

Impact and Recovery from Natural and Human Made Disasters: Literature Review

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1 Introduction

The economic impacts of natural disasters have received relatively little attention in the economic literature. Part of the reasons were pointed out by Tol and Leek [38]:

1. Disasters strike in different places (with different characteristics) and are unique in the way they impact a different place;
2. Damages of disasters are hard to measure, because disasters often affect poor areas and because people have other things in mind after a disaster;
3. The largest economic impact is on stock variables (capital and labor) while economic indicators measure flows.

Furthermore, the issues pertaining to the economic impact of natural disasters are similar to those of business cycles and risk aversion and insurance.

In a literature review, Skoufias [36] addresses questions (and answers) related not only the economic impact of natural disasters, but also of economic crises. Here we will look at:

1. Does the economy return to the previous growth path, or does it move to a new growth path? What are long term consequences?
2. What are the coping strategies of households? What problems arise after the natural disaster? What are the medium term issues that should be addressed?
3. What are the psychological impacts of a natural disaster, for how long do they persist, and how are different people affected?

In the following sections we will try answer some of these questions. In section 2 we look at the long term impact of disasters, in section 3 we analyze issues that may arise following a disasters, in section 4 we will address the psychological impact of disasters and section 5 is the conclusion.

2 Long-term impact

Dacy and Kunreuther [9] were the first to bring economic methods to the analysis of natural disasters. They also were the first to put forward the hypothesis that economies may benefit from a natural disaster through the introduction of new technology. Okuyama [27] puts their argument in a modern framework by using a Solow model to show that the introduction of new technology would lead to a slightly slower recovery and a new, higher, stable equilibrium. Miguel and Roland [25] arrive at a similar conclusion in a Ramsey framework, and test it by looking at the US bombing of Vietnam. Their results show that, after 30 years, there were no significant changes in the differences in poverty rates between regions, excluding urban areas and north Vietnam, suggesting that there is no new equilibrium. According to the authors this is because most of the bombing where in rural areas (affecting mainly agriculture) which recovered naturally with time; North Vietnam also used some strategies to avoid damage to the physical capital that did exist, there was massive post-war reconstruction effort; the population displacement was only temporary; and the literacy campaigns during the 60's and 70's also helped in the reduction of poverty. More interestingly, they found that the regions more heavily bombed by the US had, 30 year later, more access to electricity, a sign o technological "leapfrogging", perhaps as a result of the infrastructure investment during the 70's, 80's and 90's directed at more affected regions. When Davis and Weinstein [10] looked at the impact of the US bombing of Japan in World War II on the regional distribution of population they find that is has not change significantly, with most cities recovering after only 15 years. Even the hardest hit cities, such as Hiroshima (20% of population immediately died) and Nagasaki (8% of population immediately died) recovered to their pre-war trend in 30 and 20 years respectively. Skidmore and Toya [35] on the other used a panel of 89 countries from 1960-90, and find evidence that climatic disaster have a statistically significant impact on per capita GDP growth, though the evidence is less strong on a negative impact of geological disasters. Furthermore they find that this results comes about, not from physical capital or human capital accumulation (though this last is positively impacted by

climatic disasters), but rather from total factor productivity (also positively impacted by climatic disasters). Similarly Brakman et al. [4] and Organski and Kruegler [28], [29] found that the economic effects of two World Wars disappeared in 15-20 years.

Okuyama [27] also argue that a disaster could induce an increase in savings, as people try to restore what they had before. on the other hand, Skidmore [34] shows, using a overlapping generation model, how the possibility of natural disasters increases savings, so that areas more prone to natural disaster should have a higher saving rate to begin with. Savings should be even larger if households cannot find insurance (which is usually the case) and try to fully insure themselves. In fact, using a panel of 15 OECD countries from 1965 to 1995, the author finds that lager losses from natural disasters increase the saving rate by 0.5% to 2.8%.

Localized disasters requires a different analysis. In a model of a mature urban economies, where households bid for higher land prices and/or local lower wages to locate in a place with certain amenities, while firms bid for more attractive sites in both land and labor markets and together they determine land prices and wages for a given level of amenities provided by a location. When a disaster hits a city, the destruction of the city's amenities may lead to the migration of people and businesses out of the city. For this reason Bram, Haughwout and Orr [5] in their study of the economic impact of the September 11th terrorist attacks on New York, try to determine what was behind the city's growth in terms of earnings and employment for 1995-2000, by splitting it into: industry mix (what the growth would be if local growth matched national growth in each industry); and local factors (performance of local industries compared with national counterparts - city growth not explained by industry mix). They find that growth in New York has been driven by industry mix (with a high concentration of securities industry of high growth and apparel industry which is a shrinking industry nationally), with local factors contributing negatively. For this reason, the authors argue, by looking at the national job growth estimates, that the city will continue to grow, if the terrorist attacks did not significantly change local factors.

In a attempt to estimate more precisely the impact of a natural disaster on economic activity Rose and Guha [31] use a Computable General Equilibrium model to determine of the effects of a loss of electricity supply due to an earthquake, on other activities in Shelby County (TN). Using different elasticities between the different types of labor, capital and other inputs to simulate different time frames, the authors find that their results allow too much substitution of inputs by capital and labor, when compared with

the Social Accounting Matrix, as well as a large increase in the price of electricity and a large decrease in the use of electricity by final users.

3 Coping strategies and potential problems that may arise from a disaster

One of the first questions that must be answered is how do people cope with the sudden drop in income after a disaster. Looking at the 1998 floods in Bangladesh Dorosh et al. [11] find that households were more likely to borrow money for food (increasing their total debt to 150% of their current monthly expenses), with most loans coming from family and neighbors, rather than NGOs, commercial banks and local money lenders, which charged higher interest rates. Surprisingly the second most likely coping strategy was the disposal (consumption and/or selling) of asset (mostly chickens and cereals), perhaps because those more severely affected by the floods had lost more assets to begin with. Finally some people also changed their eating habits by either reducing the number of meals eaten or go whole days without eating (less frequent if they had access to NGOs and government help); or relied on less preferred and less expensive food; or limited portions at meal times. A similar study by McKenzie and Schargrotsky [23] looks at the impact of the Argentinean crises on the shopping pattern of household and find, as expected, that people not only switched to less expensive substitutes, but also increased the time they spent shopping and also increasing the number of shops they used.

The impact on income, and therefore consumption, either because of the destruction of assets or because of the death of a parent, is important as it can have lasting effect on children. For instance, Hoddinott and Kinsey [21] look at the effect of the 1994-95 drought in Zimbabwe on children's height growth from 1993-97 and find not only that children less than 2 years old grew slower that year, but also that they never caught-up in terms of height. This is even more worrying as Thomas and Strauss [37] showed that children experiencing slow height growth have slower progress through school and also lower earnings in adulthood. Evans and Miguel [14] use surveys made at 75 primary schools from 1998 to 2002 (multiple observations per year) in one of the poorest regions of Kenya and find that the death of parents has a large impact on the schooling of children, with participation rates declining an average of 5% after a parent's death (higher rate for girls, young children and poor performers at school), though children are partially insured against such an event by social networks (orphans are usu-

ally adopted). Furthermore, these social networks do not seem to collapsing even in regions with high levels of orphans (due to AIDS), for there is no significant difference in school participation in areas with large amount of orphans when compared with those with less.

On the other hand, if one of the children in the family dies as a result of a disaster, then we can have an increase in the schooling of the remaining children (que quantity-quality trade-off first hypothesized by Becker and Lewis [1] and Becker and Tomes [2]). There have been several studies on this with mixed results. A recent study by Qian [30] uses the regional and time variations in the relaxation of China's One Child Policy, which allowed families to have a second child if the first child is a girl, to instrument for family size and finds that the relaxation increased family size for first born girls and that an additional sibling increased school enrolment of the first born child by 18-20% on average (consistent with a model of fixed costs in education).

As people suffer a large income shock there the possibility of violence and uprisings. Miguel [24] for instance finds in poor areas of Tanzania that extreme rainfall, which leads to large income drops, increases the number of 'witches' (old women, usually widows) killed, in particular in villages that practice traditional religions, though there is no increase in other forms of crimes. His results are in line Dreze and Khera [12], who links murders and socioeconomic measures across Indian districts. Similarly, Miguel, Satyanath and Sergenti [26] use change in rainfall variation as an instrument for economic growth in 49 African countries and find that current and past economic slumps increases the possibility of civil conflict, while democracy, religious and ethnic fractionalization and percentage of the country that is mountainous (which helps maintaining an insurgency) are found not to be statistically significant, implying that economic factors are more important to civil conflict than political grievances. Their results are in line with Collier and Hoeffler [6], [7], [8], (which also finds natural resource dependence, lower male enrollment in secondary education and rebel military advantages positively affects civil conflict) Elbadawi and Sambanis [13] (though they had found a positive effect of ethnic fractionalization and a negative effect for democracy) and Fearon and Laitin [15].

Following a disaster, generally, there is government and even NGOs intervention in the most affected areas. This allows for the possibility of different forms of corruption at the different stages of this intervention. For instance Garrett and Sobel [16] find that between 1991-99 in the US, states that were electorally important for the president (where his chances of reelection are near 50%) had a higher rate of presidential disaster declaration (strictly up

to the president), in particular during election years, while having a governor of the same political party as the president had no significant effect. Furthermore, the Federal Emergency Management Agency (FEMA) gave higher amounts of disaster relief if a state had more representatives on its oversight subcommittees (in particular House subcommittees rather than Senate subcommittees, possibly because House members have a higher percentage of their constituency impacted by a disaster) and higher compensations in general during election years. In the same line, Besley and Burgess [3] present a model in which government's response to shocks should be greater where information flows are more developed as this enables vulnerable citizens to monitor politicians and penalize them for not responding to their needs, and also where political participation is greater as this increases the likelihood that citizens will punish unresponsive incumbents. The authors find that, in India (1952-92), the total amount of food grain per capita distributed via the public system (government responsiveness) had a strong correlation with newspaper circulation per capita, turnout in state elections (political participation) and literacy, suggesting that media combined with literacy help citizens monitor politicians. Similarly, Kingston [22] finds a negative link between newspaper circulation and transfer frequency in the Indian Administrative Service between 1976-85 (possibly related with corruption scandals) and a positive impact of social integration (measured by riots, where more socially integrated areas have less riots, and so less government officials are forced to transfer). Finally, Gugerty and Kremer [19] looking at an international NGO program (providing organizational and managerial training, and both agricultural inputs and training) targeted at women groups' in a poor region in Kenya, find that the benefits of this program were much lower than expected (indeed lower than the agricultural inputs given), possibly because most of the aid given was appropriated by new members (both in terms of training and agricultural inputs), who joined the group after the announcement of the program (the Rockefeller effect).

4 Psychological impact

The Psychiatric Literature focuses on severe stress symptoms (which may lead to Posttraumatic Stress Disorder (PTSD), anxiety disorders, or depression) of survivors of disasters experience, as described by Young, Ford and Watson [40]:

1. Dissociation (feeling completely unreal or outside yourself, like in a dream; having "blank" periods of time you cannot remember);

2. Intrusive reexperiencing (terrifying memories, nightmares, or flashbacks);
3. Extreme attempts to avoid disturbing memories (such as through substance use);
4. Extreme emotional numbing (completely unable to feel emotion, as if empty);
5. Hyper-arousal (panic attacks, rage, extreme irritability, intense agitation);
6. Severe anxiety (paralyzing worry, extreme helplessness, compulsions or obsessions); and
7. Severe depression (complete loss of hope, self-worth, motivation, or purpose in life).

Most papers look at how a disaster increases the percentage of population with severe stress symptoms and the duration of this hike. Wang et al [39] in their study 3 and 9 months after a major earthquake in North of China (1998), where able to, at least partially, address the problem of comparing different rates of prevalence of stress symptoms when different diagnostic methods were used. The authors show that in their case the difference between DSM-IV rates of PTSD and DSM-III-R resulted from the severity of PTSD symptoms criterion in DSM-IV.

Looking at the adult population, Simeon et al. [33] find high levels of subjective distress and early dissociative and PTSD symptoms shortly after the World Trade Center Disaster, even within a group of individuals who were not all maximally affected and whose personal involvement varied greatly. Wang et al [39] show the importance of immediate relief and subsequent reconstruction support in their study 3 and 9 months after a major earthquake in North of China, finding that the more affected area (those that had received more help) had lower rates of PTSD (the less affected village did not have enough resources to repair or reconstruct its houses and reported excessive worry about possibility of aftershocks). Goenjian et al [18] find no significant difference in the percentage of individuals with PTSD, anxiety and depression when they were exposed to either extreme earthquake trauma (natural disaster) or extreme violence (human made disaster) in Armenia (1988), yet these rates were significantly higher than those of a less affected area. Furthermore the authors find that those more affected did not show improvement between 1.5 and 4.5 years after these events,

while those exposed to only mild earthquake trauma found a decrease in the number of people with symptoms, partially because those most affected did not receive help and lived with external reminders of the disasters. Finally, Havenar [20] find that 6 1/2 years after the Chernobyl disaster the psychiatric problems had partially dissipated, with people from the more affected region having similar prevalence of psychiatric problems as those from less affected areas. Furthermore, the authors find that mothers in the more affected regions suffered more psychiatric disorders.

In the case of children we observe the same patterns. Goenjian et al. [17] find, 6 months after Hurricane Mitch which hit Nicaragua in 1998, that school children of three cities affected with different degrees, had a high incidence of PTSD, depression or both, and increasing with the severity of the impact. Roussos et al [32] find a higher median incidence and more severe PTSD scores among children and adolescents in the areas more affected by the 1999 earthquake in Ano Liosia in Greece, and households that suffered higher post-disaster difficulties (living arrangement, heating, water, electricity) showed significantly higher differences in mean PTSD.

5 Conclusion

We have looked at the recent developments in the literature related with natural and man made disasters. Most studies show that in economic terms disasters have only a temporary impact (up to 30 years) returning to their previous growth trend, though regions with higher frequency of disasters have higher saving rates, possibly even higher growth rates.

There are however problems in the recovery process. Firstly, survivors face a sharp, sudden decrease in income and mostly use loans, selling assets and decreasing the amount of food consumed (or changing to lower brands) to compensate. Children can suffer lasting effects (reflected in their height) such as decreasing in schooling and lower lifelong income. Surviving siblings can benefit from more attention and resources from children. Secondly, the large increase in government spending in the affected area can lead to several forms of corruption (with preferential treatment for some), though this will be lower when politician can be put at check (because of a larger media presence and a literate population that participates in elections).

Finally, severe stress symptoms from a disaster, such as post-traumatic stress, anxiety and depression can have a lasting effect on the population, though it can be mitigated if the population is assisted by NGOs and government in the recovery process. Children are also susceptible of facing lasting

problems of severe stress symptoms.

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