination coin-in variable (LDCI) was not provided by the Las Vegas property.

Expression of Predictor Variables

Bingo headcount (BH) was the primary variable of interest in this study. BH was a continuous variable that represented the aggregate number of bingo players for each day. For example, the Las Vegas property held nine bingo sessions each day, and a headcount for each session was recorded. The nine session headcounts were summed to produce a total headcount for each day. However, if the same person attended two bingo sessions on the same day, he or she would be counted twice. As a result, BH does not necessarily represent the total number of distinct bingo patrons for a given day.

In this study, the Promotions variable in Figure 1 represented an array of marketing efforts. For example, in the Las Vegas data set, a cash mail variable (CM) expressed the daily dollar-value of all direct mail coupons redeemed, while the California data included a binary variable set to one on all drawing days of a lottery promotion (DRAW). The direct mail variable represented the aggregate daily value of cash offers extended to slot club members. The dollar-amount of these offers represented the sum of many individual offers. These individual offers were based on the theoretical value of each player's tracked, historical, slot play. The lottery promotion spanned 42 days, but lotteries (or drawings) were conducted on only six of these days. DRAW was assigned a value of one on the six lottery days and a value of zero on all other days.

Day-of-the-week variables were employed to address seasonality at the daily grain. Each day was assigned a value of one to represent the current day, with the remaining day-of-the-week variables assigned a value of zero for that day. One day of the week was selected as the base period, to determine whether the coin-in on the other days was statistically different from the base period level. To reduce unnecessary multicollinearity, only significant day-of-the-week variables remained in the final models. As a result, the base period could be expanded to a multiple-day period.

The major holiday periods were also represented in a binary format. Each holiday variable was assigned a value of one only on the holiday itself and a value of zero on all other days. There were instances where more than one day was assigned a value one for a given holiday, creating a holiday period. For example, the day of the week on which the actual holiday falls can affect the business volume of days prior to or following that holiday.

The only model variable fitting the description of a special event was a player party (PP) from the California data set. The PP variable represented the event days of a themed invited-guest function featuring live music, food, and various party favors. This was a database-driven event, whereby invitations were sent to known players with theoretical win values exceeding a given minimum. Both event days were assigned a value of one, with all remaining days assigned a value of zero for the PP variable.

Results

Data Screening

The data were screened for univariate and multivariate outliers, as well as for nonlinear conditions. Histograms of the dependent variables were also reviewed with regard to the normality of their distributions. All were mildly skewed toward the positive, as expected, but transformations failed to substantially improve the condition. As a result, the variables were left in their original metrics, making interpretation of the results less abstract. Line graphs plotting the dependent variable values against time were reviewed for seasonality trends across the sample periods. A mild but steady downward trend was identified in the Las Vegas data set, resulting in the addition of a trend variable (TREND). This variable was expressed by setting the first day of the sample equal to zero and increasing its value by one each day. That is, TREND ranged in value from zero to 138. No such variable was deemed necessary for the California data sets.

Table 1 and Table 2 list descriptive statistics for the Las Vegas and California data sets, respectively. Due to the expression of TREND, the descriptive statistics listed in Table 1 were not meaningful, hence its omission. Variables representing Mondays, Tuesdays, and Wednesdays were ultimately omitted from all models, as dependent variable values were not significantly different from each other on these days. As a result, these variables served as the base period from which all other day-of-the-week variables varied. In Table 1, PATS indicated St. Patrick's Day and MEM represented Memorial Day. IND and LAB denoted Independence Day and Labor Day, respectively, in both Tables 1 and 2.

Table 1
Descriptive Statistics: Las Vegas Data Set (n = 245)

Variable:	M	Mdn	SD	f^a
ADCI	$7,057,493	$6,677,863	$1,310,709	--
BH	1,215	1,180	188	--
CM	$10,513	$12,025	$8,442	--
THU	--	--	--	35
FRI	--	--	--	35
SAT	--	--	--	35
SUN	--	--	--	35
PATS	--	--	--	1
MEM	--	--	--	2
IND	--	--	--	4
LAB	--	--	--	4

Notes. a Frequency of categorical variables. That is, the number of days the variable was assigned a value of 1.0.

Table 2
Descriptive Statistics: California Data Set (n = 139)

Variable:	M	Mdn	SD	f^a
ADCI	$15,946,988	$15,701,904	$4,007,692	--
LDCI	$9,186,762	$8,671,562	$1,995,480	--
BH	609	584	139	--
DRAW	--	--	--	5
THU	--	--	--	20
FRI	--	--	--	20
SAT	--	--	--	19
SUN	--	--	--	20
IND	--	--	--	2
LAB	--	--	--	2
PP	--	--	--	2

Notes. a Frequency of categorical variables. That is, the number of days the variable was assigned a value of 1.0.

Table 3 contains bivariate correlation coefficients related to the continuous model variables of the Las Vegas data set, while Table 4 includes the same results for the California data set. In the Las Vegas data (Table 3), only TREND and ADCI demonstrated a significant correlation at the .05 alpha level. Bingo headcount (BH) and aggregate daily coin-in (ADCI) failed to produce a significant bivariate correlation. To the contrary, all of the intercorrelations in the California data set were significant at the .05 alpha level (see Table 4). However, ADCI and LDCI are both dependent variables, so BH was the only continuous predictor variable in Table 4.

Table 3
Intercorrelations Between Model Variables: Las Vegas Data Set (n = 245)

	ADCI	BH	CM	TREND
ADCI	--			
BH	-0.01	--		
CM	-0.01	0.08	--	
TREND	-0.14	0.02	-0.05	--

Notes. Only TREND was significant at the 0.05 alpha level (2-tailed test).

Table 4
Intercorrelations Between Model Variables: California Data Set (n = 139)

	ADCI	LCDI	BH
ADCI	--		
LDCI	0.90	--	
BH	0.40	0.40	--

Notes. All variables significant at the 0.05 alpha level.

Regression Analysis: Las Vegas Data

The model produced an R^2 of .86. The model F statistic of 130.66 was significant (df = 244, 10, $p < .0001$). The results of the regression analysis are summarized in Table 5, which also includes each variable's variance inflation factor (VIF). The corresponding VIF appears in brackets immediately following each variable name.

Table 5
Summary of Simultaneous Regression Analysis for Variables Predicting ADCI: Las Vegas Data (n = 245)

Variable & [VIF[a]]	B		SE B
Intercept	6,227,439.19	***	237,138.23
BH [1.11]	69.01	n/s	176.90
THU [1.16]	516,162.12	***	96,629.70
FRI [1.21]	2,048,111.18	***	106,832.32
SAT [1.15]	2,970,087.31	***	104,408.49
SUN [1.16]	1,755,761.91	***	95,980.75
PATS [1.04]	-732,362.28	*	486,633.31
MEM [1.03]	1,345,785.00	***	405,133.64
IND [1.01]	1,933,606.26	***	319,890.02
LAB [1.05]	1,272,032.58	***	321,427.48
TREND [1.03]	-3,028.36	***	671.28
AR(1)[b]	0.31	***	0.06

Notes. [a] Indicates variance inflation factor.
[b] First-period autoregressive term.
*** p < .01, one-tailed. ** p < .05, one tailed.
* p < .10, one-tailed. n/s: p > .10, one tailed.

The bingo headcount variable (BH) failed to produce a significant effect at the .05 alpha level (t = 0.39, df = 233, one-tailed p = .35). That is, its coefficient was not significantly different from zero, under the prescribed hypothesis test parameters. With the exception of PATS, the remaining variables shown in Table 5 posted significant and positive effects at the .01 alpha level. VIF's were low for all model variables, indicating that problematic multicollinearity was not present. In fact, the VIF for BH was 1.11, indicating very little correlation with the other predictor variables.

The cash mail variable (CM) was not listed in Table 5, as it failed to produce a significant effect at the .10 alpha level (B = -3.42, t = -0.84, df = 232, one-tailed p = .20). The autoregressive term, AR(1), was needed to adjust for first-period serial correlation in the error process. Without AR(1), the model coefficients would include bias resulting from dependent error terms.

Regression Analysis: California Data

The ADCI model produced an R^2 of .83. The model F statistic of 54.68 was significant (df = 129, 9, p < .0001). The results of the regression analysis are summarized in Table 6, which also includes each variable's variance inflation factor (VIF).

Table 6
Summary of Simultaneous Regression Analysis for Variables Predicting ADCI: California Data (n = 139)

Variable & [VIF[a]]	B		SE B
Intercept	12,631,171.40	***	867,503.72
BH [1.40]	-36.67	n/s	1,265.31
DRAW [1.41]	1,401,353.44	*	851,680.36
THU [1.48]	1,382,236.51	***	466,628.93
FRI [1.17]	5,306,215.03	***	406,863.25
SAT [1.39]	9,377,010.18	***	469,811.20
SUN [1.23]	4,988,631.29	***	408,289.23
IND [1.13]	5,102,382.90	***	1,273,758.35
LAB [1.05]	6,637,833.67	***	1,238,440.05
PP [1.03]	4,506,467.22	***	1,234,159.84
AR(1)[b]	0.38	***	0.08

Notes. [a] Indicates variance inflation factor.
[b] First-period autoregressive term.
*** p < .01, one-tailed. ** p < .05, one tailed.
* p < .10, one-tailed. n/s: p > .10, one tailed.

The bingo headcount variable (BH) failed to produce a significant effect at the .05 alpha level (t = -0.03, df = 125, one-tailed p = .46). The VIF associated with BH was 1.40, indicating an absence of problematic multicollinearity. The lottery-based promotion variable (DRAW) recorded a significant and positive model effect at the .10 alpha level (t = 1.65, df = 125, one-tailed p = .051). All other variables were characterized by significant and positive effects at the .01 alpha level.

The LDCI model produced an R^2 of .93. The model F statistic of 168.86 was significant (df = 129, 9, p < .0001). The low-denomination model was the most successful of the three models, in terms of explaining variance in the dependent variable. The results of the regression analysis are summarized in Table 6, which also includes each variable's variance inflation factor (VIF).

Table 7
Summary of Simultaneous Regression Analysis for Variables Predicting LDCI: California Data (n = 139)

Variable & [VIF[a]]	B		SE B
Intercept	7,741,835.52	***	244,286.48
BH [1.40]	-57.29	n/s	398.67
DRAW [1.41]	1,606,171.00	***	276,423.61
THU [1.48]	557,034.57	***	154,190.23
FRI [1.17]	2,929,835.18	***	154,640.09
SAT [1.39]	5,077,666.67	***	173,651.53
SUN [1.23]	2,970,870.11	***	149,785.59
IND [1.13]	2,683,780.90	***	468,213.65
LAB [1.05]	2,972,443.45	***	451,667.55
PP [1.03]	845,760.89	**	499,718.91
AR(1)[b]	0.36	***	0.08

Notes. [a] Indicates variance inflation factor.
[b] First-period autoregressive term.
*** $p < .01$, one-tailed. ** $p < .05$, one tailed.
* $p < .10$, one-tailed. n/s: $p > .10$, one tailed.

Most importantly, the bingo headcount variable (BH) failed to produce a significant and positive effect ($\underline{t} = -0.14$, $\underline{df} = 125$, one-tailed $\underline{p} = .44$). In fact, the estimated effect of BH on LCDI was negative, as it was in Table 6. BH was the only model variable that was not estimated to significantly and positively influence LDCI. Of course the VIF's do not change from Table 6 (previous model), as only the dependent variable is different in the two California models.

MRA Assumptions & Diagnostics

A review of scatter plots, featuring studentized deleted residuals and adjusted predicted values, failed to indicate heteroscadastic or nonlinear error patterns in any of the three models. Further, the P-P plots failed to show a departure from a normal distribution of errors. Correlograms were examined to detect serial correlation in the error processes. When found, the appropriate autoregressive terms were added to the models until the serial correlation was removed. These terms are labeled "AR" in the regression output tables. Multicollinearity was analyzed via variance inflation factors as shown in Tables 5, 6, and 7, as well as conditioning indexes. All conditioning indexes were well below the maximum limit guidelines set forth by Tabachnick and Fidell (1996), indicating an absence of problematic multicollinearity. A graphic review of studentized deleted residuals failed to indicate the presence of problematic outliers in the final models.

Discussion

With regard to the bingo headcount variable (BH), the test results failed to reject the null hypothesis, in all three models, offering no support for the alternative hypotheses. That is, the BH coefficient was not significantly different from zero, in any of the data sets. Of course the product of any variable value multiplied by zero is equal to zero. Alternatively stated, the value of the daily bingo headcount was not statistically related to daily coin-in.

This finding differed from that of Lucas and Brewer (2001), as their study produced a significant and positive effect for an identically operationalized bingo headcount variable. Although they also analyzed data from a Las Vegas repeater market casino, the data were gathered in 1998. It is possible that the relationship between bingo and slot play has evolved since then. However, it is more likely that this difference is the result of operating and market conditions unique to particular properties. The remaining results were consistent with the findings of previous researchers.

Given the consistent operating losses produced by the California property's bingo room, the results provide further evidence of cherry picking, as described by Walters and Rinne (1986). That is, the bingo players appear to be attracted to the bingo loss leader and not the profit producing slots. Alternatively stated, the bingo players appear to be attracted to value, exhibiting behavior similar to the deal-prone consumers described by Blattberg et al. (1978). These results, along with those produced by the Las Vegas property's break-even bingo parlor, provide further support for the ineffectiveness of deep discounts to drive the business volumes of complementary goods. This finding is consistent with those reported in the retail literature (Srinivasan, et al., 2004; Walters & Rinne, 1986) and challenges the assumption that bingo players make significant contributions to slot volume.

The bingo players appear to be attracted to the bingo loss leader and not the profit producing slots.

Managerial Implications

The outcomes of the current study do not support the plausibility of the full-service model, with regard to the bingo assumption. Specifically, the results produced no evidence of a positive, indirect, bingo effect. Although incremental table game revenue was not estimated in this study, the donor properties rely heavily on slot revenues for survival. Therefore, the absence of a significant, positive, higher-order correlation between slot and bingo volumes is troubling. At a minimum, these results should prompt casino operators to take a closer look at the indirect contributions of their bingo rooms. In the specific cases of the donor properties, further research should be immediately conducted.

While considering both direct and indirect contributions of games and amenities, management must ultimately decide which combination of these elements maximizes the profit per square foot. Not to be confused with activity or customers per square foot. Bingo rooms often attract an impressive number of patrons. However, not all customers are the same in terms of profit potential. While bingo appears to satisfy a need, as evidenced by the consistent crowds it draws, it may not satisfy the needs of shareholders or those concerned with maximizing property cash flows.

Due to the low cost structure of slot operations, even minimally played slot machines could exceed the total cash flow associated with bingo operations. Most US casinos experience peak periods, such as weekends and holidays, as well as lulls in business, during midweek periods. Despite the ability of bingo rooms to supply customers during business downturns, property profits may be increased by the availability of extra slot capacity for use during the peek periods. Without evidence of significant, positive, indirect, slot contributions, it is difficult to make a compelling case for continued operation of the bingo room. Of course this assumes the bingo rooms in question are not producing sufficient direct cash flow contributions.

What would happen to the slot revenue of a casino that closed its bingo room? Would the casino lose all slot play from its former bingo clientele? Would it retain some of the play? How much? These questions are difficult to answer and depend on competitive conditions. The point is that bingo/slot players that live near the casino are likely to continue some level of slot play, despite the bingo room closure. However, taken as a group, bingo/slot players are likely to decrease patronage, especially in markets that offer alternative bingo/slot outlets. But it is important to note that choice model studies, across several different US gaming markets, find convenience of location as one of the top two reasons for casino patronage (Pfaffenburg & Costello, 2001; Richard & Adrian, 1996; Turco & Riley, 1996; Shoemaker & Zemke, 2005). Based on these results, it is likely that some portion of the slot play would remain, especially the play of those residing near the property. Of course all of this conservatively assumes that a substantial amount slot play is associated with the bingo clientele. This may be a questionable assumption for some casinos, based on the results of this research.

As an epilogue to this study, one of the two donor properties has decided to terminate its bingo operation. It is not known to what extent the results of this study influenced management's decision. This conclusion could have been reached via alternative analytical approaches or in concert with the results of this study. The second data donor continues to operate its bingo room despite these results, with additional research under consideration.

Profit per Square Foot

For operators concerned with maximizing profit per square foot, the results of the current study may provide valuable insight. Specifically, these results fail to support the argument that the donor property bingo rooms are the highest and best use of gaming space. Although further study is recommended, management may want to begin considering alternative uses of this space, such as additional slot machines. Ultimately, if a change is made, the decision should be based on optimizing the profit generated from the casino floor space, and not blind subscription to unsupported theory, such as the full service theory.

Limitations

There was no estimate of the table game play associated with the bingo room clientele. While obviously a limitation of the study, it is difficult to make a compelling argument for a meaningful relationship between bingo play and profitable table game play. First, a cursory review of Nevada's *State Revenue Analysis*, over the last ten years, clearly demonstrates a steep decline in the number of table games per property, in all major markets. Some repeater market operators, such as Barley's, located in a Las Vegas suburb, have completely eliminated table games from the casino floor. Reasons for the shrinking pit must include decreasing demand and/or decreasing profits. The economic significance of any positive correlation with table game play would be questionable, especially at the entry-level price points featuring low minimum wagers. Second, while an entourage effect may occur, the price points and bankroll requirements for bingo players and table game players are remarkably different, making them unlikely complements. Third, most casinos only track daily drop, which does not represent the amount of wagers placed. In conclusion, any decision to operate a bingo room based on the belief that it is producing substantial indirect table game contributions, would be very difficult to support.

The trade literature includes testimony from industry executives related to the positive impact of the bingo clientele on the casino restaurant business (Tosh, 1998). This relationship was not explored in this study. However, the repeater market business model rarely includes substantial profit from restaurants (Lucas & Santos, 2003), if not losses (Lucas & Brewer, 2001), especially at the lower price points. Given the lackluster results of the donor properties, the impact on restaurant volume was moot. However, it is possible that this would not be the case for other properties.

This research included three models with data from two properties. Therefore, the generalizability of the study is limited. It is quite possible that the results could vary, under different operating and competitive parameters. It is recommended that casino executives test this general model using their own data. The contrary findings of Lucas and Brewer (2001) support this notion.

Future Research

Any replication of this study would be beneficial, as the results could contain bias from any of several operating, competitive, or clientele conditions. Additional studies might also include tighter measurement constraints with regard to both independent and dependent variables. For example, casinos with the ability to poll the slot system hourly, could limit the collection of coin-in data to the hours surrounding the bingo sessions. This more narrowly defined definition of coin-in might provide different results by reducing the possible noise associated with the 24-hour version of coin-in variable. However, any slot play occurring outside of the fringe hours would go uncounted. Additionally, the R^2 values of the current models failed to indicate a great degree of unexplained or random variation.

Observation studies would be useful as well. Randomly selected bingo patrons could be observed during session breaks for card use and gaming behavior, helping researchers better understand the relationship between bingo players and other gaming activities. Finally, qualitative studies featuring deep-dive, one-on-one interviews would be most helpful in better understanding the motives of bingo players. These interviews could produce new and insightful research questions as well as new ideas for future model specification and research design.

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