Hedonic Estimation of Southeastern Oklahoma Forestland Prices

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Abstract

Forestland is a composite good, the price of which varies with its characteristics, such as its ability to produce timber and its proximity to markets. Sales of predominately forested land in southeastern Oklahoma were examined to better understand and quantify the influences of physical and spatial characteristics on sales prices.

Key words: Hedonic Models, Forestland Prices

JEL Classification: Q23, Q24

Introduction

The price of forestland is influenced by many attributes such as its physical attributes, location attributes, and other attributes such as taxation and regulation policies. The purpose of this study was to determine which attributes have the greatest influence on the sales price of forestland. Empirically a hedonic pricing model (HPM) was used to estimate the price of unimproved forestland in two counties of southeast Oklahoma.

The HPM can be traced to Court. However, the use of HPM did not become widely used until Rosen published a theoretical model that could serve as a basis for empirical techniques. Applying Rosen's logic, the many factors that influence the price of land render it a composite good and the value at which it is exchanged a hedonic price. Once these attributes of the composite good are known, we can then decompose the price of the good into the marginal value of each attribute. Goods with different combinations of the attributes will trade for different prices in the market. Empirically we regress prices for the composite good on the level for each attribute. From the regression coefficients, we obtain a value for an attribute on the composite good.

Most of the applications using Rosen's model have dealt with differentiated consumer products. A seminal paper by Palmquist in 1989 adapted Rosen's model to form a theoretical hedonic model for land as a factor or production. Following Palmquist's paper, there has been an expansion of the HPM to land markets. The purpose of Palmquist's paper was to estimate the derived demand for agricultural land as a differentiated factor of production and to develop welfare measurement techniques that could be applied to various land and agricultural policy questions.

Applications of the HPM to Forestland Markets

The majority of the land market applications have been in the analysis of farm and urban-fringe land. The application of HPM to the forestland market has been less common. A review of literature has revealed three papers applying HPM in the analysis of forestland. These are: Turner, Newton, and Dennis; Roos (1995); and Roos (1996).

Turner, Newton, and Dennis – Economic Relationships between Parcel Characteristics and Price in the Market for Vermont Forestland

The data used by Turner, Newton, and Dennis consisted of 139 sales of unimproved predominately forested parcels 100 to 500 acres in size, with sales that occurred between January 1986 and April 1988. The dependent variable was the real sales price per acre. The independent variables were grouped into physical characteristics, location characteristics, and other characteristics. They used a transcendental functional form converted to log-log form and performed the estimation using ordinary least squares (OLS) regression. The physical characteristic included: the number of acres in the parcel; percentage of non-forested area; a binary variable indicating frontage on a public road; a binary variable indicating whether frontage road is paved; and percentage of parcel area with a slope steeper than 15-percent. The location characteristics included: population per square mile in the town where the parcel is located; rate of population growth for the town; rate of population growth for the county; road distance to highway; and road distance to nearest commercial ski area. The other explanatory variables are equalized town real estate tax rate and a trend variable indicating the month of sale. The results indicate the area of non-forested area, presence of a public road on the frontage of the parcel, and the percentage of land area with a slope greater than 15% were statistically significant. Of the physical characteristics the percentage of non-forested land and the presence of a public road made a positive contribution to explaining price, whereas the others had a negative influence on price. All of the location characteristics were statistically significant, excluding population density. Population density and population growth rates had a positive impact on price and the distance to highway and commercial ski area had a negative influence on price. The property tax variable was significant and indicated that increases in property tax lead to decreases in forestland prices. The trend variable was positive, but not statistically significant.

Roos (1995) – The Price of Forest Land on Combined Forest Estates

In 1995, Roos published a paper that applied Palmquist's adaptation of Rosen's hedonic price model in a study of combined forest estate land in Sweden, which contain forestland, agricultural land, and a residence. The statistical analysis was based on 198 sales during 1992. The estates in the sample had to have a minimum productive forest area of 20 hectares. There were 10 individual explanatory variables in the model: inhabitants per square kilometer in the county (INH); area of forestland in the parcel (AFOR); percentage of productive forestland of total forestland in the parcel (PROD); average site index on productive forestland (SI); average standing volume per hectare of productive forestland (VOL); area of agricultural land in the parcel (AGR); points for farmland productivity (FER); value points for residence (VH); value points for outbuildings (VB); and a trend variable indicating the month of sale (TREND). A linear functional form with quadratic and interaction terms was chosen. The main results and interpretations of the study were: the implicit price for forestland on combined forest estates was a positive function of population density, the percentage of productive forestland compared with the total forest area, site index, and standing volume per hectare of productive forestland; forestland prices had negative relationships with the area of agricultural land, suggesting negative economies of scope between agricultural and forestland; and the estimations suggested economies of scale in agriculture and not in forestry.

Roos (1996) – A Hedonic Price Function for Forest Land in Sweden

Roos's 1996 paper focused on forestland in Sweden principally used for timber production. The parcels of land could not be more than 10% agricultural; have at least 20 hectares of commercially productive forestland; and could not have any houses. The data consisted of 143 observations from sales in 1992. The estimates were performed using a linear Box-Cox functional form and likelihood ratio tests. The dependent variable was the price per hectare deflated with the monthly consumer price index. There were eight independent variables: the number of hectares in the parcel; percentage of productive forestland of total area of forestland in the parcel; cubic meters per hectare of forestland; site productivity; population per square kilometer of forestland in the county; month of sale; a binary variable indicating the presence of agricultural land; and a binary variable indicating buyer restrictions. Excluding the two binary variables, all other independent variables were significant. The results indicated a positive relationship between the per-hectare price of forestland and the proportion of productive forestland in relation to the total forest area on the estate, the mean standing volume, the mean site productivity of the forestland, and the population density in relation to the area of forestland in the county. The parcel area has a negative effect on per-hectare prices.

The Theoretical Model

Sherwin Rosen explains that hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them. Econometrically, implicit prices are estimated by the first-step regression analysis (product price regressed on characteristics) in the construction of hedonic price indexes.

The price of the commodity $P(Z)$ is described by n objectively measured attributes or characteristics, $Z = (z_1, z_2, \ldots, z_n)$, with each z_i measuring the i^{th} characteristic contained in that good. The good Z is heterogeneous, yet each separate z_i can be considered homogeneous, and the demand for the good can be analyzed in terms of the demand for each of its homogeneous components. Each homogeneous characteristic is assumed to have a distinct market equilibrium price and thus the price of the heterogeneous good is a function of the prices of its homogeneous components. The resulting hedonic price function is defined as:

(1) $$P(Z) = p(z_1, z_2, \ldots, z_n) \ .$$

This function relates prices and characteristics and is the buyer's (and seller's) equivalent of a hedonic price regression, obtained from shopping around and comparing prices of products with different characteristics. The function gives the minimum price of any package of characteristics. If two products offer the same bundle of characteristics, but sell for different prices, consumers only consider the less expensive one.

The implicit price for a characteristic can be written as the following partial derivative of equation (1):

(2) $$P_{zi} = \frac{\partial P(Z)}{\partial z_i} \ .$$

Buyers and sellers can be thought of as facing a marginal implicit price schedule for each characteristic. A buyer maximizes utility by moving along these price schedules until the consumer's marginal willingness to pay is equal to the marginal implicit price of the characteristic.

Variables and Data

Two data sets were developed for this study, a forestland sales transactions dataset and spatial characteristics dataset. The forestland sales transactions data comes from a dataset developed by Darrell Kletke and David Lewis of the Department of Agricultural Economics and Department of Forestry, respectively, at Oklahoma State University. The primary source of their data was the State of Oklahoma Tax Commission. This data set includes: the sales price of forestland parcels, the size (acres) of each parcel sold, its location, the classification of land uses within each parcel, and the expected annual per acre timber production for each parcel. Jimmy Wood and Allen Finchum of the Department of Geography at Oklahoma State University developed the spatial characteristics data set. The data set includes information on the distance to the nearest city having a population of 2,000 or more, the population growth of that city, the distance to the nearest community containing two or more wood-processing mills, the distance to the nearest natural resource attraction, the distance to major roadways, and indication of whether the parcel fronts a road of any type.

Forestland sales transactions data set

The data set was drawn from 109 sales of land parcels in two counties of southeast Oklahoma in 1999, 40 transactions in Pushmataha County and 69 transactions in McCurtain County. The dependent variable was price per acre $(PRICE)$, which was converted to logarithmic form $(\ln Price)$. The land area in the parcels was classified into cropland, improved pasture, native pasture, and timberland. In order to be included in the study, the parcel could not include any buildings and had to include timber-producing soil. Once this adjustment was made, the total land transactions involving unimproved timberland numbered 81, 36 in Pushmataha County and 45 in McCurtain County. Of the 81 transactions, none included cropland, one included improved pasture, and 12 included native pasture. The improved and native pasture uses were combined to form the variable *OPEN*, which denotes the percentage of the parcel classified as open land. The explanatory variable *ACRES* is the size of the parcel in acres, which was converted to logarithmic form $(\ln Acres)$. The variable *TmProd* denotes the expected annual per acre timber productivity in cubic feet per acre per year.

Spatial characteristics data set

The spatial data set describes relationships between the forestland parcels and the larger regional economy, which includes most of the counties in southeastern Oklahoma and bordering counties in Arkansas and Texas. The creation of the data set involved the use of the ArcView geographic information systems (GIS) software.

The spatial data set provides the following categories of information:

1. Distance to urban areas and population growth of those areas.
2. Distance to wood processing communities.
3. Distance to land areas classified as natural resource attractions.
4. Distance to major roadways.
5. A binary variable indicating whether the forestland parcel fronts a road of any type.

The variable *DistCity* is the distance in roadway miles to the closest community having a population of at least 2,000. The variable *PopGro* is the population growth of that city measured as the change in population between the 1990 and 2000 census periods. There are thirteen communities within close proximity of the forestland parcels that contain at least two wood-processing facilities. These communities were determined from use of the *Arkansas Wood Using Industries Directory, Oklahoma Wood Manufactures Directory,* and the Texas Forest Service *Directory of Forest Products Industries.* This data was combined with data on the expected annual per acre timber output from each parcel and the cost per cubic foot mile to transport timber to form the variable *TranCost* , which measures the annualized cost of transporting timber per acre from parcel i to the nearest community having two or more wood-processing mills. Land classified as a natural resource attraction included major lakes, State Parks, or the Ouachita National Forest. The variable *DistNat* is a measure of the road mile distance to the nearest natural resource attraction for parcel i . The variable *DistHwy* is the linear distance in miles to the nearest major roadway, such as a State or U.S. Highway. *FRONT* is a binary variable that indicates whether the parcel fronts (or is near) any type of road, this may include non-paved roadways such as section line roads. To determine whether the land fronts (near) a road, a ¼ mile buffer was placed around each forestland parcel if the buffer intersected a road of any type a number one was assigned (1 = yes, 0 = no).

Table-1 provides a description of the variables of the hedonic price model, the explanatory variables' expected effect on price, and the source of data

The Empirical Model

The sales price of land per acre often varies inversely with the size of the parcel being sold. Due to this characteristic, various researchers (Chicoine; Hushak and Sadr; and Turner, Newton and Dennis) have chosen a transcendental function to model the relationship between land price per acre and the relevant attributes that influence the price per acre. In transcendental form, we have:

(3) $$PRICE = \beta_0 ACRES^{\beta_1} \mathrm{EXP}\left(\sum_{i=2\cdots n} \beta_i X_i\right),$$

where $PRICE$ is the purchase price per acre, $ACRES$ is the total acres of the parcel being sold, the X_i are the other parcel attributes, and the β_i are the estimated coefficients. Converting this equation to logarithmic form allows estimation using ordinary least squares. Thus the statistical model is:

$$\ln(PRICE) = \ln\beta_0 + \beta_1 \ln(ACRES) + \left(\sum_{i=2\cdots n}\beta_i X_i\right) + \mu_i, \tag{4}$$

where μ_i is the error term. For β_1, $\left(e^{\beta_1 / ACRES} - 1\right)$ provides the percentage change in $PRICE$ for a unit change in $ACRES$. For $\beta_i, i > 1$, $\left(e^{\beta_i} - 1\right)$ provides the percentage change in $PRICE$ for a unit change in any single X_i.

The empirical model used to estimate forestland prices for McCurtain and Pushmataha Counties was a transcendental logarithmic function specified as follows:

$$\begin{aligned} \ln Price_i = \ln\beta_0 + \beta_1 \ln Acres_i + \beta_2 DistCity_i + \beta_3 DistHwy_i \\ + \beta_4 TmProd_i + \beta_5 Front_i + \beta_6 OPEN_i + \mu_i, \end{aligned} \tag{5}$$

where $Price_i$ is the price per acre for observation i, $Acres_i$ is the parcel size in acres for observation i, $DistCity_i$ is the distance in roadway miles to the nearest town having a population of 2,000 or more for observation i, $DistHwy_i$ is the linear distance to the nearest major roadway for observation i, $TmProd_i$ is the expected annual timber productivity for observation i, $Front_i$ is a binary variable indicating whether the parcel fronts on (or near) a road of any type for observation i, and $OPEN_i$ is the percentage of the parcel that is open land for observation i. For McCurtain County $i = 45$, and for Pushmataha County $i = 36$. The variables $PopGro$, $TranCost$, and $DistNat$ were not included in the final model. Summary statistics for the variables used to estimate (5) are reported in Tables 2 and 3 for McCurtain and Pushmataha Counties, respectively.

Results

McCurtain county regression results

Due to heteroskedasticity the estimated generalized least squares procedure was used to estimate equation (5) for the McCurtain County data. Of the six explanatory variables in the model, four were significant. These were $\ln Acres$, *DistHwy*, *TmProd,* and *OPEN*. The variables *DistCity* and *FRONT* were not statistically significant. The coefficient on $\ln Acres$ was significant at the 5% level and the sign was consistent with expectations. The results are consistent with the declining marginal relationship between parcel size and per acre sales price found in most studies. The results indicate that as parcel size increases by one acre that per acre sales price declines by $4.80. The coefficient on *DistCity* was not significant. The sign on the coefficient agrees with expectations, which indicates that sales price per acre declines as distance to city increases. The coefficient on *DistHwy* was significant at the 5% level and the sign on the coefficient was consistent with expectations. It indicates that for every additional linear mile the per acre sales price of forestland declines by $90. The variable *FRONT* was not statistically significant and the sign does not agree with expectations. The variable *TmProd* was significant at the 5% level and the variable *OPEN* was significant at the 10% level. The sign on *TmProd* does not conform to the expectation that higher timber productivity increases per acre sales price. The results indicate that for each additional cubic foot of annual growth per acre, the sales price per acre declines by $1.70. The sign on *OPEN* conforms to expectations and indicates that per acre sales price declines by $7.50 for each 1-percent increase in open space for the parcel being sold. The overall F-statistic was 7.45 and significant with a p-value of less than 0.0001, the R-square was 0.54, and the adjusted R-square was 0.47. A summary of the overall regression results for McCurtain County appears in Table-4.

Pushmataha county regression results

The ordinary least squares procedure was used to estimate equation (5) for the Pushmataha County data. Of the six explanatory variables in the model, three were significant. These were *DistHwy*, *TmProd,* and *FRONT*. The variables ln *Acres*, *DistCity*, and *OPEN* were not statistically significant. Also, the sign on ln *Acres* does not agree with expectations. The results do not agree with the declining marginal relationship between parcel size and per acre sales price, as found in most studies. The sign on *DistCity* agrees with the expectation that sales price per acre declines as distance to city increases, and the sign on *OPEN* also conforms to the expectation that per acre sales price declines as the amount of open space increases. The coefficient on *DistHwy* was significant at the 5% level and the sign on the coefficient conforms to expectations. It indicates that for every additional linear mile of distance between a forestland parcel and a major roadway that the per acre sales price of forestland declines by $52. The variable *FRONT* was also statistically significant at the 5% level, and the sign agrees with expectations. The results indicate that per acre sales price of forestland increases by $210 if the parcel fronts on (or near) a road of any type. The variable *TmProd* was significant at the 10% level and the sign on the coefficient conforms to the expectation that higher timber productivity increases per acre sales price. The results indicate that for each additional cubic foot of annual growth per acre, the sales price per acre increases by $1.42. The overall F-statistic was 3.67 and significant with a p-value of 0.0078, the R-square was 0.43, and the adjusted R-square was 0.31. A summary of the overall regression results for Pushmataha County appears in Table-5.

Misspecification Tests

Tests were conducted for heteroskedastic and normally distributed residuals, as well as collinearity and influential observations. The test results for McCurtain County indicated the presence of heteroskedasticity, and thus the estimated generalized least squares procedure was used for the McCurtain County data. For Pushmataha County, the results did not indicate the presence of heteroskedasticity. The test results to evaluate whether the residuals are normally distributed, did not indicate the presence on non-normal residuals. To methods used to detect multicollinearity did indicate the presence of multicollinearity among some of the variables in the full data set. Due to multicollinearity *TranCost* and *PopGro* were dropped from the model. For reasons other than collinearity, the variable *DistNat* was dropped. This measurement used most likely was not capturing the price influence of natural resource and recreational areas. Furthermore, the variable had little explanatory power. A better alternative measure might be the percentage of land area within a certain radius of the forestland parcel classified as a natural resource attraction, such as the Rec_i variable in Nivens et al. To detect influential observations, first an informal analysis was conducted by examining each of the data series and their summary statistics. Observations having extremely large and small values were inspected to determine whether there were any errors, no errors were noted. Formal testing methods did indicate the presence of influential observations. However, no observations were dropped since there was no known information that would justify their removal.

Summary and Conclusions

The objective of this study was to examine the sales of predominately forested land in southeastern Oklahoma in order to better understand and quantify the influences of physical and spatial characteristics on sales prices. This study has provided insight into factors affecting forestland prices and the purchasing behavior of forestland owners.

The final model consisted of a series of explanatory variables describing the size of the forestland parcel, distance to the nearest city having a population of 2000 or more, distance to the nearest major roadway, expected timber productivity, a binary variable indicating whether the parcel fronts on a road of any type, and the proportion of the parcel having open land. The results for McCurtain County indicated that four of the six coefficients were significant: parcel size, distance to a major roadway, expected timber productivity, and the proportion of open space in the parcel. Of the statistically significant variables with the expected algebraic sign, the variable having the greatest influence on price was *DistHwy*. It was significant at the 1% level and explained 15% of the price variation. The results for Pushmataha County indicated that three of the six coefficients were significant: distance to a major roadway, expected timber productivity, and the binary variable indicating whether the parcel fronts on a road. Of the statistically significant variables with the expected algebraic sign, the variables having the greatest influence on price were *FRONT* and *DistHwy*. *FRONT* was significant at the 2% level and explained 65% of the price variation, and *DistHwy* was significant at the 3% level and explained 16% of the price variation. These results are similar to other studies, such as Turner, Newton, and Dennis, in that the presence of roadway access has the greatest percentage effect on the sales price of forestlands and that urban effects (distance to city) were insignificant.

This study was limited by the availability of data. Subsequent studies should involve a time series of data and a larger number of observations. Furthermore due to limited availability of data and resources, some potentially valuable variables were not included in this study. These may include buyer and seller characteristics and relationships, seasonality effects, topography, and the presence of site specific amenities such as ponds, streams, and scenic views. The addition of data on such variables would greatly enhance our knowledge about the factors affecting forestland prices and the behavior of forestland owners.

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Table 1: Description of Data for the Hedonic Price Model

Variable	Description	Expected effect on price	Data source(s)
PRICE	Parcel sale price per acre	N/A	Kletke and Lewis (2002)
ACRES	Size of the parcel in acres	-	Kletke and Lewis (2002)
OPEN	Percentage of parcel not forested (open land)	-	Kletke and Lewis (2002)
TmProd	Expected annual per acre timber production on timber soils (ft^3)	+	Kletke and Lewis (2002)
FRONT	Dummy variable whether parcel fronts on a road	+	Wood and Finchum (2003)
DistHwy	The linear distance to the nearest major roadway or highway (miles)	-	Wood and Finchum (2003)
DistCity	Distance in road miles to the nearest city with a population > 2,000	-	Wood and Finchum (2003)
PopGro	Population growth of the nearest city with population > 2,000	+	US Census 1990 and 2000
TranCost	The annualized cost per acre to deliver timber to market	-	Multiple
DistNat	Distance in road miles to the nearest natural resource attraction	-	Wood and Finchum (2003)
ln*Price*	Log of *PRICE*	N/A	Kletke and Lewis (2002)
ln*Acres*	Log of *Acres*	-	Kletke and Lewis (2002)

Table 2: Summary Statistics of the Variables for the Hedonic Forestland Price Model (McCurtain County)

Variable	Unit	Mean	Minimum	Maximum	Standard Deviation	Number of Observations
ln*Price*	$	6.34	4.18	9.14	1.0745	45
PRICE	$	1,082.59	65.58	9,329.65	1,708.80	45
ln*Acres*	acres	3.73	1.61	5.08	0.7962	45
ACRES	acres	55.11	5.00	160.00	40.0673	45
DistCity	miles	17.88	1.93	44.47	10.4819	45
DistHwy	miles	3.55	0.20	8.40	2.2390	45
TmProd	ft^3/acre	114.65	67.00	255.00	44.9682	45
FRONT	proportion	0.73	0.00	1.00	0.4472	45
OPEN	%	6.57	0.00	62.96	17.2647	45

Table 3: Summary Statistics of the Variables for the Hedonic Forestland Price Model (Pushmataha County)

Variable	Unit	Mean	Minimum	Maximum	Standard Deviation	Number of Observations
L*Price*	$	5.78	4.45	7.13	0.6552	36
PRICE	$	400.08	85.69	1,250.00	289.4684	36
ln*Acres*	acres	4.08	2.46	5.56	0.8076	36
ACRES	acres	78.42	11.67	260.00	56.6876	36
DistCity	miles	23.21	3.19	42.99	12.0636	36
DistHwy	miles	1.76	0.04	4.96	1.2990	36
TmProd	ft^3/acre	72.95	34.00	255.00	40.1575	36
FRONT	proportion	0.50	0.00	1.00	0.5071	36
OPEN	%	9.53	0.00	75.00	21.3410	36

Table 4: Regression Results for the Hedonic Forestland Pricing Model (McCurtain County)

Independent Variable	Coefficient	Standard Deviation	T-value	Prob > |t|	Percentage Effect[1]	Marginal Implicit Price[2]
ln*Acres*	-0.4306	0.1894	-2.27	0.0287	-0.78	-4.79
DistCity	-0.0213	0.0142	-1.51	0.1403	-2.11	-12.98
DistHwy	-0.1574	0.0582	-2.70	0.0103	-14.57	-89.57
TmProd	-0.0027	0.0014	-2.02	0.0505	-0.27	-1.67
FRONT	-0.2687	0.3140	-0.86	0.3976	-23.56	-144.85
OPEN	-0.0122	0.0065	-1.88	0.0678	-1.21	-7.46
Intercept	9.5579	0.8567	11.16	0.0001		
R-squared	0.5403					
Adjusted R-squared	0.4678					
F-statistic	7.4500					
Number of observations:	45					
Predicted price ($) per acre:	614.85	(Based on Mean Values)				
Mean parcel size (acres):	55.11					

[1] For B_1, $(e^{B1/size}-1)*100$ provides the percentage change in PRICE for a unit change in ACRES.
For B_i, where i>1, $(e^{Bi} - 1)*100$ provides the percentage change in PRICE for a unit change in any single X_i.

[2] The marginal implicit price is the estimated percentage change times the predicted price per acre, and is equivalent to the partial derivative.

Table 5: Regression Results for the Hedonic Forestland Pricing Model (Pushmataha County)

Independent Variable	Coefficient	Standard Deviation	T-value	Prob > |t|	Percentage Effect[1]	Marginal Implicit Price[2]
ln*Acres*	0.1158	0.1239	0.93	0.3576	0.15	0.48
DistCity	-0.0053	0.0110	-0.48	0.6338	-0.53	-1.71
DistHwy	-0.1756	0.0787	-2.23	0.0334	-16.11	-52.07
TmProd	0.0044	0.0025	1.78	0.0856	0.44	1.42
FRONT	0.5006	0.1967	2.54	0.0165	64.96	210.01
OPEN	-0.0009	0.0059	-0.14	0.8874	-0.08	-0.27
Intercept	5.1759	0.7143	7.25	0.0001		
R-squared	0.4319					
Adjusted R-squared	0.3144					
F-statistic	3.6700					
Number of observations:	36					
Predicted price ($) per acre:	323.28	(Based on Mean Values)				
Mean parcel size (acres):	78.42					

[1] For B_1, $(e^{B1/size}-1)*100$ provides the percentage change in PRICE for a unit change in ACRES.
For B_i, where i>1, $(e^{Bi} - 1)*100$ provides the percentage change in PRICE for a unit change in any single X_i.

[2] The marginal implicit price is the estimated percentage change times the predicted price per acre, and is equivalent to the partial derivative.