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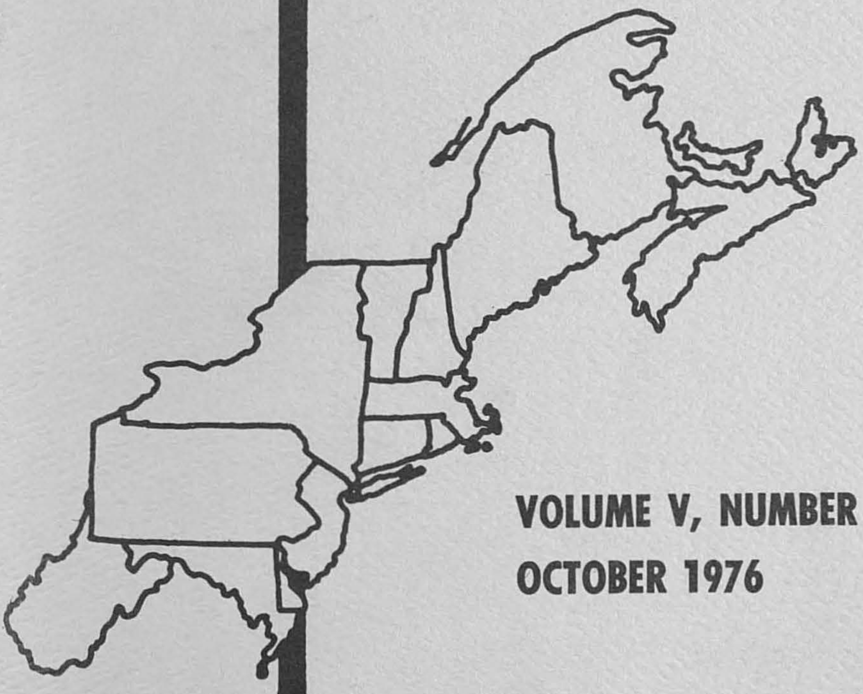

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THE IMPORTANCE OF LOCATIONAL CHARACTERISTICS IN DETERMINING RURAL LAND PRICES*

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INTRODUCTION

In recent years, the topic of land prices has received considerable attention in the literature [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18]. Part of the interest stems from the importance of land as a factor of production in agriculture. Land prices have a direct influence on the ability of young farmers to operate and expand their operations. Thus, the interest in land prices by farmers, bankers and input suppliers is easily understood.

The interest of local government leaders in land prices has received much less attention. Land prices are also a key determinant of the "profitability" of their operation. The price of real estate is related to the property tax revenues received by local governments through the property's assessed value. The following algebraic formula illustrates this relationship: Tax Levy (amount of revenue to be raised) = Tax Rate X Total Assessed Value (tax base).[1/]

The tax levy or revenue needed is determined by units of local governments - not by assessors as is often the popular myth. Every agency and public department from the road commission to the local dog catcher specifies his next year's financial needs.

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*The research upon which this article is based was performed while the authors were Graduate Research Assistant and Assistant Professor, respectively, Department of Agricultural Economics, Cornell University.

[1/]The picture is complicated considerably when one incorporates equalization rates in trying to calculate an individual parcel's taxes. An excellent discussion of the various criteria involved in New York property taxes and assessment is by Lutz [14, 15].

In turn, representatives of the governing boards of towns, counties, villages and school districts establish their total budget and determine the amount of money to be raised through the property tax. Since revenues from property taxes are determined as a residual, local officials first estimate income from other sources such as state and federal aid.

The second variable, property tax rate, is also determined as a residual. That is, local governments assess the value of property subject to the tax, estimate the revenue needed from property taxes, and then calculate the tax rate required to obtain the needed revenue. This relationship is:

$$(1)\ \text{Tax Rate} = \frac{\text{Needed Revenue (Tax Levy)}}{\text{Total Assessed Value (Tax Base)}}$$

The third (and most important factor for this study) is the assessed value. Essentially the assessor is concerned with dividing among individual property owners the total amounts of taxes which are levied by other authorities. They do this by placing a value upon each property in their assessing district. Although the Real Property Tax Law of New York requires that property be assessed at its full market value, most properties have historically been assessed at less than full value. One reason is simply that many properties have not changed hands on the open market for many years and, consequently there exists no current direct measure of real value. Nonetheless, assessors of a locality may change the general level of assessments in order to bring them more nearly into line with actual levels of property value.

In the past, assessors have concentrated on physical characteristics of the property in determining assessed values. The purpose of this paper is to suggest a model for estimating rural land values which includes both physical and locational characteristics of the property. While such techniques have been used successfully in urban areas [8, 11, 13, 19], successful models for rural property have been rare. Therefore, this study is intended to improve rural assessment practices and provide information on recent levels of property prices and important factors thereof.

METHODOLOGY

To obtain data for this study, field enumerators identified over 5,600 valid transfers of real property in eight counties in the Adirondack Region of New York State.[2/] The study was limited to property

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[2/] These data were collected during the summer of 1973 for the period 1968-73. The data regarding transfers during 1973 are, thus, incomplete.

types classified by local assessors on the New York State Real Property Transfer Report as operating farms, rural residence or abandoned farm, rural land vacant, seasonal resi ence, or forestland. From this population, a 40 percent stratified random sample of 2,255 property owners was drawn. These property owners were surveyed using a mail questionnaire. A total of 1,442 questionnaires were completed in sufficient detail to be usable in the anlaysis.[3/] Rural land price data were available from two sources. First, revenue stamps were used to estimate an unconfirmed real estate price for each property transfer.[4/] A second value was provided by the survey respondents. Respondents were asked to provide the actual transfer price or specify a price per acre for the transfer. Respondents were also asked to estimate a building value, if any, at the time of purchase.

One could surmise that the unconfirmed price calculated from the revenue stamp and the price provided by the respondent would be approximately the same. Yet, the unconfirmed price calculated from the revenue stamps was consistently about 15 percent below the price stated by the land buyer. Because the price data supplied by the buyer appeared more in line with other measures of land prices and price appreciation, the price data specified by the landowners was utilized in this study. In a sense, prices provided by the respondents were confirmed prices.

The generalized model hypothesized to explain variations in land price is:

$$(2) \quad TP_j = f(P_{ij}, \ldots, P_{nj}, L_{kj}, \ldots, L_{mj})$$

where

TP_j = transfer price, parcel j

P_{ij} = the i^{th} physical characteristic associated with parcel j

L_{kj} = the k^{th} locational characteristic associated with parcel j

The analysis was divided into five sections conforming to the property classification previously explained. Separate multiple regression equations were fitted for seasonal residence, operating farm, rural residence or abandoned farm, rural land vacant, and forestland [4]. No attempt was made to develop a single multiple regression equation for all classes of properties combined.

3/Details of the sampling techniques are reported by Craig [4].

4/Revenue stamps represent an Internal Revenue Service tax paid to the state of $1.10 per thousand dollars of consideration. The stamps are required to be placed on the deed at the time of transfer. The New York State Board of Equalization and Assessment calculates the total unconfirmed price by dividing the value of the revenue stamps by 1.1, multiplying by 1,000, and subtracting a constant $120 from the product.

RESULTS

Seasonal Residence

Seasonal residence is the most popular property type of all recent landowners. In many respects it symbolizes the "good life." A quaint cottage nestled within the Adirondack woodlands and mountains that overlooks a crystal lake is many people's dream seasonal home. Those who purchase a seasonal residence do so primarily for the tranquility and unique enjoyment it provides.

The model formulated for estimating the total transfer price of a seasonal residence is:

$$(3)\quad TP_j = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9)$$

where

TP_j = total transfer price for both land and buildings

X_1 = total acres in transfer

X_2 = month of transfer (trend variable)

X_3 = distance in miles to the nearest incorporated village

X_4 = number of front feet on a paved road

X_5 = number of front feet on a lake

X_6 = square footage in seasonal residence

X_7 = number of rooms in seasonal residence

X_8 = dummy variable indicating if property had a lakeview (0 = No, 1 = Yes)

X_9 = dummy variable indicating if property had a mountain view (0 = No, 1 = Yes)

The average transaction price of a seasonal residence was $15,500. The largest reported was well over $100,000. Of the 533 transfers reported, the median sized parcel was slightly more than twelve acres. In general, a seasonal residence was 7.76 miles away from the nearest incorporated village. In terms of front footage on a paved road, the typical was 275 feet, whereas the total range went from zero to almost ten thousand feet. Frontage on a lake averaged 152 front feet with a minimum being zero and the maximum over 1,000 front feett. As ninety-two percent of all seasonal residences had a liveable residence on the property, it also seems appropriate to include building value proximates. The average number of square feet of those reporting was 1,026; whereas the mean number of rooms was about five. Sixty-four percent of the respondents claimed that their property had a lakeview while over three-quarters of them enjoyed a mountainside view.

Results of the model are exhibited in equation (4):

$$(4)\ TP_j = -31{,}301 + \underset{(2.83)}{691.98\ \overset{*}{X}_1} + \underset{(2.46)}{296.91\ \overset{*}{X}_2} - \underset{(-1.09)}{309.31\ X_3} + \underset{(.30)}{6.37\ X_4} +$$

$$\underset{(1.99)}{47.43\ \overset{*}{X}_5} + \underset{(.46)}{0.76\ X_6} + \underset{(3.34)}{4199.87\ \overset{*}{X}_7} + \underset{(.60)}{8345.15\ X_8} + \underset{(1.69)}{8376.63\ \overset{*}{X}_9}$$

The coefficient of determination is $R^2 = .59$. That is, about three-fifths of the total price variation is explained by the above equation. The t-values are reported in parentheses. The asterisk above certain X_i's denotes the regression coefficient is significant at the 95 percent level. Significant variables include (X_1) total acres in transfer, (X_2) month property was exchanged, (X_5) number of front feet on a lake, (X_7) number of rooms in the seasonal home and (X_9) whether or not the property had a mountainview.

The explained variation achieved from those model approaches the best results of other researchers. There are a variety of variables which conform to the previous hypothesis of property characteristics as well as locational traits being important in the rural land market. Property location seems to be of particular importance in this land use model since the variables front feet on a lake and mountainview were statistically significant.

<u>Operating Farms</u>

Commercial agriculture is of secondary importance within the Adirondack Park. In fact, of the six-million acres within the Park boundary, less than 200,000 acres is suited for food and fiber products. Farming, however, is of much greater importance on the fringes outside the region as one escapes the Adirondack Mountain massif.

Other research studies have looked primarily at physical factors to explain farmland price variation. The regression model formulated to explain variations in operating farm's transaction price includes both physical and locational characteristics:

$$(5)\ TP_j = (X_1, X_2, X_3, X_4, X_5)$$

TP_j = total transaction price of land and buildings

X_1 = acres of tillable cropland

X_2 = month of purchase (trend-line variable)

X_3 = distance in miles to the nearest incorporated village

X_4 = prevalent drainage category of property, well drained to severe drainage problems

X_5 = dummy variable indicating whether or not the property contained a liveable residence

The average transaction price in operating farms was $12,764. Of the 43 tracts of farmland on which data were collected, all but one had acres of tillable cropland with the largest tract being 190 acres. The typical number of acres classified as tillable cropland was fifty-one. The second explanatory variable was a trend variable. The normal distance in miles to the nearest incorporated village was slightly over 7.5 miles with the range from one to twenty miles. The most prevalent drainage category is the fourth independent variable used. It was hypothesized that a physical soil factor may be especially important in the price paid for a farm. Well drained soil received four points, moderately well drained three, poorly drained two points, and severe drainage problems one point. Finally a dummy variable was used to represent whether or not the land transaction included a liveable residence. Of the 43 purchases, only sixty-five percent included a liveable residence.

Positive signs were expected for each variable (e.g. the more acres of tillable cropland, the higher transaction price), except distance to the nearest municipality. A negative sign would be expected there to reflect higher transaction prices closer to villages or hamlets.

The results of the regression model for operating farms are as follows:

$$(6)\quad TP_j = -12{,}856 + \underset{(3.56)}{174.33\,\overset{*}{X}_1} + \underset{(1.65)}{185.25\,\overset{*}{X}_2} - \underset{(-.32)}{109.28\,X_3} +$$

$$\underset{(1.41)}{2{,}174.11\,X_4} + \underset{(1.99)}{6{,}626.85\,\overset{*}{X}_5}$$

The value of the coefficient of determination, $R^2 = .56$, is the total amount of variation in TP_j (transaction price) that is explained by fitting the regression.[5/] In equation (6) the values in

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[5/] When R^2 is adjusted for degrees of freedom it becomes .48. This adjustment is due to the few observations on operating farms. The other coefficients of determination did not decline when adjusted.

parentheses are t-values. Three variables, (X_1) acres of tillable cropland, (X_2) date of transfer, and (X_5) liveable residence, are statistically significant at the 95 percent level. The regression coefficients may be interpreted in the usual manner. That is, for every additional acre of tillable cropland, the transaction price is increased by $174.33. Likewise, for every mile the farm is away from the nearest incorporated village, the transaction price declines by $109.28. The sign of each regressor is logical. The negative sign on distance to nearest incorporated village illustrates the phenonmenon of closer proximity to a municipality, resulting in higher value of agricultural land and buildings.

Rural Residence or Abandoned Farms

The rural residence or abandoned farm property type appears to be a catch-all category. The probability of some misclassifications appears high due to the ambiguous title. This land use category may include rural homes which are used by the owners on a year-round basis as well as marginal farms or farmsteads that were abandoned due to poor productivity.

Of the property types considered, resident landowners purchased this one most frequently. When asked what the intended land use of the property was, about sixty percent of the landowners planned to use or build a permanent home. Another 10 percent specified that private recreation was the intent. Only five percent of the respondents were going to operate it as a farm. Speculative investment, harvest timber, and others round out the remaining buyer's intentions.

In formulating a model, it was hypothesized that locational items and property traits would be useful in explaining price variation. The proposed regression model is:

$$(7) \quad TP_j = (X_1, X_2, X_3, X_4, X_5, X_6)$$

where

TP_j = total transaction price of land and buildings

X_1 = distance in miles to the nearest town or county road

X_2 = acres of residence, yard, and other buildings

X_3 = month of purchase (trend-line)

X_4 = number of rooms in liveable residence

X_5 = distance in miles to the nearest incorporated village

X_6 = dummy variable indicating if property had a lakeview (0 = No, 1 = Yes)

Of the 240 transactions in this property type, the average transaction price was $14,933. The range was from a $100 low to a $185,000 high. Although the typical distance to the nearest town or county road was two-thirds of a mile, the range of values fluctuated from zero to thirty miles. The average size of residence, yard, and buildings was 1.6 acres. The spectrum of number of rooms in the residence spread from two to thirty with the average being seven rooms. Finally, the average distance to the nearest incorporated village was 7.2 miles. Since many landowners mentioned isolation and scenic view as important factors in their decision to buy, it was thought that whether or not the property enjoyed a lakeview would be important. Only 25 percent of all respondents indicated that their property had a lakeview.

The signs expected for the coefficient denoting distance to nearest road and distance to the nearest incorporated village are negative. People searching for isolation find parcels close to incorporated villages and roads less attractive. The remaining variables should have positive signs as there should be a direct relationship between them and the transaction price.

The results of this regression are shown in equation (8):

$$(8) \quad TP_j = -3,361 - \underset{(-1.73)}{2,271.97} \overset{*}{X}_1 + \underset{(3.38)}{5,140.03} \overset{*}{X}_2 + \underset{(2.26)}{287.31} \overset{*}{X}_3 +$$

$$\underset{(1.10)}{683.01} X_4 - \underset{(-1.80)}{607.41} \overset{*}{X}_5 + \underset{(3.02)}{14,736.96} \overset{*}{X}_6$$

The amount of total price variation explained by this model is $R^2 = .22$. Five variables are statistically significant at the 95 percent level. They include (X_1) distance to the nearest town or county road, (X_2) acreage of residence and yard, (X_3) month of purchase, (X_5) distance to the nearest incorporated village, and (X_6) lakeview of property. The Durbin-Watson statistic (1.56) specified that autocorrelation may or may not exist as it is the inconclusive range.

Because the coefficient of determination (R^2) was unsatisfactory, other variables were subsequently substituted in the model for measures of building size (square feet, number of bedrooms). Unfortunately, explained variation could not be improved. Even when two buyer characteristics, family income and owner residency, were added, the model explained only 29 percent of the price variation. Although this model is unsatisfactory for price predictive purposes, it does indicate some statistically important variables.

It is believed that the number of misclassifications included in this land use by assessors prevented a successful predictive model from being estimated. Across the region, one assessor may classify a property parcel into a certain category while another may not. As most Adirondack towns have one assessor, one would expect consistency within each minor civil division. However, between localities there is less consistency.

Rural Land Vacant

This property was bought extensively by resident and nonresident landowners, either for recreational opportunities or for the purpose of building a leisure home. Nonresidents were especially interested in this property type as well as the seasonal residence and forestland categories. The hypothesized model, which includes locational characteristics and physical factors, is:

$$(9) \quad TP_j = f(X_1, X_2, X_3, X_4, X_5, X_6)$$

where

TP_j = total transaction price of land

X_1 = total acres involved in purchase

X_2 = month of purchase (trend-line)

X_3 = distance in miles to the nearest incorporated village

X_4 = amount of frontage on a paved road

X_5 = dummy variable indicating if the property had a lakeview (0 = No, 1 = Yes)

X_6 = dummy variable indicating if the property had a mountainview (0 = No, 1 = Yes)

Descriptive information on the rural land vacant model includes an average transfer price of the land of $8,338. The 265 respondents had an average of 38 acres in this type of property. The average distance to the nearest incorporated village was seven miles. Fifty-six percent of the respondent's property contained frontage on a paved road or highway with about 897 front feet being the normal size. While 63 percent of the properties enjoyed a mountainview, only 32 percent of the properties has a lakeview.

The results of the regression analysis are depicted in equation (10):

$$(10) \quad TP_j = \underset{}{8,713} + \underset{(3.24)}{137.54\ \overset{*}{X}_1} - \underset{(-.75)}{84.75\ X_2} - \underset{(-2.01)}{552.74\ \overset{*}{X}_3} - \underset{(-.92)}{1.81\ X_4} +$$

$$\underset{(1.24)}{5,971.99\ X_5} + \underset{(1.68)}{6,625.87\ \overset{*}{X}_6}$$

An R^2 = .50 indicates that about one-half of the price variation is explained by the preceding model. Variables statistically significant at the 95 percent level were (X_1) total acreage involved in the real property transfer, (X_3) distance to the nearest incorporated village and (X_6) whether or not the property had a mountainview. All of the signs appear logical with the possible exception of frontage on a paved road. Since an overwhelming number of respondents stated that "isolation and peace and quiet" were important in their decision-making process, the negative sign for front feet on a paved road is reasonable.

Thus, the hypothesized model of supply factors shows that both physical and locational characteristics are important in explaining rural land vacant price variation. Two of the three significant variables are locational in nature. Distance to the nearest incorporated village as well as property having a mountainview are extremely useful locational variables which add to the explanatory power of the model.

Forestland

Forestland resembles the other rural properties by way of its recreation potential. Camping, hiking and ski touring are among the many activities enjoyed by the property owners. Very little commercial timber harvesting is apparently planned on this type of property as only about five percent of the property owners expressed any such interest. A model hypothesized to explain price variations in forestland is:

(11) $TP_j = f(X_1, X_2, X_3, X_4, X_5, X_6)$

where

TP_j = total transaction price of land

X_1 = total acres purchased

X_2 = front feet on a paved road

X_3 = month of purchase (trend-line variable)

X_4 = distance in miles to the nearest incorporated village

X_5 = if property has a lakeview (0 = No, 1 = Yes)

X_6 = if property has a mountainview (0 = No, 1 = Yes)

Of the 330 respondents in the forestland property category, the average transaction price was $7,643. The size of transfer ranged from a quarter of an acre to almost 5,000 acres, averaging 81 acres. Only forty-seven percent of all properties surveyed abutted a paved road or highway. Those properties which did have paved road frontage contained an average of 1,068 front feet. Although some properties were fifty miles from the nearest incorporated village, the usual distance was 8.22 miles. Finally, only 35 percent of the properties had a lakeview, whereas 67.7 percent had a mountainview.

The results of the regression model on forestland are shown in equation (12):

$$(12)\quad TP_j = -1,270 + \underset{(3.84)}{32.37\,\overset{*}{X}_1} - \underset{(-.01)}{.02\,X_2} + \underset{(2.21)}{127.97\,\overset{*}{X}_3} - \underset{(-1.04)}{119.42\,X_4} +$$

$$\underset{(4.41)}{10,236.74\,\overset{*}{X}_5} + \underset{(.23)}{1,531.69\,X_6}$$

Three variables were found to be statistically significant at the 95 percent level: (X_1) total acres purchased, (X_3) month of purchase, and (X_5) whether or not the property had a lakeview. The amount of explained variation is $R^2 = .44$. The amount of front feet on a paved road and total acres purchased are positively correlated. This multicollinearity is thought to explain the negative sign on the front feet variable. The other signs were as expected.

CONCLUSIONS

This study emphasizes the importance of including both physical and locational characteristics in models designed to explain rural land price variation or predict rural land prices. The existence of a lakeview or mountainview, distance from a paved road and the distance to the nearest incorporated village are locational characteristics found to be important determinants of rural land prices in this study. As assessors expand their systematic efforts to more accurately and efficiently assess rural land, additional efforts to quantify and measure locational characteristics appears warranted.

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