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Towards an Understanding of the Root Causes of Forced Migration: The Political Economy of "Natural" Disasters

Charles Cohen and Eric Werker

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ABSTRACT

Natural disasters occur in a political space. Although events beyond our control may trigger a disaster, the level of government preparedness and response greatly determines the extent of suffering incurred by the affected population. We use a political economy model of disaster prevention, supported by case studies, that explains why some governments prepare well for disasters and others do not. We also show how the presence of international aid distorts this choice and increases the chance that governments will under-invest. Policy suggestions that may alleviate this problem are discussed.

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List of Acronyms

APSR	American Political Science Review
BBC	British Broadcasting Corporation
CORD	Christian Outreach Relief and Development
CRED	Center for Research on the Epidemiology of Disasters
NGO	Non-Governmental Organization
OFDA	Office of Foreign Disaster Assistance

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Charles Cohen and Eric Werker[2]

FOREWORD

An explanation for a mathematically-oriented model of disaster in a forum for improving non-governmental organization policy with respect to forced migration is clearly in order. Our original research question concerned the tensions between the head office and the field with respect to the appreciation of the impact of local humanitarian action on the conflict and flows of people at large. As we brought this question to humanitarian executives in Nairobi and Kampala, and later Lokichoggio and Bundibugyo, it became clear that there was little tension within individual organizations. Yet in nearly every meeting, experienced humanitarians shared their big-picture concerns with us on how the act of providing assistance to communities and forced migrants sometimes created incentives for local and national actors to do the not-so-right thing. They gave examples of interactions between their organization and the government officials responsible for relief coordination, and how these government contacts had built-in expectations of how the humanitarian agency should act and what it owes the target population.

These interactions, explored anecdotally with respect to conflict in the "Do No Harm" literature, actually lend themselves quite well to economic modeling. And economic modeling can be further generalized to disasters that do not necessarily involve armed conflict, such as earthquakes and droughts, to expose the otherwise invisible impact on incentives for government (in)action. It is thus in appreciation of the troubles expressed by the remarkable humanitarian workers we met in East Africa, and recognizing the relative strengths and weaknesses of our discipline, that we settled on this topic.

When viewed through an economic lens, forced migration ceases to be "forced," though it is certain that the benefits minus the costs of migrating exceed the benefits minus the costs of staying for those who become internally-displaced or even refugees. If, as economists, we wish to understand the phenomenon of population flight (which we do not yet), we must first understand the forces that drive the distribution of costs and benefits. Two clear candidates are war and natural disaster, each of which interacts with humanitarian relief. Of these candidates, natural disaster is the low-hanging fruit for two reasons. One, it is essentially

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[2] Department of Economics, Harvard University, Cambridge, MA 02138. E-mails: cpcohen@fas.harvard.edu; werker@fas.harvard.edu.

untouched within the economics and political science literature whereas war has seen a massive resurgence in recent years. Two, natural disasters present some of the classic insurance problems, something that economists are already familiar with. Thus we can take an economist's toolkit and apply it to a previously-ignored phenomenon, driven by insights from people working in disaster relief in East Africa on just how political disaster relief can be. And as we will model the structure of relief, we will be able to formulate real policy implications that derive from the model.

Natural disasters are a fundamental part of forced migration for a number of reasons. One, they may directly cause refugee flows, as happened with the Goma volcanic eruptions in 2002 which displaced Congolese into neighboring Rwanda. Two, they characterize conflict areas, as government leaders have incentives to ignore environmental risks facing domestic enemies, and rebel leaders have incentives to create disasters in order to draw humanitarian aid. Thus environmental phenomena interact with political structures in ways that can lead people to flee their home areas. Three, they may characterize refugee-hosting areas if refugees become equivalent to a domestic enemy—a group whose support is not required, and which may serve to draw international resources—and consequently more vulnerable to natural disasters. The assumptions and logical processes that generate these reasons are discussed in detail in the paper.

The aim of this paper is thus to provide a formal model that produces many of the institutional incentives that the humanitarian workers in East Africa shared with us and to suggest a few more subtle incentives that one cannot necessarily see from the battlefield. In so doing, we hope to show exactly how natural disasters are political, how that affects the humanitarian industry, and what we might do as policy makers concerned with the massive human costs associated with forced migration.

I. INTRODUCTION

In November 1970, a cyclone and tidal wave struck the south-eastern part of then East Pakistan, eventually leaving 300,000 people dead (OFDA/CRED, 2003). The central government, unlike the separatist Awami League party workers of East Pakistan, largely ignored the crisis, sending only one flight of relief goods to Dhaka. Meanwhile, the international community flew over 200 relief flights, and Iran even declared a day of mourning for the flood victims. In March 1971, conflict broke out between the Bengali separatists and the Islamabad government, and the relief boats provided by the United States to deliver supplies to the islands devastated by the tidal wave were confiscated by the army (Griffel, 1975).

Natural disasters occur in a political space. They are not driven by politics but nor are they immune from politics. Incentives faced by human actors can affect the prevention, mitigation, and damage of natural disasters, even if they cannot affect the likelihood of rainfall in a specific area or seismic activity along a particular fault line. This is hardly controversial. The vast literature on disaster prevention and response has appreciated the political dimension of disasters for decades (Olson, 2000; Platt, 1999; Blaikie et al, 1994; Albala-Bertrand, 1993; Bommer, 1985; Cuny, 1983; Diggins, Wright, and Rossi, 1979; Abney and Hill, 1966). There is even econometric evidence of the relationship: in the United States, political considerations may explain half of all federal disaster relief (Garrett and Sobel, 2003); around the world, disasters tend to be more severe in poorer, less democratic countries (Kahn, 2003).

If natural disasters are political, then they can be modeled in a similar fashion to other political acts of mass violence, such as deliberate starvation or even genocide. Clearly, natural disasters are less easy to manipulate than militias of killers, yet at the margin we should find similar predictions. Thus, interspersed throughout the text, we illustrate our argument with examples from traditional natural disasters as well as from insurgencies and counter-insurgencies.

We adopt a precise, mathematical definition of disaster when the model is introduced in Section II.[3] Our definition is in spirit with Erikson (1976): "[Disasters] involve considerable harm to the physical and social environment; they happen suddenly or are socially defined as having reached one or more acute stages; and something can be done to mitigate their effects before or after they happen" (quoted in Kreps, 1998: 33). In other words, disasters involve a negative shock whose severity can be affected both before and after the crisis. Since the severity of the shock can be affected, it follows that some process is choosing the level of severity of a given natural shock. It is precisely that process that we model. Henceforth, "shock" refers to the natural act itself—the volcanic eruption, earthquake, drought, etc.—and "disaster" refers to the net impact of the shock on the population when there is sufficient suffering.

Natural disasters have killed over 62 million people world-wide since 1900 (OFDA/CRED 2003). This is approximately the same number as all those killed from both World Wars[4], yet scarce attention has been paid to natural disasters in the economics and political science

[3] There is extensive debate on the definition of disaster—at least two edited volumes are dedicated solely to this task (Quarantelli, 1998; Perry and Quarantelli, 2004).

[4] White (2003) surveys the estimates for each war. Estimates for World War I are on the order of 10 million and for World War II are on the order of 50 million.

literature, while dozens of articles on conflict are published each year. Of those 62 million, 34 million were killed in epidemics (including the influenza outbreak of 1917), 10 million in droughts, seven million each in famines and floods, and two million in earthquakes. Over 85 percent of the deaths occurred between 1900 and 1950, and less than one million deaths from natural disasters have occurred since 1990. Certainly part of the credit for the relatively small number of disaster deaths in the last decade is due to the efforts of the global humanitarian community. In the month of December 2003 alone, international humanitarians and national Red Cross chapters responded to natural disasters in China, Iran, Panama, Costa Rica, Haiti, Indonesia, Philippines, and Colombia (Reliefweb 2004).

In this paper, we take as given that disaster actors work in a political space, and we model that space using a reduced-form framework. Governments derive utility from social welfare, political power, and money. They can choose the level of investment that they make to lessen the damage of a potential natural shock, and international humanitarian organizations can step in to reduce suffering. This setup produces a number of important results, some of which have been independently noted in different strands of the literature.

Rich governments and governments that care about social welfare spend more on disaster prevention and mitigation, and they concentrate their spending in populated regions of the country. Governments can also use natural disasters to redistribute power through the *political effect*, favoring disaster spending in regions that are politically aligned with the party in power. The existence of humanitarian aid produces a *bailout effect*: governments under-invest in disaster prevention when they know that they will be bailed out in the event of disaster. This effect is mitigated for pariah states that may not have access to international aid. In the extreme, we can witness a *racket effect*, where governments can deliberately neglect a population so as to attract—and steal—humanitarian aid in the event of a disaster. Governments without other sources of external income are more likely to be influenced by the racket effect. The racket effect is likely to be weaker if humanitarian aid is provided directly to the area of suffering rather than through the central government. If humanitarian agencies internalize losses from theft, the severity of the disaster may be greater and the racket effect may have an even greater impact on creating unnecessary disasters.

These results have policy implications for reducing the severity of natural disasters. One, the international humanitarian community must be involved in disaster prevention if it is to offer free relief. Two, whenever possible, disaster relief should be provided locally so as to reduce the significance of the racket and political effects on the central government. Three, political development, in the form of more responsive governments and less intrastate conflict, will naturally reduce the severity of disasters. Four, in particularly problematic areas, non-disaster payments can be given to governments but taken away in the event of a realized disaster, so as to provide the correct incentives to profit from good times rather than bad.

The paper is organized as follows. In Section II, the model is presented and the terms are defined. Section III solves the model in the case of no outside humanitarian relief, while Section IV allows for external disaster aid. Both sections III and IV discuss key comparative static results about the incidence and severity of disasters and the corresponding real-world evidence, as well as citations from the disaster literature where the result has been noted before. Policy

implications, including specific recommendations for non-governmental organizations working in relief, development, and refugee activities, are offered in Section V. Section VI concludes.

II. A POLITICAL MODEL OF DISASTERS

In this paper, we consider only the government's decision to spend money on disaster prevention, or to allocate it to other uses. The government derives utility from three sources: social welfare from disaster prevention, relative political strength, and spending on other resources. We believe that this framework is sufficiently flexible to capture the basic differences between the different types of governments that one actually sees in the world, without being overly reductionist. Formally, the government has a utility function $v(w, s, y)$, where w is social welfare of the population, s is the current government's political strength, and y is spending on other goods.

The form of this utility function should not necessarily be taken as an indication of the way that central governments actually think about the decisions that they undertake. Rather, this should be thought of as a reduced form for a series of vastly more complicated decisions that are undertaken. We also recognize that central government decisions are not perfectly coordinated; however, we still think that this functional form will capture the most important dynamics. We believe that most government actions can be understood as an attempt to increase one or more of these inputs. Therefore, even though the government may not have preferences directly over these inputs, it will behave as though it does, and hence this utility function serves as a consistent representation of these preferences.[5]

A. Government Spending

We abstract from the much larger spending decisions that the central government must make and consider only that the government has a fixed supply of money I to spend on disaster prevention or to put aside for other spending. The government must allocate this money across different regions. The population of region i is n_i. The amount it spends in region i on disaster prevention is d_i. This d_i should be thought of as encompassing both preventative and palliative measures.

B. Shocks and Disasters

[5] For example: an extremely corrupt kleptocracy may care only about stealing as much money as possible, whereas a totally benevolent president may care only about the social welfare of the general population. The kleptocracy will still attempt to guarantee some level of social welfare (to avoid a revolution) and also will attempt to crush its opponents (in order to stay in power longer to facilitate its stealing). The benevolent president also cares about money (e.g. to finance a reelection campaign) and about staying strong (in order to push through difficult but important legislation). But these different forms of government will have extremely different marginal utilities from these inputs, and these differences will play key roles in our analysis.

Oftentimes governments derive political power from implementing policies that result in high levels of social welfare, and also lose power by engaging in large amounts of theft. However, we believe that political power can also be thought of as a separate and distinct element, by understanding that the struggle for political power can also have a component that only involves jostling for position between certain elite groups. Indeed, the relative importance of this compared to the other two sources can say much about the structure of a government. In particular, we are thinking about the need for central governments to deal with *regional* political rivals/allies.

For simplicity, we are assuming that with probability p a negative shock strikes the entire country and all regions are affected. For example: a drought hits the country. This could be generalized to a distribution of different severities of shocks with potentially independent impacts on each region, but we think that this setup captures all the essential results with a minimal amount of technical complications.

If a shock hits, this negatively affects the welfare of the population. We model this by saying that, in the case of a disaster, the utility of each individual in the afflicted region is is $u_i(d_i)$, which is concave and increasing in d_i. Note that spending may be more or less effective in different regions, corresponding to different population sizes, terrains, etc. If there is no disaster the utility of each individual is $\bar{u} = \lim_{d \to \infty} u_i(d)$

We define a *disaster* as any shock that causes utility to drop below some critical level $\underline{u}$. In other words, a disaster occurs only when a shock hits and inadequate preparations have been made to deal with it. Note that spending on disaster prevention does not lessen the probability that a shock occurs, only its impact. This is because in most cases the necessary conditions for natural disasters are actual shocks from nature. Whether or not these shocks translate into actual disasters depends on the population's level of preparedness. For example, the extent to which a drought actually causes famine may be lessened by either spending adequately on the construction of reservoirs and other preventative measures, or by ensuring adequate relief systems to bring in food from other areas. We assume that all spending is done prior to any disasters taking place.

C. Regional Politics

We model political power as follows: each region has an innate political bias towards or against the government. In addition, some regions are politically weak and others are strong. The per capita political strength of a region is given by a number a_i, and thus its total political strength by $n_i a_i$. Strong regions are those where political groups are well organized and/or possess large stocks of weapons, capital, etc. Regions that favor the central government have $a>0$, and those that oppose it have $a<0$. The central government's total political power (at least in this limited sense) is captured by the sum of these regional numbers. This factor is relevant only in countries that are regionally fractionalized due to ethnic, religious, or geographic divisions. In countries where political divisions do not split along geographic lines, these numbers will be much smaller. In those countries power struggles will not necessarily be related to the issues studied here, and we ignore them in our analysis.

Disasters affect the political strength of a given region. If a disaster strikes, the political power of the region drops to $g(d_i)n_i a_i$, where g is concave and increasing. We assume $\lim_{d \to \infty} g(d) = 1$. This is totally independent from the welfare losses in the region.

D. International Aid

We assume that the cost of ex-post (palliative) humanitarian aid is higher than that of ex-ante (preventative) aid.[6] Therefore, we assume that spending one dollar after a disaster occurs is as effective as spending (1-c) dollars beforehand, where $0<c<1$. In addition, we assume that for every dollar given in aid, a fraction z is first stolen by the central government.[7] Now, assume a disaster strikes in a given region where the initial per capita spending on aid in a region was d_i. If $n_i x_i$ dollars in aid are donated by foreign aid agencies, first zn_i dollars are stolen, and then the remaining $(1-z)n_i x_i$ in aid is as effective as $(1-z)(1-c)n_i x_i$ spent in preventative measures. This means that the ex post utility of individuals is $u(d_i+(1-z)(1-c)x_i)$.

E. Modeling international organizations

We assume that the aid agencies have a quasi-linear utility function, whereby aid flows in to a given region until the per capita marginal impact on utility of a dollar spent is equal to m. This is because there are many aid needs around the world and the aid is being sent to maximize welfare, subject to this cutoff rule[8]. Note this means that more aid will be spent, and hence ex-post levels of utility will be higher, in regions where there is less waste due to corruption. In particular, if only a fraction $(1-c)(1-z)$ of every dollar of aid actually gets through, the level of final spending will be given by $d^*(z, c)$, where

$$(1-c)(1-z)u_i'(d^*) = m$$

Hence d^* is clearly decreasing in c and z, and m. The total amount that the government steals is given by $z(d^*-d)/[(1-c)(1-z)]$

Note that we are assuming that this aid does not increase the political strength of the region in question. [9] We are also assuming that aid agencies do not have any ex-ante methods of discouraging low investment by the central government.[10]

III. GOVERNMENT SPENDING AND DISASTERS IN THE ABSENCE OF AID

[6] Participants at the Public and Labor Economics Workshop at Harvard pointed out one important benefit of ex-post aid: aid agencies know which regions are affected and therefore where to spend their money. In light of this, our assumption that the cost of palliative aid is higher than preventative aid becomes a stronger assumption.

[7] For now we treat z as fixed, but there is a brief discussion of strategic theft later in the paper.

[8] In some places aid money is being spent on preventative measures, and they always have an outside option whereby $1 can increase the utility of an individual somewhere by m. If they are maximizing social welfare then this immediately implies a quasi-linear utility function with the above decision rule.

[9] This is because we believe that a disaster affects the political organization and strength of a region independently of its damage to social welfare (e.g., by damaging infrastructure, disrupting communication, increasing the opportunity costs of political organization, turning the population against the current local rulers), and that relief programs do not necessarily restore this political strength. Alternatively, we could assume that relief programs do raise political strength, but not all the way up to d^*. This would not change any of our basic results.

[10] This option is discussed further in Section V.

In this section, we solve the model without strategic interactions with an outside relief agency, get the first-order conditions, and take several comparative statics. The following section will allow for external disaster relief.

Let us recall that the central government is maximizing *v(w,s,y)*. If the central government spends d_i in each region *i*, then its expected utility is

$$(1-p)\cdot v\left(\sum_i n_i\cdot\bar{u},\sum_i n_i\cdot a_i],I-\sum_i d_i\right)+$$
$$p\cdot v\left(\sum_i n_i\cdot u_i(d_i),\sum_i n_i\cdot g(d_i)a_i,I-\sum_i d_i\right)$$

The first order conditions here are, for all *i*:

$$pn_i[u_i^{'}(d_i)v_1+g'(d_i)a_iv_2]=v_3$$

The left hand side is the benefit to spending in a particular region (social benefits and political benefits/costs) and the right hand side is the cost (lost income). From this readily follow our first propositions.

Proposition 1: Rich governments spend more on disaster prevention overall.

Proof: this follows immediately from the decreasing marginal utility of wealth.

This result is hardly surprising, and has been implicitly noted in the literature. For instance, Kahn (2003) finds that natural shocks are no more likely in poor countries than rich countries, but that poor countries have higher mortality from disasters. Moreover, the study of disaster prevention and relief is largely a technical field whose research is based in universities of urban and regional planning, and whose findings center on the American experience. Disaster prevention can be thought of as a normal good, whose consumption increases with income. Yet all governments that are involved in disaster mitigation, poor and rich, will still prioritize their spending.

Proposition 2: Governments spend more in regions where spending is effective, i.e., where $u_i'(d_i)$ is large and in more populous regions.

Proof: $n_iu_i'(d_i)$ is the marginal change in social welfare from prevention following a shock.

This proposition follows from the optimization inherent in the model. Governments will focus their disaster spending where it is effective and where it will have the largest impact. Thus, we should expect to see higher enforcement of earthquake codes in areas that have higher risk of earthquake, and in larger cities as opposed to the hinterland. This prediction would be difficult to test with disaster outcomes, as it is a classic omitted variable story: disasters are more severe where prevention has a higher marginal utility, and where the population density is higher, so we

cannot look for evidence of effective spending in reduced death tolls or damage. Of course, spending on disaster prevention and mitigation will be more valuable to some governments than others.

Proposition 3: The more the government derives utility from social welfare, the less ex-ante severe the disaster.

Proof: recall the government's first order conditions

$$pn_i[u_i^{'}(d_i)v_1 + g'(d_i)a_i v_2] = v_3$$

This means that the bigger v_1 (the marginal utility from social welfare) is, the greater the optimal level of disaster spending d is, and the more the government stands to lose from letting d drop.

Proposition 3 is essentially the bridge between our paper and the oft-cited Sen (1983) observation that democracies do not have famines. For whatever reason, whether it is benevolence or accountability, governments that govern in the interest of social welfare should have less severe disasters. Indeed, Kahn (2003) finds that natural disasters have a smaller death toll in democracies.

There are a variety of ways through which different governments can try to maintain their power. In a review of the literature on the economics of famines, Ravallion notes:

> [H]igher poverty during famines may often come side by side with absolute, as well as relative, gains to more powerful subgroups of the non-poor. Thus the incentives facing political leaders can work against effective famine avoidance or response. (1997: 1225)

For leaders to head off disasters thus requires incentives that work *towards* effective disaster avoidance or response. One potential channel is through democratic institutions that force the government to be accountable. According to Sen (1989: 42): "The nature and freedom of the news media, and the power and standing of opposition parties, are of considerable importance in effective prevention of famines." In the context of our model, the free press increases the marginal utility the government derives from social welfare, which increases disaster prevention and mitigation.

Yet it is not only the day-to-day incentives that lead governments to invest in disaster prevention. If there is potential for a disaster large enough to remove the government from power, the government may invest such that major natural shocks do not become that disaster. This is the corollary to the political science insight that even dictatorships are responsive to the will of their population.

Corollary: The potential for shocks to destabilize government will increase investment in disaster prevention.

Proof: This just follows from the concavity of $u(d)$. Very low levels of d may be inefficient as the marginal utility of disaster prevention is extremely high there.

Thus, even governments that are neither altruistic in design nor in intent may still invest in disaster mitigation if it means preventing them from being overthrown. The possibility of natural disasters affecting the political prospects of governments has long been noted, as a 1925 *APSR* article on "Rainfall and the Populist Party in Nebraska" (Barnhart) would attest. A recent empirical paper by Drury and Olson (1998) finds that the severity of the disaster positively predicts political unrest, even controlling for prior unrest.

Clearly, governments with limited resources cannot fully insure against every possible outcome. Large, unlikely disasters might still slip through the cracks and lead to the downfall of the government. Tavera-Fenollosa (1999) argues that the 1985 earthquake in Mexico city led to the democratization and government in the Federal District. Cuny (1983: 54) concurs, observing that "many governments destabilize in the years immediately following a disaster. In the Sahel drought, every government fell, many directly as a result of dissatisfaction with relief efforts." So it appears that major disasters can lead to regime changes. It is interesting to note that future governments in the Sahel region took note of the fate of their predecessors, and in December 1984 helped to establish the Network for the Prevention of Food Crises in the Sahel (Club du Sahel, 1997).

In addition, the current tension surrounding external relief for the famine in North Korea has strong elements of this corollary. Perhaps the main reason the United States is reluctant to give food aid to North Korea is that such assistance will help the North Korean government survive domestic discontent and live to see another day. Thus the American policy makers face a dilemma: whether to reduce suffering at present, or to allow sufficient damage to the regime to occur such that it loses domestic legitimacy. Of course, disasters do not only weaken governments. Used strategically they can strengthen the government if they are harnessed as instruments to weaken potential rivals.

Proposition 4 (*The political effect*): Governments spend less on disaster prevention in politically weak or hostile regions.

Proof: $g'(d_i)n_i a_i$ is the marginal change in a region's political power due to prevention, and the central government favors regions with high values of $n_i a_i$.

This observation, that disasters will "tend to happen" in opposition-aligned areas, has been noted in Albala-Bertrand (1993: 92, 151) and implicitly noted in the conflict literature on food as a weapon and in the geography literature on vulnerability and marginalization. The food-as-a-weapon literature documents how famine can and has been used as a tool of warfare against political enemies, most notably in Ethiopia (de Waal, 1997b: 106-132; Keller, 1992) and Sudan (Deng and Minear, 1992: 83-119; Keen, 1994). In contrast, the geography literature stresses that disasters disproportionately affect marginalized groups that have less political power (Mustufa, 1998; Hewitt, 1998: 85-86; Susman, O'Keefe, and Wisner, 1983).

Perhaps the most striking and widely misunderstood example of food being used as a weapon was the Ethiopian famine of 1984. According to de Waal (1997b: 115), the "principal cause of the [Tigray and northern Wollo] famine was the counter-insurgency campaign of the Ethiopian

army and air force in Tigray and north Wollo during 1980-85." Among the strategies of this campaign were "the bombing of markets in rebel-held areas; restrictions on movement and trade; the forced relocation of population; and finally the manipulation of relief programs" (117). This exacerbated the drought and harvest failure that was affecting the region. Yet the popular perception of the famine at the time of the BandAid rock music fundraising extravaganza was that the famine was a purely natural disaster. De Waal (1997b: 122) describes the famous 23 October BBC broadcast as "an appeal to an idea of famine as something simple, huge and apocalyptic and above all beyond human agency." Yet it clearly had a major political—and intentional—component.

A less stark version of this hypothesis is that natural disasters will take a larger toll on politically marginalized groups. Mustufa (1998) provides a case study of this hypothesis with respect to flood hazard in Pakistan. In the study village of Qatalpur, poorer landowners inhabited the "inundation zone" (298) while wealthier landowners occupied higher ground. This, of course, could be a function of property values, as poverty necessitates tilling cheaper land. Yet there do seem to be causal elements as well: when the spillway was constructed in 1962, it was diverted precisely to protect the land of one of the wealthier landowners in the village, at the expense of less politically-connected farmers (297). Moreover, Qatalpur, with an organized contingent of wealthy landowners, was able to attract government relief for the 1988 flood while nearby Pindi, a mostly landless village, reported virtually no relief. Thus, the impact of floods was greater on politically weak groups for two reasons: through economic sorting, and through the management of preventative and palliative public works. As one community member said, "We are poor people, the landlords in Qatalpur are powerful people… the floods are only for us poor folks" (297).

Of course, some governments are better than others at minimizing the impact of natural hazards. With the proper government or institutional environment, even politically weak groups might still get relief.

All of these effects imply that a sufficiently callous and poor government may choose to invest very low amounts in disaster prevention, especially in politically hostile areas, to the point that after a shock hits, utility may be below $\underline{u}$, and hence this constitutes a disaster. However, we wish to argue that this becomes much more likely when the possibility of outside aid is introduced.

IV. INTRODUCING EXTERNAL HUMANITARIAN AID

In this section, the government's expenditures on disasters are distorted by the flow of international aid. We allow both the government and the aid agency to react strategically, solve the model, take some new comparative statics, and revisit the results from Section III that are affected by the outside relief.

For notational simplicity, from here on we will assume that there is only one region in the country with a population of 1. This does not change any of the basic results of the model discussed below. In this case, if there is no international aid, the government solves:

$$\max_d \ (1-p)\cdot v(\bar{u},\cdot a, I-d)+ p\cdot v(u(d), g(d)a, I-d)$$

Hence, as above, the optimal level of spending is given by the first order condition:

$$p(u'(d)v_1 + g'(d)av_2) = v_3$$

However, recall that in the presence of international aid, the above decision applies only if the government invests *d>d*(c,z)*. If it invests *d<d*(c,z)*, hereafter referred to as *neglect*, humanitarian aid will flow into the region after a disaster and raise utility up to *u(d*(c,z))*. In addition, the aid will generate revenue for the government through theft. However, recall that we assume that this aid will *not* raise the political power of the region up from *g(d)*. This means that the government is now solving the following problem:

$$\max_d \ (1-p)\cdot v(\bar{u}, a, I-d)+ p\cdot v(u(d), g(d)a, I-d) \text{ for } d \geq d^*$$

$$(1-p)\cdot v(\bar{u}, a, I-d)+ p\cdot v\left(u(d^*), g(d)a, I-d+\frac{z}{(1-z)(1-c)}(d^*-d)\right) \text{ for } d < d^*$$

The first order condition in the neglect case (*d<d**) is:

$$pg'(d)av_2 = (1+ p\frac{z}{(1-z)(1-z)})v_3$$

However, if a<0, in the neglect case the government chooses the corner solution *d*=0[11] and receives:

$$(1-p)\cdot v(\bar{u}, a, I)+ p\cdot v\left(u(d^*), g(0)a, I+\frac{z}{(1-z)(1-c)}d^*\right).$$

The aid distorts the central government's investment decision for *d<d** in two ways. The first is that the marginal impact of additional investment on social welfare is zero, since the outside agency is guaranteeing *u(d*)*. Secondly, lower investment levels actually lead to *higher* government income in the case of disaster, due to increased theft. We will now show how these two distortions increase the chance of neglect, and hence of disaster.

Proposition 5 *(The bailout effect)*: The lower the global threshold of social welfare required for the humanitarian to enter (that is, the lower the level of *m*), the greater the chance of neglect, and hence of disaster.

[11] This is discussed further in Proposition 8.

Proof: this follows immediately from analyzing the government's payoff in the case of a disaster with international assistance:

$$v\left(u(d^*), g(d)a, I - d + \frac{z}{(1-z)(1-c)}(d^* - d)\right)$$

Recall that *d**, the level of spending by outside relief, is decreasing in *m*, the aid agency's floor of marginal utility on relief spending. This means that as *m* decreases, the payoff to any level of neglect ($d<d^*$) increases. This increases the chance that neglect is the optimal strategy.

This relatively simple application of moral hazard is similar to other literature, from financial crises (Fischer, 1999) to insurance (Shavell, 1979). Essentially, the bailout effect is the following: if prevention is costly and relief is free, governments will under-spend on prevention. This is not to say that there will be no spending on floodplain management or on making sure that buildings are built to withstand earthquakes, but rather that at the margin, fewer dollars will be spent on preventative activities than would be the case in the absence of free humanitarian relief.

This distortion has been noted in the disaster literature by Cuny (1983), in this case describing the incentive effect of humanitarian relief on the government's own relief activities:

> Highly publicized relief efforts in recent years have led many countries to expect similar efforts in their behalf should a disaster strike. Often countries or communities that are perfectly capable of dealing with a disaster themselves postpone taking effective action until they determine what aid they might receive. In some cases, governments and local agencies have advised people not to do anything because it might make them ineligible for disaster benefits. (100)

As Cuny points out, the expectation of international aid can delay the government's own spending on disaster mitigation.

One salient example in the United States is the farming of flood-prone areas. The government provides extremely generous flood insurance and, on top of that, disaster payments to the tune of US$6 billion in 1998 and $8.7 billion in 1999 (Grunwald, 1999: A1). Proposition 5 says that, in this case, when farmers get reimbursed for their losses in disasters, they take fewer preventative measures to limit damage. For this reason, the Department of Agriculture proposed expanding the coverage of insurance in 1994, a policy that was "aimed at ending the practice of many farmers who decline to buy insurance but collect the disaster payments routinely provided by Congress" (Quint, 1994). Yet in 1998, President Clinton introduced a disaster relief package by noting the lack of insurance coverage: "Far too many farmers don't have crop insurance at all, or only but the bare minimum—not enough to withstand a really devastating year" (AP 1998).

This payoff scheme not only results in under-insurance, but in over-farming of marginal areas. According to Minnesota Department of Natural Resources employee Kevin Lines, "People say, shoot, I can get my insurance for almost nothing, I might as well farm every square inch I've got" (Grunwald, 1999). An example of Minnesota farmers illustrates this point:

> Jackie Simmons and her husband used to collect crop insurance payments for their corn and soybean farm after almost every annual flood of the Minnesota; they used to joke that they only needed to harvest one crop out of three to break even. (Grunwald, 1999: A1)

It is clear that the Simmons would not be farming that particular land were it not for the emphasis on relief rather than prevention.

The bailout effect is not limited to the free-spending US Congress. Ethiopia, a nation that regularly makes headlines for famine threat, is another classic example. Because relief aid is forthcoming for the perennially food-insecure country, it can delay reforms that seek to address the underlying issues of food security.[12] Demands for relief have begun to sound like a broken record:

> As Ethiopia faces a possible repeat of the 1984-85 famine when at least 1 million people died, relief officials are scrambling for aid. At least 8 million Ethiopians are likely to face hunger or starvation this year, the United Nations said. And the warning signs that appeared in 1984 are showing up once again. (Kriner, 2000)

> Ethiopia's prime minister, Meles Zenawi, said that his country faces a famine even more destructive than the disaster of 1984 which so appalled western television viewers. (Economist, 2002)

> Ethiopia is heading towards one of its most serious famine crises for decades. The situation is potentially even worse than 1984 when one million Ethiopians died, and has been exacerbated by armed conflicts in the region. (CORD, 2003)

The availability of food aid means that the Ethiopian government does not need to stake its political future on solving the food insecurity problem. Certainly, it needs to expend some resources to improve the situation, yet resources that would have been spent on alleviating the structural causes of hunger in the absence of global humanitarians are freed up for other purposes. As de Waal writes, "one of the oldest arguments against aid" is "that it acts as a subsidy for inept central planners" (1997a: 626). The same might well be said for democratic governments in the face of natural disasters.

However, for the bailout effect to apply, governments must be suitable candidates for the international humanitarian apparatus. The bulk of relief aid originates from western governments and their citizens, but their compassion does not reach all areas of the globe equally.

Corollary: Pariah states that are not bailed out by international organizations will invest more in disaster prevention.

[12] Reforms have been implemented, especially following the 1984 famine and overthrow of the military regime in 1991 (Thurow, 2003; Economist, 2002). Thurow (2003) argues that the reforms focused on output and neglected issues of storage, distribution, and insurance. Interestingly, 2001—the only recent year not mentioned in the quotations—was a bumper year but as a result of the quantity produced, grain prices plummeted below production costs, so less area was planted the following years.

Proof: Consider a state that invests only $d<d^*$ due to the distortions imposed by international assistance. In the absence of this assistance, there are no distortions and hence it will instead choose its otherwise optimal level of $d>d^*$.

In essence, this corollary states that if a country will be left out to dry in the event of a shock, its leadership will take the necessary precautions to prevent it from becoming a disaster. Moreover, should it become a disaster, politicians will not dally in administering relief. We are not aware of this point having been made previously in the disaster literature.

We illustrate this point by looking at two key pariahs in the latter half of the 20th century: Libya under Qadhafi and South Africa under the Apartheid regime.[13] Since Qadhafi came to power in 1969, Libya has had only one natural disaster recorded in the OFDA/CRED database.[14] This flood occurred in 1995 when troubles with the "great man-made river" water pipeline caused US$42 million in damages. The pipeline had been insured. In contrast, Algeria (albeit with a population six times as large) had 43 natural disasters over the same time period, with a total of 4300 deaths and $US5.6 billion in damages. Even the wealthy Tunisia (with a population twice as large as Libya's) had 11 natural disasters leading to 828 deaths and over US$400 million in damages.

In South Africa, the Apartheid regime was an international pariah between the UN vote on sanctions in 1962 and early 1990 when then-President F.W. de Klerk freed Nelson Mandela from prison and lifted restrictions on opposition groups. During this time period, 808 people were killed from natural disasters in South Africa. From March 1990 through the end of 2002, 920 people were killed. This occurred against a backdrop of 1.2 million deaths in Africa from natural disasters between 1962 and 1989 inclusive, and 95,000 deaths between 1990 and 2002. In other words, while Africa as a whole reduced the mortality from natural shocks by over 90 percent, South Africa—no longer a pariah state—increased its mortality from disasters by 10 percent.[15]

International aid does not only free up government resources for other purposes; it may also be used as a source of income that can be tapped into strategically.

Proposition 6 (*The racket effect*): the possibility for theft of humanitarian relief may increase the ex-ante severity of the disaster.

[13] These statistics are candidates for measurement bias, as pariahs also have incentive to underreport damages and deaths to their own population, leading us to overestimate the reduction on disasters that pariah status implies. For such a reason we chose not to conduct formal econometric exercises. Sudan and North Korea are also notable pariah states which have had devastating natural disasters. In the case of Sudan, the disasters are likely due to the political effect, to be described in the next section. With North Korea, the famine beginning in 1995 has been an embarrassment to the country, and the North Koreans have found it very difficult to receive food aid, especially from the US (BBC Monitoring 2003). Yet the costs to North Korea of admitting outsiders to distribute the aid may be higher than the costs of the deaths.

[14] All figures for disasters, unless otherwise noted, are from the OFDA/CRED database.

[15] Even this comparison is biased against finding a pariah effect due to the political effect: during Apartheid, South African leaders had internal enemies whom they wished to punish or, at the very least, ignore.

Proof: recall that when a disaster strikes and the government is in the neglect region ($d<d^*$), income *rises* by

$$\frac{z}{(1-z)(1-c)}(d^*-d)$$

Since governments care about income, this raises the chance they will want to neglect.

In essence, Proposition 6 is a very strong version of the bailout effect. Whereas the bailout effect concerns a costless cure that lowers prevention, the racket effect deals with a cure that is not only costless, but may in fact be profitable. This not only reduces prevention, but may lead to deliberate negligence on the part of the government in allowing natural shocks to become disasters. At the extreme, leaders can create disasters in order to attract humanitarian aid to steal, as a quotation from an American aid worker in West Africa attests:

> A Liberian warlord said to me one day, "I can starve a village until the children die, and then you will come with food and medicine which I will take, and no one can do anything about it." (Montalbano, 1997: A1)

But more subtle forms of the racket effect are possible as well. During the humanitarian crisis that occurred as a result of the 2001 war in Afghanistan, the Taliban imposed a tax of US$32 per metric ton brought in by UN World Food Program convoys (Boston Metro, 2001: 4). In Somalia at the height of the famine, warlords charged relief agencies US$30 per metric ton to keep their food in the port while waiting for safe escorts into the country (Lorch, 1992). Earthquake aid to Nicaragua in 1972 was diverted to the Somoza family (Albala-Bertrand, 1993: 191).

This observation, that the potential siphoning of relief can drive incentives of war makers, has been heavily noted in the literature on humanitarian aid during the last decade (Duffield, 2001; Anderson, 1999; Marren, 1997; African Rights, 1994). However it has not yet been applied to regular governments in their prevention and mitigation of natural disasters. As noted in the humanitarian literature, war makers can steal some of the aid resources to further their military aims. Thus the provision of aid in a conflict situation when aid gets stolen can be somewhat of a dilemma: aid may reduce suffering but at the same time further the conflict. In contrast, lootable aid cannot further a natural disaster ex-post, but—as our model implies—it can provide distortionary incentives against disaster prevention and own-mitigation ex-ante. Indeed, our racket story may have as much in common with Akerlof, Romer, Hall, and Mankiw's (1993) looting model of bankruptcy for profit. The racket effect will not affect all governments equally, however.

Corollary: Poorer governments react more strongly to the racket effect.

Proof: poorer governments have a higher marginal utility of income.

Simply through diminishing returns, richer countries will be less tempted by the potential for aid racketeering. It is quite a severe policy to require suffering of one's own population in order to get income and foreign exchange, and only the most desperate of governments with the highest

marginal utilities of income would be willing to go to such lengths. Those governments, quite simply, are the ones with virtually no other source of income.

The classic government that fits this description is not a normal member of the international system that can tax its subjects, levy import duties, and appeal for international loans and aid, but rather a rebel government that—barring the presence of mineral resources or a strong diaspora—must rely on a weak and exhausted local tax base and income from taxing humanitarian relief. This factor should contribute to the observation that famines and drought seem to characterize rebel-held areas in civil wars, especially wars that are not over mineral resources. For example, the south of Sudan is a perennial client of the World Food Program, and Somalia's barren war of the early 1990s featured the manipulation of humanitarian aid as a prominent feature of the conflict (Peterson, 2000).

The racket effect and the political effect can have dangerous interactions: if the central government can not only profit from the humanitarian relief, but also harm its enemies, it will be even less likely to invest in disaster preparedness. Yet if the relief bypasses the central government and goes straight to the needy population, the benefits of disaster are reduced.

Corollary: When aid is provided locally, the racket effect is diminished.

Proof: we interpret locally provided aid as a decrease in *z*, and so the theft received in the case of a disaster is lower.[16]

If governments can reap profits from disaster assistance, they face weaker incentives to prevent disasters. Yet if the aid bypasses the government and is provided locally, the government cannot loot the aid, and the racket effect is weak to nonexistent. The delivery of aid—centralized or local—also interacts with the political effect, as aid directly to an opposition area can weaken the government's power and thus its incentives to allow disasters to occur in politically hostile or disempowered areas. On the surface, this seems sensible from a theoretical standpoint, yet an unlikely concern on the ground. However, the history of disaster assistance and humanitarian aid is rife with examples of the central government benefiting from local disasters and having strong preferences over geographical patterns of disaster relief.

A particularly egregious example of this occurred in Burundi during the majority Hutu revolt against the ruling Tutsi in 1972. While this case is not a natural disaster, the starkness of the geographic element of relief nonetheless illustrates the dynamics of centralized versus decentralized aid provision. After the Hutu revolt began, the Tutsi-controlled government "undertook a systematic purge of those Hutu still in government, the administration, and the armed forces" and vengeance "extended to most Hutu with any education at all" (Weinstein, 1975: 6). A quarter of a million people are estimated to have died, and the bloodshed drew the world's attention to the need for humanitarian assistance. According to Weinstein:

> [T]he government of Burundi requested humanitarian aid only for what it designated as the officially stricken areas of southwestern Burundi and for the capital city of Bujumbura. It also

[16] Of course, if the aid is then stolen by local authorities sympathetic to the central government, such actions might diminish this effect.

> turned down certain assistance offers, arguing that it could take care of the emergency though itself "stricken." Instead Burundian officials sought long-range rehabilitation and reconstruction for the official "disaster areas." (1975: 6-7, quoting an August 1972 press release from the Burundian mission to the United Nations.)

It is not surprising that the "disaster areas" were important Tutsi constituencies, and that the Burundian government was not willing to let humanitarian relief agencies deliver aid independently of the official government relief wing.

The centralization of disaster relief need not be limited to genocide. In the Ethiopian famine of 1984, the Ethiopian government denied relief to non government-controlled areas in addition to abusing the relief under government control (de Waal, 1997b: 120). Humanitarian agencies are not blind to these phenomena. An optimizing agency, facing constraints of funding and manpower, can decide how to allocate its relief when some operations are more prone to theft than others. The impact of the agency's strategizing on the severity of disasters, however, is unclear: on the one hand, the disaster may be worse if the government needs to create a larger disaster to siphon off the same amount of aid; on the other hand, the disaster may be smaller if the costs to the government in stealing aid become too high for the gains that they confer.

Proposition 7: When humanitarian aid is responsive to theft, the impact on the severity of the disaster is ambiguous. However, the more "desperate" the need for aid is, i.e., the greater the curvature of the utility function of individuals affected by a disaster, the more likely governments will gain from choosing high levels of theft, and hence the more attractive is neglecting a given region.

Proof: first we need to consider the impact of increasing z on the total level of theft. Recall that d^* is defined by

$$(1-c)(1-z)u'(d^*) = m$$

This implies that

$$\frac{\partial d^*}{\partial z} = \frac{1}{(1-z)} \frac{u'(d^*)}{u''(d^*)}.$$

Let $\gamma(d^*) = -\frac{u''(d^*)}{u'(d^*)}$ (the curvature of the utility function at d^*). Then we have

$$\frac{\partial d^*}{\partial z} = -\frac{1}{(1-z)\cdot\gamma(d^*)}$$

This means that if the curvature is high (which usually would occur when d^* is low), i.e. if a small decrease in aid will result in a large decrease in welfare, then the total aid given will not suffer much from an increase in theft, as international organizations cannot pull back much without severely hurting the local population. In contrast, if d^* is initially very high and the

curvature is low, then a small increase in z may result in large cutbacks from the outside aid agency. This implies, interestingly, that the threat of pullouts by the international organizations is more effective when the local population is less vulnerable to the resulting cutbacks.

Now we must calculate the impact of in increase in z on the welfare of the central government. Assume for simplicity that $a<0$ and that the total neglect strategy (d=0) has been adopted. Then utility before was:

$$(1-p)\cdot v(\bar{u},a,I)+p\cdot v\left(u(d^*),g(0)a,I+\frac{z}{(1-z)(1-c)}d^*\right).$$

Taking comparative statics with respect to z yields:

$$p\cdot\left[v_1u'(d^*)\frac{\partial d^*}{dz}+v_3\frac{1}{1-c}\left(\frac{z}{1-z}\frac{\partial d^*}{dz}+\frac{1}{(1-z)^2}d^*\right)\right]$$

substituting we have

$$\begin{aligned}
&p\cdot\left[-v_1u'(d^*)\frac{1}{(1-z)\cdot\gamma(d^*)}+v_3\frac{1}{1-c}\left(-\frac{z}{1-z}\frac{1}{(1-z)\cdot\gamma(d^*)}+\frac{1}{(1-z)^2}d^*\right)\right]\\
&=\frac{p}{(1-z)^2}\cdot\left[-v_1u'(d^*)\frac{(1-z)}{\gamma(d^*)}+v_3\frac{1}{1-c}\left(-\frac{z}{\gamma(d^*)}+d^*\right)\right]\\
&=\frac{p}{(1-z)^2}\cdot\left[v_3\frac{d^*}{1-c}-\left(v_1u'(d^*)\frac{(1-z)}{\gamma(d^*)}+v_3\frac{z}{\gamma(d^*)}\right)\right]
\end{aligned}$$

This means that increasing theft will benefit the central government on the intensive margin (it gets more of every dollar given) but hurts it on the extensive margin (less aid is given) as well as by decreasing the social welfare of its citizens. To simplify the analysis, assume that it does not care about social welfare at all, i.e. v_1=0. Then it will increase z on the margin as long as

$$\frac{d^*}{1-c}>\frac{z}{\gamma(d^*)}$$

If d^* is already low, and hence the curvature of utility is high, then this is quite likely. This is a familiar vicious circle effect, where the government will attempt to steal more and more, knowing that aid agencies will not give up as the marginal value of money getting through keeps getting higher and higher.

To summarize Proposition 7, if the agency is allowed to vary the amount of aid it supplies according to the government's theft level, the government may do one of two things. One, in a vicious circle, the government may steal a higher percentage of aid delivered and shrink the amount of aid that actually reaches beneficiaries. Two, the government may steal less to bring in

more aid, and though the total aid stolen may be smaller than in case one, the government will benefit from the aid reaching its population, as they may be less likely to revolt. These two options of the government result in different levels of severity of the natural disaster. In the first case, mitigation of the disaster is small, and the impact of the shock is greater. In the second case, the mitigation efforts are larger, with a reduced severity of disaster. Since we have assumed a racket effect in both cases, there is probably little effect on the level of prevention.

The literature on humanitarian aid in conflict situations is very sensitive to the possibility of aid getting stolen and misused for purposes far more nefarious than being sent to Swiss bank accounts. Recent works by Anderson (1999), Lautze (1997), Prendergast (1996), and others have explored operational frameworks to minimize the potential of theft and misuse of relief in conflict. Yet the potential for theft also exists in natural disaster relief, which in turn may affect the severity of the disaster.

Proposition 8 (*the political effect revisited*): In the presence of aid it becomes much more likely that politically hostile regions will be completely neglected by the central government.

Proof: as in Proposition 4, the government spends less on regions with low (or negative) political power. This increases the chance that neglect is the optimal strategy. When the government determines that neglect is optimal, the only reason it spends anything on disaster prevention is to assist its political allies in the region. In the absence of this constraint the government is free to choose $d=0$ to maximally damage its regional opponents.

The February 2004 earthquake in Morocco is an example of neglect in the presence of aid. The earthquake struck a predominantly Berber area of northern Morocco that "had been neglected by the government for decades after a rebellion in 1960" (AP, 2004). The region had poor road access, hampering relief efforts; most of the buildings were mud-brick and were not designed to withstand earthquakes (BBC 2004a). Within two days, residents staged a protest calling attention to the government inaction. A BBC reporter quoted one Moroccan in the protest:

> Look around and you see the aid coming in—from France, from Spain, America, so many countries… But where is our government? What is Morocco doing to help itself? (BBC 2004b)

And Morocco is not unique in having earthquakes hit opposition areas: the 1972 quake in Turkey struck a Kurdish area that had been promised, but not provided, earthquake-resistant housing before the earthquake (Albala-Bertrand, 1993: 134).

V. POLICY IMPLICATIONS

In Sections III and IV we described how the political economy of natural disasters can lead to different severities of disaster from the same natural shock. By pinpointing the mechanisms through which incentives can lead governments to allow, or encourage, disasters to occur, we are also able to identify both general and specific policies that may reduce this unnecessary human loss.

Our general suggestions are fourfold: invest in prevention, decentralize relief, encourage political development, and reward non-disasters. First, prevention: This stems from the moral hazard

problem that free relief generates. If the international community is willing to give relief to poor countries that have natural disasters, it should also recognize the perverse incentives this relief confers on the governments of poor countries. Wealthier nations should not expect optimizing governments to spend as much on disaster prevention as they ought to, given that they get bailed out in the event of a crisis. Thus, if we are going to offer free relief, we should also offer free prevention. There is already a massive base of knowledge on disaster prevention and preparedness, with multiple journals dedicated to just that.[17]

Second, decentralization of relief: This can combat both the political effect and the racket effect. If governments know that the affected area will get direct relief, the political benefits of a disaster are reduced, as the opposition population is less damaged. Moreover, the racket effect will be reduced, since the government can no longer gain financially from the assistance.

Third, political development: As governments become more responsive to their population, and as intrastate conflicts are fewer, the severity of disasters will naturally fall. This, in addition to the improved technology of disaster prevention and mitigation, is probably responsible for the dramatic fall in deaths from disasters over the course of the 20th Century. This is yet one more reason to work towards better and more accountable states.

Fourth, reward non-disasters: With the current institutions of relief, and through the racket effect, governments get financially rewarded when they have disasters. In other words, additional payments come during "bad times" while nothing happens during "good times." In this article, we have argued that governments can affect the probability of bad times that are triggered by natural shocks. Optimally, governments would get rewarded for good times; such an aid mechanism is not hard to imagine. Governments of poor countries already receive large amounts of foreign aid. Some fraction of that could be automatically withdrawn in the event of a high-mortality natural disaster. Or, governments could be given a good-behavior payment in addition to the aid they normally receive, inversely proportional to the deaths from natural disasters.

We translate these general institutional suggestions to ten specific policy suggestions for non-governmental organizations that offer disaster relief, humanitarian assistance, development aid, and refugee programming.

1. *Recognize that natural disasters are never 100 percent natural.* When people die from natural shocks, it is because their government allowed the risk they faced to become potentially lethal. Look for the political incentives that created the situation.
2. *Recognize that natural disasters in conflict zones are even less natural.* Poor rebel governments in conflict zones have the strongest incentives to allow, or encourage, natural disasters. Such disasters require political solutions, not extra food. If you are only in the business of providing food, lobby your donors to take political action.
3. *When encouraging political accountability, include disaster prevention and response*. Local people may view famines and earthquakes as completely natural phenomena which can exacerbate the incentive problems of their governments' under-spending on disaster.

[17] This may even extend to human-made disasters. If humanitarian organizations are willing to offer relief for conflict, they should also offer conflict prevention activities during peacetime, so that the incentives to go to war (made easier by having someone else to take care of your civilians) are counterbalanced.

Democratic governments also tend to focus on high-visibility relief which may be less effective than preventative spending on irrigation, road access, flood plain management, and building codes.

4. *If you offer natural disaster relief to a country, conduct preventative activities in those regions neglected by the central government*. It is your relief which, in part, leads to that neglect. Be sure to structure your disaster prevention activities such that they are not appropriated by those sympathetic towards the central government in countries with regional conflict.
5. *Stipulate that governments match your disaster relief with their own resources.* This will discourage a dependency on external aid, both from the bailout problem and from a logistical crowding-out problem whereby governments cease to invest in relief infrastructure and capability.
6. *Be extremely wary of theft of natural disaster relief.* Theft can occur even in non-conflict situations. When governments can steal relief, this is not only immoral in itself, but can lead to worse disasters. Minimizing theft reduces the incentives that governments face to create disasters.
7. *When the humanitarian situation is desperate, be doubly cautious with respect to theft of relief.* In desperate emergencies, governments face higher returns to theft. The less they can steal, the reduced incentive they have to allow desperate situations to occur.
8. *Whenever possible, provide aid locally.* Central governments will often try to command control of the distribution of relief that you are offering. This is a sign that their ideal distribution of relief follows political, and not simply humanitarian, patterns. Local provision of aid can be just as political, so when we say "local" we mean bypassing powerful political structures.
9. *Pay attention to the environmental risks of refugee or IDP camps.* It is understandable that governments will want to locate refugee camps in worthless areas to leave safer and more fertile regions for their own populations. If you are administering such a camp, do not be "surprised" by natural disasters, but instead spend on prevention. If, even after preventative spending, the camp is located where humans ought not permanently inhabit, discourage it from becoming permanent villages. It may not be wise to subsidize concrete housing, for example: those families would rather have the cash to move once the security situation allows.
10. *People displaced by natural disasters are probably not fleeing the disaster itself.* Rather, they are fleeing the conditions that allowed the shock to become a disaster in the first place. The natural disaster may simply be the straw that broke the camel's back—the catalyst that prompted the flight to occur.

VI. CONCLUSION

Though seismic activity, typhoons, tsunamis, and rainfall may be "acts of God," the impact of their force on a population is certainly non-random. As maximizing agents choosing the optimal level of disaster prevention and mitigation, governments are able to affect the human outcome of natural shocks. And with an eager, competent international relief ready to step in to help poor countries in the aftermath of disaster, the strategy of governments becomes increasingly complex.

Yet a simple rational-actor model delivers reasonable predictions on the severity of disasters. Through the bailout effect, the presence of free relief increases the ex-ante severity of disasters, an effect that is lessened for pariah states. Through the political effect, areas that are worst hit by natural disasters tend to be in opposition-friendly or politically disempowered regions. Governments that are more sensitive to the welfare of their populations and/or are concerned about large disasters leading to their overthrow will invest more in disaster-reducing technologies. Finally, through the racket effect, if governments can steal some of the relief, they will work less hard to prevent disasters, and may in fact provoke them. The racket effect is larger for poor governments and smaller when aid is provided locally.

Since disasters are hardly "natural" at the margin, the results of this paper can be extended to human-made disasters such as chemical explosions and outright rebellion. It is no coincidence, then, that peripheral rebellion or lawlessness tends to occur in opposition-friendly areas. The conflicts in Uganda point to this possibility: while a brutal uprising has been occurring in the north (the home region of former President Obote) for nearly two decades, attracting millions of dollars in humanitarian and military aid, insurgencies in the west—a region friendly to the Museveni government—get rapidly quelled. Likewise, it should not be surprising that the last technological disaster to kill 1000 people in North America or Western Europe was the Halifax explosion of 1917, whereas in each of the developing regions of Africa, Latin America, and Asia, technological disasters of that scale have occurred since 1990. After all, the countries do not need to pay for the relief, their constituents are less politically powerful, and they might even make a dollar or two from all the commotion.

The catastrophic floods in then East Pakistan that opened this paper characterize eerily well the political economy of natural disasters. The central government did nothing to prepare for or mitigate the damage, leaving that work to the international community. The disaster occurred in the most politically-hostile region of Pakistan—so hostile that it would soon successfully rebel to become Bangladesh, due in no small part to the severity of the disaster—and the government actively held up relief efforts by the international community. Finally, the government used relief materials for its own military campaign against the population.

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