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The Relationship Between Living in a Rural Community and Support for Agricultural Runoff Policy in the Great Lakes Region

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Abstract

In the past few years, the Great Lakes have experienced an increase in harmful algal blooms in large part due to agricultural runoff and results in increased levels of toxins in the water putting the drinking supply at risk. The current policies are fairly relaxed but there is movement towards developing policies directed more at farmers and farming practices to mitigate runoff. While past studies have looked at factors such as political party to see the influence on policy support, there has not been much research investigating how the location where someone resides impacts their support. Using statistical analysis of survey data of people in the Great Lakes region, this paper aims to understand if people in rural areas are more likely to oppose agricultural runoff policy compared to those in non-rural areas. The results of this paper find that living in a rural area does not affect whether or not a person will support runoff policy. The finding of this paper indicates that policymakers may wish to further investigate how being a farmer changes support for agricultural runoff policy to provide a clearer picture of support.

Introduction

For people growing up in the surrounding areas, the Great Lakes water system is a tremendous landmark and an important part of local economies and culture. This is not surprising considering it is the largest freshwater system in the world and provides drinking water to more than 40 million people (Pure Michigan, n.d.). In terms of economic contribution, the Great Lakes supports 51 million jobs and has over 200 million tons of cargo shipped every year (Pure Michigan, n.d.). It is without question that the Great Lakes are an integral component of daily life for the millions of people who call the region their home.

Despite being so critical for the people nearby, the Great Lakes have and continue to face challenges with regards to environmental issues. Some of the current problems challenging the Great Lakes include plastic pollution, invasive species, and harmful algal blooms (HAB) resulting from agricultural runoff. In particular, the problems caused by the HAB are dangerous for those who depend on the Great Lakes for their drinking water. HABs arise from algae reproducing under conditions with warm temperatures, light, and large amounts of nutrients and are considered dangerous as a result of containing toxins and chemicals (NOAA, n.d.). The levels of nutrients available for the algae are increasing which is largely due to issues with farming practices and results in an increased amount of phosphorus in the water (NOAA, n.d.). With all the toxins and chemicals in the water, it puts the drinking supply for many at risk as well as endangering the species residing in the lakes. While there is clear reason to be concerned about the future of the Great Lakes, the manner in which to go about protecting them generates a contentious debate.

With agricultural runoff being a major contributor of nutrients for HAB, the focus turns to farmers and their practices to try and mitigate the amount entering the lakes. The question for

many is who should bear the responsibility for ensuring the safety of the Great Lakes. Some would say there need to be regulations regarding farming practices while others point to more of an opt-in approach in which people offer to receive education about the issue without having a mandate to change (Rissman et al., 2017). Providing some level of protection is vital for sustaining the integrity of the lakes and the success of the policies for doing so is therefore critical. Part of the success of these policies is whether or not they have the support of the public behind them. Many factors such as political parties and geographic location play a role in public opinion regarding these policies and it is beneficial to understand the interactions between them in order to generate effective policy solutions for the future.

This paper will focus on the interaction between support for agricultural runoff regulations and the type of location where people reside such as a rural or urban area as well as political affiliation which is a factor known to sway support. Previous studies looking at other factors affecting public opinion on agricultural runoff policies in the Great Lakes region and government-focused interventions are drawn upon to help analyze the data. The analysis will be focused on data from a survey of public opinion in the Great Lakes region.

Literature Review

The existing literature looking at factors influencing public opinion in regards to agricultural runoff regulations can be divided based on the different components contributing to support or opposition to policies. The different elements include responsibility for restoration, political affiliation, and geographic location.

Responsibility for Restoration

Whether or not the public will support runoff policy may rely on who the public believes to be responsible for reducing the amount of agricultural runoff. Many studies have investigated

what types of policies gather the most public support which is indicative of who the public believes is responsible for curbing runoff. In one study, the researchers aimed to answer the question of what factors influence whether the public supports or opposes policies intended to alleviate some of the agricultural runoff (Guo et al., 2019a). In order to do this, they developed a survey to administer to Ohio residents to assess their acceptance of regulations which examined their psychological factors relating to the fines for excessive agricultural runoff. The survey examined indicators of their acceptance which included trust in farmers, trust in government, and risk perception. One of their findings was that most people preferred to have voluntary programs for farmers to join rather than having regulations and did not believe farmers should hold the responsibility of restoring Lake Erie. Overall, the predictions researchers had for each predictor were consistent. The factor that had the greatest effect in whether they opposed regulation was trust in the farmers. The factor of water quality perception did not show any significance when determining whether or not people supported the regulation.

In somewhat of a contrast to the previous study, another research article found that many respondents actually opposed the voluntary action of the farmers compared to having some type of government intervention (Rissman et al., 2017). Specifically, residents of southern Wisconsin were surveyed and asked a variety of questions about support for water policies, their beliefs, and worldviews. The researchers were interested in seeing what types of individuals support policies to reduce agricultural runoff and what types of policies they specifically support. The results indicated that respondents showed more support for incentives and market-based policies compared to regulation and taxes. While those surveyed opposed not having any type of government intervention, they still supported government actions that allowed some flexibility

for farmers. This is another instance of public opinion that farmers should not bear most of the punishment or responsibility for runoff-related pollution.

Political Affiliation

Many prior studies have unsurprisingly indicated that political ideology plays a role in determining public support for different environmental policies. In a study looking at environmental policies in general, researchers aimed to look at, among other aspects, the relationship between political affiliation and support for policy measures (Clayton, 2018). This article focused on an online survey of 162 adults in the United States and asked about support for various environmental policies and aspects of the respondents such as their political leaning. The results showed that all policies inquired about had more support from liberals than conservatives which was consistent with prior research. Although looking at general environmental policies, this article gives a good indication that political affiliation plays a significant role in public support for policy which means agricultural runoff policy should also be subject to this relationship.

Looking at runoff policy specifically, researchers in this study looked to see how people reacted to regulation regarding the reduction of nutrient runoff (Guo et al., 2020). They specifically looked at their opinions about the farmers themselves, accountability, political beliefs, and worldviews. The study was conducted by surveying hundreds of Ohio residents and used statistical analysis to see the relationship between support for regulation and the previously listed factors. The specific policy they asked about was a fine for agricultural runoff. The results showed that people who felt strong support for the farmers viewed the fines negatively while the people who felt strongly about accountability viewed them positively. There is not as clear of a

relationship when considering worldviews. Again, this is another study indicating the importance of assessing the views of local residents on regulations such as the fines mentioned above.

Geographic Location

It appears that the type of locations people reside in as well as their proximity to a key water source may influence their support for certain environmental policies. In one case study focusing on Canada, the researchers looked at public opinion on policies aimed at reducing carbon use in transportation through a representative survey in which they asked questions regarding support for the policies, trust in key figures, and a few other demographic factors impacting policy support (Kitt et al., 2021). Some of the additional factors looked at by the researchers included geographic location in which they believed participants in regions relying on industries with high pollution would have a negative correlation with support for climate policies. After administering the survey, the researchers viewed the results and then performed a regression analysis to look at the relationship between trust and acceptance of the proposed policies as well as the other demographic factors. The results showed that areas that do not rely on industries resulting in high pollution have a positive correlation with support for climate policies. This study gives some evidence for geographic location influencing public support for policy.

When looking at agricultural runoff policy specifically, these researchers in this next article aimed to observe whether the political beliefs and physical location in regards to Lake Erie of Ohio residents impacted their support for regulatory policies designed to reduce runoff (Guo et al., 2019b). In order to do this, they surveyed people by phone and asked them a series of questions regarding their agreement with statements regarding specific policies and how well informed they are on the algal bloom issue in the water. They also asked for the political views

of respondents and categorized them accordingly. After completing the surveys, the researchers used regression models to analyze the relationships between political beliefs, geographic location, and attitudes towards the policies. The results demonstrated that people's support for regulation often matched with their political leanings. Additionally, the geographic location did not have an impact on whether or not a person would support the regulations. In their concluding thoughts, they believe that the implication of their findings is that there should be more dialogue between groups of differing beliefs and opinions to promote the most effective policies.

While the researchers in the previous study did not find strong evidence for a relationship between geographic proximity to the Great Lakes and support for policy, it leaves an interesting idea of how the type of place someone lives in can be a factor in their support or opposition for a policy. In order to get the support needed for effective regulations to mitigate the runoff, there needs to be consideration about the type of community people live in and how they view the bearer of responsibility, and ultimately whether they would support regulations targeting one group. Essentially it is to ask, does living in a rural community affect a person's support for agricultural runoff regulation directed at farmers in the Great Lakes region?

Methods

Data Sources

In order to address whether the type of community a person lives in affects their support for agricultural runoff regulation in the Great Lakes region, data was taken from a previous survey conducted by the Center for Local, State, and Urban Policy (CLOSUP) at the University of Michigan and the Muhlenberg College Institute of Public Opinion. This survey was conducted in 2013 and occurred via random digit dialing both landline and mobile numbers which resulted in a total of 821 respondents from the Great Lakes Region. The states surveyed include Illinois,

Indiana, Michigan, Wisconsin, Pennsylvania, Minnesota, New York, and Ohio. The province Ontario in Canada was also included but was not incorporated in this paper due to the focus on participants in the United States. Phone numbers were included from places defined to be included, even partially, within the Great Lakes watershed as denoted by the United States Environmental Protection Agency. The number of responses from each state is varied as a result of the sampling method used for the survey. For the purposes of this paper, the questions pulled from the survey pertain to political affiliation, description of current location (such as rural or urban), and whether or not they support agricultural runoff policies.

Variables

The independent variables for this paper are description of current living location (rural, urban, etc.), political affiliation (democrat, republican, independent, etc.), income, education, age, and gender. The variable of most interest for this research is whether someone lives in a rural, urban, or other type of community. Specifically, the question in this survey included six options for participants to choose from to describe the place in which they reside. However, for this paper, the type of location variable was changed to be binary where it was now rural or non-rural. This was done because the focus is on whether living specifically in a rural area influences support for runoff reduction. The data for this variable are discrete. The other independent variable of political affiliation was chosen based on previous literature which indicates that it correlates with a person's decision to support or oppose policies such as the one being researched for this paper. Since it has already been identified as correlating with policy support, this will be the control variable for this research. Similar to the previous variable, the data for political affiliation are also discrete. Income, education, and age are all ordinal variables

and the data for these variables are also discrete. Age is a binary variable with the data again being discrete.

The dependent variable for this paper is support for policies pertaining to agricultural runoff. Specifically, the question refers to the participants' response on the topic of "reducing runoff from farms and agricultural areas even if it would result in a higher cost for food." The options for response were strongly support, somewhat support, somewhat oppose, strongly oppose, and not sure. The data resulting from this portion of the survey are ordinal. The ordinal aspect of this variable is due to the organization of support from strong support to strong opposition. The descriptive statistics for these variables are provided in Table 1 below.

In order to analyze the data, a linear regression was conducted to look at the relationship between the type of location and support for agricultural runoff policies. This test was also conducted with political affiliation and support for the policies as a control to compare to the relationship of interest.

Table 1: Descriptive Statistics

Variable	Min	Max	Mean	Std. dev.	Mode
Political Affiliation	2.00 (Republican)	5.00 (Democrat)	3.6893	1.22612	5.00 (Democrat)
Type of location (Binary)	0.00 (Not Rural)	1.00 (Rural)	0.1841	.38779	0.00 (Not Rural)
Level of support for runoff policy	1.00 (Strongly favor)	4.00 (Strongly oppose)	1.9528	0.85318	2.00 (Somewhat favor)
Income	1.00 (<$25,000)	5.00 ($100,000+)	2.6293	1.29961	2.00 ($25-49,000)
Age	1.00 (18-25 years)	9.00 (90+ years)	4.5438	2.03418	5.00 (51-60 years)

Education	1.00 (Less than high school)	5.00 (Graduate degree/work)	2.9996	1.05791	3.00 (Some college/ 2 year degree/Tech)
Gender	1.00 (Male)	2.00 (Female)	1.5098	0.50020	2.00

Results

A linear regression was conducted based on the level of support for agricultural runoff reduction policy. As shown in Table 2, only three variables were statistically significant after running the linear regression which includes education, age, and gender. For education, there was a negative correlation with level of support and was statistically significant with a p-value less than 0.001. This indicates participants with higher levels of education showed more support for runoff policy. For age, there was a negative correlation with level of support and was statistically significant with a p-value of 0.012. This result demonstrates that older age groups indicated higher levels of support. Lastly, for gender, there was also a negative correlation which means females displayed more support for reducing runoff. However, while this variable is still statistically significant with a p-value of 0.046, it is not as significant as the other two variables described above.

The R-squared value is 0.093 which is to say that only 9.3% of the level of support for runoff regulation can be accounted for by the model. This is a low percentage to account for and indicates that there may be other factors involved in determining a respondent's support for the policy. The other variables used for the model yielded insignificant results including the variable of interest which was living in a rural area. All comparisons between political parties yielded insignificant results. Importantly, this means that there was not a significant difference in support for runoff reduction between Democrats and Republicans.

Table 2: Linear Regression Model Results For Runoff Reduction Support

Variable	Coefficient	Standard Error	Significance
Type of Location (Rural as default)	-0.413	0.307	0.180
Republican (Compared to Democrat)	-0.232	0.342	0.498
Independent (Compared to Democrat)	-0.325	0.385	0.399
Other (Compared to Democrat)	-0.702	0.474	0.139
Education	-0.169	0.039	**>0.001**
Income	0.043	0.032	0.180
Age	-0.046	0.018	**0.012**
Gender (Male is default)	-0.747	0.374	**0.046**
R-Squared Value	0.093		

Analysis

The independent variable of interest for this research was the type of location where survey respondents live. The results demonstrated that there was not a statistically significant relationship between living in a rural area and expressing support for regulations reducing agricultural runoff. This indicates that living in a rural area does not influence whether or not a person will support policies for reducing agricultural runoff. This result is somewhat consistent with previous research. The results of the Guo and colleagues' study (2019b) indicated that physical proximity to Lake Erie did not impact support for regulations aimed at reducing

agricultural runoff. In this case, the results from this paper support the idea of location not influencing support or opposition for such policies. However, there are a few reasons that can explain the lack of a significant relationship between living in a rural area and support runoff reduction policies. The most evident reason is that the majority of participants indicated their support for the idea of reducing runoff. Table 1 shows that the mean response leaned towards either strongly or somewhat supporting reducing agricultural runoff. With an unequal distribution of opinion on the policy, it is difficult to get a relationship between the two variables. This would also explain a low R-squared value which shows the strength of this model to predict level of support. Additionally, the survey never asked about the occupation of the respondents. Specifically, there was not a question of whether a person's occupation was farming or farming-related. This variable may show higher levels of opposition to regulations reducing agricultural runoff as it would primarily affect farmers and result in more resistance. This effect may be particularly pronounced in rural areas where farming is more prevalent.

In contrast to prior research, the political affiliation of the respondents did not show a relationship with level of support. Prior studies such as the one conducted by Guo and colleagues (2020) indicate that Democrats show more support for regulation policies and that specific study demonstrated increased support for regulation aimed at reducing nutrient runoff amongst Democrats when compared to Republicans. The linear regression for this paper looked at comparing Republicans, Independents, and those indicating "other" to Democrats to see which groups showed the most support. The results did not display a significant relationship which may be explained for the same reason as mentioned above with most participants indicating their support for reducing runoff. In addition to political party, income also did not show a significant relationship with level of support. The result for income was consistent with prior research

conducted by Guo and colleagues (2019b) which indicates that there is not a statistically significant relationship between income and support for runoff policy.

The three variables that displayed a significant result were age, gender, and education. Based on previous studies conducted by Guo and colleagues (2020), the education result is consistent with what was concluded prior to this paper. As the level of education increases, the opposition to reducing agricultural runoff decreases. Effectively, those with more education tend to show stronger support for reducing agricultural runoff. Age also showed a negative correlation with level of support. This means that the higher age brackets showed more support for runoff reduction. This is contradictory to previous research done by Guo and researchers (2019b) which indicates that younger age groups tend to show more support for environmental regulations. However, this result may be explained by the fact that the age variable was continuous in the previously mentioned research whereas it was ordinal for this paper. For gender, there was again a negative correlation displayed in the results. This indicates that females were more likely to show support for the reduction of agricultural runoff. This corresponds with what prior studies have demonstrated by Guo and colleagues (2019a).

Conclusion

The results of this paper suggest that living in a rural area does not have a statistically significant influence on a person's support for agricultural runoff reduction. However, there are limitations with this work. One of the limitations was in regard to the questions asked in the survey. While there was a question to give data on the number of people living in rural areas, there was not a question asking about a respondent's involvement with the farming industry such as being a farmer themselves. The level of support for reducing runoff may see a more pronounced effect in rural regions where farming is more prevalent and more participants have

involvement in that industry. It is possible that there would be a higher level of opposition among farmers as they would be the group experiencing the most effect from policies aimed at reducing agricultural runoff. Additionally, there is a possibility that among the rural residents, the ones involved in farming expressed opposition while their neighbors may show more support for strict regulations which could explain why location did not demonstrate a significant relationship with level of support. Future research may consider looking at both the opinions among farmers and non-farmers as well as the interaction between rural and non-rural areas. This may give a clearer picture of where support is held for agricultural runoff regulations. Another factor limiting this paper was the majority support for reducing runoff as indicated by the survey. It is difficult to determine the relationship between the variables when there is not much of a difference in opinion amongst the respondents. Again, future research looking more at farmers specifically may help resolve this issue as there would likely be more of an equal distribution in opinion.

As with any policy regarding the environment, there is bound to be some type of opposition. The concern many have is that the policies targeting the reduction of agricultural runoff will unfairly target farmers and place too much restriction on them. As noted in a paper by Guo and researchers (2019a), most people preferred to have voluntary programs for farmers to join with regard to reducing runoff rather than having strict regulations set by the government. This paper noted educational programs about runoff and changing farming practices were the most popular voluntary programs people supported. This makes it clear that it is important to understand the support for policies among people in order to generate effective actions to help mitigate the problem. Another concern policymakers may have is whether they will have support for their policies in certain areas such as rural regions where farming is more prevalent. This paper indicates that there does not need to be concern amongst policymakers in regards to

gaining support for runoff reduction policies in rural areas. However, it may be beneficial to look further at resident farmers in these areas to gain a clear understanding of whether support extends to these groups as well.

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