

## DISASTERS AND MARKET RESPONSE

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The post-World War II era has seen an enormous output of scientific research on the mitigation and behavioral response to disasters, both natural and otherwise. Over this same period, world gross economic product has surged, sparked by the performance of market-oriented economies in the West and Far East. An attempt to blend some of the insights of social scientists on disasters with the record of market-driven economic activity is, I think, a potentially useful exercise whose findings can simultaneously inform, constrain, and enhance the role of government in disaster management.

In this paper, I will begin with a working definition of a disaster followed by an analysis of the American response, particularly that of the U.S. government, to the oil-supply disruptions of the 1970s and 1980s. The oil shocks, which have been thoroughly studied in the economics literature, readily qualify as a disaster under my definition. They also serve as a convenient reference for the market adjustments that follow an economic shock and to which a variety of government responses is possible. Finally, since the energy shocks have been the major disturbances to the post-World War II economies, it seems fitting that an economic analysis of disaster management begins with a re-examination of experience during the energy crises.

My assessment of the American government's management of the oil price shocks is not very positive in terms of either efficiency or

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equity criteria. The remainder of the paper will develop the relevance and implications of this conclusion for the government's role in a wide variety of natural and manmade disasters.

## Disasters Defined<sup>1</sup>

We take a disaster to be a loss of resource value beyond some socially specified level. For given physical quantities of resources, value is determined by the sum of prevailing individual attitudes as expressed, in the first instance, in market prices. Where prices are not available, as in the asset value of human resources, we rely on indirect market evidence such as personal income properly capitalized. In this context, market value, whether directly or indirectly observed, can be modified by political consensus, as in attaching above-market value to individuals thought to be unfairly disadvantaged or to regions having special ecological or national security attributes.

The threshold loss of resource value that constitutes a disaster is established by consensus and will incorporate a "taste" factor and tend to vary positively with national income and with the interval of time and space over which it occurs. For example, in the aggregate, 50,000 U.S. traffic deaths a year in a population of 250 million over an area of 3.5 million square miles are not usually perceived as a disaster. But several hundred deaths in a commercial airline crash are almost invariably so regarded, owing, in part, to the very brief interval of space and time over which they occur.

The time frame is relevant in evaluating planetary disasters, such as the onset of an ice age or the heating of the upper atmosphere that results from deforestation or the burning of fossil fuels (the "greenhouse" effect). If such events occur at a sufficiently gradual rate, they need not impose disaster-level resource losses in any given time period. Suppose, for example, that New York City were being flooded by a rise in sea level induced by atmospheric warming and consequent melting of the polar ice caps. It is at least possible that the city and its properties would be inundated at a rate no greater than the rate at which its structures normally depreciate. In that event, the city's physical capital could be gradually rebuilt in more viable sites without any sudden, disruptive, or severely uncompensated loss of market value.

Valuation of a resource may involve costs external to the event itself. Thus, while 50,000 annual traffic deaths may not generally be

<sup>1</sup>This section draws on material jointly developed with F. T. Sparrow.

seen as a disaster, an equal number of war casualties, even though spread over a number of years and a wide geographic area, might well be in the disaster category. Associated with war losses are possible reductions in the nation's security, prestige, economic and political viability, etc., the valuation of which must be added to the immediate loss of human life.

The existence of an associated larger cost is also relevant to the assessment of the seven deaths from the cyanide-lacing of the pain reliever, Tylenol, in 1982. The disaster lay in the potential threat to public safety, not only from Tylenol capsules that had been tampered with, but from all food and nonprescription drugs distributed on open shelves throughout the country. Similarly, the Three Mile Island nuclear plant accident in 1979, which has cost no lives then or since, became an immediate national disaster by casting a shadow of uncertainty over the safety and reliability of the entire nuclear power industry then and in the future.

Up to a hundred or more deaths occur annually in U.S. coal mining and are treated in the aggregate as a routine nondisaster event. Most of the fatalities are isolated incidents in various phases of transporting the coal. Occasionally, however, a small group of miners is trapped underground in a mine accident that becomes a media event and, indeed, a national disaster. Such episodes, of course, span a very brief interval. But a further cost, which also characterizes the loss of commercial airlines, is the expected cost increases that the companies, and perhaps the entire industry, may have to bear. A mining company whose safety record is worsening will have to pay higher wages and install expensive safety equipment; an airline whose safety level falls may also incur costs of new equipment or lose sales both for itself and the industry.<sup>2</sup>

Finally, we note that this view of disasters has its counterpart in the recovery stage. The concept of resource value is useful, since it permits the definition of recovery goals in rather specific and easily understood terms.

<sup>2</sup>Verification that this occurs in the airline industry comes from a study by Andrew Chalk (1987). He took manufacturer's share prices as the market's assessment of an airplane's safety. In a sample of 72 crashes from 1966 to 1979, Chalk found that when media reports indicated that the plane's design may have been a cause, the manufacturer's share price dropped 3.8 percent on average. When reports showed no such causal connection, share prices were unchanged. Similar findings are reported by Rubin, Murphy, and Jarrell (1988) for products recalled for safety reasons by the Consumer Product Safety Commission. In a sample of 31 firms involving 48 recalls from 1977 to 1981, the share prices of affected firms dropped an average of 6.9 percent.

## The Oil Shocks

World oil prices more than quadrupled in the fall of 1973 and then more than doubled from late 1979 to early 1981. Each of these increases reflected a sharp drop in the production and availability of oil. In response, the total output of goods and services in the industrial countries fell, relative to trend, by tens of billions of dollars. Depending on the discount rate used, the imputed loss in the value of national resources was a large multiple of the reduction in gross national products. In this very real sense, the energy crises imposed a state of disaster on world economies.

If we assume that some or all of the oil supply curtailment was permanent, overcoming the disaster and restoring the value of resources required a massive economic adjustment. It was necessary to find and produce alternative sources of oil, to substitute cheaper alternative sources of energy, and to use less energy of any variety in producing the national outputs. In the short run, known techniques and existing alternative energy supplies could be drawn upon to produce the same or similar goods and services. In the long run, less energy intensive technologies and new energy sources would come on stream accompanied by a vast reallocation of resources and by transformation in the kinds of goods and services produced.

In the United States the adjustment was essentially driven by market forces in response to freely fluctuating prices. The force of the long-run adjustment is attested to by a roughly one-third increase in real GNP (\$1 trillion in 1985 prices) between the mid-1970s and mid-1980s without any increase in total energy use. The short-run adjustment, however, from 1973 to 1981, was severely constrained by a rigid regime of government-imposed price ceilings and mandatory allocations of both crude oil and petroleum products. Most economists who studied this era concluded that government's management of the energy crisis increased the scale and scope of the "disaster" and delayed the longer-run adjustment.<sup>3</sup>

Price ceilings were imposed on the sale of domestically produced crude oil and refined petroleum products.<sup>4</sup> The ceilings were a complex set of regulations that varied with respect to petroleum categories and were subject to frequent change. From 1973 to 1981, they essentially succeeded in maintaining the average of U.S. petroleum

<sup>3</sup>See Arrow and Kalt (1979); Couts and Horwich (1982); Ford Foundation (1979, chaps. 1 and 5); Horwich and Weimer (1984); and Lane (1981).

<sup>4</sup>The material in this paragraph and in the remainder of this section is drawn from Horwich and Weimer (1984, chaps. 2 and 3).

prices at below world levels—crude oil by about 30 percent and petroleum products by about 10 to 15 percent.

The price ceilings kept U.S. domestic production of crude oil at a lower level and domestic demand at a higher level than either would have been at world prices. Since U.S. controls could not be effectively applied to the world market, the excess of domestic demand over supply spilled freely into the world market where it took the form of additional imports. On average, the controls are estimated to have raised U.S. petroleum demand (net of domestic supply) 12 to 14 percent, resulting in a 33 percent increase in U.S. imports throughout the control period.<sup>5</sup> Since the U.S. is the world's largest consumer of oil, its price ceilings undoubtedly had a significant impact in raising the world price of crude oil.

In the U.S. domestic market for refined petroleum products, such as gasoline and jet fuel, most products are not traded internationally. The market for such products was thus essentially domestic. The controls had the effect of maintaining the ceiling prices below the market-clearing prices. This effect occurred even though product prices were permitted to increase to reflect increases in crude oil costs. Prices could be raised only at periodic intervals, however, often some weeks after an increase in crude prices. Other component costs, such as capital and interest, were not eligible for pass through to the product prices; although labor costs were eligible for pass through, there were limitations on how those costs could be allocated among the various products of a refinery's output.

Perhaps the most serious flaw of the controls was their failure to permit refinery profit margins, and hence prices, to change in response to changes in supply and demand. Temporary changes in the margin and the price, often a cent or two or less per gallon, are the signals and the incentives by which petroleum products are allocated to their myriad uses throughout the economy. Freezing the margin over long periods effectively destroyed the market mechanism and created severe and lasting imbalances in distributing products geographically and among industries and consumers.

When ceiling prices are held below the market-clearing level, not only is there unsatisfied or excess demand in the market, there will be a shadow price—i.e., the actual value consumers place on the existing supply—that exceeds both the ceiling price and, as a rule, the market-clearing price. The combination of excess demand and extraordinarily high shadow prices motivated consumers to devote valuable time and resources to searching for supply, often by expend-

<sup>5</sup>See the data in Horwich and Weimer (1984, p. 75).

ing limited fuel supplies, queuing, and the like. Because consumers could not offer a market price above the ceiling, moreover, their efforts failed to induce any additional supply in the aggregate. Suppliers, meanwhile, faced with rising costs many of which could not be passed on, adapted by reducing the quality of their product. The octane rating of gasoline fell, and hours of operation of retail stations throughout the week were sharply reduced. What had been a highly efficient, dynamic, and dependable national fuel distribution system became sluggish, uncertain, and inflexible.

Adding to the distortions caused by the price ceilings was a vast network of government mandatory allocations of both crude oil and petroleum products. Large refiners with supplies above the industry average were required to transfer oil to small refiners, who were also subsidized disproportionately in their imports of oil at prices below the world level. Under a "supplier/producer freeze," all nonretail sellers of crude oil and products were required to service customers in proportion to the sales of an earlier base period. Exceptions were granted under a "priority" system that allocated additional supplies to agriculture, residential heating, and the emergency services sector. Under "exceptions relief," approved but self-certified "hardship" cases received transfers of oil or cash, often of epic proportions.

The incentive effects of the mandatory allocations were perverse in the extreme. Companies that had anticipated the oil price shocks by stockpiling oil were forced to share their inventories at below free-market prices with those exhibiting no such foresight or resourcefulness. Historical-use allocation under the supplier/purchaser freeze ignored the rapidly shifting distribution of population among the states and regions of the country. It also discouraged buyers from seeking alternative sources of supply and sellers from accepting new customers, whom they were automatically required to serve indefinitely.

The priority ranking of classes of buyers and the subsidies to small refiners were based on intuitive unsubstantiated criteria as to what an optimal or equitable allocation might be. Farmers, who were believed to have little flexibility in harvesting their crops, were observed on a number of occasions reselling their generous allotments of diesel fuel on the open market. Small refiners, who complained endlessly of their supposed inability to compete in the world market with larger companies for declining supplies of crude oil, were in fact only reflecting the high elasticity of demand for the heavier products (boiler fuel, low-grade heating oil) that they typically produced. Thus, when petroleum prices rose in disruptions, the demand for their products, for which there was a number of close

substitutes, fell more than the demand for products of larger refiners who generally produced lighter products, such as gasoline, for which substitutes were fewer and demand elasticity much lower. The relative decline in demand for small refiners' products in turn dampened their demand and willingness to bid for crude-oil inputs. Nevertheless, some 50 or 60 small refiners, particularly those producing fewer than 50,000 barrels per day, received subsidies that maintained them in the industry at net returns on their investment of 20 to 50 percent per year throughout 1975–81.

Throughout the energy crisis, the interventions of the U.S. government were not based on a rational set of goals that reflected the comparative advantages of private and public decisionmaking. In the absence of clearly revealed external costs and benefits, it is extremely rare for an outside entity to be able to raise the efficiency with which individuals pursue their exchanges through the mediation of free-market prices. Only those at the basic level of the firm and household are likely to know (often through a process of trial and error) what buyers desire and how best to provide it.

Although small refiners appeared to be unduly vulnerable and farmers were feared to lack sufficient access to fuel at a critical time, it was in fact impossible for government to influence the outcome with better information than the participants themselves already had. Small refiners, and only small refiners, understood clearly that in emergencies the low demand (reflecting a high demand elasticity) for their products did not justify aggressive bidding and predisruption contractual arrangements that would have augmented their efforts at oil acquisition. If farmers' harvesting plans were based on market considerations, the price of their final products would have motivated *and financed* an all-out attempt to secure fuel when, as, and in the amount the harvest required. Still, if government was willing to supply fuel to small refiners and farmers at prices well below market, they accepted it unhesitatingly.

As a rule, government's focus in supply shocks should be on broad goals of aggregate stability, national security, and social equity. None of these goals is likely to be served by individual market interventions that require information the government does not possess and that produce innumerable unintended repercussions that, overall, destroy market efficiency. The price ceilings on crude oil and petroleum products were intended to keep petroleum affordable—particularly to low-income consumers, to limit the windfall gain to domestic producers, and to dampen the general inflationary impact of the disruption. While domestic prices of crude oil were indeed main-

tained below the world level, the U.S. regulations, as we have seen, raised the world and U.S. price in some degree.

The windfall that would have gone to producers went instead to refiners, particularly small (but wealthy) ones who, by market standards, were inefficient and whose capital gain bore no obvious relation to commonly accepted canons of social equity. Meanwhile, the price ceilings and loss of windfall by producers discouraged the production of U.S. crude oil. In the product markets, the price ceilings eroded the functioning of the entire fuel distribution system. There is no evidence that under nonprice allocation (which rewards aggressive search activity and political influence—attributes more characteristic of the wealthy than the poor), low-income households were able to get even their proportionate share of the reduced supplies of fuel.

The attempt to control general inflation by capping a single group of prices simply diverts funds to other markets where prices rise disproportionately. In fact, by reducing the efficiency of the energy sector, the controls reduced total real GNP, thereby increasing the inflation rate and eliminating jobs of many marginal and low-income workers. The final irony is that despite the price ceilings and heroic transfers aimed at limiting their profits, the integrated American oil companies enjoyed above-average earnings from their domestic operations during the emergency era. A major cause of this was the restrictions on entry of new firms and the general decline of competition fostered by the government's rigid price ceilings and mandatory allocations.

Government's macroeconomic policies were as perverse as its microeconomic interventions. Almost without exception, central banks of the industrial countries responded to the inflations of 1973–74 and 1979–80 (part of which were induced by the energy shocks) by pursuing tight money policies that reduced real GNP and employment.<sup>6</sup> Monetary tightness is normally an appropriate offset

<sup>6</sup>Mork and Hall (1980) attribute one-fourth and Tatom (1981) about one-fifth of the United States's 1974–75 inflation to the rise in energy prices. For 1979–80, Tatom identifies one-fourth of the inflation as caused by energy prices. The rise in the general price level attributable to a rise in a component price is due, of course, to a simultaneous net reduction in aggregate supply—in this case caused by a decreased supply of a widely used energy input. The disturbance is analogous to a crop failure that reduces aggregate output in some degree and, for given total money expenditures, causes the general price level to rise.

See Hafer (1981) for a comparison of monetary growth rates among industrial countries during the energy disruptions. For criticisms of the nonaccommodating posture of monetary policy, in addition to Hafer, see Phelps (1978), Carlson (1979), Solow (1980), and Gordon (1984).



to prior excesses of monetary growth, but as a rule, should be pursued gradually. In light of the massive reallocation of resources occasioned by the rise in energy prices, the monetary restraint should have been tempered even more than otherwise. In the opinion of some economists, the loss of output resulting from monetary contraction exceeded that directly caused by the rise in oil prices (Bohi 1989, chap. 7).

## Disasters in General

The oil shocks differ, of course, in important respects from natural disasters or manmade disturbances such as strikes, riots, and war. They differ in magnitude, geographical extent, diversity of economic impact, loss of human life, degree to which capital is physically destroyed, and degree to which public goods, such as highway use and utility services, are curtailed. Yet all share the common feature of a decline in resource value to which a specific mix of government and private-sector responses is appropriate. As far as possible, these responses should entail least-cost supply solutions that are responsive to consumer preferences. The fact that assets in a natural disaster, for example, are physically destroyed and need to be reconstructed, whereas in an oil shock they are devalued and need to be replaced or transferred to other sites and uses, does not itself imply that private markets can or should play a major role in one case but not the other.

The argument is frequently made that uncontrolled markets cannot effectively respond to very large or catastrophic disturbances.<sup>7</sup> But in the noncommunist countries, markets have played the dominant role in the economic demobilizations and recoveries from the wars of this century; markets have also been important in the mobilizations. Even before the fighting begins, shifts of demand from civilian to wartime output impose an immediate massive loss in the value of resources that are, for the moment, in premobilization uses and locations. Only when the mobilization is completed do the resources recover their value. Although industrial mobilizations generally circumvent the market, proceeding by centralized commands, wartime reallocations of the U.S. civilian labor force have been accomplished largely by freely fluctuating wages. In World War II, tens of millions entered the labor force or changed employment, often traveling hundreds and thousands of miles, directed only by wage movements.

<sup>7</sup>For the problems involved in the restoration of markets following nuclear cataclysm, see Hill (1987) and Cantor, Henry, and Rayner (1989).

The most impressive manifestations of the power of the market have occurred in the postwar aftermath; for defeated countries, these manifestations occurred in a setting of physical and organizational ruin and devastation. But even a victorious nation, such as the United States in 1946, underwent a colossal economic transformation guided by free-market prices without any trace of centralized direction or allocative authority.<sup>8</sup> In that year real U.S. government spending fell by 77 percent— from 37 percent of GNP to 10 percent; hundreds of thousands of bureaucratic personnel literally fled the capital. Eight million troops were released from the armed forces and perhaps a fourth of the nation's 53 million civilian workers were abruptly released from wartime employment to seek peacetime pursuits. Real GNP was totally restructured and, in the aggregate, fell by 11 percent, but 2.4 million net additional civilian jobs were generated. Unemployment rose from an abnormal wartime low of 1 million in 1945 (1.9 percent of the labor force) to only 2.3 million in 1946 (3.9 percent of the labor force).

As remarkable as the American postwar adjustment was, the market-driven recoveries of West Germany and Japan border on the miraculous.<sup>9</sup> Their extensive loss of capital, infrastructure, and life is, of course, more analogous to that of natural disasters—although much more vast in all dimensions, including also geographical extent, diversity of economic impact, and loss of public goods. In both countries, reconstruction and sustainable independent recovery began only with the removal of price ceilings imposed during the wartime inflations. Centralized government played no significant role in directing postwar economic activity; it confined its policies to macroeconomic stabilization (including currency reform in West Germany), provision of public-goods infrastructure, and social programs (including land reform in Japan). An even more limited government presence characterized the recovery of the confederate South following the American Civil War. The economic chaos wrought by the Bolshevik Revolution of 1917 ended only in 1921–24 under the New Economic Policy in which the Russian government restored property rights, legalized markets, and reintroduced money.<sup>10</sup>

<sup>8</sup>See Horwich (1989) for the data in this paragraph, including the catalytic role played by high levels of real cash balances.

<sup>9</sup>The material in this paragraph is drawn from Hirshleifer (1987, chap. 1). See p. 81, n. 16; p. 83, n. 38; p. 85, n. 72; and p. 87, n. 119 for Hirshleifer's major sources.

<sup>10</sup>Mancur Olson (1982) attributes the success of postwar or postdepression economies to the tendency of severe shocks to eliminate the restrictions, protections, and other market-restraining forces that build up in mature or nondisrupted economies.

One may believe that market activity is the only route to long-term recovery and growth while one, nevertheless, remains skeptical that markets can play a significant role in predisaster planning and the immediate postdisaster response. I think this skepticism is unwarranted and overlooks what markets and the private sector can do and have already accomplished in disaster prevention and relief. It also rests on an exaggerated notion of the capabilities of government and quasi-government organizations, whose responses to disasters have often been ineffective or perverse.

### Individual and Organized Behavior in Disasters

Perhaps the major finding of disaster research by sociologists in this century is the discovery that individuals and communities rarely panic in the aftermath of natural disasters.<sup>11</sup> Even when the damage is extensive and there is considerable loss of life, survivors tend spontaneously to marshall their remaining resources and adapt to the new environment. It helps, of course, that even when 10,000 people die and an equal number are rendered homeless, the overwhelming majority in a total urban population of, say, 100,000 remain alive and in their homes. But even when the ratio of victims to survivors is far less favorable, Dynes reports that panic and anti-social behavior, such as looting—other than by “outsiders”—is extremely rare in natural disasters. Indeed, altruistic behavior is more typically the norm, as reported by both sociologists and economists.<sup>12</sup>

Dynes and others make the further point that individuals at the household and community level not only respond quickly and adaptively to a disaster, but are the only ones capable of doing so. Intimate firsthand knowledge of the location and quantity of remaining food supplies, of the best alternative sources of housing and energy, of the usable alternative roadways and means of transportation, and of the available medical care (if indeed very much is needed, since few of the injured may survive long enough to require it)—all of this will be known in the greatest detail and applied most creatively at the grassroots level.

The application of this knowledge occurs within what Dynes (1983, p. 659) designates an “emergent human resources model.” Postdisaster relationships gradually develop among those with a

<sup>11</sup>See Dynes (1970, pp. 7–8); Dynes (1983, pp. 658–59), and references cited there; and Drabek (1986, pp. 136–37).

<sup>12</sup>On looting behavior, see Dynes (1970, p. 8), and Drabek (1986, pp. 145–46, 181, and 231–33). In civil disorders, looting, of course, may be the principal activity. On altruistic behavior, see Dacy and Kunreuther (1969, chap. 3), and Hirshleifer (1987, chap. 4).

stake in the disaster operations—victims, rescuers, providers of services of all varieties. While the social and economic relationships develop spontaneously, they do so within the framework of previous relationships best known to the participants themselves. It is impossible, in Dynes' opinion, for the optimal postdisaster structure and responses to be imposed by higher authorities or outside agencies through a command and control process. The common assumption that postdisaster needs and solutions are self-evident—rescue, clearance of debris, provision of certain "essential" services—is not borne out by a far more complex reality.

Cuny (1983, chaps. 7–8), a disaster relief practitioner, documents the failures of foreign governments and agencies, usually voluntary and charitable, in responding to disasters in third world countries. Rarely do such entities have the knowledge of local conditions to make an effective response. Even brutally poor people, for example, have tastes and preferences as to the kind of housing they want and can afford to maintain—as determined by their incomes and cultural and religious traditions. Well-intentioned outsiders, lacking systematic feedback from the recipients, are unlikely to come close to anticipating or satisfying those tastes, no matter how generous their motives. The optimal timing with which housing construction is undertaken will depend on the local climate and the circumstances of the disaster; doubling up with one's relatives whose housing still stands may be the preferred option until other needs are met. Nor will local manufacturers, farmers, merchants, and providers of services greatly appreciate the depressed prices and loss of sales that donations of outside goods and services create.

Cuny's most damaging criticism of charitable organizations and foreign governments is that they not only lack adequate knowledge for meeting local needs, but they lack the incentives for acquiring that knowledge (Cuny 1983, pp. 145–47). Charitable organizations must perform in a way that maximizes their own revenues. This usually means undertaking highly visible relief efforts within a very limited time (often as a requirement of their charters). Foreign governments, particularly democratic ones, are necessarily political and must please constituents who also want fast, visible results and have little patience for the drawn-out indigenous procedures that are likely to be most beneficial in disaster-stricken countries.

In spite of these insights as to the diversity of consumer preferences, the importance of optimal supply, the inefficiency of centralized control, and the fact that individuals typically are not disoriented and are quite capable of rational responses in the postdisaster period, the sociology literature does not address the role of markets in disas-

ter prevention or the immediate recovery. Cuny (1983, p. 200) is quite explicit that prices must be held constant in the disaster aftermath—effectively preventing the operation of the market—while the community responds, often with the assistance of outside experts. But markets are precisely the institutions within which economic responses are ordinarily expressed: Individuals and families wanting goods and services signal their desires through price offers to which suppliers anywhere in the world may respond. In the immediate aftermath of a disaster, economic activity may, of course, be limited to self-help, as in the Robinson Crusoe economy, or, where exchange is possible, to barter. That is, the postdisaster tasks are performed by individuals in exchange for goods and services provided directly by others within the community. It is perhaps clearer in this context that the “helpless victim” model of disaster behavior has a limited empirical basis.<sup>13</sup> Indeed, the spontaneous self-organizing response by citizens and neighbors in barter activity may raise morale and productivity significantly above their immediate postdisaster levels.

Markets, however, operating through a common medium of exchange and prices, are an ongoing link between consumers and producers that potentially offers, relative to barter, a vastly increased quantity and variety of goods and services tailored to a multiplicity of tastes and produced by a wide range of skills and equipment at minimum attainable cost. Although many of the developing countries and most communist countries lack, or are without free access to, functioning markets, the rest of the industrial world—and in particular the urban areas—is unlikely to be totally detached from markets at any time predisaster or postdisaster.

Where markets are viable, even to a limited degree, preventing prices from moving denies consumers the free, self-selected expression of their preferences and denies producers the information that, in their supply decisions, they can weigh against the new conditions of scarcity and cost. The results of price fixing—for the whole range of goods and services sought in the disaster aftermath—are entirely comparable to the malfunctioning of U.S. energy markets during the regulatory period. Prices held artificially below market-clearing levels reduce the amount supplied, raise the quantity demanded, and drive the unsatisfied demand into sub-optimal alternatives. Simultaneously, shadow prices move well above market clearing and

<sup>13</sup>An important exception to the self-help and barter tendency seems to occur in parts of the Third World, where traditional rural economies suffer from food deprivation and famine. See Sen (1981); in particular, his discussion on the “entitlement” to food and the passive behavior accompanying it in Bengal in 1943 and Ethiopia in 1974.

promote search activity whose cost far exceeds that of information provided by market prices. Because search cannot raise market prices, it also fails to evoke any net additional supply. Available supply, meanwhile, tends, in the shortage market, to deteriorate qualitatively.

## Government, Markets, and Disaster Management

None of the foregoing implies that there are no problems with the functioning of free markets in postdisaster economies or that the resurgence of markets will be automatic. Not the least of the problems is the inability of lower income households to join in market activity following catastrophic loss of their assets and incomes. Sharp price increases may also create general social unrest, although, in the industrial world, the increases are less likely to occur or last very long when the disasters are localized—as they usually are. In fact, there is evidence that in such circumstances, price increases are frequently moderated by spontaneous, voluntary restraint of buyers in exercising their demands.<sup>14</sup> To deflect criticism, suppliers may also limit price increases, but that makes the seller a nonprice allocator, which is not economically efficient.

A further complication in natural disasters or war is the destruction of transportation and communication infrastructure—roads, bridges, harbor facilities, airports, power lines—which are usually the responsibility of government. Private markets alone will not replace the economy's infrastructure.

Government itself constitutes a problem because the incentives it is subject to are frequently inconsistent with prescribed goals of public policy.<sup>15</sup> Government representatives and employees must be concerned with retaining popular support. This concern makes them more responsive to constituents who are more likely to vote or to interest groups who, unlike the general electorate, find it worthwhile (for financial gain or because of strongly held ideological views) to incur the costs of monitoring their behavior. Government employees also have personal ambitions involving higher office or larger and more powerful agencies under their control. All of these tendencies, reinforced and exacerbated by the monopoly position of public agencies, loosen the link between government actions and the broad social welfare.<sup>16</sup>

<sup>14</sup>See Dacy and Kunreuther (1969, pp. 63–70).

<sup>15</sup>See, in particular, the discussion in Weimer and Vining (1989, pp. 101–23).

<sup>16</sup>Weimer and Vining (1989, pp. 95–101) also point out that the democratic voting process itself is flawed as a mechanism for determining the goals of public policy.

In this section, I will offer a blueprint for combining governmental initiatives and market processes in both disaster preparedness and response. My objective is to define a division of labor between government and the private sector that reflects the comparative advantages of each. Because of the incentive problem and the monopoly power that government invariably wields, my blueprint limits government's role to what the competitive private sector cannot provide. At the same time, I believe the private sector's potential contribution to disaster avoidance and recovery is much greater than commonly supposed. Government, however, is the ultimate guarantor of property rights, which are the *sine qua non* of market activity, and the implementor of any blueprint for disaster containment. Unless government promotes market processes both predisaster and postdisaster, markets will not achieve their potential contribution to disaster mitigation.

#### *Role of Government in a Free Society*

Government's economic role in a free society is (a) to define and enforce property rights and the legal framework for economic transactions; (b) to provide for the production of goods and services that the electorate desires but are not produced or consumed in sufficient quantity by the private sector; (c) to take whatever measures are necessary to internalize the external costs (such as environmental damage) and benefits of private transactions; (d) to compensate for information asymmetries, where one party in a transaction may be able to withhold relevant information from other parties; and (e) to offset the reduced output and monopoly prices that result from natural monopoly industries. The (b) category refers to public goods—those, like national defense and scientific research, that can be consumed only jointly, whose use is not excludable, and whose privately determined production or use—for all these reasons—will be less than socially optimal.<sup>17</sup>

None of these five functions, as such, require government production, as opposed, say, to government procurement of public goods or regulation of private natural monopolies. Thus, while the U.S. government produces military services, it buys war materiel from private industries. American power companies are both public (government owned and operated) and private (but government regulated).

The basic economic criterion for whether government should produce or procure is, as set forth by Vining and Weimer (1990), whether

<sup>17</sup>See Weimer and Vining (1989, chap. 3).

the market for the good or service is contestable (potentially competitive). For if the market is contestable, there is an efficiency loss in replacing private competitive production by public monopoly output. But even as procurer, government may exhibit inefficiencies, as in the frequently alleged overpayment for individual weapons components. Such inefficiencies, however, are likely to be smaller and far more readily correctable than those that result from totally nationalized or local government production. That, at least, seems to be the clear implication of the economically motivated denationalizations that have occurred in Britain and France in the past decade and the privatization of various government functions now sweeping the industrial world (see Poole and Fixler 1987).

Military services are not available in contestable markets because one of their essential attributes, absolute loyalty, cannot be provided by (since it cannot be enforced against) mercenaries who may be bid away by the enemy in the midst of a battle. One can imagine other government functions, such as the ability to repair certain weapons or carry out various tax collection procedures, that are highly specialized and are not readily transferrable to or from the private sector. Government typically will have to provide these services itself and compensate its personnel with the security of civil service status or other benefits.<sup>18</sup>

What about disaster management? Here I think government, which, as always, must play a coordinating role, should, wherever feasible, yield to a potential market role that has been growing steadily over time. I refer to the deregulation of goods and services once thought to have public goods or natural monopoly properties but no longer do and the privatization of many functions carried out by government but which contestable private markets are quite capable of performing. In this last category I include the rise of a small but growing cottage industry of disaster response specialists.

#### *Government Promotion of Disaster-Related Market Activity*

To improve the rapidity and flexibility of both disaster anticipation and response, government should, as circumstances permit, undertake the following seven initiatives.

1. *Free Up All the Sources of Information, Both Public and Private.* Dynes (1983, p. 656) urges that government promptly share all information, including disclosure of its sources, so that the public can make its own assessment of the value of the information. Kunreuther (1987) offers innovative suggestions for phrasing the information so

<sup>18</sup>For a discussion of the issues in this paragraph, see Vining and Weimer (1990).



as to overcome the public's tendency to ignore the consequences of low probability events. An important recent U.S. initiative is the 1986 Emergency Planning and Community Right-To-Know Act, which requires all users, producers, and shippers of hazardous chemicals to report this activity to state and local emergency planning commissions established by the act and to make the information available to all employees and the public at large.

2. *Remove All Regulations on Insurance Companies That Prevent Them from Setting Performance Standards for Their Clients.* Until recently, for example, all 50 American states prohibited the insurers of medical services from evaluating the performance of individual providers. Insurance companies should be free to assess the quality and quantity of health care and to set safety standards in industry. In a counterproductive intervention after World War II, state legislatures increased employer liability for industrial accidents and simultaneously reduced that of employees. A number of statistical studies have documented a resulting increase in the frequency and severity of such accidents.<sup>19</sup>

A further example of such "moral hazard"—actions that increase the magnitude of disasters they seek to mitigate—is government benefits to property owners located on flood plains, earthquake faults, and other hazardous sites. Government has, for example, often subsidized the insurance premiums on these properties and provided generous benefits, including low-cost construction loans, to those suffering disaster damages.<sup>20</sup> While this subsidy may seem humanitarian, it encourages building in hazardous places by lowering the private cost of doing so. The result is an increase in the social (total) costs of disasters, to which government is a party. Dacy and Kunreuther (1969, pp. 245–53) urge that such subsidies be phased out by making no new grants and retaining them only for existing beneficiaries.

3. *Seek the Services of Private Disaster Responders.* Some, like Frederick Cuny (1983) of Intertect in Dallas, Texas, specialize in natural disasters occurring in third world countries. Others, like Disaster Masters, Inc., of Queens in New York City, respond to individuals and firms experiencing floods, explosions, and other emergencies.<sup>21</sup> Among their specialties is the rescue and restoration of records and documents and other objects of value. James Morentz, of Rockville, Maryland, publishes *Hazard Monthly* and offers a

<sup>19</sup>See Chelius (1977).

<sup>20</sup>See Dacy and Kunreuther (1969, pp. 229–30).

<sup>21</sup>See "A General Trouble-Shooter Whose Business Is Booming" (1981).

whole range of disaster preparedness and relief services. Others offer specialized medical services, containers for shipping grain, portable bridges, and mechanized devices for removing people from burning buildings.<sup>22</sup>

In principle, one can easily imagine the rise of a worldwide industry of private disaster consultants and managers who can oversee the response to earthquakes, hurricanes, floods, and the like. Although their presence in any specific location for any particular kind of disaster will be infrequent, their ability to travel globally will give them an ongoing involvement in disasters and a growing management expertise unlikely to be matched by any local or national public disaster agency. Such consultant services are surely contestable—there is no apparent natural monopoly here—and relatively straightforward to monitor and assess. Municipal and state governments might be well advised to engage in contractual arrangements with consultants as part of a predisaster insurance program.

4. *Protect the Private Business Sector in Disaster-Stricken Areas from Gifts and Donations of Goods and Services.* In-kind gifts tend, of course, to depress the prices and destroy the markets of still-functioning enterprises. In an ingenious solution to this problem, which simultaneously addressed the needs of the poor, the Jamaican government, following the devastating hurricane of September 1988, sold all donated goods to local retailers and turned the proceeds over to low-income families in the form of stamps expendable on food, building materials, etc.<sup>23</sup> The government acted as the wholesaler of goods received from abroad and allowed domestic firms to buy them at prices they believed they could resell them for (inclusive of their profit)—in other words, at prices ultimately determined jointly by the local consumers. In this way, goods having little or no value to Jamaicans were priced accordingly; those meeting postdisaster needs were purchased by those who placed the highest value on them; and all donated goods were distributed by retailers—the individuals most qualified to do so.

To maximize consumer welfare, the population itself should determine how many of their stamps are allocated to food, clothing, or whatever. That is, the stamps should have the properties of money and indeed not be limited to the sum of foreign donations. They should be supplemented and distributed as the local electorate is able and sees fit. Disaster-stricken communities might want to encourage outside donors to give most of their aid in the form of cash,

<sup>22</sup>See "The Hazard Scene: Making a Business of Disaster" (1985).

<sup>23</sup>See Seaga (1988).

allowing the local population to determine the precise character and source of the bulk of supplies.

5. *Protect the Private Sector from Arbitrary Property Seizures, Including Looting.* A decision by authorities to expropriate private property can never be made lightly, since the costs of doing so in terms of incentives to future savings and investment can be considerable. If the owner of a warehouse containing desperately needed supplies cannot be reached, common sense humanitarianism could well dictate that the supplies be taken—although not without a plan for eventual compensation.<sup>24</sup>

6. *Remove All Rent Controls on Residential and Commercial Structures in Urban Areas.* Such controls—effectively price ceilings on rental units and almost invariably below market-clearing levels—lead to the familiar deterioration of quality and socially wasteful search activity characteristic of controlled commodities.<sup>25</sup> In the disaster context, rent controls are particularly harmful, inhibiting the rapid market-wide expansion and sorting out of the remaining housing stock that the changed pattern of demand would evoke. A decision not to impose rent controls in San Francisco following the earthquake and devastating fire of 1906 opened the way to rapid reconstruction of the city.<sup>26</sup> On the other hand, a rent-control law, imposed in 1947, left owners of nearly a square mile of real estate in Mexico City no incentive for repairing or retaining the area as low-income housing following the 1985 earthquake.<sup>27</sup> In the circumstances, the Mexican government had no better alternative than to expropriate it, attenuating still further the already emasculated private property right in the area. The government promised compensation to the owners over a 10-year period, but with few details and little credibility (the memory of the financially disastrous nationalization of Mexican banks in 1982 was still fresh).<sup>28</sup>

7. *Avoid Imposing Price Controls of Any Kind in the Disaster Aftermath.* One frequently hears horror stories of “price gouging” following disasters, such as 5-pound bags of ice selling for \$10, chain

<sup>24</sup>See Dynes (1970, p. 210).

<sup>25</sup>See Navarro (1984, chap. 2), and “Urban Decay, Regulatory Sprawl” (1985).

<sup>26</sup>See Douty (1977, pp. 134–36).

<sup>27</sup>Frederick Cuny informs me that the rent-control agreement permitted the private owners to demolish the property and convert the land to other uses if its state of repair fell below specified levels. This provision was intended to motivate occupants to maintain the property, but they were clearly unequal to the task following the earthquake. Meanwhile, the owners, deprived of a free-market return on their property for 38 years, clearly had no incentive to make predisaster or postdisaster repairs.

<sup>28</sup>See Frazier (1985).

saws selling at \$600, and plywood at \$200 a sheet in Charleston, South Carolina, following Hurricane Hugo in September 1989.<sup>29</sup> These were prices that consumers (of which many in the Charleston area are quite affluent) chose, in the circumstances, to pay on the grounds that the benefits exceeded the costs. Without ice, hundreds of dollars of frozen foods might have thawed and been lost and, if immediate repairs were not made, a damaged home worth \$100,000 or more might have been totally ruined. The action of the Charleston City Council in banning all price increases forced the populace to act in accordance with much higher shadow prices. Such shadow prices produce the familiar manifestations of nonprice allocation, such as waiting long hours in line or engaging in costly search. The cost in this context, as pointed out by Laband (1989), is the valuable time and effort that might otherwise be expended on productive reconstruction activity.

The argument that prices must be controlled to keep goods affordable to low-income families, including those hardest hit by the disaster, ignores not only the further reductions of supply that controls induce, but also the jobs that are lost when firms are not permitted to bid freely for remaining resources. Such job losses are likely, of course, to fall predominately on lower-income workers.

Unusual price increases are not likely to prevail beyond the first few days of the disaster aftermath. If they do, they perform the valuable function of signaling to the outside world the enormous gain to be made in breaking through the wreckage with additional—and inevitably—more normally priced supplies. Government can facilitate this process by giving wide publicity to high prices. Suppressing the prices is a form of denial that prolongs the problem and increases the likelihood of centrally determined allocations, with all the delays, mismatches, and *de facto* higher social costs that denial entails.

Promoting disaster-related market activity in the ways described above will not extinguish government's role in disaster management, but should serve to make that role more effective and to focus it, particularly in the direction of coordination. Government's record as a monopoly producer of goods and services (including disaster anticipation and relief) has rarely been noteworthy for efficiency<sup>30</sup>

<sup>29</sup>See "Hugo Damage Expected to Go Past \$3 Billion" (1989), McCarthy (1989), and Laband (1989). Laband's analysis, which we draw on, is particularly incisive. Although high postdisaster prices are occasionally reported, the far more common occurrence is a failure of most prices to rise very much, if at all. See n. 14 above.

<sup>30</sup>The basic difficulty is that, in the absence of competitive alternatives, there is no reliable way to evaluate government's performance or to ensure that the most efficient

and is generally inefficient as a source of social equity. There are far more direct and less costly ways, notably cash grants, to accomplish both efficiency and equity goals.<sup>31</sup> Meanwhile, societies struck by disasters should try to avoid the allocative mechanism, command and control, that works so poorly in nondisaster circumstances. The modern world has had enough disaster experience now to begin to forge more reliable coping methods that also have a high degree of automaticity, flexibility, responsiveness, and continuity.

### *The Resiliency of the Market*

Aaron Wildavsky (1988, p. 2) refers to the disaster-mitigating characteristic of a market economy as its "resiliency." He traces that quality to the tendency of a decentralized, competitive system to take incremental risks, learn by trial and error, and incorporate the knowledge in production methods and output that yield ever-increasing levels of health and safety. The same market activity that generates safety produces wealth, which acts as a catalyst, enlarging the possible scale of learning that can take place and safety that can result.

Whether or not this is the precise underlying process, a decentralized price-directed economy that enjoys a free movement of information, goods, and people is surely better able to anticipate and cope with disasters than one of centralized decisionmaking whose goods and information are produced and transmitted by heavily regulated, protected enterprises. The decentralized market economy will also tend to be wealthier, an attribute that invariably suggests reduced vulnerability to shocks. In the words of Frederick Cuny, "Disasters are a function of underdevelopment. If the earthquake that hit San Salvador hit Southern California, it would rattle the china—not kill 1,500 people."<sup>32</sup> A similar characterization applies to the 1988 earthquake in Soviet Armenia. The high death toll resulted in large part from poorly built structures that collapsed when ground trembling

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methods are adopted. One frequently hears references to one or two state emergency planning agencies as being the most accomplished and "efficient." There is, unfortunately, no dynamic competitive process to verify that claim and no built-in mechanism to force other states to emulate the most efficient—assuming that what the latter are doing is indeed both appropriate for, and desired by, other states. See Niskanen (1979).

<sup>31</sup>Grants of \$10,000 given by the Federal Emergency Management Agency to those suffering property damage in the San Francisco earthquake of October 1989 appear to have met popular perceptions of equity and efficiency criteria—the latter, in part, by defusing public support for controls. The grants, which were given freely, may, however, have introduced a degree of moral hazard in terms of future earthquake preparedness.

<sup>32</sup>Quoted in Duke (1986).

turned cinderblock supporting walls into powder. Twenty-five thousand perished in Soviet Armenia; an earthquake of identical magnitude, which struck San Francisco in October 1989, took 67 lives.

Over time, new opportunities to free markets and increase the economy's resiliency and wealth will arise and should be weighed. Among the longer-run possibilities are complete deregulation (or privatization) of telecommunications; deregulation (or privatization) of electric power generation and transmission; the pricing of highways and roads by use of electronic sensors on all vehicles; the removal of all legal barriers to entry in the taxi or jitney-service industries; open bidding by all airlines for airport landing slots; the introduction of competition into the delivery of first-class mail by ending the government's monopoly; removal of all restrictions on branch banking; removal of all barriers to establishment of private, independent "walk-in" emergency medical centers; removal of advertising bans by professional societies and trade associations, bans which tend to limit competition; privatization of other services traditionally carried out by government but, increasingly, producible in contestable markets (such as construction and operation of certain limited access roads, tunnels, and bridges); general road repair and maintenance; sanitation; firefighting; ambulance and emergency rescue operation; water supply and treatment; and, not least, the removal of barriers to the international flow of goods, services, and capital.

## Conclusion

We defined a disaster as any loss of resource value over space and time above some threshold level. In this broad definition, any loss of assets, whether resulting from physical destruction or changed valuation, qualifies as a disaster.

The American regulatory response to the oil crises of the 1970s and 1980s illustrates the high costs of postdisaster centralized intervention that contravenes rather than complements market forces. Domestic energy prices held below market-clearing levels reduced the output of energy, raised demand, and exerted upward pressure on world prices. Nonprice allocation diverted resources into costly search activity without increasing aggregate supply. Mandatory allocations failed to yield any demonstrable gains in either efficiency or equity. Macroeconomic measures exacerbated the costs of the disruptions by tightening the money supply more than was justified in the face of the widespread reallocation of resources that the energy shocks had imposed on the economy.

We argue that, in principle, the economic response to all disasters should entail least-cost supplies that meet consumer preferences. The ability of decentralized markets to equilibrate the response to an oil shock is not necessarily distinguished from, or significantly less than, their ability to restore an economy following a natural disaster or war. The claim that markets cannot equilibrate very large disturbances is belied by the record of postwar recovery in market economies.

Sociologists have documented the fact that people rarely panic following disasters. They also characterize the individual household and community response as the most efficient in the disaster context, citing the inability of centralized authorities to know or implement the optimal response. We argue that markets are a logical complement and enhancement of "emergent human resources" behavior.

The ability of markets to contribute to the spontaneous self-generating response to disasters would be facilitated by the following governmental initiatives; freeing insurance companies to impose performance standards on the insured; eliminating government subsidies and regulations that reward hazardous behavior; providing information and identifying its sources while enabling and encouraging the private sector to do the same; seeking out and employing private-sector disaster specialists and consultants; protecting the private business sector by (a) selling donated postdisaster supplies to local retailers and allocating the revenues to low-income families, (b) avoiding arbitrary property seizures, and (c) acting promptly to prevent looting; avoiding all rent and price controls in the disaster aftermath; and accommodating any general inflation that might result from the disaster-related loss of aggregate output.

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