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The Effect of Natural Disasters on Volunteerism

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Abstract:

The power of natural disasters to significantly and drastically alter the lives of the people they touch is vast, and the response rate of the provided aid can be the difference between a successful recovery and not. This study examines the relationship between natural disasters and volunteerism. The analysis makes use of panel data measurements on volunteer rate and volunteer hours per resident as well as FEMA measurements of major natural disasters from 2005 – 2012. I find that states that experience a natural disaster in the current year experience a significant and positive increase in volunteer rate in the year following the disaster. The findings highlight the importance of policy focused on harnessing volunteer labor in the wake of natural disasters.

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I. Introduction

Natural disasters have the power to drastically and significantly alter the lives of the people they touch. The efficient and effective allocation of resources is particularly important in the wake of large natural disasters where many people find themselves in need. Because of this, it is important to make use of and understand all available resources, including human capital in the form of volunteer labor. In recent years, the emergence of many large and internationally focused volunteer organizations reinforces just how useful volunteer labor may be. But volunteer labor can be equally vital and useful at home in the U.S. If we are to make proper use of volunteer labor to aid in the recovery and rebuilding process following a disaster, an adequate understanding of what influences an individual to volunteer is necessary.

A number of recent studies explore the propensity to volunteer as a function of various demographic and economic indicators (see for example, Pho 2005). While these indicators seem to capture a large portion of the variation, there remains the possibility that exogenous events, such as natural disasters, may have an effect on the decision to volunteer.

The purpose of this paper is to fill a gap in the existing literature by analyzing this effect. There are several channels through which a natural disaster could affect incentives for volunteering. First, altruistic motives may encourage volunteerism when a significantly sized natural disaster drastically increases the affected area's need for aid. Second, persons whose lives have previously been affected by disasters could more

strongly empathize with current victims and provide aid in the form of volunteer labor. This motive has the potential to result in increases in volunteering outside the area affected by the natural disaster. Third, a natural disaster may decrease paid work opportunities and thus increase the relative attractiveness of volunteerism. Finally, those individuals most severely impacted by a natural disaster may be less likely to engage in volunteering as they put forth effort to recover themselves from the disaster. Understanding the relationship between natural disasters and volunteerism is an important addition to the existing literature on volunteerism and may also inform the design of policies that help affected areas recover from natural disasters.

The findings of this study illustrate the effects of natural disasters on volunteer rates using a panel data set of U.S. states. The specifications of this study use data on natural disasters to explain changes in measurements of volunteerism. The results will suggest that a state that experiences at least one disaster in a given year experiences a significant increase of roughly 0.59 percent in the volunteer rate the following year. The findings also suggest that the effect of natural disasters on volunteer rates is not contained within the affected state; neighboring states in the same district also experience increases in volunteer rates in the year following a natural disaster. Robustness tests find that the observed results are not driven by hurricanes, which often receive significant media attention relative to other disasters.

The remainder of this paper is as follows. Section 2 discusses the existing literature. The data is discussed in section 3. Section 4 presents the estimation strategy and results. The final section concludes.

II. Relevant Literature

A number of studies in economics have examined various questions related to volunteering including its determinants, its value as a resource, and the effect of hurricane Katrina on measures of volunteerism. Within this literature, many slightly differing definitions of key terms including “volunteering” and “volunteerism” are presented; all are important for consideration in forming proper terminology. Much of the literature on the subject focuses on the value of volunteer labor and uses only demographic and economic indicators to explain the propensity to volunteer. Its consideration of volunteering in relation to disasters focuses only on hurricane Katrina, specifically on the value of the volunteer labor to provide help in Katrina’s wake. I group the previous research on volunteering into subgroups, and discuss each in turn.

The first group of papers is largely focused on using the principles of economics to understand various aspects of the volunteer industry. Pho (2005) examines methods for quantification of the value of a volunteer with a specific focus on volunteer labor, defined as unpaid labor that is used to produce economic output for the benefits of others. Pho argues that the importance of volunteer labor lies in its exclusion from national income accounting measures such as gross domestic product (GDP) due to its inability to be traded in the traditional market place. Pho quantifies the value of volunteering in the U.S. based on the existing literature and finds a value in the range of 1.9% to 5% of GDP.

Pho also presents evidence on interesting differences in volunteer participation rates across various demographics groups and other related attributes. For example,

volunteering is negatively correlated with city size. A multitude of techniques for assessing the factors that drive volunteerism based on the wage rate are also presented by Pho, including the opportunity cost approach (i.e., wage of primary occupation), the replacement cost approach (i.e., shadow wage rate), and a measurement called the propensity to volunteer. The use of demographic statistics and wage rates to explain volunteer participation is a common theme throughout the literature and explains a large portion of the variation, but there are other factors, such as crises, that also play roles.

Continuing with the assumption that demographic differences significantly influence volunteer participation, Rotolo and Wilson (2011) look at many ecological theories of volunteerism under a macro level lens using economic tools. They cite large demographic differences in volunteerism across the U.S. states. They provide statistics on Utah to emphasize this point, highlighting that it has the highest religious volunteer rate but ranks significantly lower, at seventeenth, for social service volunteering. Rotolo and Wilson consider three main theories to help understand the factors that drive volunteering: demographic theory, institutional theory, and cultural theory. The demographic theories suggest demographic causality in the decision to volunteer, the institutional theories suggest that the “organizational and institutional environment” (Healy, 2004, p. 400) help determine the supply of volunteer labor, and the cultural theories suggest the volunteer labor supply is causally related to cultural ideals, including religion. Although these three theories do a good job of capturing a large portion of the factors influencing volunteering, there remain unexplained factors that drive the variation in volunteerism.

A distinction made in Rotolo and Wilson's study is that of religious vs. secular volunteering. They make this distinction because they see participation in church groups as providing "gateways" to volunteerism. In their study, 75-78% of the variation in general and religious volunteering (by state) was explained by state-wide variables including demographic variables (educational attainment, household composition, race heterogeneity etc.), institutional variables (organizational capacity), and cultural variables (religiosity). They unexpectedly find that education reduces volunteering due to suppressing religious volunteering. Rotolo and Wilson present strong evidence that there are significant state-level differences in volunteerism.

The second subgroup of papers still ground themselves in the principles of economics, but look at the volunteer labor change that arises out of disasters. The authors look at the act of volunteering as a type of prosocial behavior, which is an action performed with the intention of helping society, and consider it an emergent (nontraditional) behavior. This is important in building up the framework for this study because new volunteers after a disaster are exhibiting a form of emergent and prosocial behavior.

Rodriguez, Trainor, and Quarantelli (2006) describe nontraditional or new behavior that emerges in the wake of a catastrophe and discuss the prosocial behavior involved in responses to Hurricane Katrina. They claim that the mass media portrayal of response to the disaster was largely negative and showed an anarchic state. The authors wanted to investigate whether, and I argue were successful in showing that, the emergent behaviors following Katrina were actually largely prosocial, and in fact opposite to what

was presented by the media. There is one main idea to be gleaned from this study in relation to this research paper, the idea of emergent behavior. Emergent behavior is defined by the authors as “nontraditional or new behavior, different from routine or customary norm-guided actions; typically heavily prosocial” (Rodriguez, Trainor, and Quarantelli, 2006, pg. 2). Considering volunteer labor in the wake of a major disaster as emergent behavior is very important. It suggests that a temporal spillover effect may be observable after a disaster and highlights the necessity to include a lagged variable to account for this.

The Corporation for National & Community Service (CNSS) notes that of the 45 million young adults between the ages of 18 and 28 who contributed to Katrina relief efforts, only 5% provided direct services (i.e. volunteering). One fact in particular provides optimism that a positive effect may be found for disasters on volunteer rates. “Volunteer.gov, an initiative of the USA Freedom Corps, is the largest searchable database of volunteer opportunities in the nation. In the six months before Hurricane Katrina, 104,444 searches were conducted for volunteer opportunities—or an average of 572 searches each day. In the six months after Katrina, the number of searches increased to 559,640 searches—or an average of 3066 searches a day. That represents a 535% increase in the number of volunteer searches conducted since Hurricane Katrina” (CNSS, p.1). This is a significant change in behavior immediately after a catastrophe. I argue that this is a clear sign of emergent prosocial behavior following a disaster. This provides justification for the study of volunteering after disasters. A counterpoint to this study is provided by another study focused more on corporations in the wake of disasters than on individual volunteers.

Muller and Kraussel (2011) looked at charitable donations made by large corporations in the wake of a disaster. In recent years, firm donations have played a vital role in the post-disaster rebuilding period; for example, after 9/11 over $200 million were donated by fortune 500 companies. Muller and Kraussel highlight the fact that while these corporate donations have become a necessary part of the recovery process, these disasters can be very damaging for the corporations themselves and actually lead to smaller post-disaster donations. When a corporation has establishments and employees operating in the affected area of a disaster, these recovery costs are made priority over providing aid to the general public. This idea can be applied in terms of this study to provide the possibility of a decrease in volunteer rates immediately following a disaster (in that disaster year) and then maybe an increase once some of the affected individuals have recovered. This further highlights the necessity to include a temporal spillover variable in the analysis.

Volunteering activities can be difficult to measure due to their self-reported nature. In order to make statistical claims on the variation of volunteer rates, it is important to consider the potential errors in statistical measurements that could lead to biases. An interesting study that sheds a different light on research in the volunteerism industry suggests that the impact of nonresponse bias on estimates of volunteering is large and significantly affects the accuracy of these estimations. Abraham, Helms, and Presser (2008) presents some very insightful findings on how nonresponse bias affects volunteering estimates. The most surprising finding of their study is that the higher the response rate to a survey, the lower the volunteering estimate. In consideration, this finding is logical. It is much more likely that an individual will report having volunteered

than another individual will report not having volunteered. The authors identify two major determinants of response rates to the survey: contactability and amenability. The factors are likely endogenously related to the decision to volunteer and may help to explain why volunteers respond in higher frequency to the surveys. This grounds the framework with which we should view studies on volunteerism and is an important caveat to keep in mind when viewing and analyzing data on volunteering.

Although it does not fit into either of the two subgroups, the final paper of this literature review section is still important to consider. It steps away from the economic view and provides a different, equally insightful lense through which to view volunteering, focused more on the internal motives to volunteer. Leventhal (2009) posits the idea that volunteerism and altruism are strongly interrelated in that volunteering is an act of long-term organized altruism. Leventhal provides a definition of volunteering as well: “a helping action of an individual that is valued by him or her, and yet is not aimed directly at material gain or mandated or coerced by others” (Leventhal, 2009, pg. 2). Leventhal also outlines 6 major motivations to volunteer: expression of values, understanding, career, social, self-esteem, and a protective motive. These are an interesting consideration in relation to this study, particularly the social and protective motivations, which would surely experience a boost in the wake of a disaster.

With this enhanced knowledge of the current literature related to this topic, I can begin to add further contribution to the study of volunteerism. In considering the relationship between natural disasters and volunteering I hope to shed light on left out

variables contributing to volunteerism. Using this newly established framework, we can begin to assess civic behaviors in the wake of natural disasters.

III. Data

As there is no comprehensive data set available for all the key variables of interest, I use several data sets for my analysis. I discuss each in turn. Specifically, I use data from the Volunteering and Civic Life in America data set collected by the Corporation for National & Community Service (CNCS), a federal government agency, to obtain information on volunteering in the U.S. The statistics provided in this data set are compiled by the CNCS from the Volunteer and Civic Engagement supplements, which is a part of the Current Population Survey (CPS). The CPS considers anyone who performed unpaid volunteer activities within the 12 – month period of the survey as a volunteer, although it only includes persons who performed formal volunteering (with an organization). This data is well-suited for my purposes because it provides detailed statistics on the volunteer rate and volunteer hours per resident. I focus on data for all 50 states from 2005 to 2012.

In looking at the state-level means for volunteer rates where the average is taken across my sample period (Figure 1), several statistics are worthwhile to note. Nevada and New York, both with volunteer rates of about 20%, are the two states with the lowest levels of measured volunteerism. On the other end of the spectrum is Utah, with its volunteer rate of about 44%. District 4, which includes Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota, has the highest mean volunteer

rate of about 36%. It is interesting to note that over the time period studied, the mean number of volunteer hours per resident significantly decreases, dropping from approximately 39.72 hours to 34.8 hours (see table 2). This decrease in volunteer hours per resident is not consistent across all states, with states such as Alaska and Hawaii experiencing an increase (50 - 52.3 hours and 33.5 - 38.8 hours respectively).

I use a data set from the Federal Emergency Management Agency (FEMA) to obtain information on natural disasters in the United States, which I argue plays a key role in explaining volunteerism. The data set (compiled from 50 individual state data sets) focuses on disaster declarations by a state, giving a brief incident description and dividing the declarations into four types. Major disaster declarations (MDDs) are used as a proxy for natural disasters, where an MDD is defined by the Stafford Act as "any natural catastrophe…which in the determination of the president causes damage of sufficient severity and magnitude to warrant major disaster assistance to supplement the efforts and resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."[1] From this data source, I create both a numerical count variable (number of MDDs) and an indicator dummy variable (=1 if there was at least 1 MDD, 0 if there were none) for major disasters declared in each state year. Most states do not experience many major disasters in a given year, with the mean at just a little over 1.2MDDs/year (see Table 1). The most disasters a single state declared in a year were Missouri's 6 in 2008. It declared that same number of disasters combined over the following three years. The state with the highest mean number of disasters over

[1] Stafford, Robert. "The Stafford Act." *FEMA* United States Code, title 42 (2013): n. page. *FEMA.gov*. Web. 11 Mar. 2014.

the time period examined is Oklahoma (2.625); the state with the lowest is South Carolina (0.125).

I also create a variable for the number of named hurricanes per state per year and a hurricane indicator variable equal to 1 if the state had a named hurricane and zero otherwise to potentially capture the effects of a specific type of disaster, one that receives a large amount of media coverage. Both variables are used because it is possible that in a state that is used to having many named hurricanes, the potential volunteers may feel more numbed by the frequency of what is happening and thereby less inclined to participate in any volunteer activities. Hurricanes are an even rarer occurrence than major disasters, with the mean number of named hurricanes in a given state year at only 0.1397 (see Table 1). The vast majority of states never experience hurricanes; the number that experience more than 1 or 2 in a year is also very small. For the time period of 2005 to 2012, only Texas and Florida ever had a year with 3 named hurricanes in it.

The demographic data used in this study comes from U.S. Census Bureau. This data includes estimates for total population, educational attainment, unemployment rate, poverty rate, and per capita income for each state and year from 2005 to 2012. It is interesting to note that the state with the highest mean number of disasters (Oklahoma) also has a very low average unemployment rate of 5.16% over the time period studied. South Carolina, the state with the lowest mean number of disasters has a much higher average unemployment rate of 8.425%.

The information in the compiled data set used for this analysis is fortuitously in the form of panel data; this has quite a few advantages. The data is provided for all 50 states over a period of 7 years (2005-2012), which gives a large number of data. This has

an increasing effect on degrees of freedom; helps solve the problem of omitted variable bias, and will ideally improve the efficiency of the econometric estimates to be performed in this analysis. Additionally, the panel data set will allow us to isolate the effects of individual variables (e.g., number of disaster declarations) on the measures of volunteerism.

The data to be used in this analysis has several potential disadvantages as well. It of course has the potential to suffer from the general biases that any panel data set can suffer from: heterogeneity bias and selectivity bias. Additionally, because the volunteering data is gathered using a supplemental response form to the CPS, it likely suffers from sampling and nonsampling error, as well as nonresponse bias (addressed in the literature review section). Sampling error is simply due to the fact that sample estimates have the potential to differ from the entire populations they are estimating. Nonsampling error suggests that in conducting a survey, there is potential to leave out portions of the population unintentionally and to have survey nonresponse.

IV. Estimation Strategy & Results

Primary Specification

This section presents estimates of the effect of natural disasters on volunteerism. A natural disaster, depending on the scale and scope of its effect, has the potential to severely interrupt the lives of many individuals and increase the need for aid, which may affect incentives for volunteering in the time following a disaster. In an attempt to measure this effect, I use several different measurements of natural disasters and look at a variety of relationships. All tests are run as a panel fixed effects regression with standard

errors clustered at the state level. The fixed effects regression controls for time-invariant observable and unobservable factors in each state affecting volunteering.

In order to identify the effect of natural disasters on volunteerism, I estimate a model of the following form:

$$Y_{st} = \alpha_s + \beta_1 Z_{st} + \delta_1 Z_{s(t-1)} + \beta_2 n_{st} + \beta_3 \gamma_t + \varepsilon_{st} \quad (1)$$

where Y is one of two measurements of volunteerism (i.e., the volunteer rate or the volunteer hours per resident) in state, *s* and year *t*. Additionally, α_s represents the state fixed effects. Z_{st} and $Z_{s(t-1)}$ denote my main variables of interest, one of two measures of major disasters (i.e., an indicator variable for at least one MDD in the state or the number of MDD's in the state). I consider contemporaneous and lagged measures of natural disasters to allow for the possibility for temporal spillovers in the effect of a natural disaster on volunteering. n_{st} is a vector of demographic and economic controls (i.e., unemployment and poverty rates, educational attainment, and per capita income). Finally, γ_t denotes year indicator variables to capture any shocks to volunteering that vary across time but are similar across states (e.g., broad macroeconomic shocks). An error term ε is also included.

I make several changes to equation (1) to test for different effects. I run the above specification under the same conditions except replace the indicator for MDDs with the number of MDDs. The second change made to this primary specification is a new

dependent variable measuring volunteerism: volunteer hours per resident. One would think that the results using volunteer hours per resident would be very similar to those with volunteer rate, but that is not necessarily the case. Replacing this dependent variable renders several previously meaningful variables insignificant. Namely, unemployment rate and per capita income now show no significant effects on the dependent variable. This disparity in responses by the two dependent variables is an interesting consideration. A quick look at a the pattern of these two variables over the time period shows a relatively constant volunteer rate but a significant decrease of approximately 5 volunteer hours per resident. Clearly these variables are responding to different factors, explaining why this change in dependent variable had the effect it did on the output. The explanation for this could be as simple as a decreasing trend in the amount of time spent performing volunteer activities, so even though a similar number of people are doing the work, they are working for less time.

The results based on equation (1) are presented in Table 3. There are several noteworthy patterns. Across specifications, I find no effect of a current major disaster (MDD) on current volunteer rates. However, the lagged MDD indicator has a significant and positive effect on the volunteer rate. The coefficient suggests that a disaster in a given state year increases the volunteer rate by 0.59 percentage points. Although this may seem like a minor increase, compared to the mean volunteer rate of 29.2, this is approximately a 2 percent increase in the volunteer rate. The estimated effect on volunteer hours per resident is positive but insignificant. These results fit well with the logic of the test and provide optimism for natural disasters' positive influence on volunteerism.

Additional results of interest in this regression lie in the demographic and economic variables. The results for educational attainment vary across specification and are never statistically significant, suggesting no discernible relationship between a state's percentage of the population with a bachelor's degree and the volunteer rate. This is in contrast with previous studies that find a positive relationship between educational attainment and volunteering (Pho 2009). However, given that educational attainment is unlikely to have changed significantly during the relatively short time period covered by my data, there may be insufficient variation in the data to reliably estimate this coefficient in a fixed effects regression. The unemployment rate of a state is significantly and positively related to the volunteer rate of a state. The coefficient implies that a 1 unit increase in unemployment rate increases the volunteer rate by 0.6, approximately a 2 percent increase. Unemployment rate was expected to be strongly correlated to volunteer rate because higher unemployment rates mean that a larger percentage of the population is available to perform volunteer work. Additionally, there are a number of government run volunteering programs (AmeriCorps, National Civilian Community Corps) aimed at providing volunteer opportunities to many groups, including those who are unemployed.

Also of interest is the per capita income variable, which is significantly and negatively correlated with a state's volunteer rate. The coefficient implies that a $100 increase in per capita income decreases the volunteer rate by 3, an approximately 10 percent decrease. The direction of per capita income's effect provides an interesting insight into the effect of money on volunteering: more money suggests less desire to volunteer. A simple opportunity cost analysis using the wage rate as the opportunity cost of time explains this result. The higher the wage rate, the higher the incentive to work

than to do other activities, such as volunteering. This could also be due to a number of other factors, including the possibility that when people have higher levels of income, they would rather just donate money to provide aid rather than provide direct aid.

The coefficient on the poverty rate is consistently negative but never significant. Although the original expectation was for this variable to behave in much the same way as unemployment rate, it retrospectively makes sense that a higher poverty rate may indicate more people in need of aid rather than more people available to provide it. The final control, total population, also proved to be insignificant in its relationship with volunteerism.

Several variables that returned no significant results yet were still very important in what they revealed were the group of year dummy variables included in the regression. It was initially very surprising to see all negative coefficients for these variables. Only in consideration of their reference year does it make sense, and shed light on a potential bias in this study. The year of reference for these dummy variables is 2005, the year in which hurricane Katrina occurred. The level of need during this catastrophe significantly increased and volunteer rates seemingly responded to this. Because these volunteer rates were abnormally high, in all years following 2005 the rates were lower, as explained by the negative coefficients on the year dummy variables.

Robustness tests

To explore the possibility that potential volunteers may be more responsive to certain types of natural disasters, I re-estimate equation (1) replacing Z with one of two measures of named hurricanes (i.e., the number of named hurricanes or an indicator

variable for a named hurricane). Although the MDD variable provides valuable insight into the frequency with which disasters are occurring within a given area, it is quite likely that there are certain types of disasters, hurricanes in particular, that receive significantly more attention than others. It is reasonable to assume then, that more people who might be inclined to perform volunteer activities are made aware of hurricanes, leading to an increase in volunteer rates.

In both tests, the hurricane variables are insignificant. In the test using a count of named hurricanes as the main independent variable, even the temporal spillover variable returns no interesting results. Unlike under the specifications using major disaster declarations, the hurricane indicator variable does not return any stronger results than the hurricane count. All of the other independent variables of interest are still insignificant. This result was at first surprising to me given the intensity with which hurricanes can strike and the higher level of awareness citizens have of this type of disaster. Retrospectively however, the insignificance makes sense given how infrequent hurricanes are.

I additionally estimate an equation of the following form:

$$Y_{st} = \alpha_t + \beta_1 R_{st} + \delta_1 R_{s(t-1)} + \beta_2 n_{st} + \beta_3 \gamma_t + \varepsilon_{st} \quad (2)$$

where R denotes spatial spillover variables, either total major disaster declarations per region or per district. I focus on the number of MDDs rather than the MDD dummy as there is little variation in the latter when focusing on a larger geographic scale. States are

divided into either 4 regions or 9 districts for this purpose using the same divisions used by the U.S. Census Bureau[2]. All other variables are as previously defined.

Table 5 reports the results from of estimating equation (2). Although contemporaneous disasters are insignificant at the region and district level, an additional disaster in the same district increases the volunteer rate the following year by 0.07. This effect is statistically significant. The estimated effect of the lagged region disaster count is also positive but not statistically significant. This suggests that potential volunteers are aware of and respond to major disasters in larger areas than just their own state, although this is limited by distance.

In an attempt to test whether the magnitude of a natural disaster (measured by the amount of aid money received) influences volunteer rates, I estimate the following equation:

$$Y_{st} = \gamma_t + \beta_1 FA_{st} + \delta_1 FA_{s(t-1)} + \beta_2 n_{st} + \gamma_t + \varepsilon_{st} \quad (3)$$

where FA is a proxy used to measure the magnitude of a disaster experienced. FA measures total federal aid received for all disasters in a state in a given year and all other variables are as previously defined. The information from this data source however is not reported consistently for each state in every year (e.g., all values are missing for Alabama

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2. Region 1: Northeast; *Region 2*: Midwest; *Region 3*: South, *Region 4*: West
District 1: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; *District 2*: New Jersey, New York, Pennsylvania; *District 3*: Indiana, Illionois, Michigan, Ohio, Wisconsin; *District 4*: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota; *District 5*: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia; *District 6*: Alabama, Kentucky, Mississippi, Tennessee; *District 7*: Arkansas, Louisiana, Oklahoma, Texas; *District 8*: Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, Wyoming; *District 9*: Alaska, California, Hawaii, Oregon, and Washington.

in 2006). Therefore, this specification will only be estimated for a subset of states and years (250 observations rather than 408) because the FEMA data on federal aid is not reported for all states and years. I argue it is important however to look at this specification because the reception of (or inversely the lack of) federal aid money could significantly impact volunteer activities.

Table 6 reports equation (3). The federal aid variable is never statistically significant. This may be due to a high degree of correlation among FA and other control variables included. FEMA's method for determining the level of need may be driven by factors such as the unemployment and poverty rates in the affected area.

V. Conclusions

The importance of volunteerism is at this point all but undeniable, with studies determining its value as a percent of GDP, numerous organizations offering volunteer opportunities, and the positive effect of its aid observable in many developing countries. Although volunteer work itself is not a new concept, the study of it is still in its relative infancy, and as such the full potential of such work is not yet understood. The policy implications of an increased understanding of volunteering are quite important; a government with a deep understanding could be strategic in when and where it forms organizations aimed at harnessing volunteer labor to aid in social development and environmental recuperation. To achieve this understanding, the factors that drive an individual to volunteer must be understood; this work is well under way as shown in the relevant literature section of this paper. This study has been a contribution to this work towards understanding the factors driving volunteerism. The results suggest an

approximately 2% increase in the volunteer rate in a state the following year after a major disaster. This effect carries across state borders into neighboring states within the same district, although with a smaller magnitude. The models used also were able to show the significance of the unemployment rate and per capita income in their positive and negative relationships, respectively, with the volunteer rate. With this increased understanding of what drives an individual to volunteer, the field can proceed in pursuing other potential influencers of volunteerism.

With our world facing numerous struggles in the years to come, including many more natural disasters that seem to be increasing in frequency, now is the time to harness the power of human capital in the form of volunteer labor. Climate change threatens the many ecosystems on our planet; already there are volunteer organizations all over the world working to combat this. A plethora of social issues and diseases are present in many of the developing nations of our world; already there are volunteer organizations working to fight these problems. At home in the United States we face our own share of environmental and social issues; again, there are many volunteer organizations working to help. But still, the percent of people performing this volunteer work is low, at just under 30% in the U.S. Why are the other two thirds of citizens not performing any sort of volunteer activities? What can be done to incentivize their participation? Hopefully in the years to come we find answers to these questions and see a marked increase in the volunteer rate. The power to create positive change does not lie in money, but rather in the combined sincere and direct effort of the many individuals that together form the components of our society. This is the power of volunteerism.

VI. Tables & Results

Table 1: Summary Statistics

Variable	Description	Mean (s.d.)	Min	Max
Major disaster count	Total number of major disaster declarations in a given state year	1.2108 (1.219)	0	6
Major disaster dummy	Indicator variable for major disaster declarations; equal to 1 if there was at least 1 disaster in a given state year, 0 otherwise	.6569 (.4753)	0	1
Region disaster count	Total number of major disaster declarations in a given region year	16.123 (7.855)	5	29
District disaster count	Total number of major disaster declarations in a given district year	7.164 (4.736)	0	22
Named hurricanes count	Total number of named hurricanes in a given state year	.1397 (.4294)	0	3
Named hurricanes dummy	Indicator variable for named hurricanes; equal to 1 if there was at least 1 hurricane, 0 otherwise	.1127 (.3167)	0	1
Region hurricane count	Total number of named hurricanes in a given region year	2.061 (3.6753)	0	13
District hurricane count	Total number of named hurricanes in a given district year	.8137 (1.666)	0	6
Education	% of the population 25+ w/ a bachelor's degree	17.775 (8.349)	.1	45.9
Unemployment rate	(# unemployed / total labor force) x 100	6.456 (2.359)	2.5	13.8
Poverty rate	(# of families & individuals living below the poverty line / total population) x 100	10.91765 (4.051)	4.6	29.4
Per capita income	Per capita personal income	39021.18 (7283.811)	26443	74710
Total population	State population in 10,000	596.8921 (668.7179)	49.52	3804.14

Table 2: Volunteerism Trends

	Mean Volunteer Rate	**Mean Volunteer Hours per Resident**
2005	31.294 (5.917)	39.7216 (11.047)
2006	29.373 (6.148)	38.384 (10.649)
2007	28.941 (5.948)	37.986 (9.3915)
2008	28.765 (5.846)	36.849 (10.309)
2009	29.216 (5.714)	37.596 (11.809)
2010	28.4902 (5.401)	36.029 (10.036)
2011	28.765 (5.2138)	34.375 (8.352)
2012	28.765 (5.2138)	34.804 (9.829)

Table 3: Primary Specification, MDD's

Variable	(1) Vol. rate	(2) Vol. rate	(3) Vol. hours per resident
Disaster dummy	.4236 (.2757)		.5227 (.7756)
Lag dis. Dummy	.5904** (.2304)		.4738 (.5706)
Major dis. Count		.0609 (.0946)	
Lag major dis. Count		.1137 (.0767)	
Education	.002 (.0435)	-.0022 (.0434)	.1016 (.2287)
Unemployment rate	.5865** (.1344)	.5869** (.1274)	.7842 (.5869)
Per capita income	-.0003** (.00008)	-.0003** (.00008)	-.00009 (.0004)
Poverty rate	-.199773 (.1543)	-.2302 (.1584)	-.1367 (.3547)
Total population	.0049 (.0053)	.0025 (.0058)	.0219 (.0135)
Year: 2007	.1004 (1.131)	.0022 (1.15)	2.386 (5.893)
Year: 2008	-.1532 (.6472)	-.1997 (.6494)	-1.253 (2.267)
Year: 2009	-2.097** (.7721)	-2.122** (.7839)	-3.164 (3.126)
Year: 2010	-2.548** (.9892)	-2.522** (.985)	-4.895 (3.108)
Year: 2011	-1.362 (1.039)	-1.24 (1.041)	-6.127 (3.394)
Year: 2012	.6687 (1.870)	.9896 (1.917	-4.046 (4.543)

Fixed effect regression. Standard errors clustered by state
**P-value ≤ .05
*P-value ≤ .10

Table 4: Robustness Test, Hurricanes

Variable	**(4) Vol. rate**	**(5) Vol. rate**	**(6) Vol. hours per resident**
Hurricane dummy	-.2009 (.3579)		-1.1059 (.8184)
Lag hurr. Dummy	.1829 (.3954)		-.6659 (1.016)
Hurricane count		-.1684 (.2458)	
Lag hurr. Count		-.1311 (.2096)	
Education	-.0018 (.0442)	-.0072 (.0447)	.0880 (.2284)
Unemployment rate	.6089** (.1287)	.6145** (.1286)	.9018 (.5568)
Per capita income	-.0003** (.00007)	-.0003** (.00008)	-.00004 (.0004)
Poverty rate	-.2351 (.1719)	-.2659 (.1655)	-.2782 (.3920)
Total population	.0010 (.0064)	.00002 (.0066)	.0150 (.0137)
Year: 2007	.0234 (1.1742)	-.1689 (1.194)	1.889 (5.872)
Year: 2008	-.1945 (.6438)	-.2777 (.6606)	-1.585 (2.232)
Year: 2009	-2.147** (.7712)	-2.204** (.7751)	-3.694 (3.039)
Year: 2010	-2.550** (.9639)	-2.619** (.9739)	-5.350* (2.937)
Year: 2011	-1.204 (1.026)	-1.230 (1.037)	-6.118* (3.218)
Year: 2012	1.031 (2.026)	1.296 (1.981)	-2.841 (4.64)

Standard errors clustered by state
**P-value ≤ .05
*P-value ≤ .10

Table 5: Robustness Test, Spatial Spillover

Variable	**(7) Vol. rate**	**(8) Vol. rate**	**(9) Vol. rate**	**(10)Vol. rate**
Region disaster count	-.0013 (.0174)			
Lag region disaster count	.0007 (.0209)			
District disaster count		.0034 (.0303)		
Lag district disaster count		.0673** (.031)		
Region hurricane count			-.0360 (.0501)	
Lag region hurricane count			-.0131 (.0329)	
District hurricane count				-.0049 (.0856)
Lag district hurricane count				.0181 (.0895)
Education	-.0046 (.0431)	-.0054 (.0447)	-.0078 (.0439)	-.004 (.0446)
Unemployment rate	.6018** (.1269)	.5763** (.1280)	.6094** (.1294)	.6002** (.1286)
Per capita income	-.0003** (.00007)	-.0004** (.00008)	-.0003** (.00008)	-.0003** (.00008)
Poverty rates	-.2461 (.1577)	-.2481 (.1608)	-.2483 (.1592)	-.2432 (.1590)
Total population	.0011 (.0061)	.0013 (.0059)	.0008 (.0060)	.0012 (.0061)

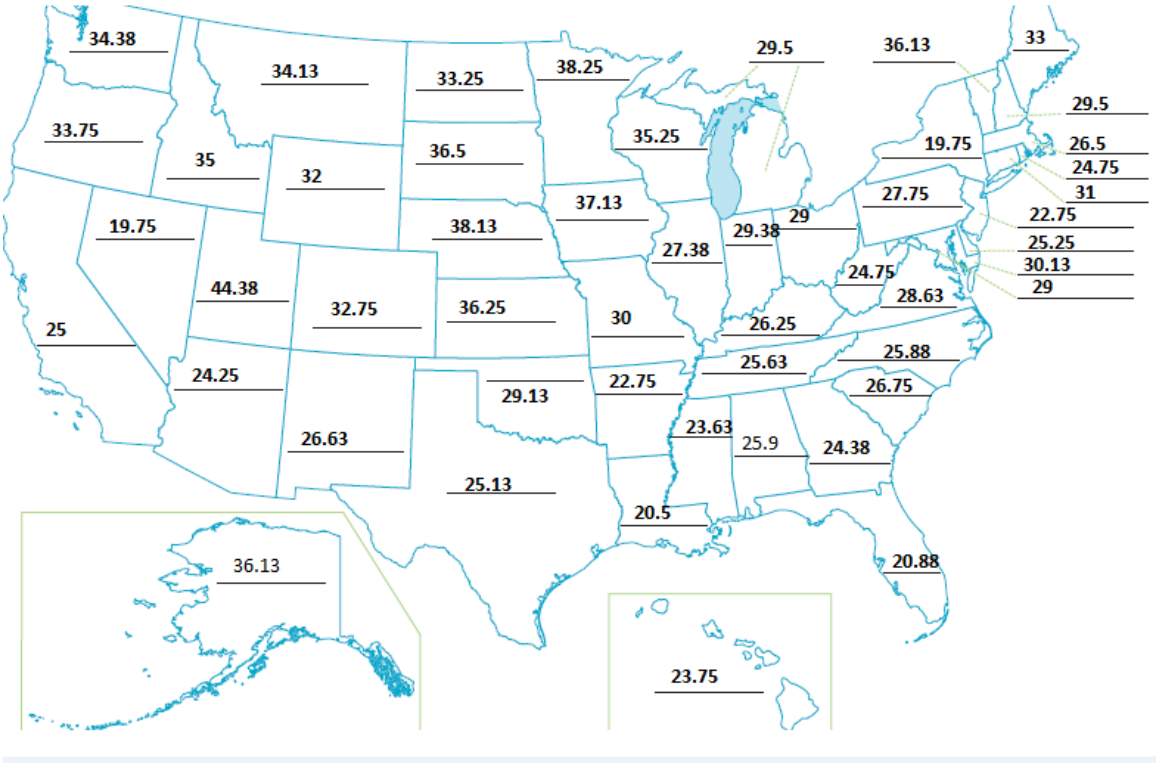
Standard errors clustered by state
**P-value ≤ .05
*P-value ≤ .10
Note: year dummy variables are included but not reported in the regressions for Table 5

Table 6: Robustness Test, Federal Aid

Variable	**(11) Vol. rate**
Federal Aid	-4.64e-11 (5.38e-11)
Lag federal aid	1.34e-10 (1.21e-10)
Education	.0387 (.0712)
Unemployment rate	.9116** (.1773)
Per capita income	-.0003** (.0001)
Poverty rates	-.2515 (.1775)
Total population	-.0112 (.0082)

Standard errors clustered by state
**P-value ≤ .05
*P-value ≤ .10
Note: year dummy variables are included but not reported in the regressions for Table 6

Figure 1: State-level mean volunteer rates across sample period (2005-2012)



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