FOREST MANAGEMENT INVESTMENTS BY SOUTHERN LANDOWNERS:
A TOBIT ANALYSIS

Donald G. Hodges

ABSTRACT

Landowners in two regions of the Southern United States were surveyed to determine what factors influenced them to invest or not invest in forest management. If they invested, the relative importance of the factors in terms of the amount invested was evaluated. In order to eliminate inconsistent results obtained from using ordinary least squares regression with a limited dependent variable, a tobit analysis was employed. Tobit also allows for estimating changes in the probability of investments in forest management and changes in the amount invested. The results for both regions were similar and revealed that investment decisions are influenced by the amount of timberland owned, the use of technical assistance from private sources, knowledge and use of financial incentives, and the formal education of the owner.

INTRODUCTION

Determining which variables significantly influence a private landowner’s decision to invest in forest management practices, such as site preparation and timber stand improvement, has been a common concern of forest economists and policy makers. Tighter Federal and state government budgets for the past decade have forced officials to examine the benefits and costs of all public programs more closely. Moreover, the wider application of econometric techniques to forestry problems has allowed researchers to test alternative analytical methods that often provide detailed evaluations of how variables influence landowner behavior.

The results of a recent study of landowner investment behavior in the Southern United States are presented in this paper. Landowners in two regions, the Southeast and Midsouth, were surveyed concerning management practices conducted on their property in the past 10 years, their socioeconomic and land characteristics, and their knowledge and

1 Postdoctoral Research Associate, USDA Forest Service, Southern Forest Experiment Station, New Orleans, Louisiana.
use of technical assistance and financial incentives. The study differed from most of the previous investment analyses in two ways. First, impacts of the two primary private sources of technical assistance—consulting foresters and the forest industry—were compared. Before Hubbard and Abt's (1988) analysis of what impact consultants and state foresters had on stumpage prices, no documented study had examined the different influences exerted by private versus public assistance foresters on nonindustrial, private forest (NIPF) management. The present study evaluates the effect of consultants, forest industry, and public assistance. The second difference is the use of the tobit model, which eliminates many of the statistical problems associated with using ordinary least squares regression on data consisting of a limited dependent variable. More important to policy makers, the tobit model provides estimates of an independent variable's influence on the probability of investing and the resulting level of investment.

BACKGROUND

An extensive amount of literature exists concerning forest management decisions and investment by private landowners. Several excellent reviews of research on these topics are available, including McMahon (1964), Royer (1985), and Royer and Risbrudt (1983). Additionally, Royer (1988) presents a general review of recent econometric studies of landowner investment behavior. The variables evaluated as possible influences on investment in the studies were grouped as (1) ownership or owner characteristics, (2) public policy variables, or (3) market influences. Specific ownership and owner variables tested and found significant in many of the analyses included income and size of ownership. Public technical assistance, cost-sharing, and tax credits were sample variables for public policy influences. Stumpage prices, planting costs, interest rates, and private assistance were sample variables for market influences.

An investment model was defined as:

$$I = f(O, G, M)$$

where

- $I$ = Investment
- $O$ = Owner or land characteristics
- $G$ = Government policies
- $M$ = Market influences.

The owner or land characteristics and public policy variables used in this analysis are similar to those employed in previous studies. The market variables were restricted to two variables that measure the use of private assistance sources and one that estimates the type of harvest, if any, conducted on the owner's land. The two regions chosen for this survey correspond to three complete Forest Service survey
units used for the periodic resource inventories and the single price reporting regions used in the standard source of stumpage prices--Timber-Mart South. Therefore, establishing the impact of product prices on regional behavior was not feasible. Similarly, intraregional cost differences were not available. While contact with other landowners may influence behavior (Rogers 1983), this type of information was not analyzed in this study.

DATA COLLECTION

Data were obtained by mail surveys of NIPF landowners in two loblolly-shortleaf pine forest regions: (1) the Georgia Piedmont and (2) southern Arkansas and northern Louisiana. The surveys were conducted from March to May 1988 and gathered information on potential investment influences, including the use of assistance and information sources and the knowledge and use of financial incentives.

The two regions were selected for their proximity to USDA Forest Service research work units that have responsibility for developing pine management techniques for application to nonindustrial, private forests--the Crossett Demonstration Forest in Crossett, Arkansas, and the Hitchiti Experimental Forest in Jones County, Georgia. Both units have a history of providing NIPF landowners in the two regions with information on management alternatives for their forests. This similarity was important, as a major feature of the analysis was examining the individual impact of each information source.

Mailing lists were originally developed from county tax records in Georgia and county tax records and Agricultural Stabilization and Conservation Service offices in Arkansas and Louisiana. In both regions, names were randomly selected from a set of counties. While the Georgia landowner names were selected from 1987 tax records, the available records from the Arkansas and Louisiana region covered the years from 1984 to 1988.

Each landowner selected was mailed a questionnaire with a cover letter explaining the purpose of the study and the importance of responding. One week after the initial mailing, all owners in the sample population received a postcard, thanking the respondents and urging the nonrespondents to complete the survey form. A second copy of the questionnaire was mailed to nonrespondents after 4 weeks urging their cooperation.

After 7 weeks, 331 of 885 landowners had returned completed questionnaires. More than 20 percent of the original 885 were not included in the final calculations due to the landowner's death, lack of a forwarding address, or the timberland having been sold. After these deletions, the final response rate was approximately 49 percent (Table 1), but this reduction had no impact on the response rate or the
average values for the variables. A comparison of respondents and nonrespondents failed to reveal any differences between the two. For example, the hypothesis that the average number of forested acres owned was equal for both groups could not be rejected at the 0.05 significance level.

Table 1. Response rates from a mail survey of nonindustrial, private forest landowners.

<table>
<thead>
<tr>
<th>Region</th>
<th>Questionnaires</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Original number</td>
<td>Adjusted number</td>
</tr>
<tr>
<td>Arkansas/ Louisiana</td>
<td>400</td>
<td>318</td>
</tr>
<tr>
<td>Georgia</td>
<td>445</td>
<td>360</td>
</tr>
<tr>
<td>Total</td>
<td>885</td>
<td>678</td>
</tr>
</tbody>
</table>

VARIABLES CONSIDERED

Dependent Variable
The dependent variable was the estimated dollar value of the investment in forest management practices by each respondent during the 10-year period preceding the survey. Respondents provided information on the management practices that had been conducted on their lands from 1978 to 1987. This included the date each practice was accomplished and the number of acres involved. Practices listed in the questionnaire included three types of site preparation, three types of reforestation, and four types of timber stand improvement. Costs for each practice (by region) were estimated using the periodic cost estimates of Watson et al. (1987). The reported costs were employed to develop a nominal price trend over the period in question using the equation: log (Price) = a + bY, where Price is the cost of the management practice and Y is the year that the price was reported. All nominal
yearly cost estimates were deflated to constant 1978 dollars using the GNP implicit price deflator. The cost of a management practice was calculated by multiplying the number of acres that had undergone each of the management practices by the appropriate discounted annual cost. The cost of all practices employed by a landowner were summed to provide an estimate of total investment.

Independent Variables
Three variables representing owner and land characteristics were included in the investment model. The first variable (FORAC), the area of timberland owned by each respondent, was measured in number of acres, as previous research has demonstrated a positive relationship between the amount of timberland owned and management decisions (Bertrand and South 1963, Boyd 1984, Hyberg 1986). A second variable (MILES) was the distance of the owner's residence from the timberland. Unlike FORAC, MILES was hypothesized to be negatively correlated with investment. The third variable (EDUC) represented the respondents' education levels, which were measured on a nine-point scale with 1 representing no formal education and 9 a post-baccalaureate degree.

The use of public assistance was measured in two ways. A dummy variable was employed to indicate the use of public information and technical assistance (ASSIST). Receiving no assistance was represented by a zero value for ASSIST, while a 1 was equated with receiving assistance from the state forestry agencies, Cooperative Extension Service, or USDA Soil Conservation Service. The knowledge and use of financial incentives (FINKNO) included those of the Conservation Reserve Program, Forestry Incentives Program, Agriculture Conservation Program, and the Federal reforestation tax incentive. Zero represents no knowledge of financial incentives; 6 is equated with involvement in at least one of the programs.

Following Royer's (1983) classification, market influences included dummy variables for the two sources of private assistance--consultants (CONSIT) and industry foresters (MAP). Due to the nature of the data (as explained earlier), no variables directly related to either the prices received for forest products or the costs of management practices were included. The value of any timber harvested (HARTYP), however, reflected some of the influence of product prices. A zero was entered for all landowners reporting no timber harvests during the 10-year period, 1 represented a harvest consisting of hardwood pulpwood, and 6 a pine sawtimber harvest.

THE TOBIT MODEL

The dependent variable in this analysis, total investment in forest management, presents the problem of evaluating a censored sample. That is, the dependent variable is limited to zero and positive values, and
many observations are clustered at no investment. Ordinary least squares (OLS) regression using such a dependent variable considers only those observations greater than zero and therefore provides biased and inconsistent results (Judge et al. 1980). Analyzing the data using only those observations with values greater than zero would be equally undesirable, as sample selection bias would be introduced. To avoid these difficulties, tobit analysis was employed.

Tobit was first described by Tobin (1958), and its popularity for economic applications has grown steadily in recent years. By utilizing all observations, tobit eliminates the shortcomings of OLS regression. Moreover, tobit allows for estimating changes in the probability of investment and changes in investment level if the value of the investment is already positive (McDonald and Moffitt 1980).

The general tobit model is defined as:

\[ Y = \beta X + \mu \quad \text{if} \quad \beta X + \mu > 0 \]
\[ Y = 0 \quad \text{otherwise} \]
\[ i = 1, 2, \ldots N \]

where
- \( Y \) = dependent variable
- \( \beta \) = vector of coefficients to be estimated
- \( X \) = vector of independent variables
- \( \mu \) = independently distributed error term
- \( N \) = number of observations.

The values of the estimated coefficients do not represent the expected change in the dependent variable that would be brought about by a change in the independent variable. Instead, the beta values are normalized coefficients that can be decomposed into derivatives providing valuable information on the hypothesized relationship (McDonald and Moffitt 1980). Specifically, the derivatives reveal the impact of the explanatory variables on the probability of being above zero (in this case some positive level of investment in forest management); they also reveal changes in the value of a dependent variable that already exhibits some positive investment level. Table 2 presents the transformations necessary to estimate the desired explanatory variable influences. Equations (1) and (2) are the equations of the expected value for the total sample and that portion of the sample above the limit (exhibiting some positive level of investment), respectively. Equation (3) represents the total change (in this case, change in total investment in forest management) brought about by a change in an explanatory variable, such as total acres owned or assistance. Equation (4) represents that portion of the total

133
Table 2. Transformations for the tobit model.

(1) \[ E(Y) = X \beta + \sigma f(z) \]
(2) \[ E(Y^*) = X \beta + \sigma f(z)/F(z) \]
(3) \[ \frac{\partial E(Y)}{\partial X} = F(z)(\frac{\partial E(Y^*)}{\partial X}) + E(Y^*)(\frac{\partial F(z)}{\partial X}) = f(z) \beta \]
(4) \[ \frac{\partial E(Y^*)}{\partial X} = \beta (1 - zf(z)/F(z) - f(z)^2/F(z)^2) \]
(5) \[ \frac{\partial f(z)}{\partial X} = f(z) \beta / \sigma \]

where
- \( E(Y) \) = expected value of all observations
- \( E(Y^*) = E(Y | Y > 0) \) = expected value conditional on being above zero
- \( z = \) normalized index = \( X \beta / \sigma \)
- \( F(z) = \) the cumulative standard normal distribution function
- \( f(z) = \) the standard normal density function

change in investment due to the effect above the limit. In terms of this study, equation (4) represents the percentage change in total investment accounted for by increased investments by previously investing landowners. Finally, equation (5) provides an estimate of the change in the probability of investment by previously noninvesting landowners brought about by a change in the independent variable.

RESULTS

The model was evaluated within the tobit framework to determine the significance of the individual variables. The MILES and ASSIST variables were not significant in either the Southeast or Midsouth region. These variables were eliminated from the final reduced tobit models for both regions, which are presented in Table 3. The high \( R^2 \) values indicate that the two models are good explanatory models for investment influences (Aldrich and Nelson 1984). As tobit analysis does not allow for standard \( R^2 \) measures, Aldrich and Nelson suggest an alternative computation for the group of qualitative and limited dependent variable regression techniques as: \[ R^2 = C/(N+C) \], where \( C = \chi^2 \) value and \( N = \) number of observations. Tests for heteroscedasticity and collinearity for both models indicated that these assumptions of regression were not violated. As samples from the
Table 3. Reduced tobit model for NIPF investment.1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORAC</td>
<td>3.14</td>
<td>1.88*</td>
</tr>
<tr>
<td>CONSRT</td>
<td>1607.79</td>
<td>1328.81</td>
</tr>
<tr>
<td>MAP</td>
<td>4292.58</td>
<td>1676.47***</td>
</tr>
<tr>
<td>FNKNO</td>
<td>810.33</td>
<td>498.11*</td>
</tr>
<tr>
<td>HARTYP</td>
<td>934.76</td>
<td>382.04***</td>
</tr>
<tr>
<td>EDUC</td>
<td>829.91</td>
<td>480.02**</td>
</tr>
</tbody>
</table>

Arkansas and Louisiana model

\[ R^2 = 0.87 \]

Georgia model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORAC</td>
<td>8.72</td>
<td>2.81***</td>
</tr>
<tr>
<td>CONSRT</td>
<td>6347.04</td>
<td>2234.83***</td>
</tr>
<tr>
<td>MAP</td>
<td>8595.79</td>
<td>3861.27*</td>
</tr>
<tr>
<td>FNKNO</td>
<td>1796.36</td>
<td>1210.22</td>
</tr>
<tr>
<td>HARTYP</td>
<td>1175.36</td>
<td>635.77*</td>
</tr>
<tr>
<td>EDUC</td>
<td>706.52</td>
<td>681.35</td>
</tr>
</tbody>
</table>

\[ R^2 = 0.91 \]

1 see text for explanation of the variables

*** significant at the 0.01 level

** significant at the 0.05 level

* significant at the 0.10 level
two regions were similar, they were tested to determine if they actually were from the same population (Chow 1960, Fisher 1970). The Chow F test demonstrated that the two samples were from different populations and, therefore, the results for both regions are presented in Table 3. In practice, the Arkansas/Louisiana data were used to develop the model, which was then tested with the Georgia data.

Several variables (FORAC, CONS LT, MAP, FNKNO, HARTYP, EDUC) were significantly related to investment decisions in one, if not both, of the regions. Table 4 contains the derivatives of the tobit model. Interpreting the derivatives for continuous variables is relatively straightforward. An increase of 1 acre in the number of forested acres in southern Arkansas and northern Louisiana (FORAC in Table 4) would increase the probability of investment by 0.02 percent. Total investment would increase by $1.71, and investment by landowners currently using forest management practices would increase by $1.22 for each 1 acre increase in forested acreage. Since the discrete variables serve as intercept shifters (Norris and Batie 1987), the shift in the regression resulting from a change in an explanatory variable would produce the shifts in the probability and levels on investment illustrated in Table 4.

Table 5 presents values for the expenditure elasticities, which were evaluated at the means of the significant variables in the two models. These values represent the elasticities for: (1) NIPF landowners with zero investment ($eF(z)$), (2) landowners who reported a positive investment level ($eE(Y')$), and (3) the total regional population ($eE(Y)$). This decomposition of the tobit coefficients is described by McDonald and Moffitt (1980). The interpretation of the elasticities for the continuous variables (FORAC, FNKNO) is also straightforward. For example, a 1-percent increase in forested acres in southern Arkansas and northern Louisiana would increase the probability of investments by landowners who are not currently using forest management practices by 0.08 percent. Those landowners who are currently managing their land would increase their investments by 0.05 percent. Total investment would increase by 0.13 percent.

Binary variable elasticity interpretation is somewhat different. With CONS LT in the Georgia model as an example, a 1-percent increase in the number of NIPF landowners using consultants for information or assistance would result in an overall increase in investment of 0.20 percent. This increase would be divided between landowners currently managing their land (0.08 percent) and landowners making their initial investment (0.12). As the total investment elasticities are interpreted in a similar fashion for all variables, $eE(Y)$ provides a means of comparing the relative impact of all variables.

Based on the elasticities, both CONS LT and MAP appear to be important external influences on investment decisions. Industry assistance (MAP) is the only significant assistance source in Arkansas and Louisiana.
Table 4. Partial derivatives for investment models.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\partial F(z)/\partial x$</th>
<th>$\partial E(Y)/\partial x$</th>
<th>$\partial E(Y^*)/\partial x$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arkansas-Louisiana model</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FORAC</td>
<td>0.0002</td>
<td>1.71</td>
<td>1.22</td>
</tr>
<tr>
<td>CONSULT</td>
<td>.1270</td>
<td>868.00</td>
<td>620.43</td>
</tr>
<tr>
<td>MAP</td>
<td>.3369</td>
<td>2386.24</td>
<td>1696.60</td>
</tr>
<tr>
<td>FNKNO</td>
<td>.0604</td>
<td>516.18</td>
<td>347.50</td>
</tr>
<tr>
<td>HARTYP</td>
<td>.0683</td>
<td>613.67</td>
<td>430.22</td>
</tr>
<tr>
<td>EDUC</td>
<td>.0392</td>
<td>701.94</td>
<td>527.12</td>
</tr>
<tr>
<td><strong>Georgia model</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FORAC</td>
<td>0.0004</td>
<td>4.85</td>
<td>3.45</td>
</tr>
<tr>
<td>CONSULT</td>
<td>.2730</td>
<td>3603.85</td>
<td>2553.37</td>
</tr>
<tr>
<td>MAP</td>
<td>.3746</td>
<td>4482.70</td>
<td>3225.80</td>
</tr>
<tr>
<td>FNKNO</td>
<td>.0748</td>
<td>1114.83</td>
<td>782.61</td>
</tr>
<tr>
<td>HARTYP</td>
<td>.0504</td>
<td>674.54</td>
<td>477.04</td>
</tr>
<tr>
<td>EDUC</td>
<td>.0277</td>
<td>479.23</td>
<td>336.37</td>
</tr>
</tbody>
</table>

1 see text for explanation of the variables
Table 5. Elasticities of significant variables.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>$e \ F(z)$</th>
<th>$e \ E(Y^*)$</th>
<th>$e \ E(Y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORAC</td>
<td>0.0796</td>
<td>0.0504</td>
<td>0.1300</td>
</tr>
<tr>
<td>CONSCT</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>MAP</td>
<td>0.0999</td>
<td>0.0653</td>
<td>0.1652</td>
</tr>
<tr>
<td>FNKNO</td>
<td>0.2064</td>
<td>0.1667</td>
<td>0.3731</td>
</tr>
<tr>
<td>HARTYP</td>
<td>0.2259</td>
<td>0.1926</td>
<td>0.4185</td>
</tr>
<tr>
<td>EDUC</td>
<td>0.2860</td>
<td>0.4979</td>
<td>0.7839</td>
</tr>
</tbody>
</table>

Arkansas-Louisiana model

Georgia model

| FORAC    | 0.1007     | 0.0659       | 0.1666     |
| CONSCT   | 0.1182     | 0.0796       | 0.1978     |
| MAP      | 0.0412     | 0.0248       | 0.0660     |
| FNKNO    | --         | --           | --         |
| HARTYP   | 0.1274     | 0.0871       | 0.2145     |
| EDUC     | --         | --           | --         |

1 see text for explanation of the variables
Given the historical importance of forest industry in the Crossett region, such a finding is not surprising. Some of the older firms in the Crossett region were the first in the forest products industry to practice forest management. The relative importance of MAP and CONS LT is reversed in Georgia, with industry playing a significant but lesser role in landowner investment. Georgia has more consultants than any other state in the nation. Moreover, most Georgia forest product firms in the Piedmont do not have as much public visibility as the large Crossett area firms.

Knowledge and use of financial incentives (FNKNO) was a significant factor in investment decisions for Arkansas and Louisiana landowners and marginally significant for Georgia landowners (0.15 level). In fact, this variable possessed the largest relative impact of any external influence on investment in the Crossett region. The results for HARTYP indicate that market forces do play a major role in landowner investment decisions, with landowners who harvested higher valued products investing more in management practices. Finally, EDUC appears to be positively related to investment level, but like FNKNO, EDUC was marginally significant in Georgia.

POLICY IMPLICATIONS

The results of this analysis have valuable implications for future policy deliberations. Little can be done to alter the owner or land characteristics. Foresters must accept the personal characteristics of the landowners and devise management activities applicable to each owner’s specific situation and objectives.

The analysis does indicate that several policy options are available that can positively influence investment in forestry if the decision makers so desire. Specifically, private sources of technical assistance were found to be positive, significant variables in the investment model. No public forms of technical assistance were significant.

Given the results of this analysis and the declining resources of many government agencies, encouraging technical assistance by private foresters is an attractive policy option. Specific actions might include limiting the amount of assistance that public foresters can provide to an individual landowner, establishing a policy that public foresters would refer any landowner with land ownerships greater than a specific size (i.e., >150 acres) to private foresters, and maintaining current lists of available private forestry assistance. Many states currently have such policies and several others are adopting similar ones.

More direct means of establishing private assistance foresters are available also. The Association of Consulting Foresters and the
Tennessee Valley Authority have provided financial assistance for private consultants to establish their business in areas lacking a large consultant population (Hoyt et al. 1988). The success of this initiative suggests that such innovations may prove to be effective options for increasing investments in NIPF management.

The results also appear to support Royer and Kaiser's (1985) argument that state forestry personnel should redirect their efforts to landowner education and refer management work to consultants or industry. Two considerations, however, make such an arrangement undesirable. First, research has demonstrated that consulting, industry, and public foresters serve somewhat different clients, at least in terms of the number of acres owned. Specifically, state foresters assisted landowners who typically owned less than 200 acres of timberland. Eliminating the assistance responsibilities of these foresters could result in a significant portion of NIPF owners having few options for management assistance.

The absence of significant public assistance variables also could be inherent to the two study areas. The Arkansas/Louisiana region is dominated by forest industry, in terms of land ownership and employment. Georgia's consultant population is the largest in the U.S., with more than 180 consultants residing in the state in 1980 (Hodges and Cubbage 1986). Therefore, the significant influence of forest industry in the one region and consultants in the other is to be expected. Public foresters in regions where private assistance is not as prevalent are likely to have a more significant impact.

Financial incentives were an important variable as well, particularly in the Arkansas/Louisiana region. Knowledge and use of financial incentives represented the most important external factor in this region. Several state and Federal incentives are currently utilized by landowners, though as the popularity of the Conservation Reserve Program demonstrates, additional funding would be utilized also. Given the current fiscal conservatism of the Federal and most state governments, large increases in public funding are unlikely. An alternative that has been employed in several states is a joint effort of the public and private sectors (Straka and Bullard 1987). These cooperative ventures normally consist of forest industry providing the funding, which is then distributed through the state agency. A severance tax on forest products may be one way of obtaining the funds, as in South Carolina and Virginia, or the funding may be the result of a voluntary contribution by individual firms as is the case in Florida and Texas. Typically, emphasis for financial incentives has been placed on those practices with large capital requirements such as reforestation, site preparation, and stand improvement. Expanding the use of these alternatives would provide additional monetary incentives to encourage investments.
Finally, this study demonstrates the usefulness of the tobit model for evaluating the influences on investment decisions. McMahon (1964) and Royer (1987) note that investments actually entail two separate decisions—whether or not to invest and, if so, how much to invest. As was illustrated, the derivatives provide estimates of the explanatory variables' influence on both decisions. One problem of tobit, however, may be the implicit assumption that the same set of factors has the same influence on the two decisions. Some evidence suggests that this may not be the case (Greber and Lawrence [n.d.]). While two-stage procedures are available to estimate the differing influences on the two decisions, they do not provide for the decomposition of the elasticities as in tobit. Moreover, the tobit elasticities give some evidence of the different impact of the variables on the two decisions. As a consequence, tobit provides more information of interest to policy makers than alternative methods of analyzing data with limited dependent variables.

LITERATURE CITED


