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Impact of casinos on residential property values: Henderson, Nevada

Barbara Kozarich Giannini
University of Nevada, Las Vegas

IMPACT OF CASINOS ON RESIDENTIAL PROPERTY

VALUES: HENDERSON, NEVADA

by

Barbara K. Giannini

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APPROVAL

The Thesis of Barbara K. Giannini for the degree of Master of Arts in Economics is approved.

Chairperson, Nasser Daneshvary, Ph.D.

Examining Committee Member, Thomas Carroll, Ph.D.

Examining Committee Member, Helen Neill, Ph.D.

Graduate Faculty Representative, Terrance Clauriete, Ph.D.

Dean of Graduate College, Ronald W. Smith, Ph.D.

University of Nevada, Las Vegas
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ABSTRACT

This thesis examines whether residential property values are affected by proximity to gaming establishments. Using a sample of houses from Henderson, Nevada, a hedonic price model is employed to relate residential sales prices to individual housing characteristics, including proximity to the nearest gaming establishment. Results indicate that proximity to gaming establishments do indeed lower residential property values. Further, it appears that larger gaming establishments have a larger impact on prices than smaller ones in Old Henderson.

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CHAPTER 1

INTRODUCTION

Hedonic functions have been applied extensively by researchers to determine the effects of a variety of externalities on housing values. Reichert, Small and Mohanty (1992) found a negative impact on residential property values located near landfills, while Delaney and Timmons (1992) found similar results for residential properties near high voltage power lines. Environmental issues such as air and noise pollution have also been tackled by Harrison and Rubenfeld (1978) and McMillan, Reid and Gillen (1980). To date, however, there is no literature dealing with residential property values surrounding establishments with gaming. It is true that there are relatively few cities in this country that can supply data for such a study. Developing a thesis concerning gaming is quite appropriate for someone living and working in Las Vegas.

The city of Las Vegas was built on gaming and is one of the fastest growing cities in the United States, as a result boasting a current migration of approximately 4,000 people per month. According to the

Las Vegas Convention and Visitors Authority, gross gaming revenue exceeds $2.6 billion (57.9% of total revenue)in Clark County and supports directly or indirectly over 450,000 jobs. In 1994 over 28 million visitors came to Las Vegas, with numbers expected to reach almost 40 million by the year 2000. (State Gaming Control Board 1995)

But tourists are not alone in enjoying gaming as entertainment in Las Vegas. The Las Vegas Convention and Visitors Authority reports that 67% of all Las Vegas residents gamble occasionally, and of those that gamble, three in ten gamble two or more times a week. It is estimated that the size of the Las Vegas local casino market accounts for approximately $900 million in revenue. This constitutes about 35% of the total gaming revenue generated in Clark County. (Ader and Lumpkins 1995)

With the large economic impact and obvious allure that establishments with gaming have, they seem more like amenities rather than negative externalities such as landfills. Defined by the New Merriam-Webster Dictionary, an amenity is something serving to comfort or convenience. Gaming establishments strive for both, offering dining and a variety of entertainment (not limited to gaming) in one convenient location, and in many cases with very "comfortable" dining prices. Yet "amenity" seems like a rather strong description for a city touting the nick-name "Sin City." What may be considered an amenity on one hand may also be considered a disamenities on another. For example, though the multitude of tourists brings in billions of dollars in revenue each year, it promotes pollution and impedes traffic.

The popularity and rapid growth of gaming has introduced the need for impact studies of all types. This thesis deals with the price-effect of gaming establishments on residential properties in Henderson, Nevada (zip-codes 89014 and 89015). Some of these establishments can claim the name "casino," and some are simply bars/taverns with slot/video poker machines (minimum of ten machines to be included in this study). Neighborhood casinos differ from the mega-resorts/casinos on the Strip in that they do not usually attract tourists. They forego the glitzy attractions such as pirate fights and erupting volcanos, offering instead lower gambling minimums and food and drink specials in order to lure in locals.

The purpose of this thesis is to determine whether residential property values in Henderson, Nevada, are affected by proximity to gaming establishments. Size of the establishment is studied in connection with surrounding residential property values as well. Perhaps residential property values are not affected by proximity to a neighborhood casino. The longevity of some of these establishments may have allowed them to blend into the neighborhood, accepted as part of living in Las Vegas -- similar to the ardent weather accepted and endured during the summer months. A hedonic price model will be employed to test whether there is an effect on residential properties, and just what that effect is. At the very least, this study should prove interesting reading to those considering buying a house in Henderson.

CHAPTER 2

REVIEW OF HEDONIC LITERATURE

Hedonic theory states that a good, X, is comprised of many characteristics. The price of this good, P(X), is determined by the type and quantities of its characteristics. Thus P(X) is an endogenous variable such that $P(X) = h(C_n)$, where $\mathbf{C_n}$ is a vector of characteristics in the sense that the characteristics of a good come in a bundle and cannot be separated. For example, let X be a single story house on the southeast side of town with three bedrooms, two bathrooms, a double garage, a pool, and a fireplace. The price of this house reflects the value of the characteristics. We cannot bargain down the price in return for one less bedroom; the characteristics of the house are inseparable.

If all goods are simply aggregations of characteristics in the hedonic model, then heterogeneous goods may be defined as aggregations of characteristics heterogeneous in nature or quantity. Number of bedrooms, square-footage of the house, type of garage, and location are examples of characteristics that differentiate one house from another.

Rosen, a pioneer in hedonic theory, developed a supply and demand model stating that the prices of bundles are determined both by the consumption decisions of households and the production decisions of firms. Consumers derive utility from different characteristics, with utility levels varying with individual tastes. According to Rosen (1974), optimality is achieved when a consumer purchases a brand offering the desired combinations of characteristics for the lowest price.

Summarizing Rosen's theoretical procedure for estimating supply and demand parameters in the housing market, step one is the estimation of a market hedonic price function by OLS using the best-fitting functional form,

$$P(X) = f(C_1, \ldots C_i, \ldots C_n), \tag{1}$$

where P(X) represents the price of the bundles and $C_1..C_n$ represent the amount of characteristics in the bundles. The results of this equation duplicate the information that is available to and thus used by agents in the market to make decisions.

Next, marginal prices (the unit price of each characteristic i) for each buyer and seller are estimated based on the amounts of all characteristics in the bundle:

(demand) $P(X_i) = f(C_1, \ldots C_i, \ldots C_n, D, e_{i1})$ (2)

(supply) $P(X_i) = g(C_1, \ldots C_i, \ldots C_n, S, e_{i2})$ (3)

where D and S are vectors of household demand and firm supply shifters respectively, and e_{i1} and e_{i2} are error terms. Finally, marginal price estimates are used to simultaneously solve for supply and demand. (Rosen 1950; Diamond and Smith 1985)

Simultaneity occurs in Rosen's model of supply and demand because supply and demand are solved at the same time to arrive at an equilibrium housing price. Simultaneity develops when the behavior of variables is jointly determined within more than one equation. Ordinary Least Squares (OLS) estimation of such equations leads to biased and inconsistent parameters because endogenous variables in one equation feed back into variables in another equation causing the error terms to be correlated with the endogenous variables.[1]

Diamond and Smith (1985) also argue that simultaneity may exist in the estimation of individual demand and supply in implicit markets. This simultaneity, however, is not due to interaction between supply and demand decisions, but rather results from the

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[1] Pindyck, R.S. and D.L. Rubinfeld, Econometric Models and Economic Forecasts, McGraw-Hill, Inc.: New York, 1991.

nonlinearity of the hedonic price function. The hedonic price function is nonlinear because the implicit, or hedonic, price of each characteristic in a bundle varies with the levels of characteristics in the bundle and others available.

In the demand for housing, the price of housing is an endogenous variable within the demand equation. Quantity demanded depends on the price of the house as well as its characteristics. Because housing bundles are inseparable, the price of housing is like a sum of the marginal prices of the characteristics, while the marginal price of each characteristic in a house depends upon the level of its own and other characteristics available.

In order to estimate the parameters of the demand equation, a source of independent variation in the supply equation is required to obtain consistent parameter estimates of demand. Thus the order condition becomes relevant, stating that if an equation is to be identified, the number of pre-determined variables excluded from the equation must be greater than or equal to the number of included endogenous variables minus one.[2] Relating this to housing demand, variation in marginal price independent of the housing characteristics is necessary to estimate demand for housing characteristics.

Both Kahn and Lang (1988) and Diamond and Smith (1985) suggest that multiple-market (cities) data may be better for demand estimation, however independent variation in price cannot always be obtained in multiple-market data because the choice of market may be endogenous. This problem is solved if market characteristics (e.g. weather) and exogenous determinants of choice (e.g. occupation) are excluded from the demand equation, implying that utility is not a function of or is separable from these variables. (Diamond and Smith 1985) For example, Muth (1969) argues that accessibility levels do not directly enter the utility function and therefore do not directly affect the marginal bids for housing characteristics. Therefore different levels of accessibility could be the needed independent variation since marginal prices would vary by locations.

A more useful technique for estimating demand of

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[2] Pindyck, R.S. and D.L. Rubinfeld, Econometric Models and Economic Forecasts, McGraw-Hill, Inc.: New York, 1991.

characteristics, according to Diamond and Smith, is the use of multiple time period data. Variation in price may be due to a change in economies of cities over time; for example, changes in comparative advantages for production may impact a city's price structure without changing individual demands for housing characteristics.

Variations in the prices of the goods reflect the implicit value of the characteristics of the goods. For example, if two houses in the same neighborhood are identical except that one has a double garage and the other a single, then the difference in sales price reflects the implicit value of a larger garage. (Graves and Knapp 1985) In the hedonic equation, the prices of heterogeneous goods (goods with differing levels of characteristic i), P(X), are regressed on the bundles of characteristics of the goods. This allows us to separate the influence of each characteristic upon P(X), thus giving us the implicit, or hedonic, price[3] of each characteristic.

When estimating a hedonic equation, the question of proper functional form arises, a concern that

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[3] It must be noted that heterogeneous goods with the same price are bought by different buyers. Since the hedonic model cannot identify individual consumer preferences, it is assumed that buyers have identical tastes. Thus willingness to pay for each characteristic is constant.

researchers have been struggling with for years. Economic theory has yet to specify a precise form, and yet use of the correct functional form is essential when estimating marginal attribute prices. Many forms have been examined by researchers. Halvorsen and Pollakowski (1981) tested linear, log-linear and semi-log functions, rejecting all of them in their study of San Francisco area homes. Cropper, Deck and McConnell (1988) show that both linear and quadratic functions perform well when all attributes are observed, but that linear forms outperforms quadratic forms when variables are not observed or are replaced by proxies.

An additional concern that arises when estimating a hedonic equations is variable selection. Within the housing market, variable selection refers to the housing characteristics chosen. Caution must be used when selecting variables because highly correlated variables (multicollinearity) may distort regression coefficients. Regression coefficients measure the change in the dependent variable due to a change in the independent variable, *ceteris paribus*. When two or more variables are highly correlated with each other, as a change occurs in one variable, the correlated variable will change as well. This results in unreliable regression coefficients. Arguea and Hsiao (1993) warn, however, that although the possibility of multicollinearity decreases when fewer characteristics are chosen, the choice of which to include is arbitrary, and essential features of the product may not be represented.

By employing a hedonic price function, it is hoped that the effects of the proximity of establishments with gaming to residential housing in Henderson, Nevada, will be quantified. Housing prices will be regressed on various housing characteristics, including the distance to the nearest gaming establishments from each residence included in the sample.

CHAPTER 3

THE MODEL

A house contains a bundle of characteristics that cannot be separated. For the purpose of researching the effect casinos have on single-family property values in Henderson, such characteristics are defined as: D, distance from the nearest casino, and $H_1 \ldots H_n$, the amount of other housing characteristics. The demand for housing then is defined as:

$$P = f(H_1 \ldots H_n,\ D),$$

where price, P, is a function of the associated bundle of characteristics. Following the functional form used by most studies and including a time-trend variable, a log-linear[4] model specified as follows:

$$\ln P = \alpha_0 + \alpha_1 TIME + \alpha_2 MMILES + \alpha_3 \mathbf{Q} + \epsilon,$$

where:

lnP = the natural logarithm of the most recent sale price in dollars,

TIME = a time trend, denoting the year in which each house was most recently sold,

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[4] Use of a linear model provided less explanatory power, thus the nonlinear model is chosen as the better fit.

MMILES = distance in miles[5] from the property *i* to the nearest casino, and

Q = a vector representing the following characteristics:

AGE = age of each house at the time of the most recent sale,

LSQFT = the natural logarithm of the square-footage of the house,

LLOT = the natural logarithm of the square-footage of the lot,

FP = a dummy variable indicating whether the house has a fireplace[6],

POOL = a dummy variable indicating whether the house has a pool,

DGAR = a dummy variable indicating whether the house has a garage.

The model will be estimated for two neighborhoods, Green Valley and Henderson, Nevada. Since Green Valley (zipcode 89014) is a master-planned residential community, and "Old Henderson" (zipcode 89015) is a mix

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[5] In the original data, distance was given in feet.

[6] The original data includes the number of fireplaces per house, which is highly correlated with building square-footage.

of residential and industrial properties, it is possible that housing prices react differently to surrounding casinos within each zipcode. The types of casinos found within the zipcodes differ; there are nine unrestricted casinos in 89015, while establishments in 89014 are all restricted to slot machines only. For this reason, the model is estimated separately for each sample.

In a variation of the model, the significance of the size of the gaming establishment is tested. *CASIZE* equals 1 if the minimum-distance gaming establishment has more than 100 slot/video poker machines. An interaction variable (*LARGECAS*) is created by multiplying *CASIZE* and *MMILES*, depicting whether the relationship between housing prices and the corresponding minimum-distance casino is different when the casino in question is "larger". There are eight such larger casinos in 89015 (all with unrestricted gaming licenses), although two are not included in the sample as they were not associated with the minimum distance to any residential property. There is only one establishment with more than 100 machines in Green Valley, and it does not have an unrestricted gaming license. It is the casino of minimum-distance to only 14 observations. Thus this variation to the basic model is not run with the Green Valley sample.

CHAPTER 4

THE DATA

Henderson is a city located to the Southeast of Las Vegas, encompassing zipcodes 89014 (Green Valley, a master-planned community) and 89015 ("Old Henderson"). A map is provided in Appendix A. The data are taken from the Clark County Assessor's Records, and consist of a total of 6,144 property sales of single-family residential dwellings (3,117 in 89014 and 3,027 in 89015) with sales prices ranging from $75,050 to $176,000. The dates of the sales range from January 1, 1980, to April 4, 1995. Some descriptive statistics for the sample are shown in table 1.

The square-footage of houses is on average 11% larger in Green Valley than in Henderson, but Green Valley lots are 28% smaller. Green Valley is a newer and rapidly developing area, and newer homes have smaller lots. It is more likely that a house will have a pool and/or a fireplace in Green Valley than Henderson.

Table 1: GENRAL DESCRIPTIVE STATISTICS OF RESIDENTIAL PROPERTIES

	Old Henderson Zipcode 89015		Green Valley Zipcode 89014	
Variable	Mean	Std. Dev.	Mean	Std.Dev.
PRICE	$104,699	$20,084	$131,267	$21,596
TIME	12.63	2.35	13.93	0.86
AGE	5.23	7.90	3.60	4.19
SQFT	1,605.23	388.11	1,776.52	438.36
LOT	8,378.77	6,010.99	6,062.82	1,878.57
POOL	8.99%		14.44%	
FP	77.11%		91.40%	
DGAR	95.31%		97.91%	
MMILES	1.13	.67	.84	.40
CASIZE	17.84%		0.45%	
TOTAL OBSERVATIONS:		3,027		3,117

The average sales price of Green Valley houses in the sample is 25.4% higher than in Old Henderson, Green Valley is a more suburban, upper-middle class area. On average, houses in Henderson are further away than Green Valley houses from the nearest gambling establishment, 1.13 miles versus .84 miles, respectively. This proves once again how Green Valley space-planned more efficiently (houses are built close to businesses as well as to each other).

Lastly, *CASIZE* (a dummy variable where gaming establishments with more than 100 slot/video poker machines = 1) represents almost 18% of the Henderson sample, but less than 1% of the Green Valley sample. To further emphasize the difference in types of gaming establishments within the two zipcodes, note that there are no places with unrestricted gaming licenses in Green Valley. Conversely, the establishments in Henderson where *CASIZE* is equal to 1 all have unrestricted gaming licenses, meaning that the establishments are not limited to slot/video poker machines. Table games (blackjack, pai gow, etc.) are allowed. This supports the fact that Green Valley is a master-planned residential community, while Henderson is an industrial, commercial area with residential housing built around the center of town.

A list of establishments with gaming licenses was retrieved from the City of Henderson License Department. Establishments serving liquor and containing at least ten slot and/or video poker machines were chosen from the list (27 in total). The mile area immediately surrounding the Henderson city limits was also scanned for similar establishments. Three outlying establishments met all qualifications and were included in the sample.

The Regional Transportation Center at the University of Las Vegas-Nevada calculated the distances (in feet) from each residential dwelling to the closest gaming establishment. In doing so, four gaming establishments[7] in 89015 and 89014 were not designated as the closest to any house, thus reducing the total number of gaming establishments used to 26 (see Appendix C). Since the distance calculation was made regardless of whether the establishment existed or not during the time of the house sale, distances from residential property to non-gaming lots were invariably captured within the original sample. Thus the sample was further stratified to those housing sales that occurred after the nearest gaming establishments were opened. Some descriptive statistics for the gaming establishments included in the study are shown below in table 2.

TABLE 2: GENERAL DESCRIPTIVE STATISTICS OF GAMING ESTABLISHMENTS

Zipcode	10-15 Slots	16-50 Slots	51-100 Slots	> 100 Slots	Total
89014 (Green Valley)	2	4	0	1	7
89015 (Old Henderson)	7	1	2	6	16
Other (Surrounding)	3	0	0	0	3
TOTAL	12	5	2	7	26

[7] Four gaming establishments were eliminated from the sample since no minimum distance observations were associated with them, including: Tom's Sunset Casino (89015, unrestricted gaming), Pat Hand Lounge (89014), Railroad Pass Casino (89015, unrestricted gaming), and Road Runner (89015).

Estimation of the original model revealed the possibility of high multicollinearity among some variables. Tests on correlation coefficients were employed to investigate the relationship between the variables. The house condition variables (extremely poor, very poor, average, good, very good, and excellent) and quality variables (low, fair, average, good, very good, and excellent) were found to be highly correlated with age. The older homes were in lower condition and had lower quality than newer homes. House quality variables were also highly correlated with size variables; larger homes were ranked higher in quality. These multicollinearity problems were resolved by dropping the condition and quality variables. Exclusion of these variables did not affect the explanatory power or the Durbin-Watson statistics of the models.

The original data also included many size variables which were all highly correlated: house square-footage, lot square-footage, total number of rooms, number of bedrooms, number of bathrooms. The square-footage variables are the only size variables used in the final models. Adding lot square-footage consistently increased the explanatory power approximately 3%, while omitting total number of rooms, bedrooms, and bathrooms did not affect the results of the models.

CHAPTER 5

THE RESULTS

Table 3 on the following page shows the results of the estimated model for both zipcode samples, including only residential property sales occurring after the nearest gaming establishments opened. In both regressions, housing prices decrease with age by approximately 0.5%; the older the house becomes, the lower is its selling price. Housing prices increase over time by about 3.7% per year in both regressions, representing inflation. The *AGESQ* variable (although very small) indicates that prices decrease at a decreasing rate in 89014, but decrease at an increasing rate in 89015. Price deteriorates more rapidly with age in Old Henderson than in Green Valley. Having a pool, a fireplace, and a garage[8] all increase the value of a house, especially a garage in 89014 (by approximately

[8] The basic model was also run replacing *DGAR* with a vector of dummy variables representing types of garages. Detached garages and not having a garage reduced housing prices in 89015, while carports and attached garages were insignificant. In 89014, attached garages and carports increased housing prices while not having a garage decreased the value. However, the inclusion of these variables did not significantly alter the explanatory power of the models.

TABLE 3: BASIC MODEL EQUATION RESULTS BY ZIPCODE

Dependent Variable: Log of Selling Price

	89015:Old Henderson		89014:Green Valley	
Variable	Coefficient	T-Stat	Coefficient	T-Stat
Constant	6.751	112.253	6.515	101.895
TIME	0.0365	0.378	0.033	18.768
AGE	-0.005	-10.503	-0.005	-5.393
AGESQ	$4*10^{-4}$	2.940	$-2*10^{-4}$	-2.273
LSQFT	0.444	53.187	0.196	72.963
LLOT	0.107	23.026	0.104	16.992
POOL	0.058	9.830	0.065	14.829
FP	0.025	5.977	0.032	6.040
MMILES	0.035	13.520	0.013	3.505
DGAR	0.078	9.555	0.175	16.920
R-squared		0.768		0.771
Adjusted R-squared		0.767		0.771
F-statistic		1,107		1,164
Durbin-Watson		1.204		1.233
Number of Observations		3,027		3,117

17.5%). The trend for newer houses is three-car garages, which would explain the high positive influence of garages in newer Green Valley. The size of the house and the lot affect the sales price in both zipcodes, with elasticities of .444 to .496 and .107 to .104, respectively. This means, for example, that a 1% increase in house square-footage in 89015 will result in a 0.44% increase in selling price. The explanatory power of the model in both regressions in between 76.8% and 77.1%.

Examination of the distance variables shows that housing prices in both zipcodes seem to react similarly to proximity to gaming establishments. A positive coefficient ranging from 1.3% (Green Valley) to 3.5% (Old Henderson) indicates that housing prices increase as distance from the nearest gaming establishment increases. Gaming establishments appear to be negative externalities in both zipcodes. The impact on house sales in Old Henderson is stronger, which may be reflective of the types of gaming establishments or the higher concentration of commercial activity found in this zipcode, as previously noted.[9]

[9] All models were also tested with a square of MMILES variable included. However, the coefficients of the square of MMILES were not significant. Thus a linear relation between distance and the log of price exists.

The Durbin Watson statistic is disturbingly low in these and all subsequent models. A low Durbin Watson usually indicates the presence of positive serial correlation, which occurs when the error terms are positively correlated or related. One of the assumptions of the classical linear regression model is that error terms are statistically independent of each other. If serial correlation is present, the efficiency of the model is affected, causing parameter estimates to appear more precise than they actually are.

Serial correlation, however, is a problem found mostly when dealing with time-series data. The low Durbin Watson is therefore intriguing since the data for this study are cross-sectional in nature. Cross-sectional data are usually randomly ordered. However, the data for this study are in ascending order by price, which may explain why an error term of one observation is related to the error term of the previous observation. Lower housing prices are over-predicted and higher housing prices are under-predicted.

To verify that serial correlation is present, *PRICE* is then run against the RESID and RESIDSQ of the basic model for zipcode 89015 (see results on the following page). The relationship between *PRICE* and RESID is strong (and positive), signaling positive serial correlation.[10] The regression systematically under-predicts housing values for more expensive houses and over-predicts housing values for lower-priced houses, indicating a specification problem. This is accounted for in the error term, RESID = Y - $\hat{y}$.

Table 4: CORRELATIONS BETWEEN *PRICE*, RESID, RESIDSQ FOR THE BASIC MODEL, ZIPCODE 89015

	PRICE	RESID	RESIDSQ
PRICE	1.000	0.498	0.142
RESID	0.498	1.000	0.163
RESIDSQ	0.142	0.163	1.000

In an alternative specification, *MMILES* is replaced with the log of *MMILES* (*LMILES*). The overall results did not change (see Appendix D). Since the data is limited to those variables already mentioned or used, finding and adding an omitted variable was not an option.

Given that the specification problem cannot be resolved due to missing variables, we return to the original model, where a question arises: Are the gaming

[10] If the low Durbin Watson was due mostly to heteroscedasticity, the relationship between *PRICE* and RESIDSQ would be stronger because it would be equally likely that positive and negative errors would occur.

establishments nuisances, causing surrounding residential property values to decrease? Or do gaming establishments tend to locate where property values are already low? If the latter is true, the gaming establishments *per se* would not be nuisances. To answer this question, the basic model is run for each zipcode, limiting the sample to residential property sales occurring before the nearest gaming establishment opened.[11] (See table 5 on the following page.) In both zipcodes the *MMILES* variable is not significant. This indicates that residential property values are not significantly related to the distance from the location of future gaming establishments in either zipcode. It is not until after the gaming establishments open that the distance variable becomes significant -- and positive. This seems to indicate that gaming establishment do indeed act as nuisances to surrounding residential property values in both Henderson and Green Valley.

[11] This methodology was employed by Dr. T. Carroll (Economics, UNLV) in a paper entitled, "Living Next to Godliness: Residential Property Values and Churches."

TABLE 5: HEDONIC EQUATION RESULTS BY ZIPCODE FOR SAMPLE LIMITED TO PROPERTY SALE OCCURRING BEFORE THE NEAREST GAMING ESTABLISHMENT OPENED

Dependent Variable: Log of Selling Price

	89015: Old Henderson		89014: Green Valley	
Variable	Coefficient	T-Stat	Coefficient	T-Stat
Constant	7.135	68.266	5.792	99.570
TIME	0.040	34.322	0.046	63.731
AGE	-0.006	-6.202	0.012	8.028
AGESQ	$4*10^{-5}$	1.596	-0.001	-10.108
LSQFT	0.345	22.406	0.595	89.844
LLOT	0.140	17.459	0.089	15.947
POOL	0.096	8.405	0.031	8.711
FP	0.050	5.318	0.042	8.710
MMILES	0.011	1.487	0.001	0.272
DGAR	0.105	7.426	0.117	7.688
R-squared		0.734		0.793
Adjusted R-squared		0.731		0.793
F-statistic		332		1,867
Durbin-Watson		1.281		1.482
Number of Observations		1,063		4,398

Results to a variation of the basic model are shown in table 6 on the following page. An interaction term (*LARGECAS*) is introduced, denoting if the relationship between housing price and minimum distance to a casino is different when the casino in question has more than 100 slot/video poker machines (when *CASIZE* = 1). If *LARGECAS* is insignificant, then there is no difference between having a large casino as the minimum-distance casino versus a smaller gaming establishment. While there are nine such larger establishments, two are not associated with the minimum distance to any house. Of the seven remaining, six are casinos with unrestricted gaming licenses in zipcode 89015, and one is a restaurant/bar with 199 machines in Green Valley.

The model in table 6 is run with the Old Henderson sample but not with the Green Valley (89014) sample due to a lack of observations. Not only are there no establishments with unrestricted gaming licenses, but only 14 residential properties (0.42%) note the 199-machine slot house as the minimum-distance gaming establishment.

Table 6: HEDONIC EQUATION RESULTS FOR ZIPCODE 89015
VARIATION TO THE BASIC HEDONIC EQUATION

Dependent Variable: Log of Selling Price

Variable	Coefficient	T-Statistic
Constant	6.727	113.616
TIME	0.037	51.953
AGE	-0.005	-11.327
AGESQ	$4*10^{-5}$	3.197
LSQFT	0.441	53.741
LLOT	0.112	24.415
POOL	0.060	10.235
FP	0.024	5.901
MMILES	0.014	4.401
DGAR	0.081	10.068
LARGECAS	0.029	10.064
R-squared		0.775
Adjusted R-squared		0.774
F-statistic		1,039
Durbin-Watson		1.245
Number of Observations		3,027

Using the Old Henderson sample, adding *LARGECAS* does not significantly alter how the remaining variables react compared to the previous models, nor does it increase the R^2 significantly (77.5%) from the results shown in table 3. The *LARGECAS* variable is positive (2.9%) and significant, indicating that there is indeed a difference between large and small casinos in relation to housing values. *MMILES* still defines the effect of the minimum-distance casinos on residential property values. Although the effect has decreased (from 3.5% to 1.4%), residential property values still increase as distance from casinos increase -- indicating that casinos are nuisances.

To calculate the specific effect of larger casinos on residential property values, the *MMILES* coefficient is added to the *LARGECAS* coefficient, resulting in a positive 4.3%. Thus, residential property values increase even more as distance from larger casinos increases. Furthermore, the negative impact on residential property values from larger casinos appears to be statistically much stronger than from smaller gaming establishments.

CHAPTER 6

CONCLUSION

The effect of residential property values' proximity to gaming establishments in Old Henderson and Green Valley appears to be negative in all models. The basic model indicates that gaming establishments act as nuisances in both zipcodes, since residential property values increase as distance from gaming establishments increase.

The model run with the sample limited to residential property sales occurring before the nearest gaming establishment opened supports the basic model, indicating that the future sites of the gaming establishments have no effect on residential property values. Only after the establishments open does *MMILES* become positively significant. The model including *LARGECAS* drives the nail into the coffin by inferring that casinos with more than 100 slot/video poker machines are even more of a nuisance than establishments with less machines.

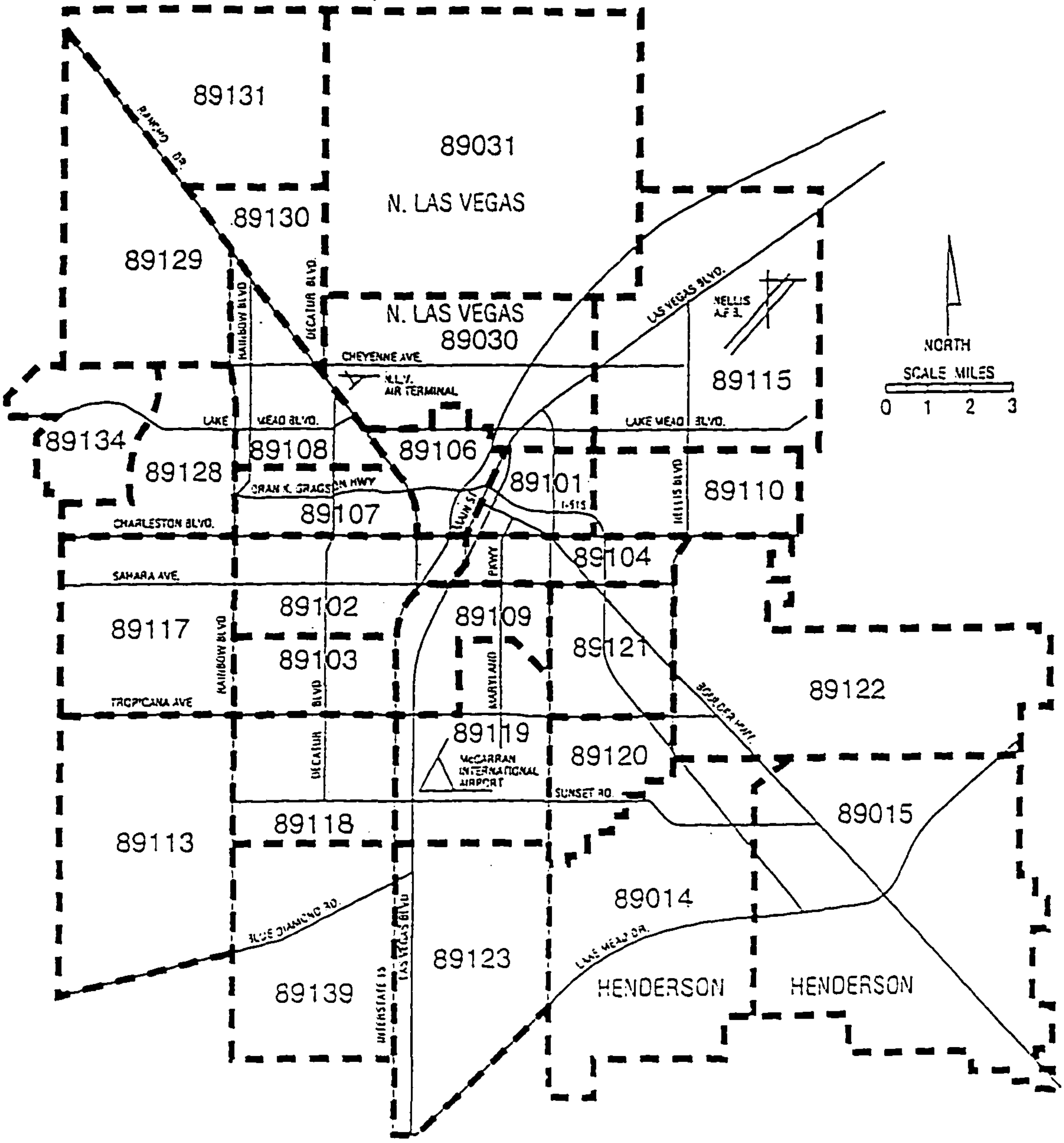
Since this variant model could not be run with the Green Valley sample, it is unknown whether proximity to larger (versus smaller) gaming establishments would be more of a nuisance to residential housing values in Green Valley as they seem to be in Old Henderson. Green Valley and Old Henderson are not similar in composition; Green Valley is a master-planned residential community, while Old Henderson is a commercial and industrial area, with residential housing included within its boundaries. Given these differences, it cannot be assumed that the Green Valley residential housing market would react similarly to large "casinos" as the housing market does in Old Henderson. However, recent protests by Green Valley residents to proposed casinos in their neighborhood prove that current residents bought properties in Green Valley specifically because larger casinos were not built nor proposed to be built in this area. Some Green Valley residents obviously believe that larger casinos will lower their property values.

But then again, casinos may simply become intrinsic to the neighborhood for new residents -- just part of living in Las Vegas.

In considering further research, it is noted that casinos are either operating or are approved in 26 states. Further, it is estimated that 30% of U.S. households gambled at a casino in 1994. The obvious popularity of gaming and its speed of expansion beg for additional studies on the impact of gaming establishments to surrounding businesses as well as residential properties. Investors of all types would benefit from such information.

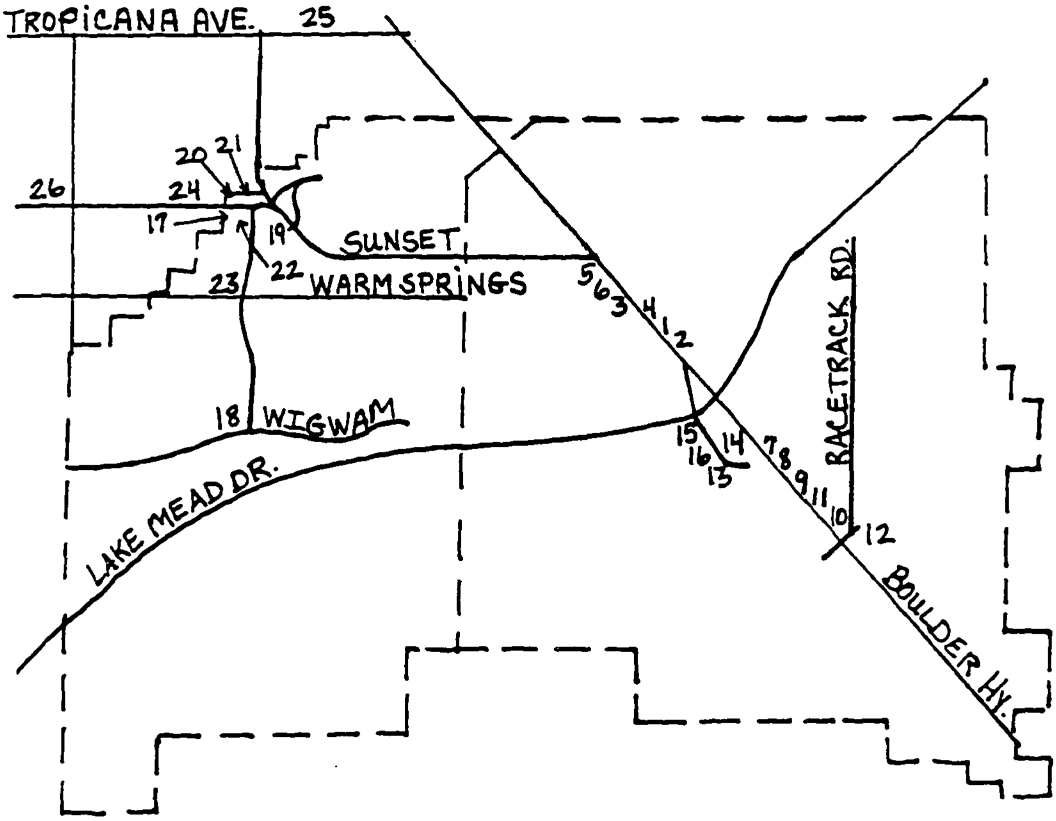
Specifically relating to this paper, more research is needed to find the missing variable(s) in order to correct for the variable specification problem. Also, this research can be expanded to include a larger data set and other zipcodes in the Las Vegas area.

FIGURE 1 LAS VEGAS VALLEY POSTAL ZIPCODE MAP



APPENDIX B

MAP OF GAMING ESTABLISHMENTS IN THE STUDY



1	Centerfold, The	14	Lotus, The
2	Jokers Wild	15	P.T.'s Slot Casino
3	Ligouris Bar & Grill	16	Rainbow Club
4	Mugshots Eatery & Casino	17	Renatas
5	Shanty Bar & Grill	18	Raes Restaurant & Lounge
6	Skyline Restaurant/Casino	19	Thirstbusters
7	Blue Moon Bar & Grill	20	One-Eyed Jacks
8	Johnny Macs	21	Coyotes Cantina
9	Lucky Strike Mining Co.	22	Billy's East
10	Rob's Wallbanger Lounge	23	Greens Supper Club
11	Villager Lounge, The	24	Bleachers Sportsbar
12	Triple J Bingo	25	Trisha Lounge
13	Eldorado Casino	26	Mickeys Cues & Brews

APPENDIX C

TABLE 7: GAMING ESTABLISHMENTS IN THE STUDY

Gaming Establishment	Street Address	Zip-code	# Slots	Opening Date	Number 89015	Closest 89014	Special Gaming License
Centerfold, The	1024 Boulder Hwy N	89015	15	01/01/88	7		
Jokers Wild	920 Boulder Hwy N	89015	656	07/26/80	128		Unrestricted
Ligouris Bar & Grill	1133 Boulder Hwy N	89015	103	10/01/84	116		Unrestricted
Mugshots Eatery & Casino	1120 Boulder Hwy N	89015	39	01/01/93	3		
Shanty Bar & Grill	1817 Boulder Hwy N	89015	15	01/01/90	7		
Skyline Restaurant/Casino	1741 Boulder Hwy N	89015	401	10/01/74	163		Unrestricted
Blue Moon Bar & Grill	526 Boulder Hwy S	89015	15	08/01/94	70		
Johnny Macs	842 Boulder Hwy S	89015	15	01/01/84	140		
Lucky Strike Mining Co.	642 Boulder Hwy S	89015	80	08/27/93	86		
Rob's Wallbanger Lounge*	2126 Boulder Hwy S	89015	10	01/01/86	807		
Villager Lounge, The	886 Boulder Hwy S	89015	15	01/01/76	1134		
Triple J Bingo	725 Racetrack Rd S	89015	307	04/07/93	94		Unrestricted
Eldorado Casino	140 Water Street S	89015	587	05/15/62	35		Unrestricted
Lotus, The	215 Water Street S	89015	12	07/01/94	51		
P.T.'s Slot Casino	46 Water Street S	89015	52	01/23/79	275		Unrestricted
Rainbow Club	122 Water Street S	89015	499	04/01/67	49		Unrestricted
Renatas	4451 E Sunset Rd	89014	199	06/08/90		14	
Raes Restaurant & Lounge	2531 Wigwam Pkwy	89014	15	01/01/93		1217	
Thirstbusters	697 N Valle Verde Dr	89014	40	06/02/93		495	
One-Eyed Jacks	2823 Green Valley Pky	89014	25	07/01/93		35	
Coyotes Cantina	4350 E Sunset Rd	89014	15	01/01/88		25	
Billy's East	4563 E Sunset Rd	89014	25	04/01/93		4	
Greens Supper Club	2241 Green Valley Pky	89014	40	09/01/92		1024	
Bleachers Sportsbar	3720 E Sunset Rd	89120	15	01/01/88		75	
Trisha Lounge	4900 E Tropicana Ave	89121	12	01/01/80		5	
Mickeys Cues & Brews	7380 S Eastern Rd	89123	10	05/01/91		424	

* *The actual opening date could not be determined for Rob's Wallbanger Lounge. Current owners estimate that the Lounge is approximately ten years old.*

APPENDIX D

TABLE 8: BASIC HEDONIC EQUATION WITH LOG OF MILES REPLACING MILES VARIABLE: ZIPCODE 89015

LS // Dependent Variable is LPRICE
Included observations: 3,027

Variable	B	Std. Error	T-Stat	Prob.
C	6.739	0.062	108.898	0.000
TIME	0.037	0.001	50.480	0.000
AGE	-0.006	0.000	-11.818	0.000
AGESQ	0.000	0.000	4.005	0.000
LSQFT	0.450	0.008	53.010	0.000
LLOT	0.107	0.005	22.578	0.000
POOL	0.059	0.006	9.779	0.000
FP	0.024	0.004	5.637	0.000
LMILES	0.024	0.003	8.369	0.000
DGAR	0.079	0.008	9.535	0.000

R-squared	0.759	Mean dependent var	11.541
Adjusted R-squared	0.758	S.D. dependent var	0.184
S.E. of regression	0.090	Akaike info criterion	-4.802
Sum squared resid	24.701	Schwartz criterion	-4.782
Log likelihood	2,983	F-statistic	1,056
Durbin-Watson stat	1.183	Prob(F-statistic)	0.000

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