Voter Income and the Mobilizing Effect of Distributive Benefits

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Abstract:

How do the voter-mobilizing effects of distributive programs vary with voter income? This paper's formal model argues that the delivery of distributive transfers causes the greatest increase in voter turnout among middle-income recipients; by contrast, the poorest and the wealthiest recipients exhibit relatively smaller increases in voter turnout. The theoretical intuition here is that the wealthy are indifferent to transfers because of the diminishing marginal utility of income. Meanwhile, the poor often lack the requisite resources for participation in politics and are thus rarely mobilized by transfers. To test these predictions, I track the voter turnout records of Floridians who applied for FEMA hurricane disaster aid in 2004. I compare the pre-hurricane (November 2000 and 2002) and post-hurricane (November 2004) turnout of FEMA applicants who received aid against those whose applications were denied. The results confirm that the turnout-increasing effect due to FEMA aid was relatively largest among middle-income individuals.

How do the voter-mobilizing effects of distributive programs vary with voter income? Since Wolfinger and Rosenstone (1980), scholars have generally found that the beneficiaries of universal government programs, such as farmer subsidies, vote at higher rates in order to protect their stake in such programs. In developing democracies, the poorest individuals in particular exhibit the largest increases in voter turnout upon receiving distributive benefits (e.g., Nichter 2007; De La O 2009). The most common theory for this relationship between poverty and distributive mobilization is the diminishing marginal utility of income, as explained by Dixit and Londregan (1996), Calvo and Murillo (2004), and Stokes (2005). The logic of this theory is that the poor are more dependent on distributive transfers; thus, poor voters are more likely to be influenced by political benefits and handouts (e.g., Diaz-Cayeros et al. 2001; Brusco et al. 2002).

But a separate empirical literature on political participation in the United States has identified a counteracting aspect of poverty's effect on voter mobilization. Poorer citizens participate in politics at significantly lower rates because they often lack the requisite leisure time and resources to do so (e.g., Almond and Verba 1965; Rosenstone and Hansen 1993; Conway 2000). As "political participation is a luxury good more readily available to higher-income citizens" (Campbell 2002), it is thus questionable whether the voter-mobilizing effects of distributive transfers could be largest among the poor, at least in the US context.

Together, these two literatures suggest two important and counteracting features of poverty's effect on the distributive mobilization of voters in the US: While the poor have the most incentive to vote in order to safeguard their future distributive benefits politically, wealthier voters are the ones with relatively greater capacity for participating in politics. Scholars have thus far analyzed these two aspects of wealth and participation in separate literatures. But considered together, these two past findings present a compelling research puzzle: If poorer voters value distributive transfers more highly, but only wealthier voters can afford to participate

in politics more easily, then how do these two counteracting forces collectively affect the relationship between voters' income and the turnout-mobilizing effects of distributive benefits?

To address this puzzle, I develop a formal model of distributive spending's effect on voter turnout that accounts for both of these counteracting forces. The model begins with Dixit and Londregan's (1996) original assumption of the diminishing marginal utility of income. But the model also incorporates the repeated finding that wealthier individuals can more easily vote in elections because "economic duress reduces a person's capacity to participate in politics" (Rosenstone 1992). By combining and incorporating these two past findings, the formal model produces a surprising prediction: Although the awarding of distributive benefits increases voter turnout generally, this turnout effect is largest for middle-income recipients. By contrast, the poorest and the wealthiest recipients of benefits exhibit relatively smaller increases in turnout.

The intuition behind the formal model is as follows. A voter who receives distributive benefits interprets this receipt as an informative signal about the incumbent politician's likelihood of delivering more similar benefits in the future. Thus, receiving distributive benefits generally increases a voter's motivation to turn out and reelect the incumbent who delivered the transfer, thereby securing future benefits. But this increased motivation is smallest for the richest individuals, who receive the least marginal utility from transfers. Meanwhile, participation in politics is most onerous for the poorest citizens, who therefore exhibit relatively little increased turnout upon receiving transfers. Therefore, the turnout-increasing effect of distributive benefits is largest for middle-income recipients and smaller for the poorest and wealthiest recipients.

To empirically test these predictions of the formal model, I compare the turnout records of registered Florida Republican voters before and after the Bush administration's delivery of hurricane disaster aid during summer 2004. In response to four hurricanes that struck Florida in 2004, the Federal Emergency Management Agency (FEMA) accepted disaster aid applications

and delivered $1.2 billion to victimized households. Over 2 million FEMA applications were filed, but only 1.1 million households received any amount of disaster aid. Hence, I compare the approved and rejected FEMA applicants by analyzing their turnout behavior in post-hurricane (November 2004) and pre-hurricane (November 2000 and 2002) elections.

Across all incomes, the approval of one's FEMA application causes an overall 2.5 percentage increase in the probability of voter turnout for someone who has not voted in the recent past. But this increased turnout effect is significantly larger, at 4.8 percentage points, for middle-class individuals near the median household income of $50,000. By contrast, the effect is statistically indistinguishable from zero for the poorest and the wealthiest applicants.

Thus, in addition to the theoretical advancements described at the outset, the empirical results build upon and advance existing literature in the following three ways:

1) Mobilization Effects of Program Participation: First, this manuscript builds upon and extends previous survey-based studies of policy feedback by measuring how government programs affect observable political behavior outside the survey context. Past literature has convincingly found repeated survey evidence that the beneficiaries of universal programs self-report higher participation in elections and other political activity (e.g., Mettler 2002; Mettler and Welch 2004) and having more contact with public officials (e.g., Campbell 2002; 2003).

These important findings compel further study to measure how beneficiaries' survey-based enthusiasm for political activity manifests through changes in observable behavior. A well-known finding in survey research is that respondents generally overstate their participation in elections, and educated respondents are relatively more likely to overreport their past voting turnout (Silver, Anderson, and Abramson 1986; Karp and Brockington 2005). Hence, it is possible that the beneficiaries of non-means-tested programs, who tend to be more educated than welfare recipients, are disproportionately overreporting their political activity in surveys.

To measure the behavioral consequences of beneficiaries' survey-based responses, I search for FEMA applicants' voter registration and turnout records, obtained from county election commissions. The time series nature of the turnout data allow for the identification of changes in FEMA applicants' behavior: I compare each applicant's turnout in elections held after (November 2004) and prior to (November 2002 and 2000) the applicant's interactions with FEMA. I find a significant increase in voter turnout after FEMA aid receipt among middle-income applicants, though not among the poor or the wealthy. Hence, these results suggest that past studies' findings of survey-based expressions of political interest indeed manifest through observed changes in turnout behavior among some, though not all, citizens.

2) Selection Bias in Program Participation: Second, this manuscript contributes to an extensive policy feedback literature addressing the bias due to individuals' self-selection into government social programs, which has been noted by Mead (2001), Bruch, Ferree, and Soss (2010) Schlozman and Verba (1979), and others. For example, Soss (2002) explains how poor individuals' self-selection into welfare depends upon their social networks. Because of this self-selection bias, differences in political engagement between government program participants and non-participants arise not only from program effects, but also from participants' self-selection.

Previous studies have addressed this selection bias by controlling for respondents' individual characteristics. For example, Mettler (2002; 2005) compares the political participation of GI Bill recipients against the participation of non-recipients who had similar levels of education and income. Campbell (2002; 2003) controls for other demographic characteristics of respondents when estimating the Social Security-based voting of senior citizens. Finally, Bruch, Ferree, and Soss (2010) measure the political engagement of welfare recipients by controlling for respondents' life experiences, such as their drug and alcohol use and criminal activity.

Contributing to and extending these past studies, this manuscript takes a different strategy

to addressing selection bias by examining only individuals who have already self-selected into applying for FEMA aid. Because of the nature of the FEMA applicant data, I am able to compare the turnout behavior of voters who were awarded aid against the behavior of voters who applied but were denied FEMA aid. This comparison addresses the confounding possibility that citizens who self-select into seeking FEMA aid may be inherently more politically active. Nearly 50% of the 2 million FEMA applications were rejected by FEMA inspectors who evaluated the extent of hurricane damage at each applicant's home. Hence, the estimated turnout effects of FEMA aid are based upon comparisons of individuals who all self-selected into applying for aid but experienced different outcomes from the home inspection process.

3) Poverty and Social Program Efficacy: Third, this manuscript's empirical findings build upon and extend previous studies analyzing the effect of government program efficacy on political participation. Soss (1999) and Mettler and Stonecash (2008) have found that poor beneficiaries of some means-tested programs, including AFDC and food stamps, exhibit lower political participation because of the stigmatizing, inefficacious, and unresponsive administration of such programs. By contrast, universal programs that generally benefit more middle and upper-income citizens, such as the home mortgage deduction, the GI Bill, VA benefits, and federal student loans, often increase electoral participation among recipients because of these programs' "ease of accessibility" (Mettler 2005) and efficient administration (Campbell 2003).

These important findings motivate a further question: Would poor voters respond to distributive transfers with increased turnout if these benefits were delivered in a more efficacious, accessible manner? Or do poor voters simply not respond to benefits with increased turnout, regardless of the government program's efficacy and responsiveness? The unusual detail of the FEMA applicant data allows us to address this question. FEMA's data report the date on which each household applied for assistance as well as the date on which FEMA finally

inspected each application and delivered any aid. Hence, these dates provide an estimate of how quickly and responsively FEMA treated each applicant. Additionally, by geocoding applicants' residential addresses, I use NOAA hurricane data to calculate the storm severity experienced at each applicant's home. By comparing storm severity to the amount of aid awarded, I estimate how generously and efficaciously FEMA handled each application, relative to hurricane severity.

The empirical results demonstrate that FEMA treated the poorest applicants most responsively and generously. Even though poorer residents applied for FEMA aid more aggressively, FEMA usually processed applications from the poor in fewer days and with a slightly higher rate of approval than applications from more affluent residents. FEMA awarded the most aid to the poorest applicants on both a per-application and a per-capita basis. Even after controlling for hurricane severity, FEMA was most generous in treating the poorest applicants.

But in spite of FEMA's relatively expeditious and responsive treatment of the poorest applicants, the turnout-mobilizing effect of FEMA aid is weakest among the poor. Even under this most favorable scenario where a universal distributive program treats the poor efficaciously, the poorest beneficiaries exhibit no statistically significant increase in turnout. Hence, although the stigmatizing nature of many welfare programs may decrease political participation (e.g., Mead 1992; Soss 1999), the distribution of benefits to the poor under a responsive, non-means-tested program does not reverse this effect. Rather, the poor respond differently from middle-income citizens because poverty is an often insurmountable barrier to political participation.

This manuscript proceeds as follows. First, I discuss the three theoretical issues that drive the formal model. Next, I present the formal model and produce comparative statics illustrating how the increased turnout caused by distributive benefits varies with income. Finally, I test the predictions of the formal model by analyzing the turnout history of FEMA applicants. I measure the turnout-increasing effects of FEMA aid across incomes and address alternative explanations.

Theoretical Intuition of the Model

This section informally explains the model by describing the three theoretical intuitions of the model that drive the main comparative static results:

1) ***The Mobilizing Effect of Distributive Aid:*** The first prediction of the model is that the delivery of pre-election distributive aid by the incumbent politician increases voter turnout. In the model, the voter always prefers to receive more distributive aid from the government. Upon observing whether the incumbent politician delivers aid prior to the election, the voter forms updated beliefs about the incumbent's likelihood of delivering aid in the future. Therefore, the voter is more motivated to re-elect an incumbent who has demonstrated a past willingness to deliver aid. Hence, turnout is higher when the voter has received aid prior to the election.

This intuition generally borrows from the logic of Campbell (2002), who argues that Social Security benefits mobilize voter turnout among senior citizens by motivating them to protect their stake in the program. Similarly, Wolfinger and Rosenstone (1980) argue that federal agricultural subsidies increased voter turnout from 1952 to 1972 among farmers seeking to protect their interests in such programs. Together, these past studies present an important account of distributive mobilization: The delivery of benefits motivates recipients to vote in order to protect their stake in the distributive program and to assure the continuation of such benefits.

2) ***Diminishing Marginal Utility of Income:*** The model assumes that an individual's utility is first-order increasing but second-order decreasing along net income. Specifically, individual utility during each period *t* is: $-1/N_t$, where N_t represents (positive) net income. This assumption follows previous theoretical accounts of distributive politics (e.g., Dixit and Londregan 1996; Calvo and Murillo 2004; Stokes 2005), as well as a voluminous empirical literature (Veenhoven 1991; Diener, Sandvik, Seidlitz, and Diener, 1993; Frey and Stutzer, 2002) documenting the diminishing marginal utility of income in numerous contexts.

In the formal model, the voter's net income (N_t) includes both his wage income and any distributive aid the voter receives from the government. Because of the diminishing marginal utility of income, a poorer voter values distributive transfers from the government more highly than a relatively wealthier voter. The poorer voter is therefore more motivated to re-elect an incumbent who has proven her distributive generosity. This dynamic drives the model's main result that the wealthiest voters are relatively unlikely to be mobilized by distributive benefits.

3) *Cost of Political Participation:* Scholars have observed that political participation, include the act of voting, appears to be more onerous for poorer individuals than for the more affluent (e.g., Brody and Sniderman 1977; Leighley and Nagler 1992; Verba, Schlozman, and Brady 1995). These accounts have argued that more affluent individuals have easier access to the requisite skills, information, and time for political participation; thus, poorer individuals are less likely to vote in elections (Walsh, Jennings, and Stoker 2004). As Conway (2000) concludes, "for those in lower income brackets, political activity might be regarded as a luxury item" (30).

To incorporate this finding, I follow previous formal models of turnout by assuming that there is an exogenously determined cost of voting (e.g., Aldrich 1993). In the model, participating in the election incurs a fixed cost, λ, that effectively reduces the voter's net income. Because of the diminishing marginal utility of income, this fixed cost is more onerous for a voter with lower wage income. Hence, this feature of the formal model incorporates past scholars' finding that the "poor are more likely to be preoccupied with personal economic concerns" and "not on remote concerns like politics" (Rosenstone 1982). As a result of this assumption, a poorer voter has more difficulty participating in the election, even when his or her stake in the election outcome is high. Therefore, this assumption drives the model's prediction that the mobilizing effect of distributive aid is relatively small for a poor voter.

The Model:

Players and Types: There are two politicians, an Incumbent (*I*) and a Challenger (*C*), and one Voter (*V*). For clarity, I use female pronouns for the Incumbent *I* and the Challenger *C* and male pronouns for the Voter *V*. At the start of the game, Nature selects the two politicians' type, $\theta_I, \theta_C \in \{0,1\}$, with probabilities: $\Pr(\theta_I = 0) = \Pr(\theta_I = 1) = \Pr(\theta_C = 0) = \Pr(\theta_C = 1) = ½$. The politicians' types are revealed privately to *I* and *C*, respectively. As explained below, a politician of type $\theta = 0$ prefers not to deliver aid the voter, while one of type $\theta = 1$ prefers to deliver aid.

Strategies: The game consists of three periods. In period 1, the Incumbent *I* holds executive office $(e_1 = I)$ and chooses the distributive policy $x_1 \in \{0,1\}$, where x_1 is the amount of aid Voter *V* receives from the government. Period 2 is the election, in which *V* decides whether to vote $(v \in \{0,1\})$ by incurring a randomly drawn turnout cost, λ. If *V* votes $(v = 1)$, then *V* elects either the Incumbent or the Challenger as the third-period executive, $e_3 \in \{I, C\}$. If *V* does not vote $(v = 0)$, then Nature determines the election winner e_3, with: $\Pr(e_3 = I) = \Pr(e_3 = C) = ½$. In period 3, the election winner e_3 holds office and chooses the distributive policy $x_3 \in \{0,1\}$, determining whether *V* receives one unit of distributive aid in period 3.

Sequence of Play: Formally, the sequence of play is as follows:

1a) Nature determines each politician's type, $\theta_I, \theta_C \in \{0,1\}$, and reveals types privately to *I* and *C*.
1b) Incumbent *I* chooses the first-period distributive policy, $x_1 \in \{0,1\}$.
2a) Nature determines cost of voting, $\lambda \sim U[0,1]$.
2b) Voter *V* chooses whether to vote, $v \in \{0,1\}$.
2c) If $v = 1$, then *V* chooses the election winner, $e_3 \in \{I, C\}$.
2d) If $v = 0$, then Nature determines the election winner, $e_3 \in \{I, C\}$, with probabilities $\{½, ½\}$.
3) The third-period executive, $e_3 \in \{I, C\}$, chooses the distributive policy $x_3 \in \{0,1\}$.

Voter's Ideology: By assumption, the Voter has an ideological preference for the Incumbent *I* and thus receives a utility of 1 if the Incumbent wins reelection. I later discuss how

alternative assumptions about *V*'s ideological preference would alter the main results.

Voter's Income and Utility: The Voter *V* earns an exogenously determined wage income of $Y > 0$ in each period $t \in \{1, 2, 3\}$. In each period *t*, the Voter *V*'s net income, N_t, consists of his wage income, *Y*, adjusted by any distributive aid received and by any incurred cost of voting. Hence, during periods 1 and 3, *V*'s net incomes are:

$$N_1 = Y + x_1; \text{ and}$$
$$N_3 = Y + x_3,$$

where x_1 and x_3 represent distributive aid. During the period 2 election, *V*'s net income is:

$$N_2 = Y - v \cdot \lambda,$$

where, $v \in \{0, 1\}$ represents V's turnout choice, and λ is the cost of turnout.

The Voter *V*'s utility payoff, U_V, is a function of his net income during the three periods and of the election outcome. Specifically, *V* enjoys a payoff of $-1/N_t$ for having a positive net income $(N_t > 0)$ during period *t*, but if his net income is a non-positive amount $(N_t \leq 0)$, then *V*'s payoff for period *t* approaches negative infinity. *V* enjoys an additional payoff of unity if his ideologically preferred candidate (*I*) wins the election. Hence, *V*'s overall utility function is:

$$U_V = 1 \cdot (e_3 = I) + \sum_{t=1}^{3} \begin{cases} -N_t^{-1}, & \text{if } N_t \geq 0; \\ -\infty, & \text{if } N_t < 0, \end{cases}$$

where the first term, $1 \cdot (e_3 = I)$, represents *V*'s ideological preference for having the Incumbent *I* win the election. The $-N_t^{-1}$ terms represent *V*'s utility from his net income during each of the three periods. As discussed in the *Theoretical Intuition* section, this asymptotic function, $-1/N_t$, implements the model's key assumption of the diminishing marginal utility of income.

Politicians' Utility: Politicians have preferences over distributive aid policy. Specifically, for each politician $p \in \{I, C\}$, *p*'s utility payoff in period $t \in \{1, 3\}$ is:

$$U_p^t = -\left|\theta_p - x_t\right|,$$

where $x_t \in \{0,1\}$ is the executive's choice of distributive aid policy. θ_p denotes the politician's type, which represents her preferred distributive policy. Hence, a politician of type $\theta_p = 1$ prefers to deliver aid $(x_t = 1)$, while a politician of type $\theta_p = 0$ always prefers no aid $(x_t = 0)$ for *V*.

Results: This section presents the SPNE results necessary to compare the voter's probability of turnout when the incumbent does and does not deliver distributive aid in period 1. The incumbent *I*'s choice of distributive policy depends on her type, and the comparative static results in this section analyze how *I*'s choice of distributive policy affects voter turnout.

> ***Lemma A* (Executive's Distributive Policy):** In each period $t \in \{1, 3\}$, the office-holding executive, $p \in \{I, C\}$, chooses the distributive policy: $x_t = \theta_p$. ***Proof: Appendix.***

Lemma A states that the equilibrium is fully separating. An incumbent of type $\theta_p = 1$ always chooses to provide distributive aid $(x_t = 1)$, whie type $\theta_p = 0$ never provides aid. Because incumbent types are fully separating, the delivery of aid during period 1 always increases *V*'s payoff from having the incumbent reelected. This increased payoff drives the model's basic result that the delivery of period 1 aid increases the probability of voter turnout in the election.

> ***Lemma B* (Voter's Ballot Choice):** Conditional on turnout, *V*'s vote choice is:
>
> $$e_3 = \begin{cases} C, & \text{if } Y < (1 - x_1)\left(\sqrt{3} - 1\right)/2; \\ I, & \text{otherwise.} \end{cases}$$

> ***Lemma C* (Voter's Turnout Behavior when $x_1 = 0$):** If the Incumbent *I* does not deliver aid in period 1, then the Voter *V* turns out to vote $(v = 1)$ iff:
>
> $$\lambda \le \max\left(\frac{2Y^3 + 2Y^2 - Y}{2Y^2 - 2Y - 5}, \frac{2Y^3 + 2Y^2 - Y}{2Y^2 + 6Y + 3} \right).$$

> ***Lemma D* (Voter's Turnout Behavior when $x_1 = 1$):** If the Incumbent *I* delivers aid in period 1, then the Voter *V* turns out to vote $(v = 1)$ iff:
>
> $$\lambda \le \frac{2Y^3 + 2Y^2 + Y}{2Y^2 + 6Y + 5}.$$ ***Proofs: Appendix.***

Lemmas B through *D* describe the Voter *V*'s equilibrium strategy during the election period. *V* prefers the Incumbent over the Challenger when either the Incumbent delivers aid during period 1 or when *V*'s income is so high that he is fairly indifferent about distributive policy. Hence, *V* prefers the Challenger only when the Incumbent does not provide aid, and *V*'s low income compels him to vote against the Incumbent on the basis of this distributive policy.

But *V* turns out to vote only if his preference for either candidate is strong enough to outweigh the cost of voting, λ. Hence, *V* participates in the election only when λ is sufficiently low. *Lemmas C* and *D* describe how the strength of *V*'s candidate preference, and hence V's threshold for participating in the election, depends on the incumbent's type, θ_I, as revealed by the period 1 distributive policy, x_1. *Proposition 1* uses the results from *Lemmas C* and *D* to calculate the change in turnout caused by different distributive policies chosen in period 1.

> ***Definition 1 (Turnout effect of distributive aid):*** *Let* $F(y)$ *denote the marginal increase in the ex ante probability of voter turnout when the Incumbent I chooses to provide aid in the first period* $(x_1 = 1)$ *rather than not provide aid* $(x_1 = 0)$. *Formally,*
>
> $$F(Y) \equiv \Pr(v = 1 \mid x_1 = 1; Y) - \Pr(v = 1 \mid x_1 = 0; Y).$$
>
> ***Proposition 1 (Comparative Statics):*** $F(Y)$ *is:*
>
> *1(a) Non-negative for all* $Y \in [0, \infty)$;
>
> *1(b) Strictly increasing in Y along the interval:* $[0,\ 0.76)$;
>
> *1(c) Weakly decreasing in Y along the interval:* $(0.76,\ \infty)$. ***Proof: Appendix.***

Proposition 1 states that the turnout-increasing effect of distributive aid is largest for a middle-income voter whose wage is: $Y = 0.76$. For any voter whose wage is higher or lower than this amount, the turnout-increasing effect of aid is smaller in magnitude. The relationship between voter income and the magnitude of the turnout effect of aid is single-peaked at $Y = 0.76$, with the turnout effect decreasing as *Y* moves in either direction.

The intuition behind *Proposition 1* is as follows. The delivery of distributive aid in period 1 increases the voter's motivation to reelect the incumbent, thus increasing his likelihood of

turnout. This increased motivation arises from the fact that the incumbent's reelection would guarantee the delivery of aid in period 2. But a wealthier voter is relatively more indifferent to distributive aid because of the diminishing marginal utility of income; hence, his probability of turnout changes very little in response to the delivery of aid. Meanwhile, a poor voter tends to find the cost of political participation too onerous; hence, distributive aid in period 1 does not increase the poor voter's actual turnout probability by much. As a result of these two competing dynamics, the increase in voter turnout due to distributive aid is largest in magnitude for a middle-income voter with wage $Y = 0.76$.

[FIGURE 1 ABOUT HERE]

To summarize the results of the formal model, Figure 1 illustrates the predictions of *Proposition 1* graphically. This figure plots the increase in equilibrium turnout probability when the Incumbent delivers aid $(x_1 = 1)$ against the voter's wage income (Y). For very low and very high values of *Y*, the turnout effect from the delivery of aid is close to zero. But the turnout effect increases as *Y* approaches 0.76 from either side, and the plot illustrates this single-peaked relationship between voter income and the turnout effect.

Alternative Assumptions: How do the main results from *Proposition 1* change under alternative assumptions about the Voter *V*'s ideological preference? Suppose that *V* receives a utility payoff of smaller than unity from having the Incumbent *I* win the election. Under this assumption, the delivery of aid in period 1 would still increase *V*'s motivation to reelect *I*, thus increasing *V*'s probability of turnout. More importantly, the main comparative statics from *Proposition 1* would still hold, with a middle-income voter exhibiting the largest increase in turnout probability upon receiving distributive aid.

But the main *Proposition 1* result would not hold under the opposite assumption that *V* receives zero payoff from the Incumbent *I*'s reelection – that is, the voter has no ideological

affinity for the Incumbent. When the game is solved under this alternative assumption, *V* prefers the Incumbent *I* if and only if *I* delivers aid during period 1. *V* turns out to vote only when: $\lambda \leq Y/(4Y+5)$, and this threshold does not vary with the Incumbent's distributive policy choice, x_1. Hence, the probability of turnout in equilibrium would not change as a result of *I*'s distributive policy in period 1. Consequently, there would be no variation in the turnout-increasing affect of distributive aid across voter income, and *Proposition 1* would not hold.

Therefore, the *Proposition 1* results – that the turnout-increasing effect of distributive aid is strongest for middle-income voters – hold most strongly when the voter has an ideological affinity for the Incumbent politician. The turnout-increasing effect will simply be absent when the voter has no such ideological affinity. Because of this qualification, the predictions of the formal model are most appropriately tested in a setting where voters are believed to have an ideological affinity for the incumbent. Thus, to test the *Proposition 1* predictions, the following empirical section examines only those voters in Florida who were registered Republicans, as the delivery of FEMA disaster aid was administered by a Republican (George W. Bush) presidency.

FEMA Applicants and Voter Turnout

This section empirically tests the formal model's main *Proposition 1* results, which predict that the turnout-increasing effect of distributive aid is relatively strongest for middle-income voters. Empirically, I analyze the effect of FEMA disaster aid awards on individual voter turnout in November 2004. As explained in the *Alternative Assumptions* section of the formal model, the main *Proposition 1* results depend upon the assumption that the voter has an ideological preference for the incumbent. For this reason, the analyses in this section examine only voters who were registered Republicans as of the November 2004 election.

The list of registered voters included in these analyses is constructed in the following way.

I first obtain the home addresses of the 2 million Florida households that requested FEMA aid during the 2004 hurricane season, and I remove duplicate requesters and anyone who did not receive a response from FEMA prior to the November 2004 election. Next, I search through Florida voter registration lists, obtained from counties' board of elections, to identify all registered Republicans residing in these households that requested aid. I include only registrants who were eligible and registered to vote in each general election during 2000, 2002, and 2004; this criterion allows me to compare voters' turnout before and after their receipt of FEMA aid in summer 2004.

These criteria produce a set of 100,279 registered Republicans who requested FEMA aid. Slightly over 50% of these applicants were awarded at least one dollar of aid. Although FEMA award sizes ranged up to $25,000, the mean award size for applicants in these data was $682. Overall, voter turnout among these individuals in the November 2004 election was 75%.

To request FEMA aid, an applicant provides his or her name, address, and other basic household information through FEMA's website or by telephone. Applicants do not request a specific amount of aid, nor do they have the opportunity to submit proof of hurricane damage or otherwise strategically improve their chances for receiving aid. Instead, FEMA aid decisions are made by inspectors who travel to applicants' homes and assess whether and how much hurricane damage has occurred; aid amounts are calculated from these inspectors' assessments. In particular, as discussed earlier, FEMA applicants cannot be disqualified on the basis of their income (42 USC § 5163; 42 USC § 5174(b)(1); and 44 C.F.R. § 206.113). Hence, as illustrated in Figure 3, even the wealthiest group of applicants sometimes receives significant FEMA aid awards.

To test the predictions of the formal model, I estimate the turnout-increasing effects of FEMA aid approval among the registered Republicans who applied for aid. The basic model is:

$$\text{logit}\left[\Pr\left(\textit{Voted } 2004_i\right)\right] = \begin{cases} \alpha + \beta_A \cdot \textit{Application Approved}_i + \beta_{00} \cdot \left(\textit{Voted } 2000_i\right) + \beta_{02} \cdot \left(\textit{Voted } 2002_i\right) \\ + \beta_{P02} \cdot \left(\textit{Voted } 2002 \textit{ Primary}_i\right) + \beta_{P04} \cdot \left(\textit{Voted } 2004 \textit{ Primary}_i\right) + \varepsilon_i, \end{cases} \quad \textbf{(1)}$$

where *Application Approved*$_i$ indicates whether the applicant was awarded at least one dollar of FEMA aid. *Voted* 2000_i, *Voted* 2002_i, and *Voted* 2004_i indicate whether applicant *i* voted in the 2000, 2002, and 2004 general elections, respectively. *Eq. 1* also controls for each voter's turnout in the two previous primary elections, for which turnout records are fully available.

In Table 2, Model 1 estimates *Eq. 1* using all registrants across all income groups. This model confirms that the awarding of FEMA aid is associated with a generally significant increase in voter turnout among registrants, corroborating *Proposition 1(a)*. But to test the predictions of *Proposition 1(b)* and *1(c)*, Table 1 estimates *Eq. 1* separately within each of five income groups.

[TABLE 1 ABOUT HERE]

To sort registered voters into income groups, I identify the Census block group within which each registrant's residence is located. I then use the Year 2000 Census median household income of the block group as a proxy for the registrant's household income. Overall, the median household income in Florida was just under $50,000, while the US median household income was slightly over $50,000. I group the Florida registrants into five income categories: 1) Under $35k; 2) from $35k to $45k; 3) from $45k to $55k; 4) from $55k to $65k; and 5) over $65k.

Table 1 thus estimates the turnout-increasing effect of FEMA aid within each income group. The results suggest that the turnout effect is largest among those voters whose income is closest to the statewide and nationwide median income ($45,000 to $55,000). Within this middle-income group, the approval of one's FEMA application causes a statistically significant 4.8 percentage increase in the probability of turnout for a registrant who has not participated in recent past elections (Model 3). But this turnout effect gradually decreases as voter income becomes higher (Models 4 and 5). And the turnout effect sharply decreases as voter income falls below this $45k to $55k group. In fact, for the poorest group of voters under $35,000, the approval of one's FEMA application has nearly zero effect on turnout (Model 1).

In Figure 2, the left plot compares the estimated coefficients for FEMA aid across the five income groups, with vertical dotted lines representing 95% confidence intervals. This plot illustrates that the relationship between FEMA aid's turnout effect and voter income is non-monotonic and single-peaked, with middle-income voters exhibiting the largest turnout effect.

[FIGURE 2 ABOUT HERE]

The right plot in Figure 2 is a simpler illustration of this single-peaked relationship. This plot displays the difference in voter turnout rates between applicants who received FEMA aid and those whose applications were denied. To control for past electoral behavior, this difference is calculated among only those registrants who had not participated in the recent past elections of November 2000 and 2002. This plot illustrates, for example, that among middle-income ($45,000 to $55,000) FEMA applicants, those who received aid exhibited a turnout rate 5.0 percentage points higher than those who were denied aid. But this turnout difference is significantly lower among wealthier and poorer voters. In fact, among the poorest income group (below $35,000), there is no difference between the turnout of approved and denied applicants.

[TABLE 2 ABOUT HERE]

Tables 2 and 3 present two tests of the robustness of these main empirical findings. Model 2 of Table 2 estimates *Eq. 1* using the full population of registrants while including indicator variables for each income group, interacted with *Application Approved*$_i$. The estimates of these interactive terms in Model 2 corroborate the earlier results from Table 1 while confirming that the turnout effect of FEMA aid is significantly higher for the middle-income group ($45,000 to $55,000) than for the poorest group of applicants (below $35,000).

Table 3 presents a second robustness check of the main findings by estimating the turnout effect of the size of applicants' FEMA aid awards. Successful FEMA applicants received aid awards ranging from under ten dollars to $25,000. Although the formal model does not

incorporate this complexity, I test for the effect of varying award sizes in order to account for the possibility that the relatively large turnout effect among middle-income FEMA applicants is caused by disparities in FEMA award sizes.

The five models in Table 3 are identical to those in Table 1, except that *Application Approved*$_i$ is replaced with a measure of each applicant's *Size of FEMA Aid Award*$_i$, expressed in logged dollar amounts. Specifically, *Size of FEMA Aid Award*$_i$ is measured as $\log(Dollars_i + 1)$, where $Dollars_i$ is the dollar amount of applicant i's FEMA award. I add one to $Dollars_i$ before logging this amount because rejected applicants received \$0. The results from Table 3 are consistent with the main results from Table 1. Middle-income applicants exhibit the largest turnout increase in response to a marginal increase in FEMA award size. The relationship between turnout effect and applicant income is single-peaked, with the poorest and wealthiest applicants exhibiting no statistically significant turnout effect from FEMA award sizes.

To test whether these turnout effects are driven by other characteristics of voters, I reestimate all of the models in Table 1 and Table 3 while controlling for several demographic and hurricane wind measurement variables, including gender, race, and the severity of hurricane storms experienced at each voter's residence. These expanded models appear in the Online Appendix, and the results illustrate that the main turnout effects remain unchanged.

Alternative Causal Explanations

This section discusses and addresses four possible alternative explanations for the main empirical findings of this manuscript. The most striking empirical result, as predicted by the *Proposition 1* comparative statics, is that middle-income (\$45,000 to \$55,000) applicants exhibit the largest turnout responsiveness to FEMA aid, while the poorest and wealthiest applicants exhibit no significant responsiveness. This section describes how these empirical results do not

appear to result from any of the following four possible confounding factors:

[FIGURE 3 ABOUT HERE]

1) *Differences in the Generosity of Applicants' FEMA Awards:* A first possible alternative explanation for the main results is that some voters may have exhibited larger turnout increases because they received more generous disaster aid awards from FEMA. I consider this possibility in two ways. First, as the left plot in Figure 3 illustrates, I examine the *probability* with which FEMA approved applications within each income group. Second, in the right plot of Figure 3, I calculate the *average size* of FEMA aid awards within each income group.

Both measures reveal that the poorest group (below $35,000 household income) of voters was handled most generously by FEMA. Applications from the poor were slightly more likely to be approved, and these applications were awarded substantially more aid on average ($860 per application) than applications from more affluent individuals. Yet, in spite of such relatively favorable treatment by FEMA, the poorest group of applicants exhibited no increased turnout in response to these FEMA awards. By contrast, middle-income voters exhibited the largest turnout increase upon application approval, in spite of their relatively more modest award sizes.

[FIGURE 4 ABOUT HERE]

2) *Differences in Levels of Hurricane Victimization:* A second possibility is that some applicant groups may have been more heavily victimized by the hurricanes, thus accounting for their inability to respond to FEMA aid with increased voter turnout. Achen and Bartels (2002) find that the mere occurrence of a natural disaster may cause negative electoral responses among local voters; hence, hurricanes may have caused negative turnout effects. To measure the severity of hurricane-related weather experienced by each FEMA applicant, I draw upon NOAA calculations of the number of hours that each applicant was exposed to severe hurricane winds, defined as winds over 70 miles per hour. Past meteorological research has found this measure to

be a useful predictor of hurricane-related property damage (Houston and Powell 2003).

The left plot of Figure 4 analyzes the average level of hurricane severity experienced by FEMA applicants across the income groups. I also plot the hurricane severity experienced by only those applicants who were approved for FEMA aid awards. This plot illustrates a positive relationship between applicant income and average levels of hurricane victimization, which reveals two patterns. First, the poorest voters self-selected into applying for FEMA aid more aggressively and at a lower threshold of hurricane severity than more affluent voters did. Second, as FEMA application approval rates were roughly even across all income groups (Figure 3), the poorest FEMA aid recipients experienced less hurricane severity than more affluent recipients.

In addition to this plot, the Appendix also re-estimates all of the models in Tables 1 and 3 to control for the maximum hurricane wind speed (*Miles per Hour*) and the hurricane duration (*Hours*) experienced by each applicant. These expanded models illustrate that controlling for hurricane severity does not affect the estimated turnout effects of aid across the income groups.

Thus, it is unlikely that poor applicants' unresponsiveness to FEMA aid is explained by differences in hurricane severity. Together, Figures 3 and 4 suggest that the poorest applicants experienced relatively less severe hurricanes and more favorable treatment by FEMA. But despite these positive experiences, turnout responsiveness was lowest among the poorest group.

3) *Differences in FEMA Responsiveness:* Past research on program design has highlighted the importance of program efficacy in shaping the feedback effects of various social programs (Mettler and Stonecash 2008). For example, Soss (1999) argues that the unresponsive, stigmatizing nature of AFDC welfare administration caused decreased political participation among its recipients. Similarly, Lawless and Fox (2001) find that the degree to which welfare clients are treated fairly and with respect by social workers influences the clients' subsequent voter turnout. Hence, a possible confounding factor in this manuscript's results is that applicants

may have experienced differing levels of bureaucratic responsiveness during their interactions with FEMA, thus shaping their subsequent willingness to vote in elections.

Although I do not have a measure of applicants' *perceptions* of FEMA, I instead *objectively* measure FEMA's responsiveness to each individual applicant. Specifically, I calculate the number of days that elapsed between the filing of each application and the date that FEMA finally inspected and issued a decision on the application. While the majority of applicants received a response from FEMA within one week of their request, others had to wait up to several weeks due to FEMA processing and inspection delays. Given the heightened needs of hurricane victims in the days immediately following a disaster, this elapsed time is an important and objective measure of FEMA's responsiveness to individual applicants.

The right plot in Figure 4 displays the percentage of applicants within each income group that received a timely response from FEMA within seven days of their initial application request. The plot reveals that FEMA responded to the poorest applicants more quickly than applicants of higher incomes. Surprisingly, middle-income applicants ($45,000 to $55,000) were the least likely to receive a timely response from FEMA, though these differences are not large. Overall, these patterns, combined with FEMA's overall responsiveness to applicants across all incomes, suggest that disparities in applicants' experiences with FEMA do not skew the main findings.

[FIGURE 5 ABOUT HERE]

4) *Differences in Perceived Program Fairness:* Scholars have argued that government programs are more likely to foster increased political participation if participants perceive government as fair, rather than arbitrary (e.g., Schneider and Ingram, 1993, 1997). Once again, I cannot measure how applicants *perceive* FEMA's fairness. Instead, as an estimate of FEMA's fairness, I measure the strength of the positive relationship between the distribution of FEMA aid and the severity of hurricanes across neighborhoods. A stronger relationship between FEMA aid

distribution and hurricane severity suggests a fairer disaster relief program administration.

Figure 5 measures the strength of this relationship across Florida at the block group level. I estimate a separate locally weighted regression line for each income group, analyzing how precisely FEMA aid was targeted to the block groups with the most hurricane damage. Within Figure 5, the left plot analyzes the distribution of FEMA aid on a per capita basis, while the right plot analyzes aid on a per application basis. While there are minor differences across income groups, these plots generally suggest that the fairness of FEMA's aid distribution does not vary dramatically by income. In other words, FEMA did not appear to treat applications from poorer neighborhoods more arbitrarily or capriciously than those from middle-income or wealthier neighborhoods. Hence, even though applicant income appears to be a significant predictor of FEMA generosity (Figure 3), the strong, positive relationship between FEMA aid distribution and hurricane damage does not appear to vary significantly across income groups.

Discussion

The findings of this manuscript explain how the participatory effects of distributive benefits vary with recipient income. The formal model combines two observations that previous literature has addressed separately – the diminishing marginal utility of income, and the difficulties of the poor in participating in political activities. By combining these two theoretical features, the formal model produces an unexpected finding: The turnout of middle-income voters should be more responsive to distributive benefits than that of the wealthy or the poor.

The formal model also qualifies this main finding in three important ways. The first qualification, as explained in the *Alternative Assumptions* section, is that these turnout-increasing effects arise only among voters with an ideological affinity for the incumbent party. The intuition here is that the delivery of benefits improves voters' evaluation of the incumbent, thereby

mobilizing increased turnout among voters who were already predisposed to favoring the incumbent on ideological grounds. Hence, registered Republicans in Florida serve as the most appropriate test for the *Proposition 1* predictions of the formal model. When the regression models in Tables 1-3 are estimated using registered voters of all parties, the turnout effects of FEMA aid maintain the same direction, but the coefficients are somewhat smaller in magnitude.

A second qualification is that the empirical results demonstrate only the participatory effects, not the electoral effects, of distributive benefits. Because of the secret ballot, I cannot directly measure the percentage of the middle-class FEMA aid recipients that cast ballots for the incumbent president. Nevertheless, the fact that all voters in the data are registered Republicans suggests that most of these new voters mobilized by FEMA aid were likely Bush supporters.

Hence, the turnout findings build upon and extend previous work that has analyzed the electoral impact of government disaster relief. For example, Bechtel and Hainmueller (2011) find that the German government's disaster relief in the aftermath of the 2002 Elbe flooding increased subsequent electoral vote shares for the SPD (incumbent) party. In the US context, Healy and Malhotra (2009) find evidence that disaster relief spending increases presidential vote shares of the incumbent party, while Reeves (2011) and Gasper and Reeves (2011) demonstrate that presidents are rewarded with higher vote shares after issuing disaster declarations.

Building on these previous studies, this manuscript demonstrates that these electoral effects emerge, in part, because disaster relief mobilizes voter turnout among the incumbent party's supporters. While government spending might also affect elections in other ways, such as by *persuading* swing voters to reelect the incumbent (e.g., Dixit and Londregan 1996; 1998; Persson and Tabellini 2000, Dunning and Stokes 2008), this manuscript focuses solely on the *participatory* effects of distributive benefits and finds that distributive-based mobilization occurs most sharply among the middle class.

A final qualification is that the formal model does not fully incorporate the many other complex ways in which policy design and beneficiaries' policy experiences can affect mass political participation, as described by Pierson (1993). For example, Soss (1999; 2001) explains how the unresponsive and stigmatizing administration of AFDC diminishes participants' sense of political efficacy, thus discouraging political participation among poor welfare recipients. As a second example, Mettler (2002) and Mettler and Welch (2004) demonstrate that the educational component of the GI Bill caused increased political participation among veterans by "alter[ing] beneficiaries' sense of obligation to the polity" (Mettler 2002, 362) and developing civic skills.

This manuscript's formal model does not incorporate these various features and consequences of policy design because FEMA aid, in contrast to programs such as AFDC, is a relatively simple, universal distributive program: FEMA aid recipients do not have sustained and regular contact with government personnel, and there is no inherently educational component to FEMA disaster aid. Additionally, as illustrated in the *Alternative Causal Explanations* section, FEMA treated poor applicants at least as quickly and responsively as wealthier applicants; thus, unlike AFDC clients, poor FEMA recipients were not more stigmatized than non-poor recipients. Hence, the formal model does not incorporate these various dimensions of policy design.

Consequently, due to the relative simplicity of the formal model and of FEMA disaster aid, this manuscript's main findings do not fully address all of the various participatory effects of more complex government programs examined in previous studies. Rather, this manuscript builds upon the previous literature on policy feedback by analyzing an additional dimension – participants' income – that shapes the participatory effects of government programs. The results explain why, even though the poor receive the greatest marginal utility from distributive spending, the middle-class exhibit the relatively greatest increases in voter turnout upon receiving distributive transfers.

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Table 1: The Effect of FEMA Application Approval on Voter Turnout (November 2004) Among FEMA Aid Applicants by Income Group

	Dependent Variable: Voted in November 2004				
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
Household Income Group:	Under $35,000	$35,000 to $45,000	$45,000 to $55,000	$55,000 to $65,000	Over $65,000
FEMA Application Approved	0.036	0.135***	0.202***	0.124*	0.085
	(0.036)	(0.032)	(0.042)	(0.061)	(0.077)
Voted in August 2004 Primary Election	1.274***	1.260***	1.052***	1.186***	1.496***
	(0.058)	(0.054)	(0.064)	(0.105)	(0.138)
Voted in November 2002 General Election	1.558***	1.552***	1.531***	1.560***	1.924***
	(0.043)	(0.039)	(0.050)	(0.072)	(0.085)
Voted in August 2002 Primary Election	0.179**	-0.001	0.014	0.160	0.246*
	(0.055)	(0.050)	(0.061)	(0.090)	(0.119)
Voted in November 2000 General Election	1.255***	1.271***	1.279***	1.377***	1.251***
	(0.039)	(0.036)	(0.047)	(0.069)	(0.085)
Constant	-0.776***	-0.622***	-0.596***	-0.413***	-0.579***
	(0.035)	(0.031)	(0.042)	(0.059)	(0.080)
Pseudo R^2	0.41	0.37	0.35	0.35	0.40
N	25,306	33,574	21,429	11,988	7,982

***p<.001; **p<.01; *p<.05 (two-tailed). Standard errors in parentheses.

Note: Data include registered Republican voters whose household applied for FEMA disaster aid and who were eligible and registered to vote in all elections since November 2000. *Household Income* refers to the median household income (2000 Census) of the block group in which the voter's residential address is located.

Table 2: Logit Regression of Voter Turnout (November 2004) Among FEMA Aid Applicants

	Model (1)	Model (2)
FEMA Application Approved	0.110***	0.034
	(0.019)	(0.036)
FEMA Application Approved × Med. Household Income Between $35,000 and $45,000	----	0.104*
		(0.048)
FEMA Application Approved × Med. Household Income Between $45,000 and $55,000	----	0.171**
		(0.052)
FEMA Application Approved × Med. Household Income Between $55,000 and $65,000	----	0.087
		(0.070)
FEMA Application Approved × Med. Household Income Over $65,000	----	0.046
		(0.082)
Med. Household Income Between $35,000 and $45,000	----	0.127***
		(0.035)
Med. Household Income Between $45,000 and $55,000	----	0.123**
		(0.040)
Med. Household Income Between $55,000 and $65,000	----	0.429***
		(0.050)
Med. Household Income Over $65,000	----	0.366***
		(0.060)
Voted in August 2004 Primary Election	1.213***	1.220***
	(0.031)	(0.031)
Voted in November 2002 General Election	1.582***	1.575***
	(0.023)	(0.023)
Voted in August 2002 Primary Election	0.088**	0.083**
	(0.029)	(0.029)
Voted in November 2000 General Election	1.295***	1.277***
	(0.019)	(0.021)
Constant	-0.643***	-0.770***
	(0.019)	(0.029)
Pseudo R^2	0.38	0.38
N	100,279	100,279

***p<.001; **p<.01; *p<.05 (two-tailed). Standard errors in parentheses.

Note: Data include registered Republican voters whose household applied for FEMA disaster aid and who were eligible and registered to vote in all elections since November 2000.

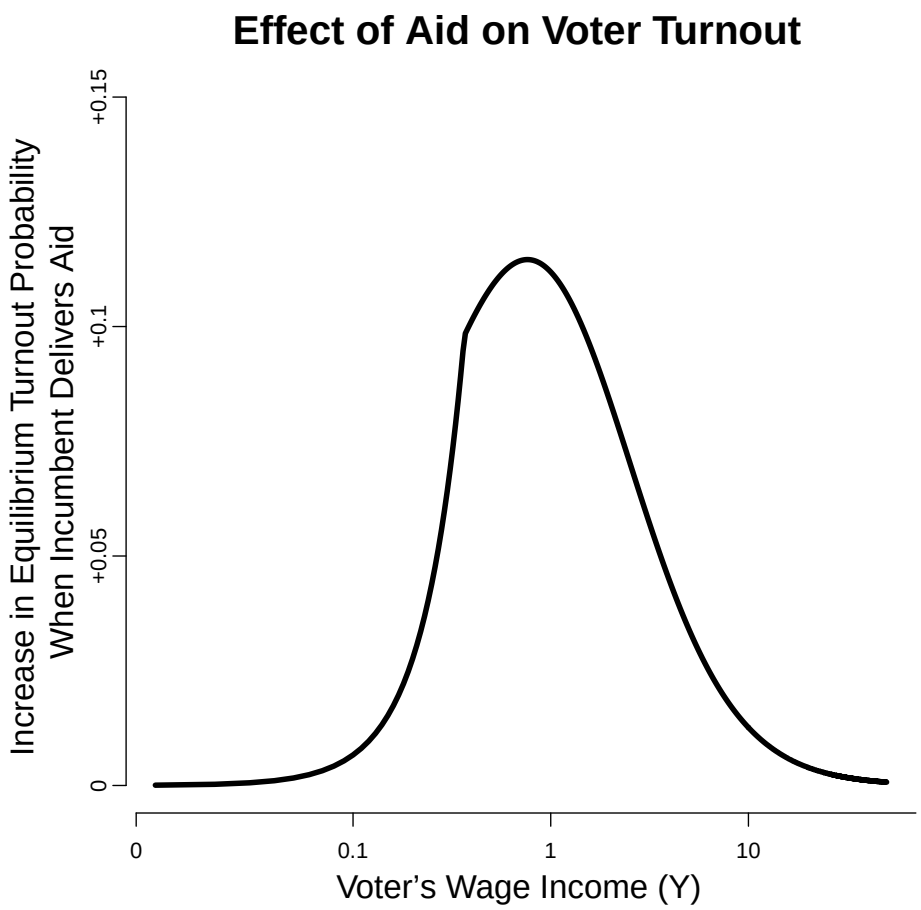
Table 3: The Effect of FEMA Award Size on Voter Turnout (November 2004) Among FEMA Aid Applicants by Income Group

	Dependent Variable: Voted in November 2004				
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
Household Income Group:	Under $35,000	$35,000 to $45,000	$45,000 to $55,000	$55,000 to $65,000	Over $65,000
Size of FEMA Aid Award (Logged $)	0.000	0.018***	0.031***	0.018*	0.011
	(0.005)	(0.005)	(0.006)	(0.009)	(0.011)
Voted in August 2004 Primary Election	1.274***	1.260***	1.052***	1.186***	1.496***
	(0.058)	(0.054)	(0.064)	(0.105)	(0.138)
Voted in August 2002 Primary Election	0.179**	-0.001	0.014	0.160	0.247*
	(0.055)	(0.050)	(0.061)	(0.090)	(0.119)
Voted in November 2002 General Election	1.558***	1.552***	1.532***	1.560***	1.924***
	(0.043)	(0.039)	(0.050)	(0.072)	(0.089)
Voted in November 2000 General Election	1.253***	1.272***	1.288***	1.377***	1.251***
	(0.039)	(0.036)	(0.047)	(0.069)	(0.085)
Constant	-0.757***	-0.617***	-0.560***	-0.412***	-0.573***
	(0.035)	(0.031)	(0.041)	(0.059)	(0.079)
Pseudo R^2	0.41	0.37	0.35	0.35	0.40
N	25,306	33,574	21,429	11,988	7,982

***p<.001; **p<.01; *p<.05 (two-tailed). Standard errors in parentheses.

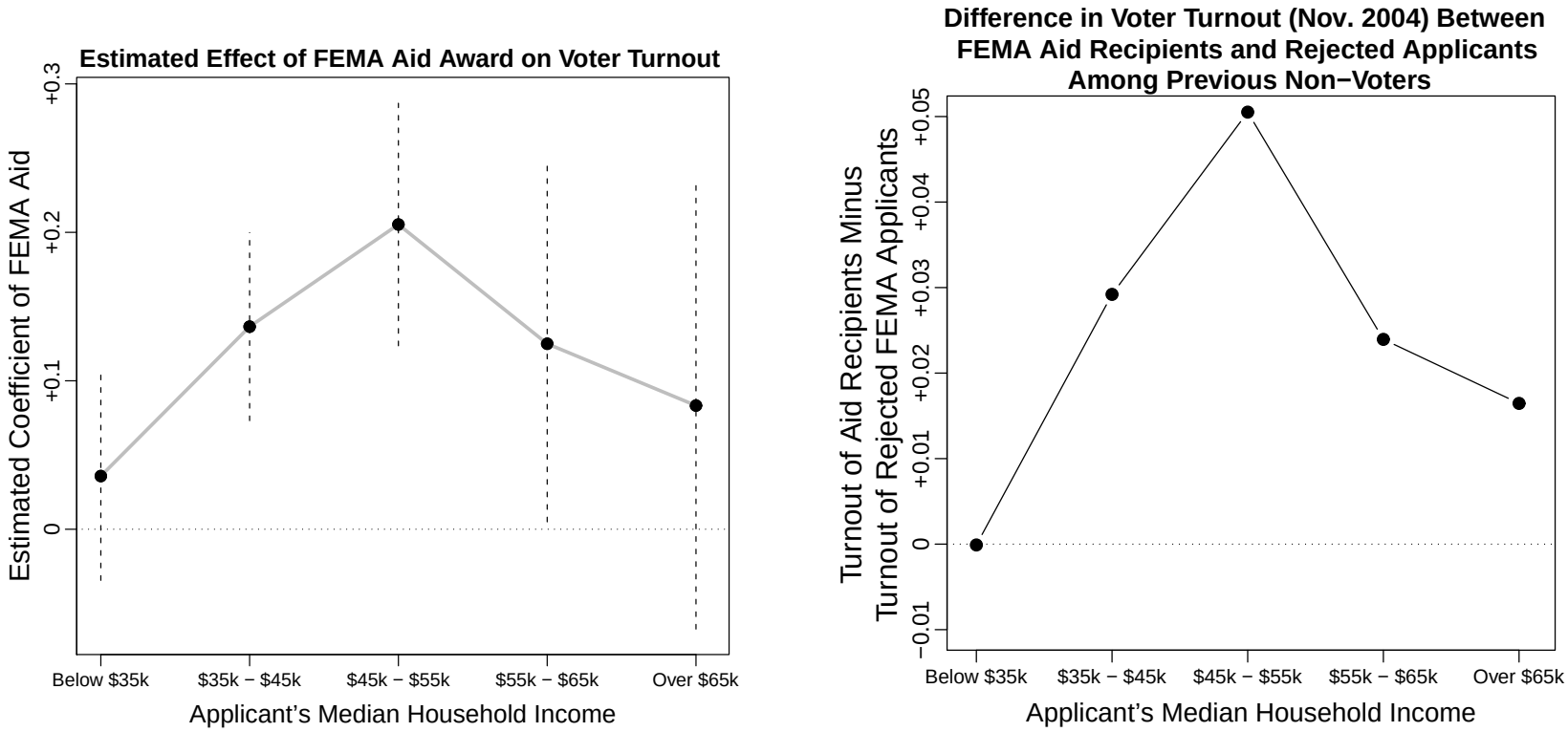
Note: Data include registered Republican voters whose household applied for FEMA disaster aid and who were eligible and registered to vote in all elections since November 2000. *Household Income* refers to the median household income (2000 Census) of the block group in which the voter's residential address is located.

Figure 1: Formal Model Predictions on the Effect of Distributive Aid



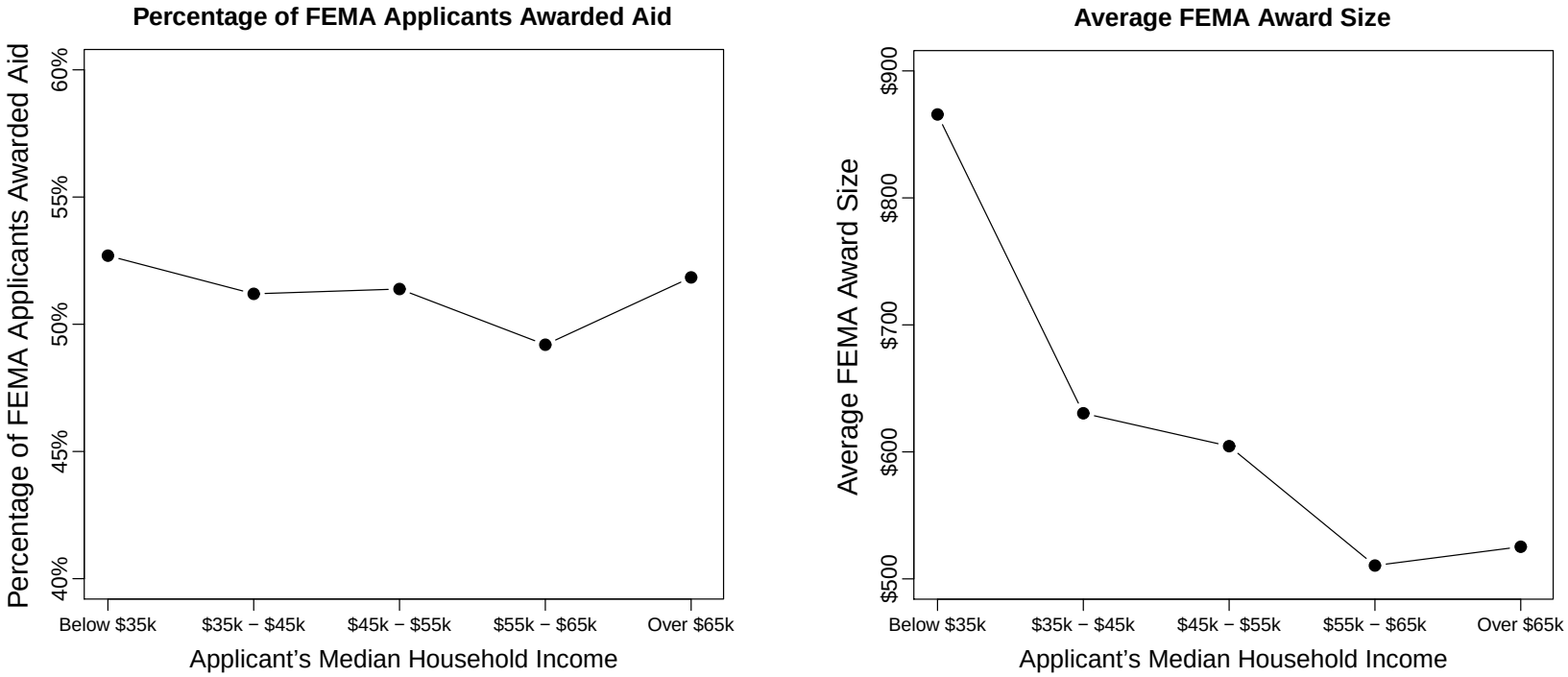
Note: This plot describes the comparative static predictions of *Proposition 1*. The vertical axis measures amount by which the voter's probability of turnout increases if he receives distributive aid from the incumbent in period 1. The horizontal axis measures the voter's per-period wage income, *Y*.

Figure 2: The Effect of FEMA Aid on Turnout



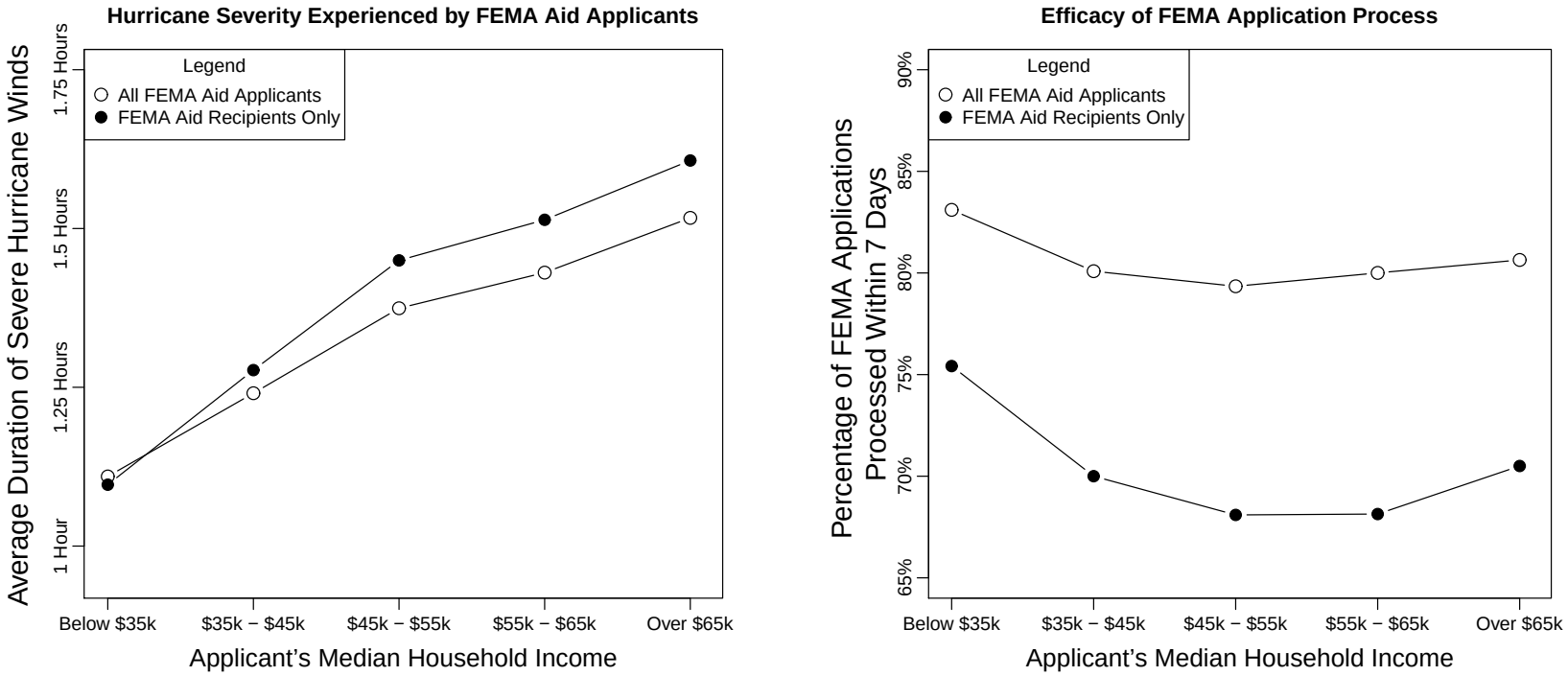
Note: In the left plot, estimated coefficients are taken from Models (1) through (5) of Table 1. Vertical dashed lines represent 95% confidence intervals. In the right plot, each point represents the difference between the turnout rate of FEMA aid recipients and the turnout rate of rejected FEMA applicants. This right plot includes only registrants who did not vote in the previous two elections. Both plots reveal that middle-income recipients ($45,000-$55,000) exhibited the largest turnout increases upon receiving aid.

Figure 3: FEMA Aid Approval Rates and Award Sizes



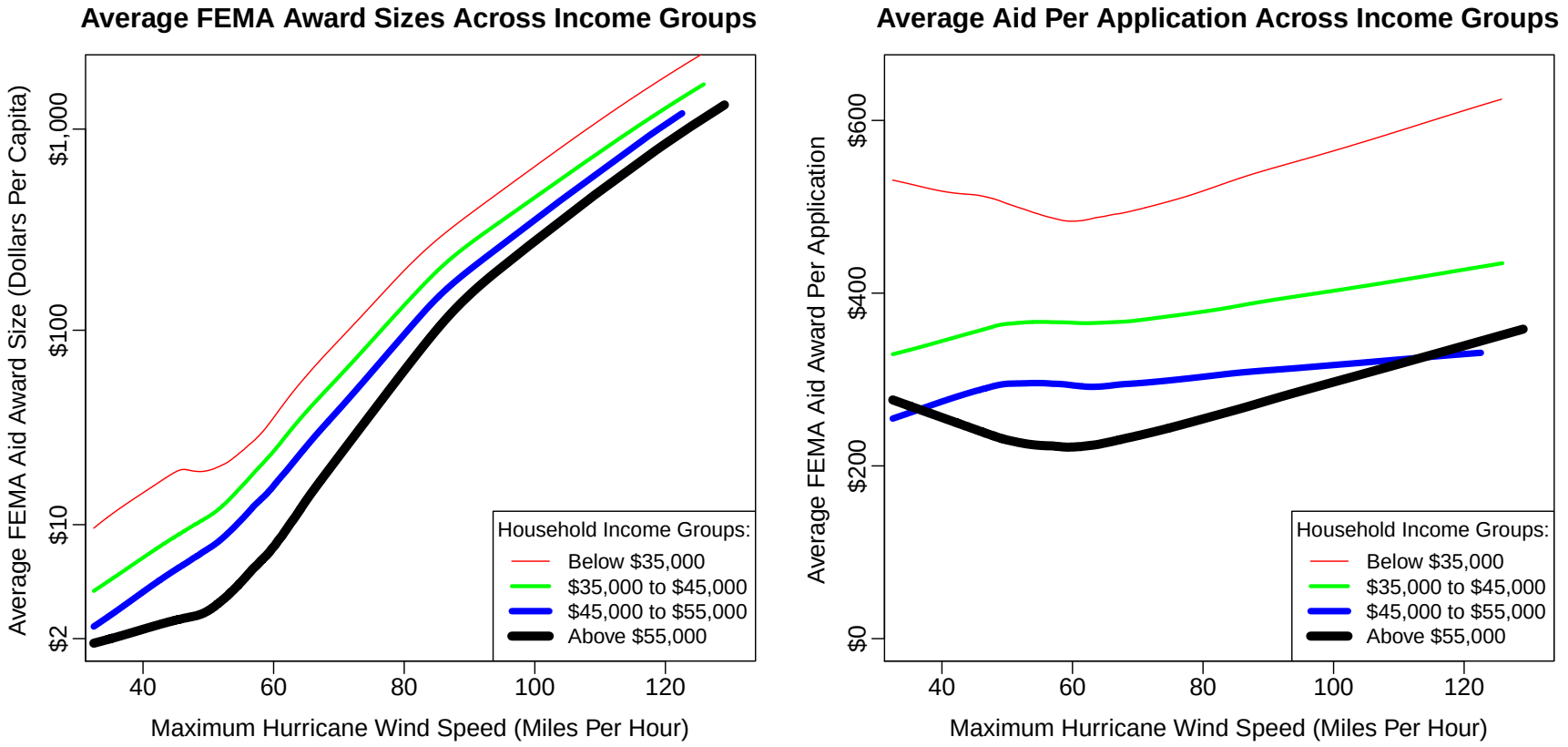
Note: The left plot illustrates that the percentage of applicants awarded aid was relatively constant across all income groups. The right plot illustrates that on average, poorer applicants received significantly more aid than wealthier applicants.

Figure 4: The Experiences of FEMA Aid Applicants



Note: The left plot measures the average number of hours that residents suffered severe hurricane winds (over 70 miles per hour), as measured by the surface wind estimates of the NOAA's Hurricane Research Division. The right plot measures the percentage of applications that received a decision within 7 calendar days of the applicant's request for aid.

Figure 5: Hurricane Severity and FEMA Aid Distribution



Note: In both plots, each line represents a locally-weighted regression estimate of the relationship between hurricane wind speeds and FEMA aid awarded. Data for both variables are measured at the census block group level. Both plots reveal that across all income groups, FEMA consistently awarded more disaster aid, on both a per-capita and a per-application basis, to block groups that experienced more severe hurricane winds.

Online Appendix: Formal Model Proofs

Proof of Proposition 1: There are four cases to consider, depending on the value of *Y*:

Case 1: $Y < \left(\sqrt{3}-1\right)/2$.

If $x_1 = 0,$ then via *Lemma C, V* turns out to vote iff: $\lambda \le \left(2Y^3+2Y^2-Y\right)/\left(2Y^2-2Y-5\right)$. But if $x_1 = 1,$ then via *Lemma D*, V turns out to vote iff: $\lambda \le \left(2Y^3+2Y^2+Y\right)/\left(2Y^2+6Y+5\right)$. Hence, the probability of turnout when $x_1 = 1,$ minus the probability of turnout when $x_1 = 0,$ is: $F(y) = \left(2Y^3+2Y^2+Y\right)/\left(2Y^2+6Y+5\right) - \left(2Y^3+2Y^2-Y\right)/\left(2Y^2-2Y-5\right)$. The first-order derivative is:

$$\frac{\partial F(Y)}{\partial Y} = -\frac{(4Y+6)\left(2Y^3+2Y^2+Y\right)}{\left(2Y^2+6Y+5\right)^2} + \frac{(4Y-2)\left(2Y^3+2Y^2-Y\right)}{\left(2Y^2-2Y-5\right)^2} + \frac{6Y^2+4Y+1}{2Y^2+6Y+5} - \frac{6Y^2+4Y-1}{2Y^2-2Y-5},$$

which is strictly positive along the interval: $\left[0,\ \left(\sqrt{3}-1\right)/2\right)$.

Case 2: $\left(\sqrt{3}-1\right)/2 \le Y < 2.71$.

If $x_1 = 0,$ then via *Lemma C, V* turns out to vote iff: $\lambda \le \left(2Y^3+2Y^2-Y\right)/\left(2Y^2+6Y+3\right)$. But if $x_1 = 1,$ then via *Lemma D*, V turns out to vote iff: $\lambda \le \left(2Y^3+2Y^2+Y\right)/\left(2Y^2+6Y+5\right)$. Hence, the probability of turnout when $x_1 = 1,$ minus the probability of turnout when $x_1 = 0,$ is: $F(y) = \left(2Y^3+2Y^2+Y\right)/\left(2Y^2+6Y+5\right) - \left(2Y^3+2Y^2-Y\right)/\left(2Y^2+6Y+3\right)$. The first-order derivative is:

$$\frac{\partial F(Y)}{\partial Y} = -\frac{(4Y+6)\left(2Y^3+2Y^2+Y\right)}{\left(2Y^2+6Y+5\right)^2} + \frac{(4Y+6)\left(2Y^3+2Y^2-Y\right)}{\left(2Y^2+6Y+3\right)^2} + \frac{6Y^2+4Y+1}{2Y^2+6Y+5} - \frac{6Y^2+4Y-1}{2Y^2+6Y+3},$$

which is positive along $\left[\left(\sqrt{3}-1\right)/2,\ 0.76\right)$, zero at *Y*=0.76, and negative along $(0.76,\ 2.71)$.

Case 3: $2.71 \le Y < 2.82$.

If $x_1 = 0,$ then via *Lemma C, V* turns out to vote iff: $\lambda \le \left(2Y^3+2Y^2-Y\right)/\left(2Y^2+6Y+3\right)$. But if $x_1 = 1,$ then via *Lemma D*, V always turns out to vote. The probability of turnout when $x_1 = 1,$ minus the turnout probability when $x_1 = 0,$ is: $F(y) = 1 - \left(2Y^3+2Y^2-Y\right)/\left(2Y^2+6Y+3\right)$,

The first-order derivative is: $\dfrac{\partial F(Y)}{\partial Y} = \dfrac{(4Y+6)\left(2Y^3+2Y^2-Y\right)}{\left(2Y^2+6Y+3\right)^2} - \dfrac{6Y^2+4Y-1}{2Y^2+6Y+3},$

which is negative along $[2.71,\ 2.82)$.

Case 4: $Y \ge 2.82$.

If $x_1 = 0,$ then via *Lemma C, V* always turns out to vote. And if $x_1 = 1,$ then via *Lemma D*, *V* always turns out to vote. Hence, the probability of turnout when $x_1 = 1,$ minus the turnout probability when $x_1 = 0,$ is: $F(Y) = 1 - 1 = 0$. The first-order derivative is: $\dfrac{\partial F(Y)}{\partial Y} = 0,$ so $F(Y)$ is weakly decreasing along $[2.82,\ \infty)$.

Hence, via these four cases, $F(Y)$ is strictly increasing along $[0,\ 0.76)$ and weakly decreasing along $(0.76,\ \infty)$.

Proof of Lemma A: In each period $t \in \{1,3\}$ and for either politician $p \in \{I,C\}$, p's utility payoff is: $U_p^t(x_t) = -|\theta_p - x_t| = \begin{cases} -|\theta_p - \theta_p|, & \text{if } x_t = \theta_p; \\ -1, & \text{if } x_t \neq \theta_p. \end{cases}$ Hence, in the final period, *t*=3, choosing $x_3 = \theta_p$ is a strictly dominant strategy. In period *t*=1, an incumbent of type $\theta_I = 0$ could increase her probability of reelection by choosing $x_1 = 1,$ but this increased probability is never sufficiently large to outweigh the disutility of playing her less-preferred strategy in period 1. Hence, choosing $x_1 = \theta_I$ is always strictly dominant.

Proof of Lemma B: Via *Lemma A*, incumbent types are fully separating, so after observing x_1, *V*'s updated belief about *I*'s type is: $\Pr(\theta_I = 1 \mid x_1) = x_1$. Thus, *V* expects to receive $E(x_3 \mid e_3 = I) = x_1$ units of aid in period 3 if *I* is reelected and $E(x_3 \mid e_3 = C) = E(\theta_C) = ½$ units of aid if *C* wins the election. Hence, V's expected third period payoff from *I*'s reelection would be: $EU_V(e_3 = I) = 1 - 1/(Y + x_1),$ whereas his expected third period payoff from *C*'s election would be: $EU_V(e_3 = C) = 0 - 1/(2Y) - 1/(2Y+2)$. Therefore, conditional on turning out, *V* votes for *I* iff: $EU_V(e_3 = I) \geq EU_V(e_3 = C) \Rightarrow 1 - 1/(Y + x_1) \geq -1/(2Y) - 1/(2Y+2) \Rightarrow Y \geq (1 - x_1)(\sqrt{3} - 1)/2$.

Proof of Lemma C: If $x_1 = 0,$ there are two cases to consider, depending on whether *Y* is above or below the threshold specified in *Lemma B*. When *Y* is low, $Y < (1 - x_1)(\sqrt{3} - 1)/2$, *V* prefers the Challenger win the election, so V's total payoff in periods 2 and 3 from voting is:

$$EU_V(v = 1 \mid Y < (1 - x_1)(\sqrt{3} - 1)/2;\ x_1 = 0) = -1/(Y - \lambda) - 1/(2Y) - 1/(2Y+2).$$

When *Y* is above this threshold, *V* prefers that the Incumbent win the election, so V's total expected payoff in periods 2 and 3 from voting is:

$$EU_V(v = 1 \mid Y \geq (1 - x_1)(\sqrt{3} - 1)/2;\ x_1 = 0) = -1/(Y - \lambda) + 1 - 1/Y.$$

In both cases, *V*'s total combined expected payoff in periods 2 and 3 from not voting is:

$$EU_V(v = 0 \mid Y;\ x_1 = 0) = -1/(Y) + 1/2 - 1/(2Y) - [1/(2Y) + 1/(2Y+2)]/2.$$

Hence, in equilibrium, *V* turns out to vote iff:

$$EU_V(v = 1 \mid Y;\ x_1 = 0) \geq EU_V(v = 0 \mid Y;\ x_1 = 0) \Rightarrow \lambda \leq \max\left(\frac{2Y^3 + 2Y^2 - Y}{2Y^2 - 2Y - 5},\ \frac{2Y^3 + 2Y^2 - Y}{2Y^2 + 6Y + 3} \right)$$

Proof of Lemma D: If $x_1 = 1,$ *V* prefers the Incumbent to win, via *Lemma B*. *V*'s expected payoff in periods 2 and 3 from voting is: $EU_V(v = 1 \mid Y) = -1/(Y - \lambda) + 1 - 1/(Y + 1)$. *V*'s expected payoff from not voting is: $EU_V(v = 0 \mid Y) = -1/(Y - \lambda) + 1/2 - 1/(2Y+2) - [1/(2Y) + 1/(2Y+2)]/2$. Hence, in equilibrium, *V* turns out to vote iff:

$$EU_V(v = 1 \mid Y;\ x_1 = 1) \geq EU_V(v = 0 \mid Y;\ x_1 = 1) \Rightarrow \lambda \leq \frac{2Y^3 + 2Y^2 + Y}{2Y^2 + 6Y + 5}.$$

Online Appendix: Expanded Version of Table 1 to Control for Demographics and Hurricane Severity

	Dependent Variable: Voted in November 2004				
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
Household Income Group:	Under $35,000	$35,000 to $45,000	$45,000 to $55,000	$55,000 to $65,000	Over $65,000
FEMA Application Approved	0.034	0.128***	0.194***	0.132*	0.087
	(0.036)	(0.032)	(0.042)	(0.062)	(0.077)
Voted in August 2004 Primary Election	1.263***	1.255***	1.056***	1.180***	1.508***
	(0.058)	(0.054)	(0.064)	(0.105)	(0.138)
Voted in November 2002 General Election	1.552***	1.547***	1.532***	1.549***	1.924***
	(0.043)	(0.039)	(0.050)	(0.073)	(0.089)
Voted in August 2002 Primary Election	0.179**	0.001	0.021	0.180*	0.237*
	(0.055)	(0.050)	(0.062)	(0.090)	(0.119)
Voted in November 2000 General Election	1.246***	1.267***	1.284***	1.396***	1.258***
	(0.040)	(0.036)	(0.047)	(0.070)	(0.085)
Female	0.140***	0.097**	0.115**	0.160**	0.020
	(0.036)	(0.032)	(0.042)	(0.061)	(0.258)
African-American	-0.339***	-0.341**	-0.415*	-0.306	0.782
	(0.084)	(0.118)	(0.193)	(0.337)	(0.615)
Hispanic	-0.223*	-0.300***	-0.469***	-0.314	0.012
	(0.090)	(0.077)	(0.110)	(0.175)	(0.077)
Maximum Hurricane Wind Speed (Miles Per Hour)	-0.004***	-0.002	-0.003*	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
Duration of Severe Hurricane Storms (Hours)	0.015	-0.010	-0.019	-0.082***	-0.074*
	(0.013)	(0.011)	(0.014)	(0.023)	(0.033)
Constant	-0.538***	-0.486***	-0.335***	-0.351*	-0.457
	(0.079)	(0.081)	(0.105)	(0.153)	(0.290)
Pseudo R^2	0.41	0.37	0.35	0.35	0.40
N	25,306	33,574	21,429	11,988	7,982

***p<.001; **p<.01; *p<.05 (two-tailed). Standard errors in parentheses.

Note: Models are identical to those in Table 1, except for the inclusion of the demographic and hurricane wind variables.

Online Appendix: Expanded Version of Table 2 to Control for Demographics and Hurricane Severity

	Dependent Variable: Voted in November 2004				
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
Household Income Group:	Under $35,000	$35,000 to $45,000	$45,000 to $55,000	$55,000 to $65,000	Over $65,000
Size of FEMA Aid Award (Logged $)	0.000	0.017***	0.030***	0.019*	0.011
	(0.005)	(0.005)	(0.006)	(0.009)	(0.011)
Voted in August 2004 Primary Election	1.263***	1.255***	1.057***	1.180***	1.509***
	(0.059)	(0.054)	(0.064)	(0.105)	(0.138)
Voted in November 2002 General Election	1.551***	1.547***	1.532***	1.549***	1.924***
	(0.043)	(0.039)	(0.050)	(0.073)	(0.089)
Voted in August 2002 Primary Election	0.179**	0.002	0.021	0.180*	0.237*
	(0.055)	(0.050)	(0.062)	(0.090)	(0.119)
Voted in November 2000 General Election	1.245***	1.267***	1.285***	1.397***	1.257***
	(0.040)	(0.036)	(0.047)	(0.070)	(0.085)
Female	0.139***	0.096**	0.115**	0.160**	0.020
	(0.036)	(0.032)	(0.042)	(0.061)	(0.077)
African-American	-0.340***	-0.343**	-0.416	-0.306	0.780
	(0.084)	(0.118)	(0.193)	(0.337)	(0.615)
Hispanic	-0.226*	-0.301***	-0.468	-0.315	0.010
	(0.090)	(0.077)	(0.110)	(0.175)	(0.228)
Maximum Hurricane Wind Speed (Miles Per Hour)	-0.004***	-0.002	-0.003*	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
Duration of Severe Hurricane Storms (Hours)	0.015	-0.010	-0.019	-0.081***	-0.074*
	(0.013)	(0.011)	(0.014)	(0.023)	(0.033)
Constant	-0.518***	-0.480***	-0.339**	-0.349*	-0.452
	(0.079)	(0.081)	(0.105)	(0.153)	(0.290)
Pseudo R^2	0.41	0.37	0.35	0.35	0.40
N	25,306	33,574	21,429	11,988	7,982

***p<.001; **p<.01; *p<.05 (two-tailed). Standard errors in parentheses.

Note: Models are identical to those in Table 2, except for the inclusion of the demographic and hurricane wind variables.