Article
Private Support for Public Disaster Aid

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Abstract: Despite its growing economic and political importance, this is the first study in economics to investigate public opinion in the United States regarding both the allocation of government disaster aid to stricken households and communities as well as total expenditures by government on such aid. This is also the first study to bridge a gap in previous research on disasters by comparing and contrasting our results to related behavioral studies from political science, social psychology and sociology. Combining individual data from the 2006 General Social Survey with county-level information about the local environment of survey respondents, we estimate probit models to ascertain the magnitude and significance of the socioeconomic, demographic, political and experiential determinants of public opinion on these issues. Among other results, we find that Black survey respondents strongly support increasing total aid expenditures and aid to affected households and communities while income, age and a conservative political ideology largely exert a negative influence on these same variables. Surprisingly, the effects of prior experience with disasters and educational level have only a weak effect on the allocation of aid and none on the level of expenditures on aid. These and other results are consistent with only a portion of previous findings from other disciplines. Several implications of our results for current federal disaster policy are discussed and we also suggest directions for further research into this important topic.

Keywords: natural disasters; political economy; survey data and methods

1. Introduction

The role of the United States (U.S.) federal government in bearing the risk arising from the increasing incidence of domestic natural disasters is an important issue for elected officials, policy makers and researchers in economics, political science and other disciplines. Estimated annual losses from geological and hydrometeorological disasters in the U.S. have averaged over $40 billion per year over the last decade and, during that time, have increased at an average annual rate of approximately 8% and at a cumulative rate exceeding 500% (CBO 2020; FEMA 2020), affecting every state and almost every county in the U.S. (Lindsay and McCarthy 2015). The public share of total expenditures on disaster recovery, relative to those from private sector sources, has increased from 26% to 45% of direct economic losses in the first two decades of this century (FEMA 2020). Congressional appropriations for federal disaster aid in 2018 alone constituted approximately 18% of that fiscal year's federal budget deficit, with over $139 billion obligated through emergency appropriations in addition to annual appropriations to the Disaster Relief Fund (CBO 2020; FEMA 2020). Should these trends continue, the discounted current value of federal expenditures on disaster aid alone over the rest of this century will exceed $2 trillion real US dollars (Zanjani et al. 2010).

While a variety of rationales for public aid have been made on the basis of both economic efficiency and social equity, very little academic research has directly assessed the factors that determine the consensus of American public opinion about the net benefits and desirability of such aid.[1] This is highly surprising in light of the economic and political implications for the design and implementation of U.S. disaster policy and for academic

research as well. In particular, the occurrence of a major disaster provides a rare opportunity to investigate several important but relatively unexplored questions about the nature of individual and collective preferences for government spending in the context of a relatively unpredictable and catastrophic event. Such questions include (a) the extent to which such preferences are determined by the same socioeconomic and ideological factors that influence public opinion about government subsidies to targeted groups in more ordinary situations; (b) the role of demographic influences on support for government disaster aid; (c) whether a systematic difference exists in public support for aid to communities relative to households; and (d) whether individuals with previous experience of major disasters and of disaster aid display systematically different attitudes than others toward disaster aid.

This paper is one of only two studies in economics to address this research gap and is the first to use public data to rigorously measure the influence of a comprehensive set of socioeconomic, demographic, political and experiential influences on the collective opinion of the U.S. public about the relative allocation of government aid to affected households and communities in the aftermath of a major natural disaster, and on the current magnitude of total federal aid expenditures. We estimate probit models on a combination of survey data from the 2006 U.S. General Social Survey (GSS), county-level data on government disaster aid from the Federal Emergency Management Agency (FEMA) and environmental and political data from other public sources.

Among our results, we find that: (a) certain demographic factors such as ethnicity and age, and ideological orientation, as represented by the party affiliation of a respondent, exert stronger and more consistent effects on opinion than do any socioeconomic or experiential variables; (b) several other demographic characteristics previously found to be important determinants of support for other forms of government spending have little or no effect on support for either the allocation of current aid or changes in total future expenditures on aid; (c) differences in the degree of support for aid to affected communities relative to households vary widely between different groups of survey respondents; and (d) previous experience with disasters has a modest and inconsistent effect on support for aid.

This paper also addresses a second research gap, which is the virtual absence of any attempt to integrate related research from political science, social psychology and sociology on attitudes toward government spending and the extent of social compassion exhibited in household preferences. We compare and contrast our methods and results to those in the salient studies from these disciplines and discuss several implications for current disaster research.

The paper is organized as follows. The methodology of survey research into disasters and the salient research on disasters and related aspects of individual and collective behavior from a variety of disciplines in the social sciences are reviewed in Section 2. Section 3 contains a detailed discussion of our data set and sources. Section 4 describes our econometric model. Our results are presented and discussed in Section 5. Concluding remarks appear in the final section.

2. Literature Review

Public support for disaster aid programs is essential to providing the appropriate political incentives to elected officials to adopt and sustain such programs, but possibly at levels incompatible with economic efficiency. Simultaneously, a sufficient level of public trust in government and other social institutions is necessary to support for the allocation of aid to different households, who likely possess a variety of demographic and socioeconomic characteristics, as well as household compliance with the delivery of such aid to affected individuals and communities.

Two alternative approaches have been used to gauge such support and the results in this paper have implications for studies using both approaches. The first approach, underlying most research on this topic in political science, takes an ex post perspective in which the degree of public support is measured by the impact on the electoral success of an

incumbent government's implementation of government aid to an affected region suffering significant and well-publicized losses in the aftermath of a major disaster. That government disaster aid exerts a positive influence on the aggregate opinion and subsequent voting by a national electorate for that government in a subsequent election has been documented for the U.S. and other countries by Healy and Malhotra (2009), Manacorda et al. (2009), Cole et al. (2012), Fuchs and Rodriguez-Chamussy (2014), Rubin (2020) and others. However, using voter data disaggregated by region, Chen (2013) and Chen and Healy (2014) find that this support is sensitive to public perceptions of the timeliness of aid and the efficiency of its distribution.

The second approach takes an ex ante perspective, based on statistical analyses of data compiled from a sample of household opinions solicited through large-scale surveys. This method and the use of survey data are common to much of the research by social psychologists, sociologists, some economists and others into the determinants of social compassion in respondent preferences and support for government aid, excluding that for disasters, to recipients whose welfare is of common concern. A number of potential sources of influence on both compassion and support have been examined, including different demographic characteristics of survey respondents, their socioeconomic status, their political ideology, and their self-identified degree of trust in government programs and institutions.[2] Hypotheses about the influence of many of these demographic and socioeconomic factors have largely been atheoretical or equivocal, with the net effects of such variables as age, educational level, ethnicity, gender, income and marital status depending on various tradeoffs, particularly these involving individual resources, confidence in the performance of government, empathy toward affected individuals, particularly those possessing the same characteristics as the respondent and the average respondent's projection of own experience with consumption of private goods relative to public amenities (Eismeier 1982; Hasenfeld and Rafferty 1989; Skitka 1999). Among the relatively few studies to have directly examined the analogous influences in the context of government disaster aid are Kunreuther et al. (1978) and Skitka (1999).

Like those studies involving analyses of demographic and socioeconomic characteristics of respondents, studies analyzing the influence of the political ideology of respondents on their support for government aid programs have virtually all involved subsidies to recipients affected by exigencies of a relatively common and more predictable nature than disasters, such as poverty, homelessness, and drug abuse (Iyengar 1990; Groskind 1994; Jaeger 2006). Such studies have largely found that politically conservative attitudes, involving the premises that individuals adversely affected by predictable events bear most responsibility for their own welfare and that failure to do so involves both individual and group attributes, are opposed to aid programs while those of more liberal attitudes are more supportive, possibly due to a belief that at least a minimal level of private welfare should be a social guarantee. With the exception of Skitka (1999), we are aware of virtually no research that has examined whether these attitudes and their conjectured motivations remain true in situations, like disasters, that lack great predictability and individual control. In those studies that have considered support for a government response to disasters, the occurrence of a major disaster often reduces the trust of the general public in government programs (Han 2011; Dussaillant and Guzman 2014; Fleming et al. 2014; Akbar and Aldrich 2017). Experience with subsequent distributions of government aid have been found to have mixed effects on public trust and approval of government institutions more generally. One of the most acute instances of a strong and sustained disapproval of the timeliness and distributional efficiency of government aid is that arising from the response of FEMA to the severe losses inflicted on residents of New Orleans by Hurricane Katrina in 2005 (Maestas et al. 2008; Darr et al. 2019).

The public consensus toward government aid can also be affected by cognitive biases in household perceptions of disaster risk, by personal exposure to risk, and by the extent to which observable household opinions or behavior, determined by unobservable personal preferences, display social compassion relative to self-interest. Biases in individual perception of personal risk and the risk to residents of communities exposed to recurrent

disasters has been the topic of research in decision science, psychology, and behavioral economics. Survey evidence supporting the presence of cognitive biases and inaccuracy in individual beliefs about disaster risk have been documented by Kunreuther et al. (1978), Kunreuther (2006), Botzen et al. (2019) and others. Related studies by psychologists and decision scientists have found that such biases lead individuals to overestimate the importance of risky events that occur frequently but inflict low costs and attribute low importance to low frequency, high-cost events (Slovic et al. 1977; Tversky et al. 1988; Kujawski et al. 2004).

Although focused on different questions than this study, the paper by Viscusi and Zeckhauser (2006) is the only other economic research to consider popular support for disaster aid but does so on the basis of proprietary data from a survey with unreported design and sampling method. The purpose of their paper was to examine how the perception of moral hazard on the part of potential recipients, and certain behavioral characteristics of survey respondents such as their self-reported perceptions of their personal exposure to three different sources of personal risk, affected respondent opinion of government disaster aid to individuals residing in geographical areas with different exposure to disaster risk. While they found mixed effects from some demographic variables also appearing in our data, they find respective approval of disaster assistance to all recipients by Black respondents and disapproval by Republicans and no significant influence of their three measures of respondent's risk to disasters on attitudes about aid to any group of recipients.

Finally, survey data have been extensively used by economists, psychologists, and sociologists to examine the extent to which household preferences exhibit altruism, or more specifically in the context of significant disaster losses, social compassion, as well as the determinants of such compassion and related types of charitable behavior by households toward individuals suffering adverse consequences from unanticipated events. While none of this research assumes complete congruence between the respective motivations of households to behave charitably and to support government disaster aid, several characteristics are found to affect these motivations in related ways. The focus of economists is whether such behavior by individuals reflects the presence of compassion or self-interest in their preferences. *Pure* altruists are motivated by a genuine concern for the welfare of others, rather than being motivated by such a concern, while *impure* altruists behave charitably because they receive satisfaction, referred to by Andreoni (1990) as a warm glow effect, directly from charitable acts. Since preferences are unobservable, this distinction is tested by how government transfers, and particularly disaster aid, affects aggregate household donations to private charities.[3] In contrast, social psychologists and sociologists have primarily studied the demographic, political and socioeconomic determinants of charitable behavior. Most of these studies find that such behavior is positively correlated with household income, respondent age, female respondents, higher education and home ownership, and negative correlations with minority ethnic status, and affiliation with the Republican party. Our results have direct implications for those findings and are discussed in Section 5.

3. Data and Summary Statistics

Although survey data are extensively used by disaster researchers in political science, social psychology, sociology and by an increasing number of economists, a variety of undesirable properties can potentially arise from the design of many surveys and have the potential for biasing statistical analyses of their data.[4] These include a range of panel conditioning, questionnaire design, planning and sampling issues, including nonresponse effects, background information and prompts provided to respondents, framing effects, self-responses to survey questions, and measurement accuracy (Bourque et al. 1997; Stallings 2007; Kayabu and Clarke 2013; Henderson et al. 2009; Donner and Diaz 2018). Assessment of the presence of such characteristics is precluded by the proprietary nature of the surveys used in several economic and related studies, including those used in Viscusi and Zeckhauser (2006); Kriesel and Landry (2011).

Our source of data is the 2006 General Social Survey (hereafter 2006 GSS). This was the only edition of the GSS to solicit subject opinions regarding government disaster aid. Although the temporal proximity of Hurricane Katrina in 2005 undoubtedly affected public consciousness and attitudes toward disaster aid, the use of GSS data avoids many of these traditional sources of bias. Details of its design, questions and sampling procedures as well as the data compiled from it are publicly available.[5] Our use of data from only the 2006 GSS eliminates any biases from panel conditioning, respondent attrition, and systematic misrepresentations across different waves of the survey. In addition, it uses in-person interviews to avoid the potential issues with remote interviews. The GSS "Sensitive Data Files" identify the location of each respondent by county: and it has incorporated methods to overcome bias from framing effects and subject nonresponses (Sterrett et al. 2017). It is also regularly reviewed for potential sources of bias by researchers from a variety of disciplines on behalf of the NSF (Rasinski et al. 1999; Christofides and Perri 2019). Using consistency across administrations to the same respondents spanning the period 2006–2014 and objective comparison data, Hout and Hastings (2016) found that the reliability of responses to more than 50% of the core questions in the GSS was greater than 70%.

3.1. Dependent Variables

There were 4510 individuals surveyed in the 2006 GSS. Four subsamples (uneven numbers in each) were created from this full sample and respondents in each subsample were asked a different set of survey questions, some common across all four subsamples (e.g., race, income, marital status) and some exclusive to a particular subsample. Each edition of the GSS poses a set of attitudinal questions about significant topics in the areas of politics, social trends, and government policies and one such topic unique to the 2006 GSS concerned expenditures by the federal government for disaster recovery. One subsample of 1518 respondents were asked three questions about their opinions of government disaster assistance. The three dependent variables for each of the two specifications of our empirical model are the respective individual responses to these three questions about the allocation of federal disaster aid to individuals and communities and the appropriate level of expenditures on total aid:

- Q1: Do you think it should or should not be the government's responsibility to help individuals affected by natural disasters?
- Q2: Do you think it should or should not be the government's responsibility to help rebuild communities affected by natural disasters?
- Q3: Would you like to see more or less government spending on natural disasters? Remember that if you say "much more", it might require a tax increase to pay for it.

Q1 and *Q2* involve the degree of support for the respective allocation of aid to individuals and communities and are coded "yes" or "no".[6] *Q3* focuses on the difference between the magnitude of total government aid deemed appropriate by the subject, relative to their knowledge of the current magnitude of aid, and requires respondents to select one of five ordered responses: (1) "Spend Much Less", (2) "Spend Less", (3) "Spend the Same as Now", (4) "Spend More" or (5) "Spend Much More". Most of the 1518 respondents answered all three questions. Approximately 89% of the 1499 respondents to *Q1* thought that it was the government's responsibility to help individuals suffering losses from a natural disaster. Approximately 91% of the 1493 respondents to *Q2* thought that the government should assume responsibility to help restore or rebuild damaged infrastructure in communities affected by natural disasters. Responses to *Q3* regarding the level of government spending on natural disasters had considerably more variation. Approximately 48% of the 1496 individuals responded "Spend More" or "Spend Much More" and nearly 14% responded "Spend Less" or "Spend Much Less." The mean response over the sample respondents was 3.47.

3.2. Independent Variables

Individual data for each of our demographic, political, and socioeconomic explanatory variables were directly compiled from self-reports of the 2006 GSS respondents. These include the demographic variables—measures of the respondent's race/ethnicity ("*Black*" "*Hispanic*" and "*Other Race*"), gender ("*Female*"), marital status ("*Married*"), educational level ("*College Graduate*") and age ("*Age*"), the political affiliation ("*Republican*"), and one of the socioeconomic variables, the respondent's average annual family income ("*Income*"). All but the last three independent variables are binary and coded as 'variable name = 1'. The political affiliation of the respondent corresponds to Democrat, Independent or Republican, with these categories, respectively, coded as -1, 0 and 1. Age, in years, and family income, measured in terms of twenty-five ascending dollar intervals, were treated as approximations to continuous variables.[7]

Our second socioeconomic variable is the respondent's mode of housing tenure— *homeownership*. Although all subjects in the 2006 GSS sample were asked hundreds of the core of common demographic and socioeconomic traits with which they identified, subjects in the 2006 GSS who were asked for their opinions of disaster aid in questions *Q1–Q3* were members of a different subsample than those 1992 subjects that were asked whether they owned or rented their homes. Since these subsamples were distinct and did not overlap, we could not use GSS data to directly identify respondents to *Q1–Q3* who were homeowners in our sample.

We needed to construct a proxy variable to represent homeowners among the respondents to *Q1–Q3.* Since we had 2006 GSS data for all such subsamples, we used data from those subjects who were queried about their mode of housing tenure to estimate the probability of homeownership for each member of the subsample who responded to *Q1–Q3.* This was performed by estimating a probit model, using as a dependent variable the response to the question "Do you or your family own your home/apartment or pay rent?" and, as independent variables, an extensive set of characteristics common to subjects in both the sample for which homeownership data had been collected and the sample which had been asked to respond to the disaster aid questions *Q1–Q3.* Based on earlier empirical research into the probability of homeownership by Carliner (1974) and Linneman (1985), we included, among these characteristics, respondent's household income, race, gender, marital status, family size, age, head of household status and inter-actions between the race and gender variables with the head of household status. Coefficient estimates from that probit model were then applied to the same characteristics of the subsample of 1,518 respondents to the disaster aid questions to create our proxy variable, the probability of their homeownership ("*homeownership*").[8] Although this probability is restricted by the availability of key independent variables common to both subsamples, it is highly correlated (simple correlation approximately 0.6) to the homeownership variable from the initial subsample.

The 2006 GSS Sensitive Data Files allow us to identify each respondent's county, which we can link to various county characteristics, including county politics and disaster experience. The general county-level political data are obtained from the online database, Leip's *Atlas of U.S. Presidential Elections,* accessed through the Elections and Voting Data Guide hosted by Princeton University. The relative size of county Democratic voters to Republican voters—*Co Dem Voters/GOP Voters*—is our proxy measure of the strength of the collective ideological beliefs held by other voters in the respondent's county and is an attempt to account for the well-known "political conformity" effect (Di Palma and McClosky 1970; Suhay 2015; Perez-Truglia 2018). Since evidence exists that voters with conservative ideological attitudes differ in their response to the pressure of this social conformity, we also interact this ratio with the respondent's affiliation with the Republican party by "*Republican*Co Dem Voters/GOP Voters*" (Malka 2015; Levitan and Verhulst 2016).

Our remaining variables that measure the respondent's own exposure to disaster risk and experience are also county-level variables that are linked to the survey data using the GSS Sensitive Data Files. This disaster experience may bias personal beliefs about

the level of such risk faced by the average disaster victim (Grothmann and Reusswig 2006; Kouabenan 2009; Brown et al. 2018) and we create objective independent measures of disaster risk experience to control for such bias. The first—Co Disaster Risk—is taken directly from FEMA (2020), a 100-point scale measuring the risk in each U.S. county to eighteen types of natural disasters.[9]

Three additional variables measure the respondent's potential previous experience with natural disaster damage and analogous experience with government disaster aid, reflecting the disaster risk by the severity and frequency of major disasters recently occurring in each county in which a respondent resided at the time of the survey. County disaster damage data are drawn from the "Spatial Hazards and Loss Estimates Database for the United States" (SHELDUS), an online repository hosted by the Arizona State University. County disaster assistance data are obtained from the OpenFEMA database provided by the FEMA (2015). Several studies have found that such experience affects a subject's respective beliefs and opinions about disasters in general and about the nature and efficacy of government disaster aid, whether through Bayesian updating or behavioral heuristics (Baccini and Leemann 2010; Liu 2019). Owing to the temporal proximity to the administration of the 2006 GSS, the extraordinary publicity from the losses inflicted by Hurricane Katrina in 2005 and the availability of consistent frequency and loss data, we use each county's number of major disasters over the period 2004–2005—*Co Number of Disasters 04 + 05*—to represent frequency, while severity was measured by the real per capita economic loss inflicted in each county—*CO PC Disaster Damage 04 + 05*—by those same disasters. These loss estimates from SHELDUS are measured independently of those made by states and FEMA and are used to avoid any ex ante relationship with FEMA aid expenditures. Experience with county-level government disaster aid—*CO PC Disaster Aid 04 + 05*—is drawn from data on real per capita aid obligated by FEMA through the Public Assistance program, its largest disaster aid program, to each county suffering loss from each specific major disaster occurring in the same two years 2004–2005.[10]

Summary statistics for our dependent and independent variables are found in Table 1. All continuous variables in our sample, *Income*, *Age*, *CO PC Disaster Assistance*, *CO PC Disaster Damage*, and *Risk*, are in logarithmic form. Using these data, we test the extant hypotheses, as they appear in research studies from economics, political science, social psychology and sociology, about the influence of each of our independent variables on the degree of support for the allocation and magnitude of government disaster aid. The details of our results and their implications for the results of such studies are presented and discussed in Section 5.

Table 1. Summary Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Households	1478	0.911	0.284	0	1
Rebuild	1472	0.892	0.311	0	1
Spending	1492	3.468	0.947	1	5
Household Income	1278	55,560.25	44,287.18	500	175,000
Black	1492	0.142	0.349	0	1
Female	1492	0.534	0.499	0	1
College	1489	0.244	0.43	0	1
Age	1483	46.979	16.338	18	92
Democrat	1481	0.13	0.853	−1	1
Co Disaster Risk	1492	20.57	16.657	0	100
Co PC Disaster Damage 05	1479	178.451	1336.135	0.01	16,205.46
Co PC Disaster Damage 04 + 05	1479	270.188	1399.231	0.01	16,213.6
Co PC Disaster Assistance 05	1468	13.711	81.988	0	1182.169
Co PC Disaster Assistance 04 + 05	1468	20.282	88.444	0	1186.646

4. The Econometric Model

Dichotomous responses (yes/no) to the government disaster assistance to individuals and communities in *Q1* and *Q2* and the categorical ordering of the five responses to the government spending in *Q3* require the use of limited dependent variable models to estimate the influences of our socioeconomic, demographic, political and experience variables on public support for government disaster aid. We used a standard probit model to analyze the determinants of the responses to questions *Q1* and *Q2* and present our estimated coefficients for each of the independent variables in marginal form.

Analyzing the ordered responses to the level of government aid expenditures in *Q3* requires a model to accommodate the relative intensity of a subject's opinion about the current total value of such aid. We use the ordered probit model, owing to its consistency with the method of most other survey studies of disasters as well as its ability to endogenously account for unequal differences between the frequencies of these ranked responses, which correspond to the values of our dependent variables (Johnson 1996; Chen and Tsurumi 2010). The ordered probit model is based on the assumption that a continuous and latent random variable underlies the probability that a subject will choose one of the five possible *Q3* responses to represent an opinion of total government expenditures on disaster aid and that this variable determines the observed frequency of such choices across our entire sample. The general representation of this relationship is

$$z_i = \beta X_i + \varepsilon_i, \tag{1}$$

where z_i denotes the latent choice probability for respondent i, β is the vector of parameters to be estimated, X_i is the vector of independent variables measuring the attributes of respondent$_i$, and ε_i is the random error term following the standard normal distribution. Although z_i is unobservable, the assumption that a high probability of the choice of a given response value is directly related to the observed frequency of the sample choice of that value, y_i, the relationship between the two, given the values in the vector X_i, can be expressed as

$$y_i = k \quad \begin{matrix} 1 & if & z_i \leq \pi_1 \\ if & \pi_{k-1} < z_i \leq \pi_k \\ K & if & \pi_{K-1} < z_i \end{matrix} \tag{2}$$

where $\{\pi_1, \ldots \pi_k, \ldots \pi_{K-1}\}$ are the endogenous threshold values which divide the range of the unobservable latent variable z_i into K intervals corresponding to the K observed values of the dependent variable y_i. The probability of a choice of $y = k$ can consequently be interpreted as

$$P(y = k) = \varphi(\pi_k - \beta X_i) - \varphi(\pi_{k+1} - \beta X_i) \tag{3}$$

where $\varphi(\ )$ denotes the standard normal distribution and π_k and π_{k+1} denote the lower and upper thresholds for response value k. A change in the value of an independent variable will then, based on the estimated corresponding regression coefficient, change the highest and lowest values of the highest and lowest ordered response values.

5. Results and Discussion

The maximum likelihood estimates for the regression coefficients from our probit and ordered probit models appear in Tables 2 and 3. Tables vary by the independent variables that were used to represent the survey respondent's prior disaster experience. Table 2 presents model estimates with prior disaster experience measured by both the number and per capita loss severity of county disasters in the two year (2004 and 2005) preceding the 2006 GSS. Table 3 presents the analogous estimates with prior disaster experience measured by per capita government aid to the county in 2004 and 2005 replacing disaster loss severity. The first column in each table displays the estimated marginal coefficients for our *Q1* dependent variable—households—while the second column in each table displays the marginal coefficients for our *Q2* dependent variable—communities. The third column in each table displays estimates for the ordinary coefficients for our third dependent variable—

Expenditures—corresponding to the response frequencies to our *Q3* dependent variable. The sign of the coefficients from this ordered probit model are interpreted in terms of support for total government aid expenditures.

Table 2. Support for Government Disaster Aid (Disaster Loss Severity).

Independent Variables	Households	Communities	Expenditures
Income	−0.0118	−0.0198 **	−0.0850 **
	(−1.33)	(−2.04)	(−2.33)
Homeownership	0.00737	0.0139	0.0390
	(0.40)	(0.65)	(0.49)
Black	0.0687 ***	0.0813 ***	0.364 ***
	(4.67)	(5.32)	(3.51)
Hispanic	0.0546 ***	0.0356	0.466 ***
	(2.81)	(1.03)	(2.75)
Other Race	0.0450 **	0.0315	0.0958
	(2.23)	(1.07)	(0.71)
Female	0.0354 **	0.0302	−0.0371
	(2.06)	(1.63)	(−0.48)
Married	−0.00123	0.000994	−0.0491
	(−0.07)	(0.05)	(−0.65)
Female*Married	0.0250	−0.000997	−0.0269
	(1.34)	(−0.04)	(−0.25)
College Graduate	0.00483	−0.0474 **	−0.0526
	(0.30)	(−2.29)	(−0.71)
Age	−0.0401 **	−0.0447 **	−0.229 ***
	(−2.14)	(−1.65)	(−2.65)
GOP	−0.0308 ***	−0.0324 ***	−0.225 ***
	(−3.73)	(−3.54)	(−5.85)
CoDem/CoGOP	0.0150	0.00738	0.00462
	(1.18)	(0.49)	(1.83)
CoGOP *(CoDem/CoGOP)	−0.00764	−0.00610	0.00681
	(−0.75)	(−0.40)	(0.13)
Co Disaster Risk	−0.0141	0.00741	0.0503
	(−1.43)	(0.70)	(1.07)
Co Number of Disasters 04 + 05	0.0133 **	0.0115	−0.0147
	(1.99)	(1.49)	(−0.44)
Co PC Disaster Loss 04 + 05	−0.00289 *	−0.00332 *	0.00433
	(−1.73)	(−1.82)	(0.60)
Observations	1248	1244	1248
Pseudo *R²*	0.087	0.096	0.040

The significance level of coefficients marked *, ** or *** are, respectively, 10%, 5% and 1% and unmarked coefficients are insignificant.

The coefficients in both tables are grouped by our categories of independent variables, which are socioeconomic (*Income, Homeownership*), demographic (*Black, Hispanic, Other Race, Female, Married, Female*Married, College Graduate, Age*), political (*GOP, Co Dem Voters/Co GOP Voters, GOP*Co Dem Voters/Co GOP Voters*), and prior experience with disasters and government disaster assistance (*Co Disaster Risk, Co Number of Disasters 04 + 05, Co PC Disaster Loss 04 + 05* in Table 2 and *Co Disaster Risk, Co Number of Disasters 04 + 05, Co PC Disaster Aid 04 + 05* in Table 3). Along with the maximum likelihood estimates of the value and statistical signficance of each of the model coefficients, a pseudo-goodness-of-fit measure—adjusted R^2—is also reported.

The statistical significance and signs of the coefficients estimated for the independent variables are, with a few notable exceptions, generally consistent for the respective specifications of our model in both Tables 2 and 3 and are, in some cases, consistent with some of the hypotheses and results from previous studies found in economics, political science, sociology and psychology. The statistical insignificance found for some variables is as important to note as those found to be significant.

Table 3. Support for Government Disaster Aid (Government Disaster Aid).

Independent Variables	Households	Communities	Expenditures
Income	−0.0121	−0.0200 **	−0.0893 **
	(−1.31)	(−2.06)	(−2.41)
Homeownership	0.00692	0.0186	0.0453
	(0.36)	(0.87)	(0.57)
Black	0.0679 ***	0.0806 ***	0.364 ***
	(4.29)	(4.57)	(3.35)
Hispanic	0.0546 ***	0.0414	0.471 ***
	(2.60)	(1.33)	(2.77)
Other Race	0.0441 **	0.0309	0.0992
	(2.04)	(1.06)	(0.74)
Female	0.0358 **	0.0254	−0.0453
	(2.07)	(1.38)	(−0.58)
Married	−0.00466	−0.00175	−0.0500
	(−0.27)	(0.09)	(−0.66)
Female*Married	0.0258	−0.000515	−0.0373
	(1.36)	(−0.21)	(−0.35)
College Graduate	0.00647	−0.0421 **	−0.0513
	(0.39)	(−2.04)	(−0.69)
Age	−0.0401 **	−0.0447 **	−0.231 ***
	(−2.20)	(−1.96)	(−2.66)
GOP	−0.0321 ***	−0.0329 ***	−0.223 ***
	(−3.80)	(−3.59)	(−5.80)
CoDem/CoGOP	0.0149	0.00581	0.0943 *
	(1.17)	(0.39)	(1.66)
CoGOP *(CoDem/CoGOP)	−0.00764	−0.00492	0.00462
	(−0.59)	(−0.33)	(0.09)
Co Disaster Risk	−0.0104	0.0159	0.0589
	(−0.90)	(1.34)	(1.16)
Co Number Disasters 04+05	0.0108	−0.0139	−0.0276
	(0.81)	(−1.00)	(−0.49)
Co PC Disaster Aid 04+05	−0.000394	0.00191	0.00238
	(−0.32)	(1.46)	(0.50)
Observations	1237	1233	1237
Pseudo R^2	0.083	0.094	0.040

The significance level of coefficients marked *, ** or *** are, respectively, 10%, 5% and 1% and unmarked coefficients are insignificant.

We first consider the coefficient estimates for the two socioeconomic independent variables. Income is consistently found to decrease popular support for aid to communities (*communities*) and for total government aid expenditures (*Expenditures*), while exerting an insignificant influence on support for aid allocated to affected individuals (Individuals). One plausible economic explanation is, on average, the preferences of higher-income respondents reflect self-interest to a degree sufficient for them to simply regard disaster

aid in general and aid to repair damaged infrastructure in stricken communities as inferior goods. A second and related explanation, based on recent research in behavioral economics and psychology, is that the relative lower usage of infrastructure services, such as mass transit, by higher-income households may bias their perception of the value of such services to lower-income households (Mayo and Tinsley 2009; Loughnan et al. 2011). This second explanation, however, is not supported by our results, which finds an insignificant influence of income on opinions about aid to affected individuals, rather than the disapproval predicted with a sufficient perception bias.

A third explanation, involving an adverse reaction by insured individuals to government aid to uninsured individuals, is also inconsistent with our findings. Since earlier survey research has found that higher-income and risk-averse individuals more frequently purchase disaster insurance (Kriesel and Landry 2011; Landry and Jahan-Parvar 2011; Petrolia et al. 2013), to the extent that these individuals comprise a significant portion of the GSS sample, a negative effect of income on individual aid might be expected, since these respondents would presumably disapprove of recipients receiving public coverage of loss without charge while they paid for private coverage. The insignificance of income with respect to individual assistance also precludes our ability to infer anything about the potential presence of respondent altruism. Independently of this question about preferences, our results sharply contrast to the traditional findings in sociological research that income and charitable behavior are highly correlated (Havens et al. 2002).

Homeownership has also been found to be highly correlated with charitable attitudes of individuals in some previous sociological research (Havens et al. 2002). While homeownership might be expected, like income, to have an insignificant effect on support for aid to communities and the magnitude of aid in general, our finding of an insignificant effect of homeownership on the average opinion of aid to individuals is inconsistent with these earlier findings. One explanation, based on the work of psychologists and behavioral economists such as Slovic et al. (1977), is that despite the risk to their primary asset, homeowners may consistently underestimate the probability and severity of their own risk of loss from low-probability, high-cost events like disasters and hold a similar belief about that of others.

Our results show unusual degrees of consistency and strength in the influence of some of the demographic variables. The most striking results are the opinions of minority respondents to both the allocation and magnitude of aid. Regardless of variable specification, Black respondents are more supportive of aid directed to both individuals and communities following a disaster, as well as more strongly supportive of increasing the magnitude of total aid and Hispanic respondents are supportive of aid to individuals and total spending, relative to White respondents (the omitted category). For example, the probabilities that a Black respondent supports aid to individuals and communities are approximately 7 and 8 percentage points more likely than White respondents to, respectively, support aid to individuals and communities. Probabilities for Hispanic respondents for individual aid are approximately 5.5 percentage points higher than White survey respondents. Respondents classified as "Other Race" are also supportive, though less so, of aid to individuals. Although the temporal proximity of Katrina and the disproportional incidence of damage in largely Black neighborhoods of New Orleans could have induced this response through sentiments of group solidarity, or by an updating of beliefs regarding both potential storm severity and the vulnerability of poorer neighborhoods, survey evidence underlying the "worthiness of aid" index of Fong and Luttmer (2011) suggests that it could also have arisen from a systematic difference in the collective perceptions of Black and White respondents regarding the relative merit of Black or poor disaster victims. Findings similar to ours for the influence of minority ethnicity were found in Skitka (1999) and Viscusi and Zeckhauser (2006) as well. However, to the extent that the respective motivations for charitable behavior and support for aid are correlated, the strength of support for aid by Black respondents also contrasts with the research in both traditional and more recent studies from sociology that find Black respondents hold significantly less charitable

attitudes than White respondents (Havens et al. 2002), or display little collective difference to White respondents (Brown and Ferris 2002; Rooney et al. 2005).

Two other notable results are the significant disapproval of older respondents (*Age*) regarding the allocation of aid to individuals, communities and increases in total aid expenditures, along with the disapproval of aid to affected communities exhibited by College Graduates. While the negative effect of age contrasts with the consistently positive correlations of both age and education with attitudes of social compassion found in previous survey research by both social psychologists and sociologists (Havens et al. 2002; Bekkers and Wiepking 2011), it is consistent with recent research by political scientists on the positive relation between aging and the retention of conservative social and political ideology (Van der Brug 2010; Van Hiel and Brebels 2011) and by seveal social psychologists, including Skitka (1999).

Females are generally supportive of aid to individuals in both model specifications, but this gender effect is insignificant with respect to aid to communities and to increasing total government aid. Both the support for aid to individuals and collective ambivalence in regard to the magnitude of total aid is consistent with the bulk of earlier research in sociology and social psychology (Reed and Selbee 2002; Bekkers 2004; Lyons and Nivison-Smith 2006). However, it is not consistent with research by some political scientists, such as Golebiowska (1999) and Schlesinger and Heldman (2001), who find women are relatively less likely than men to be disposed toward aiding minorities and identifiable groups, such as those who reside in areas with a high frequency of hurricanes or other hydrom-eterolgical disasters and that repeatedly seek aid from the majority of the population. The insignificant influences on support for aid by married respondents in general and by married women in particular is consistent with findings in recent survey research by some sociologists and psychologists (Bekkers and Wiepking 2011) but inconsistent with others (Havens et al. 2002).

The coefficient estimates for our set of political variables are generally consistent with previous research. Republican voters are opposed to aid to either individuals or communities and also opposed to increasing the magnitude of total government disaster assistance. This is in keeping with a conservative ideology regarding both government spending and the responsibility of those exposed to the risk of disaster losses, both individually and collectively, to avoid the consequences of natural disasters.

A number of studies of social conformity in electoral politics have found that the opinions of voters affiliated with a particular party will more frequently become supportive of the candidate of the other party as the proportion of voters affiliated with the other party increases (Suhay 2015; Coleman 2004; Perez-Truglia 2018). We find instead that Republican voters display a considerable degree of ideological resilience, with no significant influence on their opinions about public aid from the relative density of Democratic to Republican voters in the county. Such resilience is consistent with evidence that certain personality traits conducive to holding opinions consistent with highly conservative political and social opinions create strong resistance to changing those opinions regardless of majority attitudes (Riemann et al. 1993; Rudolph and Evans 2005; Jost et al. 2018).

Contrary to proponents of the bounded rationality view of individual preferences, including Kunreuther et al. (1978), we find statistically insignificant effects of our measure of the degree of personal risk borne by respondents (*Co Disaster Risk*) on attitudes toward both the allocation and magnitude of government aid. These results are, however, consistent with the effects of personal risk found by Viscusi and Zeckhauser (2006). This insignificance could imply that the estimates of disaster risk made by the average individual are close to the true actuarial probabilities of such risk. It could also imply that the realism of the traditional assumption in economics that household preferences reflect only narrow self-interest may be less than previously thought.

Finally, we find some intriguing and unexpected results in regard to the influence of respondent experience with both major disasters and with previous disaster aid. Coefficient estimates in Table 2 indicate that when prior experience with disasters is measured both

by their frequency and loss severity, subjects respond differently to the frequency of disasters relative to the severity of losses from those disasters. Increases in the number of disasters experienced in the two years preceding the GSS survey have, as might be expected, a significant positive effect on support for disaster aid to individuals suffering losses, but have no significant influence on either support for the allocation of aid to affected communities or on average opinion about whether total government expenditures should be increased or decreased. We also find that prior experience with disaster loss severity is also a significant, albeit weak, influence on support for aid to both households and communities, but somewhat surprisingly, this influence is negative rather than positive, as found for disaster frequency. However, when the effects of previous experience with disaster aid and disaster frequency are assessed, as in Table 3, neither variable has a significant effect on support for any aspect of disaster aid.

The significant influence on respondents of their previous experience with both the frequency and severity of disasters is consistent with two distinct explanations of the effects of recent experience on beliefs, respectively, found in research from traditional economic theory and from behavioral economics and cognitive psychology. Even a limited influence of recent personal experience with disasters or a highly-publicized episode such as Hurricane Katrina in 2005 could reflect, according to traditional economic theory, a rational Bayesian updating of beliefs by respondents. Alternatively, a systematic effect of recent experience on beliefs is also consistent with behavioral interpretations of individual preferences and cognitive capacity, most often referred to as the bounded rationality of economic agents, and could specifically constitute evidence for the presence of the availability heuristic in the formation of individual expectations (Carroll 1978; Kahneman et al. 1982; Kahneman 2003). This observational equivalence highlights the difficulty in resolving, from field data, these different explanations. Neither of these explanations is entirely able to account for the reversal in the sign of these effects. Moreover, these explanations about the effects of experience on beliefs are only compatible with the insignificant influence of experience with disaster aid in the case where the beliefs of the average respondent about the consequences of aid were already consistent with observations of its ambiguous effects on both households and communities receiving it.

Another possibility is that the influence of the number of recent disasters on support for aid to households could reflect narrow self-interest on the part of respondents, while the contrasting effects of disaster severity with respect to aid to both households and communities might reflect interaction between location and disaster type. Some respondents may have resided in close proximity to recurring disasters that inflict only localized damage, such as tornados, without themselves or their communities suffering severe losses. While somewhat divergent from the findings of some social psychologists, concerning the impact on personal beliefs of experience with catastrophic events, these results are potentially consistent with the empirical regularities recently documented in a small number of studies, such as Tanner and Arvai (2018), that prior experience with disasters has little, if any, discernable effect on individual beliefs about their risk of loss or that of their neighbors from future disasters.

The coefficient estimates reported in Table 3 are also potentially inconsistent with findings from some political scientists, such as Chen (2013) and Chen and Healy (2014), that disapproval (approval) of aid programs is directly influenced by unfavorable (favorable) experience with such programs. One possible explanation is that respondents either regard their own experience with aid to be singular or idiosyncratic, or that they were unwilling to generalize from their experience to the net benefits of disaster aid more generally. Another possible explanation, related to that for disaster severity, explicitly involves the presence of a threshold level of loss which determines eligibility to receive disaster aid. A respondent's experience of disasters may primarily or exclusively be with disaster such as tornados, which occur more frequently than most other types of disasters but inflict highly localized loss. A respondent might again be affected by the number of nearby tornados, but regards personal or county losses to be too low to qualify for federal aid.

Regardless of any of these interpretations, our unique finding of a differential effect of disaster frequency and severity on support for aid suggests a distinction between different dimensions of experience with disasters. These findings in regard to experience with both disasters and aid require additional research before compelling explanations are established.

Our results regarding the respective influences of experience with disasters and with aid also have several practical economic and political implications for federal disaster policy in the United States. First, based on our results, nearly 90% of the public supports the allocation of some level of government aid to affected households and communities. The clear political incentives from the popularity of such aid virtually guarantee that both incumbents and challengers for elected office will be highly predisposed to favoring a permanent role for government in assuming some proportion of liability for what are primarily private losses from disasters. Second, since public opinion is highly unlikely to discriminate between the economic efficiency and equity of such aid, a strong likelihood exists that, from an efficiency perspective, government will assume too large a proportion of such liability, leading to some degree of loss in national wealth and a larger fiscal burden to taxpayers. Third, assuming aid is primarily determined through compensation for uninsured loss, the potential exists for significant moral hazard in the purchase by both households and local governments of private disaster coverage, which in turn leads to a possibly substantial advere effect on risk markets in general and the property-liability insurance industry in particular. Two final implications also arise from the pronounced divergence of public opinion over the appropriate level of total aid expenditures. The size and nature of government aid policy will inevitably be determined, at least in part, by purely political considerations and create uncertainty through periodic swings in electoral influence of those, respectively, favoring and opposing increases in disaster expenditures. Parallel to this, the incentives for political candidates and elected officials provided by the consistent support for aid by minorities and equally consistent opposition by older and more conservative households will exacerbate such aggregate uncertainty and help perpetuate the existing ideological divergence over government spending in general between these portions of the electorate.

6. Concluding Remarks

Surprisingly, little research has been performed on the extent of public support for government programs of disaster aid in the United States and what socioeconomic, demographic, political and environmental factors influence such opinion, despite the great relevance of this topic for the economic and political aspects of current disaster policy and for the design of future policy. This paper is one of the first to rigorously examine such influences on public opinion about the allocation and magnitude of disaster aid. Our findings also have implications for related research on disasters from political science, psychology, and sociology.

Combining individual data from the 2006 GSS with county-level data on disaster experiences, we find that (1) household income, age, and affiliation with the Republican party have, in general, statistically significant negative effects on public support for aid; (2) educational level has a significant, if negative, effect only on support for aid to communities; (3) relative to White respondents, Black and Hispanic respondents exhibit remarkably strong support for aid to individual households and communities and for an increase in total expenditures on disaster assistance, while members of other minorities support aid to individual households and favor an increase in aid expenditures but exhibit some ambivalence regarding aid to communities; (4) women consistently support aid to households but exhibit equivocal opinions about aiding communities and changing the current level of aid expenditures; (5) contrary to results found from other disciplines, homeownership, marital status, personal risk, and political conformity all fail to significantly influence public opinion about aid; and (6) a larger number of disasters has a positive relationship with the respondents' support for assistance to individuals, holding constant the size of

disaster damage, but when controlling for the amounts of government disaster assistance all previous experiences have insignificant effects on support for any aspect of aid.

Overall, these results yield insights into several of the questions raised by social psychologists, sociologists and researchers in other fields as to whether the economic, demographic, and political characteristics most often found to be the primary determinants of public opinion about government spending on common aid programs targeting the welfare of certain households and communities persist in these roles when the nature of the exigency affecting portions of the population is considered to be difficult to predict and fully control, such as a natural disaster. We have found that several of these characteristics do remain as major influences on support for disaster aid. Minority ethnicity, age and political ideology largely assume similar significance here, with minorities strongly supporting aid and age and conservative political ideology are correlated with a strong disapproval of the size of government aid expenditures and its allocation, while simultaneously being inconsistent with previous findings in both social psychology and sociology about their effects on charitable attitudes and opinions of the public.

These results, like those for all research studies, should be interpreted with full consideration of the limitations imposed by the data and implications for both the construction of our independent variables and the nature and precision of the questions able to be asked and answered. Potential sources of bias arising from the use of survey data, including nonresponse and framing effects, prompts provided to respondents, and measurement accuracy, have already been discussed above. While the GSS has a publicly available research design and methods have been implemented since its inception to mitigate these issues, it would be unrealistic to assume that these are absent from our data. Two particular issues exist that cannot be addressed in this study, nor have been addressed in any of the studies cited here. The first is the temporal proximity of the survey to a recent major disaster, in this case Hurricane Katrina in 2005. The second is our ability to only partially control, through our measures of prior experience, variation in the background knowledge of disasters across survey respondents. The extent of bias, if any, induced by these issues is unknown.

Another implication of the general use of survey data is that the extent to which the independent variables capture the true nature of the effect they are used to represent is limited by the precision of the questions in the survey. The GSS survey did not solicit any respondent's homeownership status or experience with previous disasters, for example, forcing us to construct proxies for the effects of each of these unobservable attributes. Another issue arising from such data limitations is the extent to which our measures of disaster and aid experience capture the actual influence on respondent beliefs. Again, while we use the measures standard in the literature, bias could arise to the extent that those experiential aspects not captured by our measures, if any, are correlated with the dependent variables. Finally, as pointed out by Bertrand and Mullainathan (2001), bias can arise in any regression analysis based on survey data if the measurement error in such a regression is correlated with any of the characteristics used as independent variables. These are all problems that qualify the interpretations of the results of any survey-based research, of course, and the cost of eliminating such problems is to avoid the use of survey data entirely, which in turn precludes the investigation of many significant issues, including those of this paper.

Our findings suggest several directions for future research. Additional research should be performed on distinguishing different dimensions of experience with disasters and the introduction of additional measures of prior experience with government aid programs. Progress in future disaster research based on an ex ante perspective and involving the use of subject responses should avoid the use of proprietary surveys and instead make the salient details of their survey design, sampling methods, and questionnaires public to allow any implicit sources of bias to be mitigated. Finally, additional cross-disciplinary research needs to be performed to assess the reasons behind contrasting findings across similar research topics in economics, political science, social psychology, sociology, and other fields of social science.

Notes

1. Husted and Nickerson (2019) provide a comprehensive survey of economic and political research into the efficiency and equity issues in public disaster aid.
2. Surveys of this research include those of Portes (1998) and Simpson and Willer (2015).
3. Since the concern of pure altruists is solely with the welfare of affected households, government aid should not affect such donations and, by implication, the attitude of these individuals toward government aid should, on average, be favorable. Depending on their subjective rate of substitution between charitable donations to households sustaining disaster losses or to other groups, impure altruists would be deprived of an opportunity to act charitably and so decrease their own donations as government disaster aid increases. By implication, these individuals could be expected to disapprove of disaster aid. Empirical evidence on the prevalence of impure altruism has proven mixed (Hartmann 2017).
4. Survey-based economic research into aspects of disasters other than public support for government aid has extensively increased over the last decade. Examples of such studies and their topics include Landry and Jahan-Parvar (2011) and Petrolia et al. (2013), on the response of disaster insurance demand to risk aversion and public information about disaster frequency and severity; Andor et al. (2020) on charity hazard; and Weng et al. (2015) on public trust and corruption in the local administration of disaster aid.
5. Started in 1972 and funded by the National Science Foundation (NSF), the GSS is now administered on a biennial basis by the National Opinion Research Center (NORC) at the University of Chicago. A nationally representative survey, it features over 940 questions concerning respondent characteristics, attitudes, and opinions. It is the largest demographic and socioeconomic survey of households in the United States and the most used in social science research. Details of the GSS survey design and questionnaire, as well as access to the data compiled from it, can be found through links at https://gss.norc.org/ (accessed on 1 February 2021).
6. These questions correspond closely to the two primary and most publicized aid programs administered by FEMA. The first is the Individual Assistance (IA) program, which provides financial compensation and emergency accommodation to eligible households, and the Public Assistance (PA) program, which finances emergency services provided by the community and restoration of public infrastructure.
7. Individual data from GSS 2006 can be found through the NORC 'data explorer', at https://gssdataexplorer.norc.org/ (accessed on 1 February 2021).
8. Coefficient estimates for this probit model are available by request.
9. It should be noted that this index was created in 2020, so it must be treated as a proxy measure for county disaster risk in 2006.
10. FEMA aid expenditures under the auspices of their Public Assistance program (PA) consistently averages at least 45% of all such expenditures on an annual basis, representing by far the largest source of federal disaster aid. Over 75% of PA expenditures are for repair and reconstruction of public infrastructure suffering disaster damage. The next largest source of federal aid is FEMA's Individual Assistance program (IA), now known as the Individual and Household Program (IHP), which has averaged 25% of annual federal aid expenditures annually. Expenditures under the smaller IA program are not made publicly available by FEMA.

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