The Value of Smoking Prohibitions in Vacation Rental Properties

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Abstract:
We examine the value of smoking prohibitions by developing a model of the rent differential between smoking and nonsmoking properties. We empirically test for the rent differential using a data set of vacation rental properties from the Outer Banks of North Carolina. Given peak season rents, hedonic variables such as oceanfront location, and number of bedrooms and bathrooms price according to expectations. Distance from vehicular congestion also leads to greater rent, reflecting vacationer desires for beauty as well as peace and quiet. Most significantly, our results reveal that vacationers are willing to pay substantial additional rent for properties that prohibit smoking. Understanding the demand for smoking prohibitions is important to academics, professionals, and others associated with owning, operating, and financing real estate.
Key Words: smoking, rental housing, water views, vacation properties

1. Introduction

Every summer, millions of households head for the beach. Once there, many stay in beach houses rented from individual owners. Vacation homes make up only 2.8 percent of the nation's housing stock, but in some beach resort areas they accommodate more visitors than traditional hotels and motels (see U.S. HUD, 1998, p. 85). The popularity of vacation- home rental property is supported by the income tax code, which allows owners to exclude two weeks of rental income or to charge off depreciation and other expenses against reported rents. These tax incentives allow vacation-home owners to rent equivalent or greater space at rates competitive with those at conventional resorts, hotels, and motels.

This study examines the factors that influence weekly rental rates of vacation rental properties with a special focus on the value of smoking prohibitions contained in some of the vacation rental property leases. A smoking prohibition (that is, a ban on the use of tobacco on the premises) is a residential amenity associated with some vacation rental properties. Our study uses a sample of vacation rental properties located on the Outer Banks of North Carolina, a prime East Coast rental destination, obtained during the peak rental season of the summer of 1998. In this barrier island market, vacation properties are typically rented to families on a weekly basis. The week begins on Saturday afternoon and ends the following Saturday morning, allowing for adequate time to clean (if necessary) and inspect the unit prior to the next rental. The weekly rents for these family oriented properties range from a minimum of $375 to a maximum of $3,850. The peak season (also known as "in season"), which covers our period of rental price investigation, begins during the third week of June and ends after the third week of August. Specific factors of interest include renters' willingness to pay for oceanfront location, for lower traffic density, and for smoking prohibitions. We also examine the data for spatial autocorrelation.

The valuation of smoking prohibitions is expected to provide insights relevant to other markets that have smoking bans. The second section of the article provides background information regarding vacation property and the valuation of specific property attributes. A model of smoking prohibition and rent is presented in the third section. In Section 4, sample data from vacation homes offered for rent by the week and located on the Outer Banks of North Carolina are discussed. The empirical methodology and results from estimating the value of smoking prohibitions are reported in Section 5. A summary and concluding remarks are found in Section 6.

2. Literature review

Other studies have examined the monetary costs of smoking to society, but few have looked at the interrelationship between real estate rental values and smoking prohibitions. Several authors have examined the value of beachfront location and vacation homes. Most recently, Benson et al. (1997, 1998) explore the relative values of water access and water views using data sets of single-family properties that were sold and that were located in the state of Washington.1

To explain the actual rent paid in the market for rental units, most studies draw on hedonic price theory. This hedonic approach is developed in the work of Lancaster (1971), Rosen (1974), and others. This literature has been reviewed by Jud et al. (1996). More recently, Pace et al. (1998) recommend the use of spatial statistics to control for the clustering of residuals associated with real estate regressions and to allow for better prediction and more efficient estimation. We therefore geocode the vacation rental property observations by assigning a latitude and longitude coordinate for each transaction.2

Most studies employ some variation of the following model:

$$\log(R_i) = \Phi(D_i, L_i, A_i, V_i, LL_i, u_i), \quad (1)$$

where R_i is rent of the ith rental unit, D_i = distance, L_i = a vector of variables describing the location of the ith unit, A_i is a vector of variables describing the amenities of the ith

unit, Vi is a vector of variables describing the average vacancy rate of the ith unit, LL_i is a vector of variables that assigns a latitude and longitude coordinate for each transaction, and u_i is a stochastic term. This hedonic approach looks at rent as being determined by the location and other attributes (or amenities) of the property.

While the literature relating to apartment and hotel rents is very extensive, we are unaware of any studies dealing with vacation rental property.

3. A model of smoking prohibitions and rent

Drawing from recent hedonic pricing literature concerning apartment and single-family residential attribute valuation, we propose a model of rent pricing where consumers view smoking prohibitions as a benefit. In a market of symmetric information for vacation rental housing, renters choose from properties with smoking prohibitions and those without. Smoking prohibitions are generally enforced by the loss of the renter's substantial security deposit (approximately $400). Given vacation properties with and without smoking prohibitions, renters are assumed to rent identical dwellings so as to allow the consumption of other housing attributes to be suppressed in the renter's utility function (see Benjamin et al., 1998).

In recent years, many nonsmokers have expressed a desire for a nonsmoking environment. State and local regulations have often been enacted to accommodate the nonsmoking voting constituency. In many states, the imposition of regulations has mandated either a nonsmoking environment or a choice for customers. Even in the absence of regulation, many service organizations such as hotels and restaurants have increasingly catered to the desires of their many nonsmoking customers by offering them nonsmoking sections in their facilities. The extent to which they are able to cater to customer preferences depends on the size of the facility and on demand.

Likewise, owners of vacation rental properties may choose to have either a smoking or nonsmoking facility. Because owners usually use their rental property themselves in the off-season, one might reasonably assume that only owners who are nonsmokers would offer nonsmoking vacation properties for rent. This might be true for personal preference reasons and for economic reasons (such as reducing costs associated with smoking clients) or because landlords expect higher rents received from nonsmoking customers. The important consideration is that vacation rental property owners elect to have either a smoking or nonsmoking facility.

This choice is complicated by a number of factors, such as (1) conversion of existing properties to nonsmoking at an initial cleanup cost and the need to sustain periodic, recurring maintenance costs (some customers may break the rules), (2) differences in the vacancy rates of smoking and nonsmoking properties, and (3) uncertainty of the size and duration of the rent premium for nonsmoking facilities. The initial cost of converting a smoking to a nonsmoking property may include repair of furniture, carpets, and draperies caused by burns as well as removing the long-lasting effects of smoke stains and odors. With a renovation of an existing facility or the construction of a new facility there should be little if any additional costs incurred. Conversions of existing facilities, however, incur this cost.

We model the owner's decision and the rental rate for nonsmoking facilities as a capital budgeting decision. Let NCF_{NS} represent the additional net cash flow of a nonsmoking facility versus a smoking facility. Inspite of the aforementioned initial cost of a converting to a nonsmoking facility, the relative "newness" of the idea of nonsmoking vacation properties might lead one to expect that early entrants to this market would earn higher than normal profits, but that this nonnormal profit would disappear over time.

Let I_{NS} (1— T) and NCF_{NS} represent the initial additional up-front (after-tax) cost and the initial additional net cash flow, respectively, of the nonsmoking facility relative to a smoking facility. A declining growth function is represented by f (g, t), where g is the rate of growth and t is time. The discounted value of future net cash-flows function is denoted by h(r, t), where r is the discount rate and t is time. The net present value of converting an existing facility from smoking to nonsmoking. $NPV_{NS,E}$, with net benefits extending N periods (until $NCF_{NS} = NC_{FS}$), is

$$NPV_{NS,E} = -I_{NS}(1-T) + \sum_{t=I}^{N} NCF_{NS} f(g,t) h(r,t). \quad (2)$$

For a renovated or new facility, the initial up-front incremental cost is avoided; however, there is a delay until time R when these nonsmoking facilities will be available for rent. The net present value of a nonsmoking facility for a new or newly renovated facility, $NPV_{NS,N}$, is

$$NPV_{NS,N} = \sum_{t=R}^{N} NCF_{NS} f(g,t) h(r,t). \quad (3)$$

From an economic perspective, the owner's decision is whether to convert now (equation (2)) or wait until day R for the scheduled renovation. Subtracting equation (3) from equation (2) yields this change in net present value:

$$\Delta NPV_{NS} = -I_{NS}(1-T) + \sum_{t=1}^{R-1} NCF_{NS} f(g,t) h(r,t). \quad (4)$$

By setting equation (4) equal to zero and solving for NCF_{NS}, the break-even net cash flow point is determined as follows:

$$NCF_{NS} = I_{NS}\left[\sum_{t=1}^{R-1} f(g,t) h(r,t)\right]^{-1}. \quad (5)$$

To arrive at the break-even rent level, we decompose the net cash flow into the rental rates (R_S and R_{NS}) and ongoing expenditures (E_S and E_{NS}) for smoking and nonsmoking options, and the number of days of occupancy by renters ($D_{S,R}$ and $D_{NS,R}$) for both choices, all adjusted for taxes. The loss of utility to the owner of not smoking in a nonsmoking unit is converted to a monetary equivalent expenditure. The owner loses UNS of utility per day for $D_{NS,OW}$ days when the unit is occupied by the owner. The difference in net cash flow for a smoking versus nonsmoking property is

$$NCF_{NS} = [(R_{NS} - E_{NS}) D_{NS} - (R_S - E_S) D_{S,R} - U_{NS} D_{NS,OW}](1-T). \quad (6)$$

Substituting equation (6) into equation (5) and simplifying the resulting expression renders the following:

$$R_{NS} = \frac{I_{NS}}{D_{NS}}\left[\sum_{t=1}^{R-1} f(g,t) h(g,t)\right]^{-1} + E_{NS} + \frac{D_{S,R}}{D_{NS,R}}(R_S - E_S) + \frac{D_{NS,OW}}{D_{NS,R}} U_{NS}. \quad (7)$$

A simple declining growth function is specified as $f(g, t) = (1 - g)^{-t}$ and a discount function as h(r, t) = (1 + r)¯t. Substituting these as growth and discount functions into equation (7) yields

$$R_{NS} = \frac{I_{NS}}{D_{NS}}\left[\sum_{t=1}^{R-1} \frac{(1-g)^t}{(1+r)^t}\right]^{-1} + E_{NS} + \frac{D_S}{D_{NS}}(R_S - E_S) + \frac{D_{NS,OW}}{D_{NS,R}} U_{NS}. \quad (8)$$

Equation (8) indicates that the rental rate charged by the owner of a preexisting property, after conversion to a nonsmoking facility, a rate also based on the alternative of waiting until the next refurbishing cycle. The first term on the right-hand side of equation (8) is the amortized cost per day based on days of occupancy; it is adjusted for the rate of decrease in rent rate (g) owing to increasing competition as properties are converted, and there is an adjustment for the required return (discount rate) for use of capital. The larger g is, the faster the introduction of nonsmoking units and the larger the initial rent. A larger discount rate also increases the initial rent. The second term on the RHS is the daily expenditure on the nonsmoking facility. The third term is the net revenue (after expenses) of the smoking property adjusted for the relative level of occupancy between smoking and nonsmoking facilities. This term represents the opportunity cost of lost net revenue when converting from a smoking to a nonsmoking facility. The last term indicates the additional rent that the owner charges to compensate him or her for not smoking in the nonsmoking unit. The utility loss is in monetary terms and is adjusted by the number of days occupied by the owners relative to the number of days rented.

In the long run, all units are subject to renovation, so that I_{NS} is equal to zero. Also, in the long run, markets equilibrate so that there is no differential in the vacancy rates of smoking and nonsmoking units. Thus, the long-run rent differential is expected to be $R_{NS} - R_S = E_{NS} - E_S + (D_{NS,OW}/D_{NS,R})U_{NS}$. If, as expected, the maintenance expenditures for a nonsmoking unit are less than those for a smoking unit, the rent differential will be negative (when the utility loss is zero). On the other hand, if there is a large utility loss to unit owners from not smoking in the nonsmoking unit, then $(D_{NS,OW}/D_{NS,R})U_{NS}$ will more than offset the negative maintenance differential and the initial rental rate differential will be positive.

4. Sample data

Our data are drawn from a sample of vacation homes offered for rent by the week during peak season summer 1998 on the Outer Banks of North Carolina. The Outer Banks region is an expansive barrier island between Albemarle Sound and the Atlantic Ocean, connected to the mainland on the north end by Highway 158 and on the southern end by Highway 264. Although the year-round population is only about 30,000 persons, the region hosts an average of more than 300,000 visitors each weekend during the summer. Tourists stay in the small beach communities, stretching from Duck in the north to Kitty Hawk, Kill Devil Hills, and Nags Head in the south.

Our 208 rental property sample comes from a large Outer Banks' realtor who maintains information regarding property type and physical characteristics as well as location. Rental property units range in size from small one-bedroom houses to large seven-bedroom houses, which could hold an extended family. Virtually all properties are separate, self- contained buildings renting as a single unit. Other amenities include pool, dishwasher, washer/dryer, and central air. A prohibition for smoking is of concern for many families who choose to rent the properties.3

A uniqueness of our data set is that it represents a small time period of approximately nine weeks for a market that has virtually 100 percent occupancy. The strong economy of the summer of 1998 and the narrowness of the peak season created great demand for vacation rental properties with the result being an extensive waiting listing for any available rentals during the peak season. Interviews with brokers indicated that there was very little, if any, rental price negotiation. We therefore use the asking rental price for the actual rental price.

The requirement for a security deposit has been shown by Benjamin et al. (1998) to be a key predictor of rental property rents and, subsequently value. In our data, a security deposit requirement is also a nonissue in that each rental property has the same security deposit.

5. Model and empirical results

We employ a standard hedonic model of rents incorporating 15 independent variables. We adjust the model for heteroskedasticity and test for spatial autocorrelation.

To explain the level of rents, we operationalize equation (1) in the log-linear functional form commonly utilized in the literature:

$$\begin{aligned}\log(R_i) = {} & a_0 + a_1 D_i + a_2 Lat_i + a_3 Lon_i + a_4 L1_i + a_5 L2_i + a_6 L3_i + a_7 C1_i + a_8 C2_i \\ & + a_9 BRM_i + a_{10} BTH_i + a_{11} POL_i + a_{12} WD_i \\ & + a_{13} DW_i + a_{14} AC_i + a_{15} NS_i + e_i, \qquad (9)\end{aligned}$$

where

R_i = rent of the ith vacation rental unit during the summer season;
D_i = distance of the ith unit from the Wright Brothers Monument,
Lat_i = the the latitude of the ith unit,
Lon_i = the longitude of the ith unit,
$L1_i$ = location on the oceanfront (1 = oceanfront, 0 = otherwise),
$L2_i$ = location is semi-oceanfront (1 = semi-oceanfront, 0 = otherwise),
$L3_i$ = location on the oceanside (1 = oceanside, 0 = otherwise),
$C1_i$ = condition of the ith unit (1 = new, 0 = otherwise),
$C2_i$ = condition of the ith unit (1 = moderate, 0 = otherwise),
BRM_i = number of bedrooms,
BTH_i = number of bathrooms,
POL_i = swimming pool (1 = yes, 0 = otherwise),
WD_i = washer and dryer in the unit (1 = yes, 0 = otherwise),
DW_i = dishwasher in the unit (1 = yes, 0 = otherwise),
AC_i = air conditioning (1 = yes, 0 = otherwise),
NS_i = no-smoking unit (1 = yes, 0 = otherwise),
e_i = a random error term.

Rent is the weekly rental rate during the summer peak season. Distance, as measured in degrees, is defined from the Wright Brothers Monument. This well-known national monument is one of the oldest tourist attractions on the barrier island and traditionally a center of tourist activity. An oceanfront unit is one located directly on the Atlantic beach with no view obstruction. A semi-oceanfront unit is situated one lot back from the beach and may have a partially obstructed view of the beach. An oceanside unit is one located 70 to 900 yards from the beach and usually does not have a view of the ocean. The condition variables (C1 and C2) measure the effective age of the unit. A table showing the means and standard deviations of all variables is included in Appendix A.

Estimates of the model are shown in Table 1. The model is estimated using the White (1982) procedure for estimating a heteroskedasticity consistent covariance matrix in the presence of heteroskedasticity of unknown form. The adjusted R2 for the estimated model is 0.89 and all of the variables, except dishwasher (DW_i) and air conditioning (AC_i), are statistically significant at the 0.05 level or better using a two-tailed test. Appendix B reports very similar regression results using the spatial autoregressive response model.4 The spatial autocorrelation coefficients is 0.02, which indicates virtually no spatial

Table 1. **Vacation rental rates on the Outer Banks, North Carolina.**

Variable	Coefficient	Standard Error	t-Statistic
Constant	472.26	76.80	6.15
D_i	1.78	0.45	3.97
Lat_i	3.65	0.88	4.14
Lon_i	7.91	1.41	5.61
$L1_i$	0.47	0.04	12.63
$L2_i$	0.22	0.04	5.58
$L3_i$	0.09	0.03	2.61
$C1_i$	0.18	0.04	4.78
$C2_i$	0.08	0.03	2.38
BRM_i	0.18	0.02	10.45
BTH_i	0.12	0.02	6.75
POL_i	0.17	0.04	4.55
WD_i	0.10	0.04	2.16
DW_i	0.06	0.03	1.75
AC_i	0.04	0.05	0.77
NS_i	0.11	0.04	2.67
n	208		
R^2	0.90		
Adj R^2	0.89		

autocorrelation. The model specification and data are sufficiently robust, therefore, to use standard regression techniques.5

Estimates of our model (equation (9)) reveal that rental rates rise with distance from the Wright Brothers National Monument. As a center of activity, the nearby area is often congested with tourist vehicles. The positive coefficient on the distance from the monument variable indicates that renters are willing to pay additional rent to avoid crowds and congestion. Furthermore, the coefficients on the latitude and longitude variables indicate that rental values rise to the north and east along the barrier island, the east side of the barrier island being nearer the Atlantic Ocean. This indicates that vacationers are willing to pay more to be located nearer the Atlantic Ocean and north of the monument.

Among the location variables, the dummy variable for oceanfront location (L1) indicates that renters are willing to pay some 60 percent more for a unit on the beach.6 They are willing to pay 25 percent more for a semi-oceanfront unit (L2), and 9 percent more for ocean side unit (L3). The omitted location variable is the sound side location, a clear negative to many of the beach vacationers.

The condition variables show the effect of effective age on rents. Units that are essentially new (C1) as defined by being five or fewer years old command 20 percent higher rents than those that are old, defined as being at least 15 years old. Units of moderate age (C2), those properties between these two extremes, bring 8 percent more than older units.

Looking at the various rental unit amenities included in the model reveals an additional bedroom raises rents about 18 percent. An extra bathroom increases rent by 12 percent, access to a swimming pool brings an additional 18.5 percent more rent, and a washer and dryer in the unit raises rent by 10.5 percent. The availability of either a dishwasher or air conditioning has no statistically significant effect on rent.

The no-smoking variable (NS_i), our variable of primary interest, indicates the value that renters place on a smoke-free unit. No-smoking units bring 11.6 percent more rent. Only 6 percent of the units in the sample have no-smoking prohibitions.7 As shown in equation (8), the rental premium on no-smoking units reflects the cost of converting an existing smoking unit to nonsmoking, the relative maintenance expenditures of smoking and nonsmoking units, the utility loss to owners from not smoking, and relative vacancy rates. We expect that over time the premium will decline as more units are converted to nonsmoking and more nonsmoking units are constructed. In the long run, the premium depends on the relative maintenance costs of smoking and nonsmoking units and the utility loss to owners from not smoking in their nonsmoking units.

6. Summary and conclusions

In this article, we develop a model of smoking prohibitions and rent. The value of smoking prohibition is empirically examined using a data set of vacation rental properties from the other banks of North Carolina. Employing spatial statistics and using peak season rents, our results reveal that vacationers are willing to pay substantial additional rent for properties that prohibit smoking. Other property-specific variables such as oceanfront location and number of bedrooms and bathroom price according to expectations. Distance from vehicular congestion also leads to greater rent, reflecting vacationer desires for beauty and peace and quiet. Understanding the demand for smoking prohibitions as exhibited by the rental price increment to be realized is important to academics, professionals, and others associated with owing, operating, and financing real estate.

Appendix A. Sample means and standard deviations

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	N
R_i	1172.93	992.50	3850.00	375.00	616.788	208
$\log(R_i)$	6.96	6.90	8.26	5.93	0.45775	208
D_i	0.10861	0.07275	0.21799	0.01190	0.06761	208
Lat_i	36.05385	36.01320	36.21040	35.95720	0.10500	208
Lon_i	−75.68250	−75.65520	−75.62460	−75.76670	0.06124	208
$L1_i$	0.26	0	1	0	0.44	208
$L2_i$	0.06	0	1	0	0.24	208
$L3_i$	0.36	0	1	0	0.48	208
$C1_i$	0.33	0	1	0	0.47	208
$C2_i$	0.47	0	1	0	0.50	208
BRM_i	3.61	4	7	1	0.89	208

Appendix A. (continued)

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	N
BTH_i	2.25	2	6.5	1	0.84	208
POL_i	0.19	0	1	0	0.39	208
WD_i	0.87	1	2	0	0.36	208
DW_i	0.79	1	2	0	0.42	208
AC_i	0.08	0	1	0	0.27	208
NS_i	0.06	0	1	0	0.24	208

Appendix B. Autoregressive response regression of vacation rental rates on Outer Banks, North Carolina ($n = 208$)

Variable	Coefficient	Log-Likelihood Ratio	Probability
Constant	460.81	35.53	0.00
D_i	1.67	16.79	0.00
Lat_i	3.61	17.02	0.00
Lon_i	7.74	29.90	0.00
$L1_i$	0.47	161.56	0.00
$L2_i$	0.22	19.83	0.00
$L3_i$	0.09	8.02	0.00
$C1_i$	0.19	23.87	0.00
$C2_i$	0.08	6.02	0.00
BRM_i	0.18	99.79	0.00
BTH_i	0.12	38.92	0.00
POL_i	0.16	25.90	0.00
WD_i	0.09	6.42	0.01
DW_i	0.06	3.93	0.05
AC_i	0.03	0.51	0.47
NS_i	0.11	6.35	0.01
n	208		
Log-likelihood (model)	− 154.00		
ρ	0.02		

Notes

1. In a study of vacation homes in resort towns, Tirtiroglu (1996) shows that buyers and sellers tend to have high search costs and are more likely to use a real estate broker. In addition, Tirtiroglu reports that commissions are not only fully capitalized into sales prices but that buyers appear to overpay commissions.
2. Geocoding and spatial statistics allow for a more elaborate spatial analysis than the traditional ruler on a paper map technique that generates estimates of distance. See Pace, et al. (1998), Pace and Gilley (1998), Dubin (1998), and Basu and Thibodeau (1998) for further discussions on its implementation in a hedonic study.
3. The smoking prohibitions contained in some leases is uniform across the vacation homes where it is present. Evidence of smoking or tobacco smoke may result in loss of security deposit and loss of vacation home rental privileges.
4. We used Spatial Statistics Toolbox 1.0 by Kelley Pace and Ron Barry for the spatial autocorrelation regressions and thank Kelly Pace for his assistance.
5. This model has a prediction equation as follows: $\boldsymbol{R} = \rho \boldsymbol{W}\boldsymbol{R} + \boldsymbol{X}\beta + \xi$
where, R is the vector of rental rates, X is the vector of independent variables as shown in equation (9), W is the spatial weight matrix, β is the matrix of independent variable regression parameters, ρ is the spatial autocorrelation coefficient, and ξ is the error vector. Two other spatial models, the simultaneous autoregressive model and the mixed autoregressive model, yield even less evidence of spatial autocorrelation.
6. In a semi-log equation, the percentage impact of a one-unit change in a dummy variable (from 0 to 1) can be calculated as 100* (c^{α} - 1), where a is the estimated regression coefficient for the dummy variable. We apply this transformation throughout in the discussion of the impacts of various dummy variables on rents. See Halvorsen and

Palmquist (1980) for a discussion of how to interpret dummy variables when the dependent variable is expressed in logs.

7. An anonymous referee suggested that we introduce the square of bedrooms and bathrooms and an interaction between bedrooms and bathrooms into the model as a test of the model specification. This new specification, however, had virtually no effect on the estimated size of the no-smoking coefficient, which was 0.10 with a t-value of 2.39 in the reestimated model. The same referee also suggested that we test for the influence of outlying observations. We reestimated the model eliminating all observations that had residual errors more than 2 standard deviations from the mean. This also did not substantially alter our conclusions about the significance of the no-smoking coefficient, although the reestimated coefficient was somewhat larger, with a value of 0.14 and a t-value of 4.45.

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