Predicting Landowner Enrollment in Government Assistance Programs

the Tennessee Northern Cumberland Plateau

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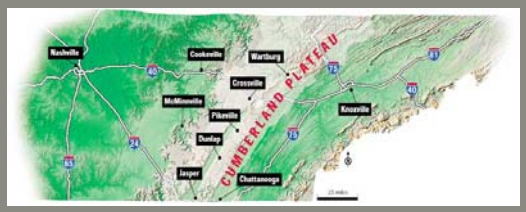
Research Background and Justification

- The Tennessee Northern Cumberland Plateau has experienced large population growth in the last half century (Strickland 2003)
- As a result, there has been a loss of forest area to development/urbanization leading to decreases in timber quality, wildlife habitat, and water quality (Bell et al. 1994; Wear and Greis 2002)
- 1982-1992 there was a loss of 178,900 acres of forest area
- Policies are necessary to deter forest loss (e.g. conservation assistance programs)

Research Background and Justification

The Tennessee Cumberland Plateau



Objectives

- Provide background on the data set used
- Provide a model that can be used to assess whether a landowner is likely to enroll in government assistance programs
- Suggest who is likely to enroll in conservation assistance programs
- Suggest some policy implications for increasing the probability of landowners enrolling in conservation assistance programs

Methods

- Secondary Data Analysis using Initiative for Future Agricultural and Food Systems (IFAFS) Data collected by the UT Human Dimensions Lab
- Data was collected in a 2005 mail survey to 1,462 residents of the Northern Cumberland Plateau
- Of these 1,462 surveys, only 1,010 were verifiable addresses – response rate was 55 percent (~555)
- Variables were assigned, recoded, and analyzed using STATA

Dependent Variable:

enroll	1 = Yes 0 = No
Yes if:	Greenbelt Forest Program Wildlife Habitat Program Conservation Reserve Program Forestry Incentives Program Stewardship Incentives Program Wetland Reserve Program Forest Land Enhancement Program Wildlife Habitat Incentives Program

Independent Variables (signs in parentheses are expected correlation):

acre (+)	Amount of land owned in study area (acres)
tenure (-)	Amount of time majority of land owned (years)
female (+)	1 = Female 0 = Not Female
hsch[†] (+)	1 = Completed high school or higher 0 = Had not completed high school
age (+/-)	Age of land owner (years)
impfin[‡] (+)	1 = Long-term Financial Investment important reason for owning 0 = Not important
imptim[‡] (+)	1 = Timber production important reason for owning 0 = Not important
impwat[‡] (+)	1 = Protecting Watershed important reason for owning 0 = Not important
harv (+)	1 = Yes, have harvested or cut trees 0 = No
Plant (+)	1 = Yes, have planted trees 0 = No
infagy (+)	1 = Yes, have used information from a government agency 0 = No Agency = TDEC, USDA FS, NRCS, Farm Bureau, SWCD, or County Extension
inffor (+)	1 = Yes, have used information from a forester 0 = No
infmed (+)	1 = Yes, have used information from the media 0 = No Media = Internet, Books or Magazines, TV, Radio, or Newspaper
infenv (+)	1 = Yes, have used information from environmental groups 0 = No

† Although most researchers have evaluated the effect of education with college-level education, the educati
of the respondents (and in the region) were such that using high school as the cut-off level provided a better
distribution of the population. A Preliminary analysis was conducted with college as the indicator level, wh
determined to be non-significant.
‡ A value of 1 was assigned if the landowner indicated that their woodland was important or very important
long-term financial investment (impfin), timber production (imptim), or for protecting water quality (impwa

Methods/Research Model 1

- LOGIT Regression
- 1 Dependent Variable, 14 Independent Variables

$$LOGIT\,P(enroll=1|X_i)=\beta_0+\beta_1 acre_i+\beta_2 tenure_i+\beta_3 female_i+\beta_4 hsch_i+\beta_5 age_i+\beta_6 impfin_i+\beta_7 imptim_i+\beta_8 impwat_i+\beta_9 harv_i+\beta_{10} plant_i+\beta_{11}\inf agy_i+\beta_{12}\inf for_i+\beta_{13}\inf med_i+\beta_{14}\inf env_i+\varepsilon$$

Nagubadi et al. 1996. *Program participation behavior of nonindustrial forest landowners: A probit analysis.*

Methods/Research Model 2

- LOGIT Regression
- 1 Dependent Variable, 6 Independent Variables (only included variables whose coefficients exceeded their standard errors and those significant at the .05 level or above in Model 1)
- Result is a more parsimonious model

$$LOGIT\,P(enroll=1|X_i)=\beta_0+\beta_1 acre_i+\beta_2 tenure_i+\beta_3 female_i+\beta_6 impfin_i+\beta_{11}\inf agy_i+\beta_{12}\inf for_i+\varepsilon$$

Model Results

Variable coefficients and odds ratios from theoretical logistic model for predicting probability of participation in conservation aid programs

	Model 1 enroll	Model 2 enroll
acre	0.0018*** [1.0018]	0.0018*** [1.0018]
tenure	0.0161 [1.0162]	0.0202** [1.0204]
female	-1.0962*** [0.3441]	-0.8852*** [0.4124]
hsch	1.0841* [2.9581]	0.9734* [2.6466]
age	-0.0078 [0.9922]	
impfin	0.5039 [1.6536]	0.5661* [1.7613]
imptim	0.3835 [1.4675]	
impwat	-0.1013 [0.9038]	
harv	-0.2035 [0.8159]	
plant	-0.2250 [0.7985]	
infagy	1.1553*** [3.1576]	0.8761*** [2.4015]
inffor	0.8852** [2.4241]	0.8172** [2.2801]
infmed	0.2736 [0.6846]	
infenv	-0.0571 [0.9445]	
constant	-1.0107	-2.8273***
Observations	323	382
Pseudo R-squared	0.1928	0.1625
LR Chi²	57.45***	56.64***
Correctly Classified	83.9%	84.3%
Correctly Classified w/o Model	82.7%	82.9%

Odds ratios are in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Model 1
acre (+)
female (-)
hsch (-)
infagy (+)
inffor (+)

Model 2
acre (+)
tenure (+)
female (-)
impfin (+)
infagy (+)
inffor (+)

Discussion

- Model 1 was able to correctly classify 83.9 percent of the observations correctly
- Model 2 relied on less independent variables and was able to correctly classify 84.29 percent of the observations correctly – the result being a more parsimonious model without losing predictive power

Model 1	Expected
acre (+)	+
female (-)	-
hsch (-)	+
infagy (+)	+
inffor (+)	+

Model 2	Expected
acre (+)	+
tenure (+)	-
female (-)	+
impfin (+)	+
infagy (+)	+
inffor (+)	+

Nagubadi et al. 1996; Bell et al. 1994; Gan et al. 2005; Lambert et al. 2006

Who is Likely to Enroll?

- Probably not… Rumor has it, he lives in a sub-division.

Who is Likely to Enroll?

- Using the model results:
- Male
- Has lived in the same place for a while >10 years
- Owns a large amount of acreage >100 acres
- Someone who considers the land important as a long-term financial investment

Policy Implications

2 x More likely to enroll when contacted by a government agency or a forester!

Future Research

- More landowner characteristics need to be assessed to increase the accuracy of the model(s), such as:
- Income level
- Dependence on income
- Whether they actually reside on the land

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