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Who Cares About the Environment? A study of Environmental Behavior in Maine

Introduction:

With global warming on the rise, it is now more important than ever to lower or reduce the world's carbon emissions. Doing this, however, is a very difficult task because it requires cooperation from a large percentage of the world population, in order to sustain significant results. In order to facilitate this cooperation, there are two main types of studies that need to be done. The first, is the type of study that figures out how people respond to certain types of advertising, such as public and private information or voluntary environmental programs. These types of studies will help find out which methods are most effective when trying to convince a group of people to take a certain action.

The second type of study is those that identify which areas or groups of people should be targeted, with these advertisements, for maximal results. This will allow environmentalists to be able to have the largest environmental impacts with their campaigns, without wasting resources. This paper is the second of these types. It is a study to determine which demographic population factors contribute to a higher disposition to help the environment. To find this out I will be studying the state of Maine, and break things down on a county level. I am going to look at factors about each county, and analyze whether or not each factor contributes to a higher level of environmentalism. I have selected questions that relate to environmentalism from various referendums over the years and will use a county's voting on these specific issues to determine its level of environmental friendliness.

This method will be very accurate for two main reasons. First, voting is done in private, so we can assume what each person votes is their true opinion and was not swayed by pressure from other people. Second, the questions they are voting on are bills that will help the environment, though will require a large amount of funds, which will increase taxes. Since the cost of each project is on the bill, each voter is aware of this tax increase. Therefore voting for the environmental action despite this, demonstrates that they are personally willing to sacrifice to help the environment. These are exactly the types of people it is important to identify for targeted marketing, because many non-command-and-control environmental programs offer very little personal benefit to participants, and often require them to take some action that will cost them time or other resources. Since these programs are becoming increasingly popular, the results of this study would be very helpful to new environmental initiatives in the future.

Specifically, my research objective is to find out whether three main variables (averaged across each county) have any correlation to how a county votes. The three variables are: income, education level, and household size. From reading previous studies I predict that income will be positively correlated with environmental friendliness. This may partly be due to the fact that people with more disposable income have more to spend in general, and therefore would be sacrificing less as a proportion of their total resources. However, since they also

theoretically pay a higher portion of their income to taxes, they should be contributing more towards the environmental projects, though this is not likely to cross their minds.

I expect education level to also correlate positively after the regression. This is because they are more likely to be aware of environmental issues and I expect they also may be more forward looking in general. The reason I expect them to be more forward looking, on average, is because school is costly and not very rewarding until afterwards. This is similar to environmental contributions. They are not very rewarding immediately but pay off in the long run through better parks, more scenic areas, cleaner lakes, etc. that will be achieved after a natural restoration project. Being more aware of environmental issues such as global warming is likely to make people more willing to donate their resources to help out because they will be expecting a benefit from the park, clean lakes, etc. as well as a warm glow from helping the planet. People who are unaware of environmental issues will not get this warm glow and therefore will receive less benefit from spending their resources on environmental projects. Therefore I expect that more educated communities will favor environmental bills more heavily than less educated communities.

I expect household size to correlate positively to eco-friendliness. This correlation will happen for a few main reasons. Firstly, larger households are more likely to have children, or more children, than small households. If two parents have children, they are more likely to care about what the world will be like in 50 years, because they will be thinking about their kids and the grandchildren they will have. If the children are young, they will also be very concerned about clean air and water, and be all for having clean state parks, which are popular for family trips.

A low household size would usually mean either an area with a lot of old couples, young couples, single people, or some combination of the three. This is because, on average, a much higher proportion of middle aged adults have children than older adults or young adults. If the area is dominated by the elderly, I expect that their voting will not be very pro-environment because older people are less likely to buy into things like global warming or be up-to-date on new scientific developments. However, if an area is filled with young couples, I expect the opposite to be true. Though I do not have the data on age for each county, it would not be very useful because, at a county level, there would undoubtedly be both very old and very young people which would average out and not leave us with very much insight.

As a whole, younger people are very eco-minded and would be expected to support most projects and investments pertaining to preserving the environment. Though this may offset the effects of household size on environmentalism slightly, I believe that the number of 1 or 2 person households who are elderly is far larger than the number of 1 and 2 person households who are young.

I expect families with children to locate in communities near other families with children, at least to some extent. This should be true with many other types of people as well such as the elderly and the young both grouping together. Though this won't be true everywhere, and obviously there are people in all three of these categories in every county I believe that there will still be enough of this effect at a county level for us to see some effect of household size on voting patterns. Since areas where the wealthy live are usually higher priced real estate, such as the coast, there is likely to be mostly people of similar income levels in each county, at least in general. As for education level, high school graduation rates are usually similar on a county level, though there is no way for me to predict how people who are educated at a university level are distributed in the area.

Literature Review:

There have been many studies done trying to identify what a "green" person is like. However, most of these studies focus on the personality type of a person who cares for the environment, not their demographics. Studies like *Environmental Sensitivity Environmental Sensitivity in a Developing Country: Consumer Classification and Implications* by Muzaffer Bodur and Emine Sarigollu, *Ecological Concern, Attitudes, and Social Norms in Voting Behavior* by James D. Gill, Lawrence A. Crosby and James R. Taylor, and *Altruism, self-interest, and the reasonable person model of environmentally responsible behavior* by JB Corbett focused on what personality aspects played the biggest factor in how environmentally conscious a person was, but did not discuss demographical attributes of these people. Studies like these three were very common, though most of them would examine one particular aspect of personality and see if it correlated to environmental actions.

The paper by Joachim Schahm and Erwin Holzer titled: *Studies of Individual Environmental concern: The role of Knowledge, Gender, and Background Variables* found that women are more likely to be environmentally friendly than men, but did not look at any of the same background variables as my study. The paper that was closest to my topic was a second study by Muzaffer Bodur and Emine Sarigollu called *Environmental Sensitivity in a developing Country*, which looked at demographic variables in Turkey and their correlation to environmentalism in a small part of their study. It was not the main part of the study but in the paper they ran two regressions that found that environmentally minded people were both more educated, and also made more money, on average. Their test for education level was very thorough because they accounted for all types of education, even five year elementary school completion. They also found that people with four or more kids were less environmentally conscious but they linked that to lower education as well. Their test of how much people cared about the

environment was a questionnaire that asked them whether they were concerned or unconcerned about the environment, as well as other personal information.

One of the main differences between these studies and mine is that they all used questionnaires to collect the data on whether or not people cared about the environment. Since my study uses voting data, I expect it to capture a group of people's real environmentalism better because it is asking them about the environment at a time where it will raise taxes for them to say "yes" as opposed to on a survey where you can say anything you want. However, the cost of using this method is that I am unable to break the data down to an individual level, and have to assume the averages I get are repetitive of the entire population. However, this paper's result will contribute to the search for who exactly the "green" consumer is because it is the first one to specifically look for characteristics of this consumer in the state of Maine.

Data:

My ideal data would be each individual's income level, education, and household size, and their response to a survey of questions designed to assess their level of environmentalism. Having the data down to an individual level would be ideal because it would not only give me much more data, but eliminate effects that cancel each other out such as families and elderly singles living together in the same county, which is of course prevalent in all counties.

My data for demographics is from the U.S. Census website. It was a survey sent to all households. The response rate was almost 100% because they would send someone to do the survey with you if you did not mail it back. However, it does not measure homeless people or illegal immigrants in any way.

My data for voting history is from the Maine government website. It is a direct tally of voting data. Since everyone does not vote, the data does not represent everyone but for the study I am assuming that those who chose to vote were representative of the entire population. I combined voting data over 3 separate years (2010, 2012, 2014) because those were the years environmental issues were on the referendum. For the demographics I used the census data from 2013 and assumed that things had not changed heavily in the 3 years around it.

In my dataset there are 19 rows. The first 16 each represent one of Maine's 16 counties. The next one (17) is the average of all the columns, the 18th one is the standard deviation, and the last one is a measure of how well each environmental issue in the referendum represented a person's environmentally friendliness. I used this to weigh the averages by multiplying the number (1-3) by the percentage of "yes" votes, before taking the average. The idea behind this is to account for the fact that all issues voted on are not the same and some fit the research question better, which should be accounted for. In order for a question to receive a score of 3, it had to have the sole purpose of helping the environment, and not have any

other incentives, such as job creation, built in. These were the two questions that were to buy land strictly for the purpose of conservation. To receive a score of 2, a question had to have the main focus of helping the environment, but could include other economic benefits built in as well. To receive a score of one, a question would be mainly aimed at something that is not directly environmental (ie. pest control), but the method they proposed to achieve their main goal would benefit the environment.

The first 5 columns each represent a separate environmental issue that was voted on. The next two are the overall percentage of “yes” votes, by county, and the weighted overall vote. I ignored the number of voters and focused on percentage because the number of people voting could have a lot of other factors that influence it, such as what else is on the ballot. The next categories are the demographics of each county, and the titles explain what they are.

The reason I included both bachelors and above as well as high school and above for education level, is because I believe they represent two different things. High school and above is a factor that is more broadly applicable and represents the general education level of a community, while bachelor’s degree and above represents a more developed region because it indicates more high-qualification jobs in an area.

There has not been any data that I have been unable to find, though for some of it there was no excel spreadsheet so it required very time-consuming methods to get it into excel and stata.

Results:

County	1	2	3	4	5	Overall	Overall (Weighted)	Med. Income	H.S. or higher	Bach. or above	Household Size
Androscoggin	0.540	0.595	0.528	0.546	0.545	0.551	0.549	44,921	87.9	18.8	2.37
Aroostook	0.548	0.611	0.492	0.592	0.487	0.546	0.530	37,855	85.1	16.7	2.26
Cumberland	0.610	0.670	0.643	0.660	0.653	0.647	0.650	57,461	93.7	41	2.34
Franklin	0.548	0.582	0.569	0.562	0.555	0.563	0.565	41,626	91.5	23.7	2.44
Hancock	0.579	0.597	0.566	0.586	0.545	0.575	0.569	47,460	92.5	33	2.17
Kennebec	0.585	0.612	0.563	0.581	0.549	0.578	0.572	46,808	91.4	24.6	2.29
Knox	0.607	0.626	0.612	0.599	0.612	0.611	0.613	49,755	92.8	30.4	2.28
Lincoln	0.587	0.591	0.599	0.575	0.593	0.589	0.592	50,181	93	33.1	2.28
Oxford	0.560	0.592	0.563	0.543	0.566	0.565	0.567	40,674	89.7	18.9	2.47
Penobscot	0.536	0.566	0.511	0.559	0.489	0.532	0.523	43,734	90.7	23.8	2.34
Piscataquis	0.494	0.516	0.475	0.489	0.441	0.483	0.476	36,646	87.8	16.4	2.2
Sagadahoc	0.586	0.628	0.606	0.610	0.597	0.605	0.606	56,733	93.4	32.3	2.32

Somerset	0.530	0.558	0.509	0.532	0.474	0.521	0.513	38,642	87.3	15.4	2.36
Waldo	0.567	0.571	0.546	0.547	0.539	0.554	0.551	42,221	91.2	28.2	2.32
Washington	0.513	0.541	0.499	0.539	0.442	0.507	0.496	37,236	87.2	20	2.2
York	0.586	0.640	0.617	0.630	0.620	0.618	0.621	57,348	91.9	28.8	2.41
Average	0.561	0.593	0.556	0.572	0.544	0.565	0.562	45,581.3	90.4	25.3	2.32
Std. Dev.	0.033	0.038	0.050	0.042	0.063	0.043	0.047	7116.9	2.6	7.4	0.09
Env. Rating	1	2	3	1	3						

TABLE 1: All demographics and voting data broken down on a county level, including summary statistics

The first regression I will run will have the unweighted votes at the dependent variable and income, household size, and percentage of people with a bachelor's degree as the independent variables. The results of this regression are depicted below. The votes are depicted as a proportion in the unweighted model, so a 0.1 increase would corresponded to a 10% change in voting percentage. This is true for the second unweighted model as well, but for the weighted votes this is not true because each proportion is multiplied by a number that is 1-3.

. regress G I K L

Source	SS	df	MS	Number of obs = 16		
Model	.024639986	3	.008213329	F(3, 12) = 29.09		
Residual	.003387698	12	.000282308	Prob > F = 0.0000		
Total	.028027684	15	.001868512	R-squared = 0.8791		
				Adj R-squared = 0.8489		
				Root MSE = .0168		

G	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
I	3.14e-06	1.27e-06	2.47	0.030	3.68e-07	5.91e-06
K	.0023866	.0012012	1.99	0.070	-.0002307	.0050039
L	.1200124	.0571803	2.10	0.058	-.0045729	.2445976
_cons	.0838712	.123651	0.68	0.510	-.1855411	.3532836

TABLE 2: The results of the regression between median income, household size, and college education versus voting percentages that are **not** weighted

In this model, and all subsequent models, the weighted or unweighted votes are the dependent variable and the independent variables are as follows:

G: Mean percentage of unweighted votes
 H: Mean Proportion of Weighted Yes Votes
 I: Median Income
 J: H.S. Degree or Above
 K: Bachelors Degree of Above
 L: Household Size

Of the three independent variables, only income was significant at the 5% level model. Household size was close, but not quite significant. The correlation with income is positive, which means that higher income areas are more likely to vote positively on environmental issues. Since median income is in dollars, and voting is a proportion, our result suggests that a 10 thousand increase in median income increases environmentally friendly votes by 3.14%. The correlation with household size, and bachelor's level education was also positive, which suggests higher levels of these two things increase environmental friendliness, however since neither correlation is significant, we can't draw any conclusions.

The next regression I will run will be exactly the same, except the college education variable will be switched to a variable representing the proportion of the population (over 18) who graduated high school. All letters represent the variables described above.

. regress G I J L

Source	SS	df	MS	Number of obs = 16		
Model	.023718797	3	.007906266	F(3, 12) = 22.02		
Residual	.004308887	12	.000359074	Prob > F = 0.0000		
Total	.028027684	15	.001868512	R-squared = 0.8463		
				Adj R-squared = 0.8078		
				Root MSE = .01895		

G	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
I	4.65e-06	1.18e-06	3.93	0.002	2.07e-06	7.23e-06
J	.0023366	.0031856	0.73	0.477	-.0046043	.0092774
L	.0724389	.0584277	1.24	0.239	-.0548641	.199742
_cons	-.0255842	.280096	-0.09	0.929	-.635861	.5846925

TABLE 3: This table is the results of the regression between **un**weighted votes and median income, high school graduation rate, and household size.

From this table you can see that, again, only median income is significant. In fact, here it is more significant (0.02 vs. 0.03). It also suggests a higher correlation (4.65% per 10k increase in income). In this regression, high school education and household size are both positive, but far from significant.

The next regression I will run uses the same independent variables as the first regression, except the dependent variable is the weighted votes.

. regress H I K L

Source	SS	df	MS	Number of obs = 16		
Model	.030286987	3	.010095662	F(3, 12) = 34.96		
Residual	.003465583	12	.000288799	Prob > F = 0.0000		
Total	.03375257	15	.002250171	R-squared = 0.8973		
				Adj R-squared = 0.8717		
				Root MSE = .01699		

H	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
I	3.25e-06	1.29e-06	2.53	0.027	4.47e-07	6.05e-06
K	.002784	.001215	2.29	0.041	.0001368	.0054312
L	.1566856	.0578339	2.71	0.019	.0306764	.2826949
_cons	-.0194259	.1250643	-0.16	0.879	-.2919176	.2530658

TABLE 4: The results of the regression between median income, household size, and college education versus voting percentages that **are** weighted

In this regression all three variables have statistically significant correlations. They are also all positive, which implies an increase in any of these increases environmentalism as well. These three variables are median income, percentage of the population who hold at least a bachelors degree, and average household size. Unfortunately, due to the weighting, we can no longer interpret these results quantitatively. For example, these results do **not** say that a 1 person increase in average household size increases environmental voting by 15.67%. This is because some votes are multiplied by a number greater than 1, which would exaggerate the results. Also since different questions are multiplied by different numbers, we cannot divide by a certain number to find the actual value. However, the fact that there is a positive correlation between these variables is still valid.

For the final regression, I will do the same thing as the third regression, only swapping out college education with percentage of the population that is college educated.

regress H I J L

Source	SS	df	MS	Number of obs = 16		
Model	.02926835	3	.009756117	F(3, 12) = 26.11		
Residual	.00448422	12	.000373685	Prob > F = 0.0000		
Total	.03375257	15	.002250171	R-squared = 0.8671		
				Adj R-squared = 0.8339		
				Root MSE = .01933		

H	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
I	4.70e-06	1.21e-06	3.90	0.002	2.07e-06	7.33e-06
J	.0037507	.0032498	1.15	0.271	-.00333	.0108313
L	.1014194	.0596046	1.70	0.115	-.0284479	.2312867
_cons	-.2263435	.2857379	-0.79	0.444	-.8489128	.3962259

This regression again finds median income to be significantly correlated with environmental voting, but we cannot tell exactly how much for the reasons described in the regression above. It does not find either high school education or household size too be correlated with environmental voting. For high school education this is not surprising, as there was no correlation in the unweighted regression either. However, the fact that household size is no longer significantly correlated is surprising. This is likely due to some confounder or correlation between high school education and household size. Or it is possible that there is a negative correlation between college graduation proportion and household size. There may be other overlap in the regression such as median income and education level. For example people who went to college are likely to have higher salaries, which could account for some variation that otherwise may be attributed to education level. This may be the reason that we found minimal evidence suggesting a correlation between education level and environmental voting.

Conclusion:

Overall, our only conclusive evidence in this study was that income correlates positively with environmental voting. This is what we expected because it is similar to what studies in other countries have found. However, for education level, we did not find any evidence that high school education had any impact, and only evidence that college education had any effect in our weighted regression. In this weighted regression we found that environmental voting was positively correlated with the percentage of a county that had a bachelor's degree or higher. Household size was found to be positively correlated with environmental voting in one regression and almost significantly correlated in another regression. The one it

was significant in was the weighted votes and college as the education level. The one it was nearly significant in was the same regression, unweighted. This would be an interesting topic for future research because there is currently not much on the topic. It would also be interesting to test how the makeup of a household affects voting, though this would require much more in-depth data. Another drawback of our data was the magnitude it was grouped at. A county level is very larger, which can hide a lot of variation in the data by averaging things out across a county. Since this is all the data that is currently available for all of the questions I was interested in, it was impossible to perform the study at a more detailed level. However, in other states this data may be available and this could be done.

Appendix:

Below are the questions I used (in that order) and the websites I got the information from.

2014

Question 2: Bond Issue

Do you favor an \$8,000,000 bond issue to support Maine agriculture, facilitate economic growth in natural resources-based industries and monitor human health threats related to ticks, mosquitoes and bedbugs through the creation of an animal and plant disease and insect control laboratory administered by the University of Maine Cooperative Extension Service?

2014

Question 6: Bond Issue

Do you favor a \$10,000,000 bond issue to ensure clean water and safe communities across Maine; to protect drinking water sources; to restore wetlands; to create jobs and vital public infrastructure; and to strengthen the State's long-term economic base and competitive advantage?

2012

Question 3: Bond Issue

Do you favor a \$5,000,000 bond issue to purchase land and conservation easements statewide from willing sellers for public land and water access, conservation, wildlife or fish habitat and outdoor recreation, including hunting and fishing and deer wintering areas, and to preserve working farmland and working waterfronts to be matched by at least \$5,000,000 in private and public contributions?

2012

Question 5: Bond Issue

Do you favor a \$7,925,000 bond issue to be expended over 2 years for revolving loan funds for drinking water systems and for wastewater treatment facilities, which will make the State eligible to secure \$39,625,000 in federal grants?

2010

Question 3: Bond Issue

Do you favor a \$9,750,000 bond issue to invest in land conservation and working waterfront preservation and to preserve state parks to be matched by \$9,250,000 in federal and other funds?

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