
Measuring Homeowners' Willingness to Pay for Land Conservation Easements

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Motivation of study

- An increasing number of rural homeowners, interfacing with neighboring urban communities
 - Population of nonmetro counties grew by 5.3 million, or 10.3% percent in the 1990s, compared with an increase of just 1.3 million, or 2.7%, in the 1980s
 - Rapidly growing counties with amenities that attract retired people
 - Rise to concerns over declining environmental quality
 - Popularity of conservation easement program
 - Challenges of land use policy
 - Alternative way of sustainable development
 - Need for measure of local Willingness to pay (WTP) for the program
 - Allocation of resources for matching funds
 - Estimated impacts on land conservation
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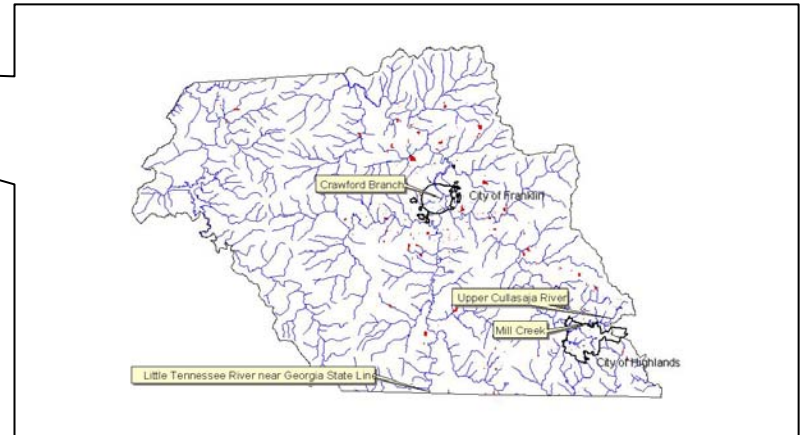
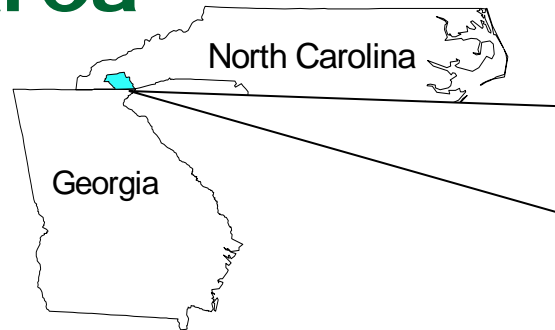
Previous literature

- People's perceptions regarding land use policy
(Dubbink 1984; Healy and Short 1979)
 - Length of time residency (Baldassare, 1986; Myers, 1989 Doherty, 1987)
 - Social class or income (Lovejoy, 1982; Salamon and Tornatore, 1994)
 - Values and knowledge (Engel, 1984; Spain, 1993)
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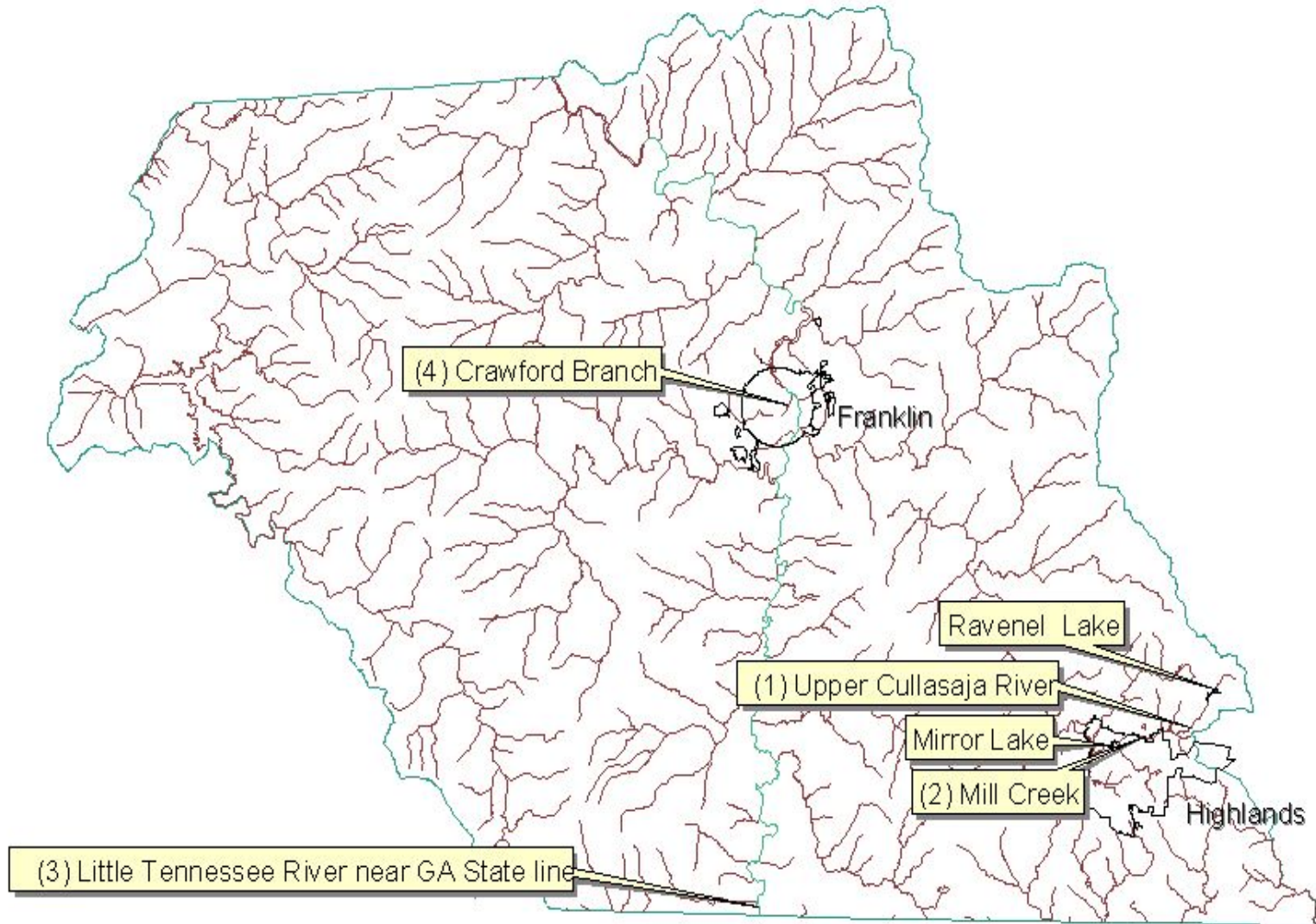
Objectives of the Research

- Measure local WTP for hypothetical conservation easements as an alternative way of sustainable development
 - Estimated impacts on land conservation
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Study Area



- Macon County, NC
 - 330,240 acres, rural, mountainous (500-1,700 feet)
 - 13,358 homes to 20,746 (55% increase), from 1980-2000
 - In 2002, 45% of the new home construction was for second home
 - Interfacing with the unprecedented growth of the metropolitan Atlanta area's northern suburbs
 - Diversified groups
 - Long term residents & new comers
 - Primary home residents & Second home residents
 - Supporters & Opponents of Land Use Policy



Macon County, NC

Land Use Policy & Conservation Easement of Macon County

- Protect Freedom / Stop Zoning
 - Relatively successful conservation easements
 - Land Trust of Little Tennessee
 - One third of river frontage along Little Tennessee River
 - Needmore Tract, 1,100 acres of Macon & 3,500 acres of Swain
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Data

- Survey
 - Knowledge level
 - WTP per year
 - Reasons for zero
 - Income
 - Duration of residency
 - Tax assessment records in a shape file
 - Location
 - Distance to problematic area
 - City
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Survey

- Survey Draft based on
 - 2002 Assessment report by the Division of Water Quality, NC
 - Interview with Macon County land planners, the director of the Little Tennessee River Watershed Association, and ecologists

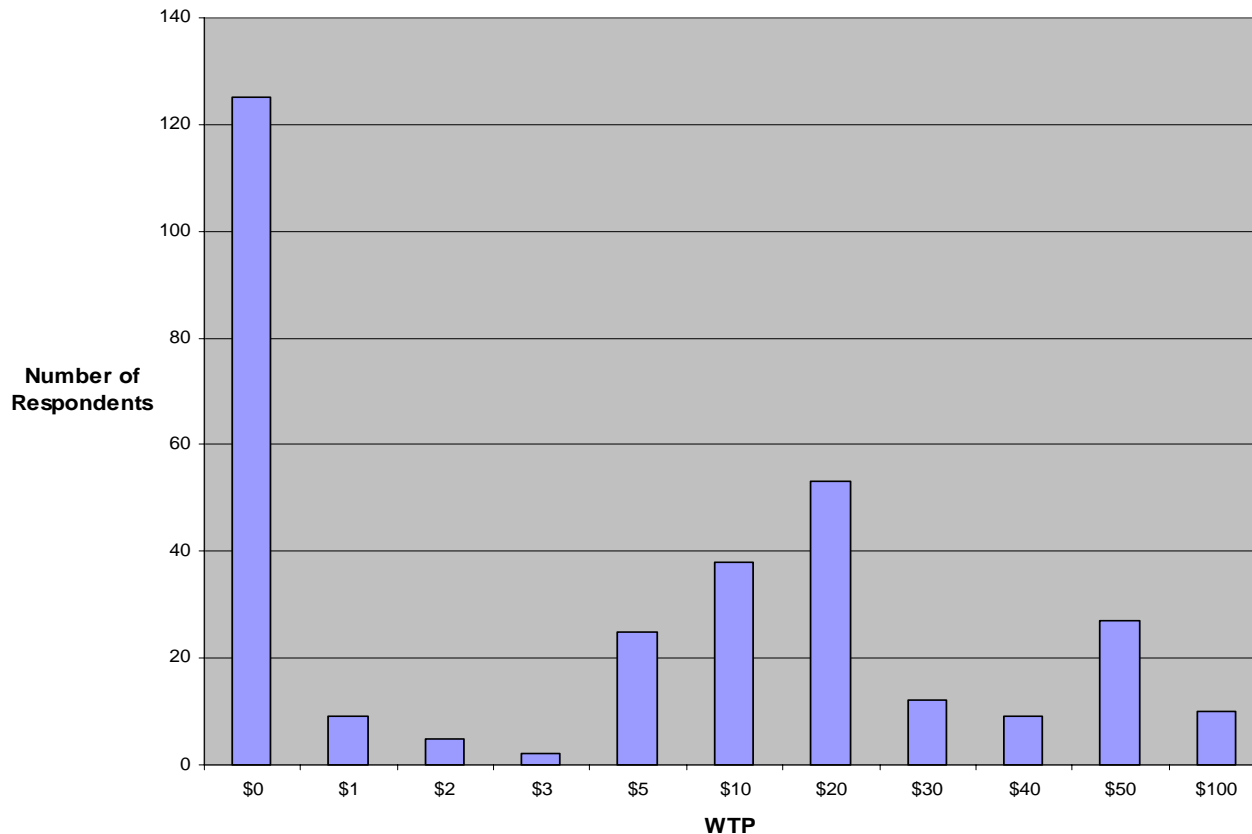
 - 1,400 randomly chosen homeowners of Macon County following Dillman's Total Design Method
 - 1,400 Pre-notice letter mailing (Oct 3, 2003)
 - 1,400 Survey mailing (Oct 10, 2003)
 - 1,400 Reminder letter mailing (Oct 17, 2003)
 - 695 Replacement survey mailing (Oct 31, 2003)
 - 571 survey to correct address mailing (Dec 8, 2003)

 - 344 out of 1,015 delivered survey
 - 34% response rate
 - 287 response with all the answers
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Survey Description

- **First, Introduction to conservation easements**
 - “Legal agreement that permanently limits land development between a landowner & a land trust or government agency”
 - **Second, Current status of land use in the county**
 - “Between the years of 1987 and 1997, Macon County lost 2,969 acres of agricultural land to development. The rate of loss, 12% is much greater than the national rate of loss, which was 3% during the same period of time. The funds will be used for the purchase of conservation easements on agricultural and forest land to slow down the rate of loss and help maintain the rural landscape.”
 - **Third, Expected Outcome**
 - “After establishment of the fund, the rate of loss on resource land is expected to slow down to half of the current rate because the county will be able to offer an incentive for voluntary conservation. If every household were to pay \$20 annually into the fund, this would allow the purchase of approximately 300 acres of easements per year at current prices.”
 - **Fourth, Knowledge Level**
 - knowledge concerning land use issues in the county using the likert scale (e.g., none, very little, some, a lot, and detailed knowledge)
 - **Fifth, WTP question**
 - dichotomous choice elicitation mixed with an open-ended value of WTP in the form of property tax is asked (e.g., multiple choices of \$0, \$1, \$2, \$3, ..., and \$100 along with blank of open-ended value)
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Statistical Summary of the WTP Answers



- 315 respondents answered question regarding WTP for a conservation easement
 - Knowledge about current status: between very little to some
 - 125 respond \$0, max \$100, mean \$15, std dev \$21

Zero Bidders

■ Protesters

- I don't think additional taxes are the best way to fund the conservation easement projects
- I don't believe conservation easements will lead to the outcomes as claimed

■ Legitimate zero bidders

- I can't afford to pay more taxes
 - It just isn't worth it to me to pay anything to change the current rate of land development
 - I would rather see more development
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Empirical Model

- Tobit with and without protest bids
 - Does a household decide on how much he or she wishes to pay?
 - Imagined to include negative as well as positive values, with \$0 representing a censored negative observation

 - Heckit with and without protest bids
 - Does he or she decide whether or not to pay and then, if the first decision is affirmative, decides on the exact amount of WTP?
 - Factors influencing “pay or not” are not the same as the factors that influencing the WTP amount.
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Estimates of Tobit with Protest Bids

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	0.604	3.179	0.190	
Years of Residency	-0.209	0.062	-3.379	20.10
Distance to the closest problematic stream (mile)	-0.705	0.237	-2.965	6.52
Household Income (\$1,000)	0.219	0.039	5.642	51.533
Knowledge Dummy	6.092	2.839	2.146	0.156
Sigma	27.571	1.543	17.865	

Dependent Variable: WTP for land conservation easement,
Mean: 16.30, Std. Dev.: 8.72, Number of obs:287

Estimates of Tobit without Protest Bids

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	4.392	3.919	1.121	
Years of Residency	-0.192	0.076	-2.541	18.49
Distance to the closest problematic stream (mile)	-0.612	0.287	-2.128	6.17
Household Income (\$1,000)	0.278	0.047	5.934	53.194
Knowledge Dummy	12.918	3.548	3.641	0.143
Sigma	23.095	1.245	18.544	

Dependent Variable: WTP for land conservation easement,
Mean: 21.79, Std. Dev.: 10.40, Number of obs:216

Estimates of Heckit with Protest Bids (First Stage: Probit for Pay or Not Pay)

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	0.340	0.152	2.245	
Years of Residency	-0.005	0.002	-2.997	20.10
Distance to the closest problematic stream (mile)	-0.0228	0.007	-3.129	6.53
Household Income (\$1,000)	0.005	0.001	3.936	51.533
City Dummy	-0.190	0.090	-2.117	0.885

Dependent Variable: Discrete Choice of Pay or Not Pay,

Number of obs:287

Estimates of Heckit Model with Protest Bids (Second Stage: Sample Selected WTP)

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	10.499	12.657	0.830	
Years of Residency	-0.236	0.180	-1.310	16.673
Distance to the closest problematic stream (mile)	-0.812	0.583	-1.394	5.882
Household Income (\$1,000)	0.293	0.125	2.335	57.486
Knowledge Dummy	12.002	4.292	2.797	0.168
Lambda	7.870	19.257	0.409	0.536

Dependent Variable: WTP for land conservation easement,
Mean: 17.42, Std.Dev.: 13.47, Number of obs:287

Estimates of Heckit without Protest Bids (First Stage: Probit for Pay or Not Pay)

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	0.168	0.109	1.540	
Years of Residency	-0.002	0.001	-1.842	18.486
Distance to the closest problematic stream (mile)	0.010	0.005	-1.773	6.172
Household Income (\$1,000)	0.004	0.001	4.485	53.194
City Dummy	0.047	0.065	-0.727	0.879

Dependent Variable: Discrete Choice of Pay or Not Pay,

Number of obs:216

Estimates of Heckit Model without Protest Bids (Second Stage: Sample Selected WTP)

Variable	Marginal Effect	St. Er.	b/St. Er.	Mean of X
Constant	3.622	15.490	0.234	
Years of Residency	-0.280	0.174	-1.609	16.673
Distance to the closest problematic stream (mile)	-0.913	0.558	-1.635	5.882
Household Income (\$1,000)	0.395	0.197	2.001	57.486
Knowledge Dummy	12.362	4.299	2.876	0.168
Lambda	25.716	31.769	0.809	0.253

Dependent Variable: WTP for land conservation easement,
Mean: 15.57, Std. Dev.: 22.08, Number of obs:216

Estimated WTP & Farmland Conservation

	Tobit with Protest	Tobit without Protest	Heckit with Protest	Heckit without Protest
Adjusted by County Population Income				
Adjusted Household WTP	13.20	17.39	11.54	7.43
Aggregate WTP	273,847	360,772	239,409	154,143
Farmland Conservation per acre per year	133	175	116	75
Farmland Conservation next 10 years	1,030	1,358	901	580
Reduction of farmland loss from 1987-97	35%	46%	30%	20%
Assuming Zero WTP for All Non-Respondents				
Household WTP	16.30	21.79	17.43	15.57
Adjusted Aggregate WTP	114,974	153,699	122,945	109,825
Farmland Conservation per acre per year	56	75	60	53
Farmland Conservation next 10 years	433	578	463	413
Reduction of farmland loss from 1987-97	16%	19%	16%	14%
Assuming Zero WTP for All Non-Respondent & Zero WTP for All Protest Bids				
Household WTP		21.79		15.27
Adjusted Aggregate WTP		115,274		80,782
Farmland Conservation per acre per year		56		39
Farmland Conservation next 10 years		434		304
Reduction of farmland loss from 1987-97		15%		10%

(based on 20,746 Households, conservation easement price of \$2,059 per acre under Farmland Protection Program by USDA, Median County Household Income \$37,381, Response Rate of 34%, Non-protest rate of respondents of 75%, 2% discount rate, & 3% increase of farmland price increase)

Conclusion

- Unclear WTP value
 - Potential biases associated with protest zero bids
 - sample selection bias associated with deleting protest zeroes
 - Regardless
 - Substantial reduction of the rate of land conversion, should they adopt the hypothetical conservation easements
 - Homeowners' support of a less regulatory and more voluntary conservation easements
 - Starting point for the analysis of more site-specific Analysis
 - Question regarding specific environmental benefit
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