

## **The Willingness to Pay to Remove Billboards and Improve Mountain Views**

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ABSTRACT: We use the contingent valuation method to measure the amount citizens are willing to pay to improve mountain-view aesthetics through the removal of billboards. Our approach addresses both the perceived property rights as well as the perceptions of the status quo in the southern Appalachian Mountains. We find that individuals who retire to the mountains have different preferences for land use and mountain views than individuals who have ancestors who lived in Watauga County. In the aggregate, we find that citizens are willing to pay up almost one-half million dollars to remove billboards from Watauga County roadsides. This study provides insights to the debate surrounding land use in the mountains.

## **Introduction**

The debate on land use in the southern Appalachian Mountains has been around for years. Debate points include, should counties develop zoning ordinances? Should states designate roads as scenic byways? Should billboards be removed? Should cell towers be built? Should the county regulate the number of abandoned cars? In Watauga County, North Carolina, grassroots organizations have formed to monitor land use. Partially, through the efforts of one such group, the Committee of 100, a section of the new Route 421 was designated a scenic byway where no billboards were allowed to be built. Another group, identified with the other side of the debate, had bumper stickers printed saying “No Zoning in Watauga County.” This statement was also placed on billboards along the old section of Route 421.

The debate of the removal of billboards does not exist only in the southern Appalachian Mountains. In Poland, a study found that travelers along highways are willing to pay to remove billboards and improve the rural views (Szoega et al 2005). In the United States, since the highway beautification act passed during the Johnson Administration in 1965, municipalities have passed laws for the removal of billboards for aesthetic reasons. Some have suggested that billboard bans infringe upon freedom of speech but, in *Metromedia Inc. vs. San Diego*, the Supreme Court ruled that a city may regulate aesthetics under its police power and generally ban outdoor signs for aesthetic reasons alone (Bond 1990). In North Carolina, a new state ordinance requires that landowners must be compensated for the lost revenue if a municipality bans billboards. This explicitly assigns the property rights to the landowner.

We conducted a contingent valuation method survey to assess whether citizens are willing to pay to remove billboards for aesthetic reasons. In the next section of this

paper, we discuss the survey and methods of our survey. In section two, we provide some insights in to how people perceive property rights and mountain-view amenities. In section three we report the results of the willingness to pay for the removal of billboards. In section four, we provide estimates of willingness to pay for different subgroups of the population of Watauga County. We also provide an aggregate estimate of willingness to pay. In section five we conclude.

### **Section 1: The Survey**

To help understand the value of mountain views and land use, we developed a contingent valuation method (CVM) survey to elicit the willingness to pay (WTP) for changes in the county's view-shed amenities for the removal of billboards (Mitchell and Carson, 1989). The survey was mailed in the spring of 2005 to a random sample of 1200 Watauga County residents. We used a primary mailing, a post card reminder and a second mailing to all non-respondents of the first mailing. In the end, we had 901 useable addresses and 389 responses giving us a response rate of 43 percent. We find that the average age of our respondent was 56.5 years, while the average age for county residents over 20 was 43.5 (Table 1). We find that the average income of survey respondents was \$60,470. The average income in Watauga County from the 2000 census was \$50,300 in 2005 dollars. The average education for the respondents was 15 years while for the county it was 14 years. The percentage of male survey respondents was 60 percent where the county average is 49.8 percent male. The sample of respondents is more likely to be male, older, more educated and have higher household income than the population.

Eighty-one percent of the respondents report they have a daily drive with a scenic view that could be altered by cell towers, billboards or electrical generation windmills; while 59 percent report their residence has a scenic view that could be altered. We also find that eleven percent of the respondents moved to Watauga County after they retired. Lastly we find that 33 percent of respondents report having ancestors who lived in Watauga County.

## **Section 2: Opinions on Mountain Views**

We next consider opinions about land use in Watauga County (Table 2). We find that 67 percent either agree or strongly agree that land use zoning should be used in Watauga County while 42 percent either agree or strongly agree that land owners should use their land any way they want. Ninety-seven percent either agree or strongly agree that mountain views are an important part of the quality of life and 92 percent agree or strongly agree that ridge laws that prevent buildings on the top of mountains are important. Twenty-six percent agree or strongly agree that Route 421 should not have been designated a scenic byway while only 10 percent agree or strongly agree that abandoned cars do not harm the landscape. Lastly, we find that 60 percent agree or strongly agree that electrical generation windmills should be allowed in Watauga County and 51 percent agree or strongly agree that cell towers harm the mountain view-shed.

To further explore people's opinions about land use, we analyze these attitudes using ordered logit regression (Table 3). We find that when a respondent reports that they own a home with a view, it increases the likelihood that they are of the opinion that ridge laws are important. These same individuals also are more likely to find that cell towers

harm the mountain landscape and that mountain views are important for quality of life in Watauga County. We also find that when respondents report they have a daily drive with a mountain view that can be altered they are more likely to be in favor of zoning ordinances and ridge laws. These respondents are also less likely to believe land owners should be able to use their land any way they want. In addition, respondents who have daily drives with views that can be altered report that cell towers and abandoned cars damage mountain views and that mountain views are important to the quality of life in Watauga County. They also are more likely to answer that Route 421 should be designated as a scenic byway and that electrical generation windmills should not be allowed in Watauga County.

Individuals with ancestors from Watauga County are more likely to agree that electrical generation windmills should not be allowed in the county. These same individuals are also less likely, however, to agree that zoning and ridge laws should be used, and that Route 421 should have been designated a scenic byway. They are also less likely to agree that cell towers or abandoned cars harm mountain landscapes and that mountain views are important to the quality of life in their county. Lastly, residents with ancestors in Watauga County are more likely to agree that land owners should be able to use their land as they choose.

Individuals who have retired to Watauga County are less likely to agree that land owners should use their land any way they want. Respondents with more education are also less likely to agree that land owners should use their land any way they see fit and more likely to agree that Route 421 should have been designated a scenic byway. Lastly, as age of the respondent increases the more likely they are to agree that zoning is

important and less likely to agree that land owners should use land any way they want. The importance of ridge laws also increases with age.

In Table 4, we summarize the opinions of the usefulness and impact on mountain views of billboards. We find that 46 percent of respondents report that billboards provide somewhat useful information and 42 percent use billboards to make decisions on where to shop and eat when they visit other locations. Yet around 80 percent find that billboards are somewhat harmful or very harmful to the mountain views of Watauga County.

We find a negative correlation,  $r = -.61$ , between those who state that billboards provide useful information and those who find billboards harmful to mountain views. We also find a positive correlation,  $r = .65$ , between those who report that billboards provide useful information to tourists and residents and those who report using billboards to make decisions when they travel to other locations.

These results suggest that respondents tend to find that billboards are somewhat useful. They also feel that billboards harm mountain-view amenities, suggesting that tradeoffs need to be made. In the next section, we analyze the CVM questions on the willingness to pay for changes in mountain-view amenities.

### **Section 3: Willingness to Pay for Billboard Removal**

#### *Theory*

Consider a resident's utility function who receives utility from both a consumption good,  $z$ , and a scenic view amenity,  $q$ , where  $q$  represents quality of the scenic amenity that can be affected by the presence of billboards. Then a resident

maximizes her utility,  $u(q, z)$ , subject to a budget constraint  $y = pz$  where the price of  $z$  is normalized to one. Solving for the indirect utility function yields  $v(q, y)$ . The willingness-to-pay,  $WTP$ , for the scenic view amenity is implicitly defined at the payment that equates indirect utility with different quality conditions,  $v(q^0, y) = v(q', y - WTP)$ , where  $q^0$  is the current quality,  $q'$  is the improved quality.

In our case, the willingness to pay question for billboard removal follows a dichotomous choice framework. The variable *Yes* is a qualitative variable equal to one if the respondents answered yes to the question:

*The State of North Carolina through the Highway Beautification Act has suggested removing billboards along roads. The federal government has mandated that when billboards are removed land owners need to be compensated for lost income from billboards. Suppose Watauga County wants to remove billboards to improve mountain views. Suppose that to implement the removal of billboards county residents must pay \$A to compensate land holders for the removal of billboards. Are you in favor of this proposal,*

\$A is a randomly assigned cost variable. Respondents were given three alternative answers: yes, no and don't know. One problem that arises when coding dichotomous choice CVM questions is what should be done with "don't know" responses. We follow the conservative approach and code all "don't know" responses as "no" responses (Caudill and Groothuis 2005). This is our *Yes1* variable.



Another problem that arises with CVM surveys is hypothetical bias (Whitehead and Cherry, 2004). Hypothetical bias exists if respondents are more likely to say that they would pay a hypothetical sum of money than they would actually pay if placed in the real situation. Since economic values are based on actual behavior, hypothetical bias leads to economic values that are too high. One method that is used to mitigate hypothetical bias is the certainty rating. For those respondents who say that they are willing to pay we ask: “On a scale of 1 to 10 where 1 is “not sure at all” and 10 is “definitely sure”, how sure are you that you would make the one-time donation of the tax amount?” Following their recommendation only respondents who answer greater than 7 are coded as a yes response. We identify this variable as *Yes2*. In Table 4, we report the proportions of *Yes1* and *Yes2* at each cost level. The yes responses follow the expected pattern; as the payment goes up the proportion of yes responses fall.

We estimate three logit models specifications for each of our “yes” variables:

- (1)  $P(\text{Yes}) = 1/(1 + \exp[\beta_0 + \beta_1 \ln(A) + \beta_2 \text{Income}])$
- (2)  $P(\text{Yes}) = 1/(1 + \exp[\beta_0 + \beta_1 \ln(A) + \beta_2 \text{Income} + \beta_3 \text{Education} + \beta_4 \text{Ancestor} + \beta_5 \text{Homeview} + \beta_6 \text{Driveview} + \beta_7 \text{Retire}])$
- (3)  $P(\text{Yes}) = 1/(1 + \exp[\beta_0 + \beta_1 \ln(A) + \beta_2 \text{Income} + \beta_3 \text{Education} + \beta_4 \text{Zone} + \beta_5 \text{Billboard-useful} + \beta_6 \text{Billboard-harmful}])$

where  $P(\text{Yes})$  is the probability of a “yes” response.

### *Results*

First considering the models without the hypothetical bias correction (i.e., *Yes1*) we find that the tax payment negatively affects the likelihood of a yes response and income positively effects the payment indicating that the improvement of mountain views

from billboard removal is a normal good (Table 5). Note that when the log of the cost amount is used in the specification the median *WTP* is estimated and the mean is undefined (Haab and McConnell, 2003). The median is lower than the mean estimate thus providing a conservative estimate of the benefits of removing billboards. Following the method described by Cameron (1987, 1991), we estimate that the median *WTP* for billboard removal is \$48 per household with a 95% confidence interval of \$19 to \$77.

In model 2 we find that the coefficient on education is positive and significant. In addition those who report a home with a view and a drive with a view that can be altered are more likely to answer “yes” to the removal of billboards. We also find that those who moved to Watauga County after they retire are more likely to answer “yes”. Those who have ancestors in Watauga County are less likely to answer “yes” to the willingness to pay question. We explore these differences in the next section. The median *WTP* in this specification is \$41 per household with a 95% confidence interval of \$16 to \$67.

In model 3, we focus on three dummy variables measuring preferences about billboards. The first dummy variable, *Zoning*, is coded as one if the respondent is in favor of zoning in the county and zero otherwise. Individuals who are in favor of zoning are more likely to say “yes” to the removal of billboards. The second dummy variable, *Billboard-Useful*, is equal to one if the respondent found that billboards provide very useful information answer either 4 or 5 on the Likert scale. The third dummy variable, *Billboard-Harmful* is equal to one if the respondent felt that billboards are very harmful to mountain views answering either 4 or 5 on the Likert scale. The coefficients on both are as expected. Individuals who state that billboards provide useful information and those who state that billboards are harmful are more likely to say “yes” to the proposal.

The WTP in this specification is estimate to be \$40 with a 95% confidence interval of \$12 to \$67.

In the second set of models, we use the *Yes2* measure that corrects for hypothetical bias. The results mirror the results from the first set of models in terms of sign and significance. When the median *WTP* estimates are corrected for hypothetical bias they fall to \$31 for the first specification with a 95% confidence interval of \$14 to \$48. In the second two specifications we find that both have a median *WTP* estimate of \$25 per household with 95% confidence intervals of \$10 to \$40.

#### **Section 4: Demographic Difference and Aggregate Willingness to Pay**

The debate over land use in the mountain consists of many different subgroups in the county with different preferences. Using the information from the logit specifications above, we can focus on each subgroup and calculate their WTP by evaluating each dummy variable at either one, indicating the respondent has the characteristic, and zero indicating the respondent does not have the characteristic. One subgroup is individuals who have retired to the mountains. We find that their median WTP is \$495 while those who didn't retire to the mountains have a WTP of thirty dollars. In addition, we find that individuals who have ancestors in the county have a WTP of only six dollars while those who do not have ancestors in the county have a WTP of one hundred dollars. These results support the conjecture that new-comers' preferences are different then those who are native to the county. It also suggests why the debate becomes contentious with one sub group finding the removal of billboards unimportant and another finding that it is a major concern.

Overall, however, our results indicate that the majority of households perceive that the mountain-view amenity would be improved through the removal of billboards with the sample being willing to pay a positive amount from \$25 to \$48. To estimate the aggregate WTP to remove billboards from all roads in Watauga County, we use the most conservative WTP estimate. Using the 2000 census we find that there are 18,540 households in Watauga County giving an aggregate WTP of about \$463,500 dollars. This estimate can be thought as the amount that would be approved in a referendum election -- reflecting the preferences of a median voter. Once again, it can also be thought of as a lower bound benefit estimate because the mean WTP, which is more appropriate for benefit cost analysis, is above the median.

To help understand the meaning of the aggregate WTP, note that the county has three highways that have been designated scenic byways: Route 194, Route 421 (called the Merle and Doc Waston scenic byway) and the Blue Ridge Parkway. No billboards are allowed on these three roads. In addition, the county has three corridors that all pass through Boone: Highway 105, Route 321, and Route 421 West. Along these roads there are a total of 165 billboards. Households are willing to compensate land owners \$2810 per billboard to remove billboards and improve mountain views.

## **Section 5: Conclusions**

We find that the majority of individuals value mountain views and desire some regulation to protect the aesthetic values of mountain views. For example the majority are in favor of ridge laws that prevent mountain top building as well as zoning restrictions. We also find that while individuals find that billboards provide useful

information they also find billboards harmful to mountain views. Our results show that individuals who buy homes with views that can be altered by billboards, electrical generation wind mills, or cell-phone towers, and those who retire to Watauga County have different preferences than individuals who have ancestors in the county when it comes to changes in the view shed. A conservative total benefit of removing billboards from Watauga county roads is \$463,500 or \$2810 per billboard. If landowners are willing to accept this offer it would be efficient to remove billboards from Watauga County, North Carolina.

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**Table 1. Means of Variables**

Variable	Mean (Standard Deviation)
Age (years)	56.5 (15.8)
Income <sup>1</sup>	\$60,470 (33.9)
Education (years)	14.97 (3.8)
Male	.60 (.49)
Drive with View	.81 (.39)
Home with View	.59 (.58)
Ancestor from Watauga	.33 (.46)
Retire to Watauga	.11 (.31)
Billboards Useful Information	.15 (.36)
Billboards Harmful	.51 (.50)

n=355

<sup>1</sup>We impute 18 missing wage values using a wage equation (Whitehead, 1994).

**Table 2. Opinions about Land Use**

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
Zoning	43.4%	23.3%	11.1%	13.4%	8.5%
Cell Tower	17.0%	34.2%	30.1%	9.8%	9.0%
Landowner	21.6%	20.3%	33.7%	19.8%	4.6%
Scenic Byway	10.5%	14.4%	23.4%	37.8%	13.9%
Ridge Law	71.2%	21.6%	3.3%	1.3%	2.5%
Mountain View	70.2%	26.5%	1.3%	0.3%	1.8%
Windmills Electrical	19.0%	40.6%	14.4%	8.2%	14.7%
Abandon Cars	3.6%	5.9%	20.8%	66.8%	2.8%

Sample size = 355



**Table 3. Determinants of Opinions of Land Use: Ordered-Logit**

	Zoning	Cell Tower	Land Owner	Scenic Byway	Ridge Law	Mt View	Electric Wind Mills	Abandon Cars
Intercept1	-2.72* (14.06)	-3.55* (27.98)	1.13* (3.20)	-1.02* (2.31)	-0.74 (0.89)	-0.01 (0.00)	-0.08 (0.02)	-0.93 (1.42)
Intercept2	-1.25* (3.08)	-1.63* (6.26)	2.47* (14.79)	-0.17 (0.07)	1.50* (3.43)	3.35* (15.10)	2.18 (9.45)	0.24 (0.11)
Intercept3	-0.31 (0.19)	0.50 (0.60)	4.36 (42.55)	1.50** (4.98)	2.88** (9.90)	5.17** (17.05)	3.40** (21.84)	1.88** (6.30)
Income	0.003 (0.03)	-.006* (3.04)	-0.013 (0.17)	0.003 (1.19)	0.003 (0.53)	-.003 (0.72)	-0.007* (3.30)	-0.01* (5.13)
Home View	0.36 (2.34)	0.86* (14.37)	-0.15 (0.53)	-0.21 (0.89)	0.60* (4.86)	0.49* (3.50)	-0.159 (0.44)	-0.32 (1.47)
Drive View	0.96* (11.50)	0.79* (7.42)	-1.13* (16.37)	-0.88* (.43)	0.88* (7.38)	0.75* (5.42)	-0.592* (3.79)	-1.19* (14.62)
Ancestor	-1.41* (33.11)	-0.67 (8.34)	1.19* (26.89)	0.82* (12.29)	-0.87* (10.31)	-1.04* (15.71)	-0.498 (1.92)	0.72* (7.84)
Retire	-0.011 (0.00)	0.35 (1.02)	-0.57* (2.61)	-0.09 (0.04)	-0.67 (1.89)	-0.28 (0.43)	-0.50 (1.92)	0.32 (0.55)
Age	0.017* (5.41)	0.012* (2.90)	0.006 (0.98)	0.004 (0.44)	0.019* (4.71)	-0.003 (0.14)	0.095 (1.56)	-0.028* (11.71)
Education	0.058* (3.32)	0.042 (1.98)	-0.11** (13.78)	-0.08** (6.25)	0.001 (0.00)	0.04 (0.04)	0.05 (61.25)	0.01 (0.08)
Model $\chi^2$	91.36*	57.47*	104.13*	48.70*	38.48*	39.72*	15.92*	51.47*
Sample Size	341	339	357	320	363	366	306	351

\*\*Significant at the p = .01

\*. Significant at the p = .05

**Table 4. Opinions about Billboards**

	1 – Not at all useful	2	3	4	5 – Very useful
Provide Useful Information	14.9%	22.5%	46.3%	7.8%	8.3%
Harmful to Mt Views	9.4%	8.9%	32.5%	18.3%	30.9%
Use to Make Decisions	27.2%	16.2%	42.4%	6.8%	7.3%

Sample size = 355

**Table 5. Yes Responses by Payment Level**

		\$10	\$25	\$100	\$250	\$500
Yes1	Yes	41	42	30	31	14
	Total	64	80	61	85	65
	Percent	64%	52%	49%	36%	22%
Yes2	Yes	39	39	28	25	8
	Total	64	80	61	85	65
	Percent	61%	48%	45%	29%	12%

Sample Size = 355

**Table 6. Determinants of Willingness to Pay for Billboard Removal**

Variable	Yes1			Yes2		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	1.08 (2.68)	-0.83 (1.12)	-1.02 (1.40)	1.18 (2.85)	-1.46 (3.73)	-1.31* (1.72)
Log \$A	-.388* (4.80)	-.440* (4.82)	-.465* (4.44)	-.493* (5.81)	-.585* (5.95)	-.648* (5.58)
Income	0.007* (2.03)	-0.0004 (0.12)	-0.0022 (0.63)	0.009* (2.43)	-0.0004 (0.91)	-0.0007 (0.87)
Education		0.10* (2.66)	0.09* (2.31)		0.13* (3.18)	0.12* (2.76)
Drive with View		1.17* (3.01)			1.61* (3.50)	
Home with View		0.49* (1.80)			0.61* (2.12)	
Ancestor in Watauga		-1.21* (4.06)			-1.30** (3.97)	
Retired to Watauga		1.23* (2.67)			0.98** (2.30)	
Zoning			1.18** (3.95)			01.36* (4.29)
Billboard-Useful			-1.20** (2.24)			-1.03* (1.72)
Billboard-Harmful			2.14** (7.17)			2.31** (6.91)
Model $\chi^2$	27.81*	96.92*	168.36*	41.63*	117.89*	185.51*
Willingness to Pay	\$48 (\$19, \$77)	\$41 (\$16, \$67)	\$40 (\$12, \$67)	\$31 (\$14, \$48)	\$25 (\$10, \$39)	\$25 (\$10 \$40)

\*Significant at the p = .05 level.

Sample size = 355

**Appendix 1**

We should have land **zoning** in Watauga County. SA A D SD DK

**Cell towers** harm the mountain landscape in Watauga County. SA A D SD DK

**Landowners** in Watauga County should be able to use their land any way they want. SA A D SD DK

The new Route 421 from the Blue Ridge Parkway to Boone should not have been designated as a **scenic byway**. SA A D SD DK

The **ridge law** preventing tall buildings on top of mountains is important for Watauga County. SA A D SD DK

**Mountain views** are an important part of the quality of life in Watauga County. SA A D SD DK

**Electrical generation wind mills** should be allowed in Watauga County. SA A D SD DK

**Abandoned cars** do not harm the landscape of Watauga County. SA A D SD DK

**Billboard Questions**

B1. Do you feel **billboards provide useful information** to tourist and residents?

1 2 3 4 5  
(Not At All Useful) (Somewhat Useful) (Very Useful)

B2. Do you feel that billboards are **harmful to the mountain views**?

1 2 3 4 5  
(Not At All Harmful) (Somewhat Harmful) (Very Harmful)

B3. Do you **use billboards to make decisions** on where to shop and eat when you visit other locations?

1 2 3 4 5  
(Never) (Some of the Time) (All the Time)