DETERMINANTS OF RURAL PROPERTY VALUES IN GEORGIA

H. Evan Drummond and Fred C. White

Recent patterns of rural land use in Georgia have stressed urban aggrandizement and the transformation of a significant portion of the available rural land into forests. The area covered by commercial forests in Georgia has increased 21 percent over the past quarter century to the point where two out of every three acres in Georgia are presently growing tree crops [1]. During the 1958-68 decade the proportion of land in farms in Georgia fell from 31.3 percent to 27.0 percent, representing a withdrawal of approximately 1.6 million acres from farm use.[1] As a partial consequence of this shift in rural land use patterns, the price of farm land over the past ten years has increased more rapidly in Georgia than in any other state but one.[2]

Recent structural changes in rural land markets make it imperative that tax assessors and policy makers have a clear understanding of the factors that determine rural land prices. Farm land tax assessment techniques should not ignore any factors found to be important in the determination of farm land prices. At the policy level it is important that the interrelationships between the various component markets of the rural land market be explicit. Full knowledge of these structural interrelationships will encourage the formulation of equitable and effective policies that affect rural land use.

The objective of this study is to specify the structure of an econometric model of the rural land market in Georgia. Because of the importance of forests in Georgia, the rural land market will be disaggregated into the farm land market and the forest land market. Simultaneous equations will emphasize the structural interdependence of these two markets. Cross-sectional data from 47 Georgia counties will be used to estimate the structural parameters of the model. Those factors that are related to inter-county differences in farm and forest land values will be identified in a general equilibrium framework.

RELEVANT THEORY

As with any other input, the price of rural land is determined by the interaction of the supply of and demand for land in each market; and the attainment of an equilibrium among the various markets for rural land. Therefore, a completely specified economic model of the rural land market is needed in order to accurately depict the structure of the complete market. Theory that is relevant to the rural land market is presented in the following sections.

Demand for Rural Land

The demand for rural land as a productive resource is equal to the present value of net revenue streams over the planning horizon. Regional differences in farm land quality, market proximity, climate, etc., cause differences in the net revenue that is expected from that land. Ceteris paribus, rural land values in areas with highly productive land capable of generating high net returns are expected to be relatively high. Therefore, a positive correlation is hypothesized between the net revenue generated by production on forest or farm land and the price of

H. Evan Drummond and Fred C. White are assistant professors of agricultural economics at the University of Georgia, Athens.

[1] A similar trend seems to exist at the national level. In 1950 the total acreage of farm land in the U.S. reached its historic maximum. By 1964, the land used in farms had fallen by 161 million acres. During that same period, land in forests increased by 123 million acres and land in cities, highways, etc. increased by 34 million acres [6]. Much of the increase in commercial forest acreage has occurred as farm woodlands have been transformed into commercial forests. For the purposes of this paper, farm land is defined net of farm woodland.

[2] The term "land price" and "land value" are used interchangeably in this paper.

that land. Moreover, if one area has either lower input prices (relative to those of products) or higher factor productivity (resulting from adoption of improved technology), its land prices should be greater as expected higher net revenues are capitalized. Likewise, real estate taxes and other elements of production costs should be capitalized (in a negative sense) into land values.

Expectations of changes in future land use patterns should also be capitalized into the current market value of rural land [4]. That rural land which is closest to urban areas should command a higher price than that which is far away. This price differential is equal to the capitalized value of expectations that the rural land may eventually be converted into even higher priced urban land. Therefore, it is hypothesized that the price of rural land is positively related to its proximity to urban areas. This hypothesis applies equally to farm land and forest land, the effect being exogenous in either case.

Supply of Rural Land

At any point in time, the quantity of rural land available is essentially fixed. However, the distribution of that fixed quantity of land between alternative uses is not predetermined. The theory indicates that when a fixed quantity of input is used in more than one production process, an efficient allocation of that input is achieved if it is distributed in such a manner as to equalize the value of the marginal product (VMP) of that input in each of its uses. This theory is relevant for explaining inter-county differences in farm land and forest land prices in Georgia.

Given that the rural land market should operate in such a manner as to equate the VMP of forest land to the VMP of farm land, it follows that any factor that affects the VMP of either will tend to affect the market price of both. Therefore, inter-county land quality differences and other factors that affect the demand for either farm land or forest land should tend to affect the current market price of land in both markets.

Consequently, a positive correlation between cross-sectional farm and forest land prices is hypothesized. Moreover, the theory suggests that changes in either market must affect the price of land in the other as well. Therefore, it is not valid to consider the determination of land prices in either market in isolation. Since the farm land and forest land markets are interdependent, farm land prices cannot be considered exogenous to the determination of forest land prices and vice versa. Failure to consider the two as being endogenous would obscure their structural interdependence.

PREVIOUS STUDIES

Earlier studies have substantiated the expected relationship between those factors that affect the demand for farm land and the market price of farm land. Using national time series data and a recursive model, Reynolds and Timmons estimated that an expected $1 increase in net farm income would have increased the price of farm land by $2.25 per acre over the period 1956-65 [2]. A similar study by Tweeten and Nelson emphasized the importance of government transfer payments in the determination of expected net returns. As the theory would suggest, they found that transfer payments are capitalized into land values [5]. Both models included variables to account for the impact of non-farm land uses on the farm land market.

Schuh and Scharlach's study of the land market in Indiana used cross-sectional data and a single equation model to demonstrate that expected net farm income is capitalized into land values [4]. They substituted a land quality index as a proxy for expected net farm revenue and found it to be a major factor in explaining inter-county farm land price differences. In addition, variables were included to account for the effect of proximity to Chicago and other metropolitan areas on farm land prices. They found that "the distance from a major metropolitan area such as Chicago is an important determinant of cross-sectional variations in land values" [4].

Cross-sectional studies in Florida further support the hypothesis that net farm income is an important determinant of farm land prices. In their study, Reynolds and Tseng also found non-farm population density and the proportion of total farm land that was in fruits, nuts and grapes to be significantly related to inter-county differences in Florida farm land values [3].

The most recent study of the land market in Georgia is that of Wise, Dover and Miller [7]. They developed a single equation model to estimate the price of farm land parcels recently sold on the land market. Their results reiterated the importance of expected net farm income and proximity to urban areas in explaining cross-sectional differences in Georgia farm land prices. In addition to these variables, the number of seedlings and saplings on the property was also found to be important in determining the market value of farm land. This result provides limited support for the hypothesis that the farm land and forest land markets in Georgia are structurally interrelated.

THE MODEL

Previous econometric studies of the market for farm land have developed single equation models in which the forest land market was either neglected or considered to be exogenous to the system. However, for research designed to emphasize the structure of the rural land market this approach is not well advised whenever the farm land market is not exogenous to the forest land market, and vice versa. In order to stress the interdependence of these two land markets in Georgia, a simultaneous equation model is suggested in which the price of farm land and the price of forest land are endogenous.

The simultaneous consideration of these two segments of the rural land market should enhance our insight into the structure of inter-county land price differences and improve our understanding of the operation of the rural land market in Georgia. For both markets the exogenous variables include measures of urban proximity and factors that affect the expected net revenue from production on each type of land. The two equation model which will be estimated by two-stage least squares is specified as follows:

$$VFLB = f_1 (VFST, VB, FY, CF, PCY, AT, MI)$$
$$VFST = f_2 (VFLB, GS, PS, TX, PCY, AT, MI)$$

where:

- VFLB = value of farm land and buildings per acre,
- VFST= value of forest land per acre,
- VB = value of buildings per acre of farm land,
- FY = net farm income per acre of farm land,
- CF = importance of commercial farming; CF = 1 if 90 percent or more of farm land is in commercial farms, otherwise CF = 0,
- GS = volume of growing stock per acre of forest land,
- PS = price of sawlogs
- TX = tax rate of real estate (corrected for sales-assessment ratios),
- PCY = average per capita income,
- AT = a dummy variable for the proximity of the county to Atlanta; AT = 1 if the county is within a one hour drive of Atlanta; otherwise AT = 0, and
- MI = number of miles from the county seat to Atlanta for those counties within a one hour drive of Atlanta.

The variables VFLB and VFST are endogenous to the system. FY, CF, GS, PS, and TX are included in the model to reflect the demand for rural land as a productive resource. The effect of urban proximity on cross-sectional rural land prices is accounted for by the MI, PCY, and AT variables. The inclusion of the VB variable will be discussed in a later section of this paper. The cross-sectional data used in the estimation of the model's parameters were taken from 47 randomly selected counties of Georgia, representing all geographic regions of the state. Each county constituted an observation. The data selected are for 1969.

DISCUSSION OF THE STATISTICAL RESULTS

The estimated coefficients, standard errors, and statistical significance levels obtained by two-stage least squares regression procedures are presented in Table 1. The values of the R^2 obtained are satisfactory and all signs of the estimated parameters are those predicted by the theory.

The coefficients for VFLB and VFST indicate that farm and forest land prices are responsive with respect to changes in prices of one another. That is, an increase in the price of either will tend to drive the price of the other higher. The specification of farm land values and forest land values as being endogenous appears to be justified. The highly significant statistical results obtained in the estimation of the above model affirm the importance of a simultaneous equation approach in understanding the farm land market. In effect, previous studies considered the value of farm land to be demand determined - as the demand for farm land changed, the price for that land also changed. Although the results of this study reaffirm this hypothesis, they further suggest that inter-county differences in farm land prices are also influenced by the demand for forest land. In other words, the structure of the rural land market in Georgia is characterized by the interaction of the demands for forest land and farm land. Each of these demands emanates from the productivity of the land and the proximity of the land to urban areas.

The implications of these results for Georgia policy makers and property tax assessors are straightforward. Current assessment techniques estimate the market value of farm land based on the expected stream of net returns from production on that land and the expected gains from urban

Table 1. SUMMARY OF STATISTICAL RESULTS FROM SIMULTANEOUS EQUATION MODEL EXPLAINING FARM LAND AND FOREST LAND VALUES IN GEORGIA, 1969.

Variables by type	Units	Equation Explaining Farm Land Values: Coefficient	Standard Error	Equation Explaining Forest Land Values: Coefficient	Standard Error
Constant		16.870	30.100	-17.460	61.800
Endogenous Variables					
Value of farm land and buildings[a]	$ per acre of farm land			0.195**	0.064
Value of forest land[b]	$ per acre of forest land	0.506*	0.248		
Exogenous Variables					
Value of buildings[b]	$ per acre of farm land	1.284**	0.108		
Net farm income[c]	$ per acre of farm land	0.807	0.509		
CF (County is predominately commercial farming)[a]		42.008**	13.710		
Volume of growing stock per acre of forest land[d]	100 cubic feet			14.902**	4.233
Price of growing stock[e]	$ per cord			1.418	1.163
Tax rate on real estate	$ per $1000 value			-2.976*	1.080
Per capita income by county[f]	$1000	41.182**	9.578		
AT (within one hour drive of greater Atlanta)		256.340	202.900	690.770**	47.930
Miles to Atlanta for those counties within one hour drive of Atlanta	miles	-4.456	3.660	-12.536**	0.947
R^2		0.963		0.972	

* Indicates significance at .05 level.
**Indicates significance at .01 level.
Data sources:
[a]U.S. Census of Agriculture, 1969.
[b]Survey of tax assessors and county agents (taken by the authors).
[c]ASCS Annual Report and U.S. Census of Agriculture, 1969.
[d]USDA Forest Service, Forest Statistics.
[e]Georgia Forestry Commission.
[f]Office of Business Economics, 1969.

proximity. The present results indicate that a third factor–the effect of the demand for forest land as measured by the value of forest land–should also be considered when assessing the value of farm land. Ceteris paribus, any increase in the demand for forest land that drives the price of that land up will also affect the price of farm land. In effect, any increase in the price of forest land will cause a redistribution of the available rural land supply among competing uses which will thereby cause the price of farm land to increase. In other words, inter-county differences in farm land prices should not be attributed to differences in farm productivity alone but to forest productivity in the region as well.

Several other results of this study warrant mention:

1. Previous cross-sectional studies based on Census data have been hampered in the measurement of land values. Census data only report farm real estate values. This measure combines the value of buildings and the value of farm land into a single variable. Consequently, inter-county differences in the ratio of building value to land value introduce undesired variation into the measurement of VFLB. In the present study, this limitation has been overcome through the inclusion of an independent variable for the value of farm buildings. The variance in farm real estate values embodied in farm buildings should be absorbed by this variable. The fact that the coefficient of the farm buildings variable is statistically significant suggests that the detrimental effects of using these Census data have been largely eliminated in the present study. As a consequence, we can assert that the inter-county variance in the Georgia Census data attributable to farm building values is different than the variance in farm land values. The results of studies using farm real estate value as a proxy variable for farm land value therefore deserve special scrutiny.
2. The results presented in Table 1 corroborate those of previous studies with regards to the relationship between net farm income and farm land values. As expected, any increase in farm income (farm marketings plus

government payments) or decrease in production expenses has the effect of increasing farm land prices. All production costs are not included in the calculation of net farm income. Therefore, the lack of statistical significance for this variable may be related to a high variance in the relative importance of omitted production expenses for different observations. It should be noted that the magnitude of the regression coefficient for net farm income is within the range expected and that no intercorrelation difficulties were observed. An effort to disaggregate the effect of the net farm income variable into net production income and government transfers was not conclusive. However, the nature of the results (not presented herein) suggests that each dollar of income is capitalized at approximately the same rate irrespective of the source of that income. Farm land values are higher in predominately commercial farming areas.

3. Those variables in the model that were designed to measure the impact of urban proximity on the price of farm land and forest land were important in both land markets. The model includes variables that measure both the impact of urban-ness within each county (per capita income) and the proximity of the county to major urban areas (miles to Atlanta and the dummy variable for proximity to Atlanta). The results leave little doubt that anticipated urban growth is presently being capitalized into both farm land and forest land values.[3]
4. The equation for forest land prices behaved very much as predicted by the theory. Volume of the growing stock per acre is highly related to the value of forest land. This variable measures the quality (i.e., yield) of forest land and the value of the existing stand of timber. As expected, the higher the quality of forest land, the greater the price of forest land. The price of sawlogs is also positively related to the price of forest land. Needless to say, any increase in the price of sawlogs will shift the value of the marginal product curve upward, causing the profit maximizing price of forest land to increase and/or the quantity of forest land used to increase. Finally, the coefficient for real estate taxes on forest land was negative and statistically significant. As expected, this indicates that taxes on forest land (an important cost factor) are being capitalized into the value of that land.

SUMMARY

Previous studies of the farm land market have supported the hypothesis that farm land values are dependent on the expected net farm revenue and the proximity of the farm land to urban areas. While sustaining this hypothesis, we posit that inter-county differences in farm land values cannot be accurately analyzed in isolation when forest land plays a significant role in the rural land market. We argue that consideration of the interrelationships between the farm land market and the forest land market should be explicit.

A system of simultaneous equations describing the relationship between the farm and forest land markets was developed. Parameter values were estimated using 1969 cross-sectional data from 47 counties of Georgia–each county being taken as an observation. Two-stage least squares estimating procedures were employed. Most coefficients were statistically significant and all were of the hypothesized sign.

The nature of the statistical results indicates that the simultaneous equation model was well specified. The expected positive relationship between the endogenous farm and forest land prices was confirmed. This implies that it is not valid to consider prices in either market as being determined in isolation. The demand for land in both markets must be considered in a general equilibrium context if we are to fully understand the structure of either.

[3] Further research might be suggested in which the demand for urban land is also considered endogenous to the system. Such a formulation seems more appropriate for temporal analyses than for the present cross-sectional study.

REFERENCES

[1] "Forest Management Shortcourse, Landowner's Manual," Forestry Department, University of Georgia, revised 1970.

[2] Reynolds, John E., and John F. Timmons, *Factors Affecting Farmland Values in the United States,* Iowa State University Res. Bull. 566, 1969.

[3] Reynolds, John E., and Ron Horn Tseng, *Factors Affecting Farmland Values Among Florida Counties,* Florida Agri. Exp. Sta. Journal Series No. 3525, n.d.

[4] Schuh, G. Edward, and Wesley C. Scharlach, *Quantitative Analysis of Some Farm and Non-Farm Determinants of Agricultural Land Values--Impact of Economic Development,* Purdue Univ. Res. Bull. No. 821, 1966.

[5] Tweeten, Luther G., and Ted R. Nelson, *Sources and Repercussions of Changing U. S. Farm Real Estate Values,* Oklahoma State Univ. Tech. Bull. T-120, 1966.

[6] United States Department of Agriculture, *Agricultural Statistics,* 1968.

[7] Wise, James O., H. Jackson Dover, and Bill R. Miller, *Factors Affecting the Value of Rural Property in North Georgia,* University of Georgia Res. Bull. No. 103, 1972.