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Hedonic Analysis of Auctioned Hunting Leases: A Case Study of Mississippi Sixteenth Section Lands

JACOB D. RHYNE, IAN A. MUNN, AND ANWAR HUSSAIN

Forestry Department, Mississippi State University
Mississippi State, Mississippi, USA

This analysis evaluates factors affecting the value of hunting leases on Sixteenth Section Lands in Mississippi using hedonic analysis. These lands are owned by the state and hunting rights are auctioned to the public. Because these market data are generated in a competitive setting, this analysis has certain advantages over previous investigations of hunting lease markets, which relied on surveys of non-industrial private landowners to elicit information about their hunting leases or contingent valuation methods to infer lease values from landowners or hunters. Due to the competitive nature of the issuance of Sixteenth Section leases, their prices better reflect the full impact of lease characteristics such as cover type, game quality, distance to urban areas, and location on hunter valuation of hunting access. Estimates of the implicit prices of these characteristics suggest that land managers should adopt shorter lease lengths, smaller lease sizes, and improve habitat to increase lease revenue.

Keywords auctioned leases, hedonic analysis, hunting leases, public lands

Introduction

To provide landowners with useful information about hunting lease markets, a thorough and accurate understanding of the values that hunters place on lease characteristics is required. Previous studies have relied on non-market data obtained by using the contingent valuation method or data from hunting leases on non-industrial private lands to draw conclusions about values that hunters place on leases and their characteristics. Hypothetical data generated via contingent valuation has limitations and drawbacks and are less reliable than data generated from actual market transactions. Information from hunting leases on non-industrial lands is typically priced in a non-competitive manner and do not capture the full market value of hunting access. Competitively issued hunting leases, in contrast, more likely capture full market value and provide more reliable information for land owners engaged in the lease market.

Data issues have prevented a clear understanding of the value that hunters place on hunting lease characteristics. Most leases are issued on private lands, resulting in no public record of the market transactions available for study. To gather information for

Address correspondence to Dr. Ian A. Munn, Professor—Forest Economics and Management, Box 9681, Forestry Department, Mississippi State, MS 39762, USA. E-mail: imuun@cfr.msstate.edu

empirical studies, researchers have relied on surveys to (a) infer lease values from landowners or hunters using contingent valuation (CV) (e.g., Goodwin, Offenbach, Cable, & Cook 1993; Hussain, Zhang, & Armstrong, 2004; Stribling et al., 1992), or (b) elicit transaction information from NIPF landowners about their hunting leases (e.g., Hussain et al., 2007; Messonier & Luzar, 1990; Munn, Loden, Grado, Jones, & Jones, 2005; Shrestha & Alavalapati, 2004; Standiford & Howitt, 1993; Zhang, Hussain, & Armstrong, 2006). The resultant data are the basis for conclusions about the hunting lease market and the valuation of lease characteristics (Buller, Hudson, Parkhurst, & Whittington, 2006). Hypothetical data generated via CV, however, do not necessarily represent actual market conditions and there are concerns about the reliability and accuracy (Freeman, 1993; Mitchell & Carson, 1989). Data based on actual market transactions (revealed preferences) are preferable. Even market data are not ideal for valuating lease characteristics, however, if the market is not competitive. Hunting lease research has focused on leases on non-industrial private lands. Evidence suggests that NIPF hunting leases are not necessarily issued in a fully competitive manner. Lease prices are typically negotiated. Few landowners advertise to the public, either on the Internet or in print media. Most rely on word-of-mouth or family and friends to develop their customer base (Miller & West, 2007; Munn, et al., 2007). Munn, Hussain, West, Grado, and Jones (2007) found that landowners experienced in the hunting lease market generated higher lease rates than their less experienced, less knowledgeable counterparts. Given that less than 12% of NIPF landowners in the study were classified as experienced, a large majority of landowners were not capturing full market value. Finally, landowners who lease to family and friends may derive non-pecuniary benefits from such arrangements and the stated lease price would not reflect the full value of the lease. In such cases, using the stated lease price in a hedonic analysis would undervalue the lease components.

Additional case studies of the hunting lease market under different institutional arrangements are needed (Mozumber, Starbuck, Berrens, & Alexander, 2007). Studies of auctioned leases have been limited but would provide valuable insight into the actual value hunters place on leases. Auctioning goods or services generally results in greater revenue than if the price is negotiated (McAfee & McMillan, 1987; Milgrom, 1989).

Hunting leases on Sixteenth Section Lands in Mississippi present an excellent opportunity for study because these leases are advertised and auctioned to the public. These tracts were set aside to benefit public education in the Land Ordinance of 1785 (Public Lands Division, 2005). The sixteenth section, an approximately 640-acre block, of every township was reserved for public school districts to use in support of education. In Mississippi, the Board of Directors of each school district decides how these lands will be utilized. Revenue is generated from these lands through the sale of timber and from various leases such as oil, gas, mineral, farming, and hunting. Hunting leases are allowed only on forested land and are awarded to the highest bidder in a sealed bid auction. School districts advertise lease sales in local newspapers for two consecutive weeks prior to the lease auction.

Greater competition vying for the leases coupled with a competitive bidding format can be expected to push the lease price upward. Hunters bid based on what they think the lease is worth to acquire the lease. Comparing the average lease price on hunting leases on non-industrial lands in Mississippi to the average lease price on Sixteenth Section Lands would reveal if studies of hunting leases on non-industrial lands have captured the full value that hunters placed on lease characteristics.

In this study we examined hunting leases on Sixteenth Section Lands in Mississippi to determine what role lease length, size of the lease area, habitat quality, market segmentation,

game quality, and distance to the closest urban area have on hunting lease prices. We first compared lease prices for NIPF and Sixteenth Section Lands to ascertain if lease prices vary significantly between these market segments. The study also added to previous research on the impact that game quality and cover type has on hunting lease prices because we used quantifiable measures of these attributes. Our goal was to provide information on factors affecting hunting lease prices to non-industrial private landowners, companies, and corporations that lease, and the Board of Directors of Public Schools in Mississippi. Analysis of competitively issued hunting leases will provide more accurate estimates of the value hunters place on leases.

Conceptual Background

Analyzing hunting leases is challenging and complex. Previous studies have improved our knowledge of hunting leases and have determined that game quality, cover type, proximity to urban areas, lease length and size, and market segmentation influence hunting lease prices. These factors and the likely direction of their impact on lease rates are described in the sections that follow.

Game Quality

Game quality is one of the most important site attributes that influences hunters' valuation. In a study of hunting leases on private lands in California, Loomis and Fitzhugh (1989) found that hunters were willing to pay \$106 more per hunter for a 10% increase in trophy-quality deer in the total deer harvest. Likewise, Standiford and Howitt (1993) observed a positive correlation between lease price and trophy size of deer in California hardwood rangeland. Both studies classified game quality as the number or percent of trophy deer; trophy size was not defined and was subjective. We hypothesized hunting sites that have greater potential of harvesting quality game to command higher lease rates than otherwise similar sites.

Cover Type

Cover type is a significant determinant of food availability and defines the amount of game an area can sustain. Hardwoods, in particular, provide year-round food sources and are ideal habitat for deer and other game (Dickson, 2004; Harris, Sullivan, & Badger, 1984; Hazel, 1995). Hardwoods also provide diverse food sources such as browse, fruits, mushrooms, and soft and hard mast that are relished by deer and other game (Hazel, 1995). More food sources equate to larger game populations and game density is positively related to hunting lease revenue (Livengood, 1983). In contrast, mature pine cover provide deer and other game with relatively little food (Thill, 1990). Gigliotti (2000), Hussain et al. (2004), and Messmer, Dixon, Shields, Barras, and Schroeder (1998) showed that hunting success-related variables influence hunter willingness to pay for hunting access. Stribling et al. (1992) found that hunters in Alabama preferred a mix of pine-hardwood age classes with less than 50% in regenerated stands of young pines.

Impact of Urban/Rural Issues

Distance to the closest major metropolitan centers negatively impacted hunting lease prices in Texas (Pope & Stoll, 1985). In Kansas, urban residents were more likely to

purchase a hunting lease than rural residents (Goodwin et al., 1993). These two findings combine to suggest that urban hunters are driving lease prices, not their rural counterparts. As the distance and associated travel cost for urban hunters increases, aggregate demand for leases decreases as evidenced by decreasing prices with distance.

Length of Lease and Number of Acres Leased

Findings concerning the impacts of lease size on lease price have been contradictory. Shrestha and Alavalapati (2004) found a positive correlation between hunting lease revenue and lease length in a study of recreational hunting on ranches in Florida. Likewise, Messonier and Luzar (1990), Pope and Stoll (1985), and Standiford and Howitt (1993) found a positive relationship between lease revenue per acre and lease size. Zhang et al. (2006), however, reported a negative relationship, citing diminishing returns to size due to management limitations as a possible explanation.

Market Segmentation

Studies evaluating hunting leases should account for different hunting lease markets within the study area. Separate markets result from differing supply and demand structures coupled with barriers that prevent market integration (Freeman, 1993). If market segmentation exists and only one hedonic price function is calculated, the study will provide inaccurate estimates of model coefficients (Freeman, 1993). In a study of hunting leases in the coastal and Delta regions of Mississippi, Munn et al. (2005) found that lease characteristics impacted hunting lease prices differently in each region. In the coastal region, lease prices were significantly impacted by the number of forested acres and wildlife management expenditures. In the Delta region, the number of agricultural acres, number of forested acres, percent increase in amount of wetlands of the total acres leased significantly influenced hunting lease prices.

Methods

To support our argument that NIPF lease prices do not represent full market value, we first compare lease prices collected in this study to lease prices collected from Mississippi NIPF landowners in a 2003 statewide survey (Munn et al., 2007). NIPF lease prices were adjusted for inflation to 2005 levels using GNP deflator values. The mean values were then compared using a two-sample *t*-test with unequal variances.

The Hedonic Method

The hedonic pricing method is a market evaluation technique used to estimate the economic value consumers place on non-market characteristics of a good or service. It is often used with goods that have varying attributes or characteristics that can only be sold as a collective unit (Rosen, 1974). Hunting leases can be considered composite goods with varying attributes. Hedonic analysis enabled lease prices for heterogeneous sites made up of a bundle of characteristics to be decomposed into a specific price for each characteristic (Brown & Mendelsohn, 1984). Other studies have used the hedonic method to evaluate hunting leases (Buller et al., 2006; Hussain et al., 2007; Munn et al., 2005; Pope & Stoll, 1985; Zhang et al., 2006). Based on previous research, we specified a hedonic price equation for hunting leases as:

$$\text{Lease price per acre} = F \left[\begin{array}{l} \text{lease size, lease length, habitat quality, market segment,} \\ \text{game quality, and distance to urban area} \end{array} \right]$$

Data Sources and Construction of Variables

Lease data were obtained for hunting leases on Mississippi’s Sixteenth Section Lands from the Public Lands Division of the Mississippi Secretary of State’s Office. In 2005, there were 875 hunting leases on Sixteenth Section Lands (Figure 1). Revenue generated from these leases was over 2.5 million dollars.

Not all Mississippi counties have auctioned lease data. There are fifteen counties in northern Mississippi that do not have Sixteenth Section Lands set aside for public education.

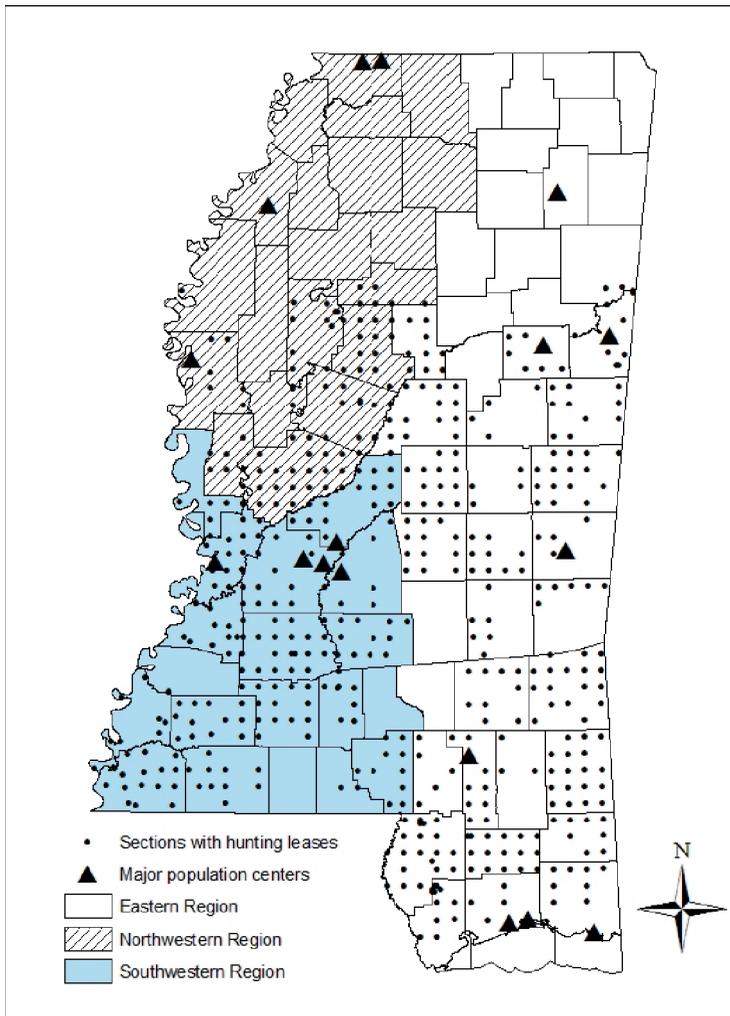


Figure 1. Map of Sixteenth Sections with hunting leases in Mississippi in 2005.

When Mississippi became a state in 1817, a large portion of northern Mississippi was still owned and inhabited by the Chickasaw and was not subject to the Land Ordinance of 1785. The U.S. government subsequently sold this land occupied by the Chickasaw and failed to set aside the Sixteenth Section Lands for public schools. A small number of other counties throughout the state do not lease hunting rights for a variety of reasons.

The usable dataset had 715 observations, where each observation was composed of one hunting lease on Sixteenth Section Lands in 2005. A section may have multiple hunting leases. Data collected for each hunting lease included the per acre revenue for 2005, lease acres, lease length, cover type information, average county-level Boone and Crocket score (B&C), and the distance from each hunting lease to the nearest urban area (Table 1). Specific details about data sources and construction of variables used in the analysis were:

Lease Price. Hunting lease information was provided by the Public Lands Division of the Mississippi Secretary of State's Office. The annual lease price per acre for 2005 was the dependent variable for the hedonic price function.

Table 1
Definitions of explanatory variables used to predict hunting lease prices on
Sixteenth Section Lands in Mississippi in 2005

Name	Description	Expected sign
Size of lease		
log (leased, acres)	Logarithm of number of acres leased	+
Length of lease		
One year to four	1 if lease is less than five years, otherwise 0;	+
Five years	1 if lease length is five years, otherwise 0;	+
Six year and over	1 if lease length is greater than five years; otherwise 0;	-
Cover type		
% pine	Percentage of land in pine	-
% mixed pine-hardwoods	Percentage of land in mixed-pine hardwoods	+
% water	Percentage of land under permanent/temporary lakes, streams, ponds	+
% regenerated	Percentage of land that has been recently regenerated	-
% open	Percentage of land that is open	-
% hardwoods	Percentage of land that is in hardwoods	+
Market segmentation		
Northwest	1 if land is located in northwest, MS, otherwise 0;	+
Southwest	1 if land is located in southeast, MS, otherwise 0;	+
East	1 if land is located in east, MS, otherwise 0;	-
Game quality	Projected average Boone and Crocket Score by county	+
Distance to urban area	Miles from hunting lease to closest urban area	-

Lease Length and Acres Leased. This information was also provided by the Public Lands Division of the Mississippi Secretary of State's Office. Given the clustered nature of lease lengths, three dummy variables were generated to represent lease lengths of one to four years, five years, and over five years. The over five years category served as the base (omitted) category in the regression analysis.

Cover Type. Cover type information was provided by the Mississippi Institute of Forest Inventory (Parker et al., 2005). The information included the number of acres in the following cover types for each sixteenth section: pine, hardwoods, mixed pine-hardwoods, water, regenerated, and open. Acreages by cover type were converted to percentages of each section. We theorized that the cover type information for each section was representative of the cover type for each hunting lease on that section. Percent pine cover type was used as the base category.

Geographic Regions of the State. Three regions were delineated as distinct market segments based on the major population centers in the state (Figure 1). These segments were southwest Mississippi, northwest Mississippi, and east Mississippi. To model market segmentation, dummy variables for each of the three regions were employed. The eastern region served as the base category.

Projected Average Boone and Crocket Scores. Projected average B&C scores for four+-year-old bucks for each county were obtained from Strickland and Demarais (2000). Their technique effectively approximates B&C scores from a subset of the antler measurements required for a direct B&C score. Strickland and Demarais (2000) calculated projected B&C scores from deer harvest data collected by the Mississippi Department of Wildlife Fisheries and Parks through the Deer Management Assistance Program (DMAP). DMAP monitors the deer population in Mississippi by taking biological samples from harvested game on wildlife management areas and from participating landowners and hunters.

Distance to Urban Area. The straight line distance in miles from each lease to the closest urban area was determined using ArcGIS. Five areas in Mississippi are classified as urban areas in the 2000 U.S. Census. The areas are Biloxi, Pascagoula, Hattiesburg, Jackson, and Olive Branch, a suburb of Memphis (U.S. Department of Commerce, 2000).

Results

Descriptive Statistics

The average annual lease price was \$2,959.73 or \$8.73 per acre; the average lease size was 349 acres. However, there were broad departures from these averages. Annual lease price ranged from \$10 to \$32,000 and lease size varied from 3 to 3,059 acres. Pine stands constituted 35% of the forest cover types covering the sections containing leases, hardwoods 29%, mixed pine-hardwoods 10%, regenerated forests 9%, and open land and water accounted for the residual (Table 2).

Of the 715 leases, 80% were of a five-year length, 13% were of 1–4-year duration, and the remaining leases were of 6 or more years in length. The leases were not evenly distributed between regions. East Mississippi accounted for 48% of the leases. Southwest Mississippi region accounted for 36% of the leases and northwest Mississippi accounted for the remaining 16%. The average county Boone and Crocket Score was 114. The average distance to the closest urban area was 54 miles.

Table 2
Descriptive statistics related to hunting leases on Sixteenth Section Lands
in Mississippi in 2005 ($n = 715$)

Name	Mean	Std dev	Min	Max
Dependent variable				
Annual lease price	2,959.73	3,501.36	10.00	32,000.00
Annual lease price/acre	8.73	6.97	0.82	52.41
Log-annual lease price/acre	0.84	0.28	-0.09	1.72
Independent variables				
Size of lease				
Average lease size (acres)	348.73	261.14	3.00	3,059.00*
Log-acres leased	5.45	1.08	1.10	8.03
Length of lease				
One year to four	0.13	0.34	0.00	1.00
Five years	0.80	0.40	0.00	1.00
Six year and over	0.07	0.26	0.00	1.00
Cover type				
% pine	0.35	0.25	0.00	0.95
% mixed pine-hardwoods	0.11	0.07	0.00	0.40
% water	0.01	0.04	0.00	0.64
% regenerated	0.09	0.10	0.00	0.81
% open	0.15	0.16	0.00	0.90
% hardwoods	0.29	0.22	0.01	0.98
Market segmentation				
Northwest	0.16	0.37	0.00	1.00
Southwest	0.36	0.48	0.00	1.00
East	0.48	0.50	0.00	1.00
Game quality	113.77	11.62	81.50	133.50
Distance to urban area	54.45	29.82	1.80	261.66

*Giles Island is 3,059 acres entrusted to the Mississippi School Board.

Comparison to NIPF Lease Prices

The mean price per acre for NIPF leases in 2003 reported by Munn et al. (2007) was \$6.50, which was significantly lower (p -value < .01) than the mean lease price per acre for Sixteenth Section leases reported above even after adjusting for inflation.

Factors Influencing Hunting Lease Revenue

Ordinary least squares regression was used to estimate the hedonic price equation relating the dependent variable (lease revenue per acre) to the independent variables (lease acres, lease length, cover type, average county-level Boone and Crocket scores, and distance to the nearest urban area). As hedonic price theory does not specify which functional form to use, a variety of models were estimated involving the Box-Cox procedure. The log-log functional form provided the best fit for the data. This agreed with Cropper, Leland, and McConnell (1988) who reported that when proxies were

used, simpler data forms such as linear, semi-log, and log-log work best. A variety of diagnostic tests were performed to determine whether assumptions underlying the ordinary least square method were satisfied. In particular, diagnostics related to heteroskedasticity, multicollinearity, and model specification were conducted. Based on the Breusch-Pagan test, the hypothesis of nonconstant variance was rejected; thus heteroskedasticity was not a problem. Based on the Ramsey specification test, the null hypothesis of model misspecification was also rejected. To examine multicollinearity, variance inflation factors (VIF) and correlations between explanatory variables were estimated. The correlation matrix did not indicate significant correlations between any pair of explanatory variables. The VIF statistics did not indicate that multicollinearity was an issue.

Of the 12 variables in the model, nine were significant at the 10% level of confidence (Table 3). The coefficient for lease size was negative and significant. Thus, a 1% increase in the size of the lease caused the average lease price per acre to decrease by 0.027%.¹ Variables representing lease length were significant and positive. Hunting leases less than five years in length generated 18% more per acre revenue than hunting leases greater than five years in duration.² Five year hunting leases generated 11% more per acre revenue than hunting leases greater than five years.

Of the variables representing habitat quality, percent pine and regenerated lands were significant and had negative coefficients. In line with expectations that hardwoods

Table 3
Estimated coefficients of hedonic price model for hunting leases on
Sixteenth Section Lands in Mississippi in 2005 ($n = 715$)

Variable	Coefficient	<i>p</i> -value	Elasticity
Dependent variable			
Log-annual lease price/acre			
Independent variables			
Size of lease			
Log-acres leased	-0.027	0.003	-0.027
Length of lease			
One year to four	0.225	0.000	18.252
Five years	0.182	0.000	10.649
Cover type			
% pine	-0.283	0.000	-0.100
% mixed pine-hardwoods	-0.021	0.875	-0.002
% water	-0.094	0.695	-0.001
% regenerated	-0.420	0.000	-0.036
% open	-0.096	0.162	-0.014
Market segmentation			
Northwest	0.226	0.000	17.241
Southwest	0.171	0.000	5.722
Game quality	0.003	0.002	0.364
Distance to urban area	0.001	0.066	0.029
Intercept	0.477	0.000	
Adjusted R-squared	0.340		

are preferred habitat for deer and other game, results indicated hunters valued pine and regenerated stands significantly less than hardwoods. Thus, a 1% increase in the percent share of land in pines and regenerated areas with a corresponding decrease in the share in hardwoods caused lease prices to decrease by 0.10% and 0.04%, respectively. Collectively, the coefficients representing mixed pine-hardwoods, water, and open areas on hunting lease property were all negative, albeit not significant in the model, reinforcing the notion that hunters perceive hardwoods as preferred habitat for game. The lack of significance for these variables individually, however, indicates that any hunter preference against these cover types is weak at best.

Consistent with our expectations, there were different hunting lease markets in Mississippi; the coefficients for variables representing northwest Mississippi and southwest Mississippi were significant and positive. Accordingly, hunting leases in the northwestern and southwestern region generated approximately 17% and 6% higher revenue per acre than hunting leases in the eastern portion of the state.

The estimated coefficient on the projected average Boone and Crocket Score by county was positive and significant. A 1% increase in the projected average Boone and Crocket score increased the average lease price by 0.36%. Finally, the coefficient for distance to an urban area was significant and positive. A 1% increase in distance to urban areas caused the lease price to increase by 0.03%.

Discussion

Evaluating hunting leases that are awarded competitively in an open market provides valuable data in assessing the “going rate” of hunting lease characteristics. Hunting leases on Sixteenth Section Lands in Mississippi are different from a vast majority of issued hunting leases because they are competitively awarded. Goods and services sold by auction generate more revenue than if the price is negotiated (McAfee & McMillan, 1987; Milgrom, 1989). Compared to negotiated hunting leases, competitively issued leases more accurately reflect the value that hunters place on hunting lease characteristics. In theory, hunters’ bid prices approach the full market value when leases are auctioned in a competitive manner, otherwise they might lose out on the lease. Studying these leases can shed light on the value hunters place on hunting locations.

To effectively analyze hunting leases on Sixteenth Section Lands in Mississippi, we used hunting lease data from market transactions instead of hypothetical data as generated by contingent valuation methods typically used to study this market. Information collected included: the amount of revenue generated, lease length, lease acres, cover type of the lease area, county-level Boone and Crocket Scores to proxy game quality, and distance of the hunting lease to nearest urban area. A functioning hunting lease market has not been examined in previous studies and provided more conclusive results than previous studies that relied on hypothetical methods to evaluate the hunting lease market. Results of this study provide land managers with a better understanding of how to generate more financial benefit from their hunting leases.

Our findings regarding specific hunting lease attributes largely mirrored that reported in previous research. Cover type composition, as proxy for habitat quality, was strongly linked to lease prices, which agreed with results by Stribling et al. (1992). Pine and regenerated areas did not generate as much lease revenue as hardwoods and clearly indicated that habitat quality matters in the hunting lease market—as would be expected. Given that game quality is in large part a function of habitat

quality, this result is also reflected in the higher prices for leases in counties with higher mean Boone and Crocket scores for 4.5-year-old deer. Hunters in this study paid significantly more for hunting leases as the quality of game increased. This objective result corroborated subjective findings by Loomis and Fitzhugh (1989) and Standiford and Howitt (1993).

In addition to game and habitat characteristics, this study supported previous results regarding lease location. The result that hunting lease prices increased with distance from urban areas agreed with Pope and Stoll (1985) who found that lease prices increased when distances to metropolitan areas exceeded 89 miles. Lease location was also important in that supply and demand for leases could vary dramatically from one location to the next. The existence of multiple hunting lease markets within Mississippi was consistent with Munn et al. (2005) who found different hunting lease characteristics impacted lease prices differently in different parts of Mississippi. Future studies that examine hunting leases must also take into consideration the possibility of distinct hunting lease markets within the study area.

Some of our findings regarding specific hunting lease attributes conflicted with previous research. Estimation results indicated that shorter duration leases generated greater revenue than longer term leases. These results are contrary to Shrestha and Alavalapati (2004) who reported that longer term leases generate greater per acre revenue than leases of a shorter duration. Similarly, in this study, smaller leases brought higher per acre prices than larger leases, while agreeing with Zhang et al. (2006), contrasted with most of the literature, which found a positive relationship between per acre revenue generated and lease size (Messonier & Luzar, 1990; Pope & Stoll, 1985; Standiford & Howitt, 1993). Our study indicated that there was a market for smaller size leases. This is likely due to a number of individual and small groups of hunters who can effectively compete for small leases but cannot match the financial resources of large clubs in bidding on large leases. A limitation of our study is that we did not consider the possibility of interaction effects between variables. While this is consistent with most of the literature, there are exceptions (e.g., Little & Berrens, 2008). One approach is to include specific interaction terms based on *a priori* expectations.

There are several practical implications from this study that benefit land managers and future hunting lease studies. First, land managers can increase the amount of revenue generated from leasing by offering hunting leases five years or less in duration. Of course, trade-offs between increased revenues from shorter leases and increased costs of more frequent auctions must be considered. Second, if access is available, and there are logical and enforceable boundaries such as roads, rights-of-way, or major streams between adjacent blocks, landowners should consider dividing up large hunting leases into multiple smaller hunting leases to generate more lease income. Third, providing better habitat for game by leaving hardwoods in regenerated stands is an alternative that can also lead to increased revenues. Future studies, however, will have to determine whether habitat improvements of this magnitude will be feasible and financially advantageous. Fourth, many hunters prefer hunting leases in remote locations away from urban areas, so advertising rural hunting leases in urban newspapers might be worthwhile in attracting prospective lessees. Fifth, advertising and auctioning hunting leases to the public is worth considering. The disparity between the average lease price on Sixteenth Section Lands and non-industrial lands in Mississippi suggests that studies that have examined hunting leases on non-industrial lands have not captured the full value that hunters place on lease characteristics. Competitively issued hunting leases more accurately reflect these values.

Notes

1. Elasticities, evaluated at means, for explanatory variables were derived by using: $\partial \log price / \partial x_i = \hat{\beta}_k \bar{X}_k$. Elasticities for log-acres leased was based on $\partial \log price / \log leaseacres = \hat{\beta}_{acres}$. For details, see Johnson, Johnson, and Buse (1987, p. 251).
2. Calculated using Halvorsen and Palmquist (1980) and Kennedy (1981) elasticity effects for dummy variables: $\{ \text{Exp}[\hat{\beta}_k - 1/2V(\hat{\beta}_k)] - 1 \} * 100$.

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