

that the proposed catastrophe bonds, Treasury catastrophe notes, and similar devices are excellent ideas because with them one develops a transparent price for the tail end of the distributions of losses. The reinsurance community does support such a development. We may, however, be expecting too much. This country works on a pay-as-you-go basis. And nothing will change unless a different political will is brought to the process than has been evinced heretofore.

In conclusion, I think that it will unfortunately take a major calamity to rationalize the system. Only then will the interested parties—the private sector, the consumer, the state regulator, and the federal regulator—recognize that they all must give up something. I don't say that this is a good way to solve the problem, but it may be the only way.

Comment R. Glenn Hubbard

David Moss's illuminating paper considers the current state of federal disaster policy from a historical perspective. In a sweeping discussion of the evolution of federal disaster-relief policy since 1803 (when Congress assisted the victims of a fire in Portsmouth, N.H.), Moss highlights the rapid expansion of federal intervention after 1960. Arguing that this expansion is consistent with broader trends in government intervention in risk management, he suggests that expectations about intervention constrain the potential for rationalizing disaster policy. If unchecked, these expectations and constraints may lead to an exit of private insurers, further increasing disaster costs to taxpayers. Moss's paper closes by describing potential reforms and suggesting that the French policy of government reinsurance of natural catastrophe risks may serve as a good model for U.S. disaster policy in the future.

After describing the setting of the problems considered by Moss, I will organize my remarks in three areas: (1) lessons from political economy, (2) lessons from social insurance design, and (3) the role of private markets in disaster-risk management. While I will not discuss them in any detail, I recommend Moss's historical descriptions of disaster policy to anyone interested in the development of this increasingly costly area of federal intervention.

The Setting

Costs of property catastrophes in the United States have reached unprecedented levels in the 1990s. Total insured losses from natural disasters amounted to \$75 billion between 1989 and 1995, where as they were only \$51 billion for the whole of the period between 1950 and 1988 (see Borden and

R. Glenn Hubbard is the Russell L. Carson Professor of Economics and Finance at Columbia University and a research associate of the National Bureau of Economic Research.

Sarkar 1996). In addition, two developments suggest that high costs will remain for the foreseeable future. First, rising catastrophe-related costs offer some evidence that catastrophic risk has increased significantly in recent years. Second, rapid population growth in catastrophe-prone areas indicates a continuing trend toward increased costs of catastrophes. These developments do not bode well for private insurers. As a point of reference, U.S. primary-insurance-industry capital is about \$20 billion (Canter, Cole, and Sandor, in press). This greater exposure raises the question of what role the federal government should play in disaster insurance or, more broadly, in disaster policy.

Federal intervention has grown in ad hoc phases and in systematic phases. Prior to the 1920s, federal responses were largely minor and coordinated with the Red Cross. Following the disastrous Mississippi Flood of 1927, the federal government increased spending on flood relief and effectively assumed responsibility for flood-control projects (see also the popular account in Barry 1997). The Federal Disaster Act of 1950 authorized a permanent relief fund with broad discretion (giving future officials the opportunity to feel their constituents' pain). This scope for intervention was expanded further by the 1970 disaster relief act. In tandem with relief policies, federal disaster insurance expanded in the 1960s and 1970s. The National Flood Insurance Act of 1968 and the Federal Crop Insurance Act of 1980 tried to substitute a federally backed insurance program for ad hoc disaster relief, but participation by propertyowners was poor. In 1978, the Federal Emergency Management Agency (FEMA) was created to coordinate disaster programs distributed across several government agencies and to consolidate the management of escalating spending.

The Great Midwest Flood of 1993 was the proverbial watershed event in federal disaster relief, with FEMA overseeing the expenditure of more than \$1 billion of disaster insurance (compared to the \$10 million spent by the government in response to the 1927 flood). The Clinton administration requested additional payments to communities, small businesses, and farmers.

The problems emerge from this evolution of federal disaster relief and insurance policy. First, potential budget costs are significant, in the light of a federal commitment with no clearly articulated limits. Second, past government behavior makes statements that aid will not be forthcoming to individuals not meeting particular criteria or following prescribed rules not credible. Third, the combination of an expanding federal commitment and increased uncertainty about catastrophe risk may lead to widespread exit by private insurers putting further pressure on federal disaster intervention.

These concerns have led to proposals at the state and federal levels. Florida and California have established insurers or reinsurers of last resort, although states are poorly equipped to diversify catastrophe risks. At the federal level, 1994 legislation tightened enforcement of flood-insurance requirements in the National Flood Insurance Program, although credibility issues remain. The insurance industry has suggested the creation of the Natural Disaster Insurance

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Corporation (NDIC), to be financed and administered collectively by private insurance; the NDIC would cap private insurers' disaster liability and would be authorized to borrow from the U.S. Treasury in the event of severe catastrophes. The Clinton administration proposed selling disaster-contingent claims on the open market, but the administration's proposal does little to encourage the development of private markets. The historical record suggests, however, that pressure for cross-subsidization across regions and credibility problems will limit the potential for success of the scheme.

Outside the United States, Moss identifies the French Caisse Centrale de Réassurance (CCR) as a possible model for reform. Mapping the scheme to the U.S. setting, a CCR-like approach would suggest the following. The federal government would require that specific coverage against natural catastrophes be included in every property-insurance policy. In addition, a premium surcharge would be mandated to pay for the additional coverage. Finally, such a plan would establish a federally guaranteed reinsurance program, allowing private insurers to cede most of risk (and premiums) to the government. I will return to this proposal in the context of social insurance below.

Lessons from Political Economy

As Moss's paper makes clear, economic analysis of government disaster policy must address "political economy" as well as "optimal policy" considerations. Historical developments in the U.S. banking industry offer some guidance for the present case. In the late nineteenth and early twentieth centuries, losses (generally by smaller, poorly diversified banks) in particular regions of a state generated political pressure for redistribution within a state—in the form of state deposit-insurance schemes (see, e.g., the discussion in Economides, Hubbard, and Palia 1996). The subsequent failure of state insurance schemes in the presence of larger banking crises ("catastrophes") led to political pressure for federal cross-subsidization (among banks and among regions of the country) of risk bearing through federal deposit insurance.

As is by now well known, the government assumption of bank deposit-risk management through deposit insurance failed key tests of insurance design. The presence of large amounts of insured or effectively insured deposits created the potential for moral hazard precisely when adverse shocks to industry capital appeared (as in the savings-and-loan industry in the early 1980s and the banking industry in the late 1980s). Moreover, it is difficult to motivate U.S.-styled deposit insurance as simply a response to a market failure.

Lessons from U.S. banking regulatory experience have shaped present banking-regulation proposals and offer guidance for casualty insurance. Chief among these are the importance of risk-based pricing and an expanded role for private markets in reinsurance of deposits to ensure market discipline. Economists generally argue that a public lender of last resort (such as the Federal Reserve in the United States) can be the final "catastrophic" reinsurer.

For disaster policy, experience of the political economy of banking regulation suggests the need to be wary of excessive cross-subsidization of risk and the need to encourage the development of private reinsurance and market discipline.

Lessons from Social Insurance

Sidestepping the political economy of intervention, how might we set up a "social insurance" approach to disaster policy? The basic problem is that of systematic risk—in this case, the chance of a major catastrophe or series of major catastrophes that might bankrupt the private-insurance industry.

Social insurance principles suggest a way of organizing thoughts about deposit insurance. First, to mitigate the free-rider problem so endemic to disaster insurance, coverage for individuals and businesses must be (credibly) mandatory. Second, deductibles and coinsurance should align incentives for risk management by the insured. Third, private-sector reinsurance should be mobilized to pool risks across insurers in different regions with different exposures to catastrophic risks. Fourth, as in the banking analogy, the government's role would be limited to that of a lender of last resort. In the insurance context, this amounts to the combination of a catastrophic payment (mandatory insurance) with a deductible and coinsurance. The "lender-of-last-resort" role would replace ad hoc interventions.

To be successful, such a scheme based on social insurance principles must develop strong markets for private reinsurance. I say this for two reasons. First, private-reinsurance markets offer market discipline in the pricing and management of catastrophic risk. Second, absent well-functioning and deep private-reinsurance markets, the temptation for ad hoc government intervention in a disaster with large private losses becomes great, undermining the credibility of overall disaster policy.

Enhanced Role for Private Markets

The key to the improvement of private catastrophe insurance and reinsurance markets is the development and promotion of property-catastrophe-risk financial instruments ("securitization") of risk. In addition to the desirability of liquid financial markets for risk management, insurers have few additional avenues of assistance. Escalating prices for reinsurance combined with lower coverage amounts have made it more difficult for insurance companies to mitigate their risk through reinsurance. In addition, state regulatory restrictions limit (and in some cases prevent) companies from increasing premiums and reducing coverage in response to higher costs of reinsurance.

Since 1992, several financial instruments have emerged to securitize property-catastrophe risk. These instruments include exchange-traded options and futures, over-the-counter insurance products, and insurance swaps. As a consequence, individuals or businesses can take positions on the occurrence and cost of property catastrophes. Insurance companies can hedge their ex-

posure by transferring positions to investors.

While securitization offers the potential for enhancing the private market for catastrophe risk, design issues remain. Catastrophe risk, for example, location, disaster frequency, and the participants bear which types of risk, credit risk, adverse selection, and financial instruments will be used to manage risks.

For example, property-catastrophe bonds (or Trade [CBOT]) offer one alternative to purchasing a layer of risk (given the role of the CBOT as a reinsurance company because of its role in managing moral hazard is mitigated). Adverse selection notwithstanding, liquidity is not a problem; many analysts believe that property-catastrophe bonds are likely in the future (see below).

Catastrophe bonds (or over-the-counter instrument. Such instruments are catastrophe with variable maturity and exchange-traded product. In addition, exchange-traded products are not standardized, the customized nature of the product only the riskier insurance companies. Repayment is related to the occurrence of a catastrophe.

Finally, property-catastrophe bonds (or Exchange (CATEX) are being developed. A general agreement with reinsurance companies are standardized. The market is too early to assess the impact of the property credit risk must be managed. The market depends on the attributes of the risk.

To summarize, recent developments in the market for property-catastrophe risk play a larger role in the market for risk spread across a broader range of risks. This can reduce the effect of the market for risk.

Conclusion

David Moss's interests in the market for risk, industry leaders, and the market for risk.

posure by transferring property-catastrophe risk to a wide pool of willing investors.

While securitization represents an important and necessary development in enhancing the private sector's role in catastrophe management, instrument-design issues remain. Catastrophe-risk exposures can be specified by, for example, location, disaster type, and time of year. One must also sort out which participants bear which type of investment risk (i.e., among liquidity risk, basis risk, credit risk, adverse selection, or moral hazard). The most successful financial instruments will be those with low costs imposed by these investment risks.

For example, property-catastrophe options (traded on the Chicago Board of Trade [CBOT]) offer one approach. Most trades create "call spreads" comparable to purchasing a layer of insurance. The options offer minimal credit risk (given the role of the CBOT clearinghouse) and basis risk (unless for an insurance company because the payoff is based on aggregate industry claim payments). Adverse selection is minimized by the use of standardized instruments; moral hazard is mitigated by the use of an industry-based index. These advantages notwithstanding, liquidity risk remains a concern because of the low trading volume; many analysts believe that higher volume and lower liquidity risk are likely in the future (see Borden and Sarkar 1996).

Catastrophe bonds (or "act-of-God" bonds) are an example of an over-the-counter instrument. Such bonds create a link between the repayment and the catastrophe with variable coupon and principal repayments. As with the exchange-traded projects, liquidity risk remains a problem. Unlike the exchange-traded products, credit risk must be borne. While basis risk is nonexistent, the customized nature of the bonds could lead to adverse selection (if only the riskier insurance companies issue the bonds) and moral hazard (if the repayment is related to the issuer's individual catastrophe costs).

Finally, property-catastrophe swaps to be traded on the Catastrophic Risk Exchange (CATEX) are at an early stage of development. The swap is a bilateral agreement with reciprocal reinsurance between two insurers. Units of exchange are standardized by specifying "equivalent" risks and exposures. It is too early to assess the liquidity risk associated with these products. Counterparty credit risk must be borne. Basis risk, adverse selection, and moral hazard depend on the attributes of the individual swap design.

To summarize, recent market developments suggest that private markets can play a larger role in property-catastrophe risk management. Risks can be spread across a broader pool of individuals and business. These developments can reduce the effect of catastrophes on the insurance industry as a whole.

Conclusion

David Moss's interesting and readable paper highlights the need for economists, industry leaders, and policymakers to rethink federal disaster policy in

the United States. The history of federal involvement in disaster insurance and relief—combined with experience with government intervention in risk management in other industries—leads one to be concerned about the need to maintain healthy private markets for managing risk. Lessons from both the political economy of regulation and social insurance design point out the need for well-functioning private-reinsurance mechanism. Recent developments of financial instruments for managing property-catastrophe risk offer an encouraging sign for private-insurance and -reinsurance markets in the future.

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9.1 Motivation

It has long been understood that the benefits (and costs (more on this later)) of so many insurance contracts are realized in the event of cases, the benefits are realized if the company provides insurance. Presumably, the benefits are realized if the company provides insurance. Presumably, the benefits are realized if the company provides insurance. Presumably, the benefits are realized if the company provides insurance.

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James G. Bohn is an economist at the University of Texas at Dallas. J. Hall is associate professor of economics at the University of Texas at Dallas. The authors thank David A. Moss for helpful comments and Tom