Chapter 7: Democracy and Social Insurance

The commitments we make to each other: through Medicare, and Medicaid, and Social Security, these things do not sap our initiative; they strengthen us. They do not make us a nation of takers; they free us to take the risks that make this country great. (B. H. Obama, inauguration speech 2013)

The previous chapter suggests that governments are not principally concerned with externality and public goods problems, but rather with risk management, only a subset of which fall readily into those categories. It is not that risks and uncertainties are never caused by externality or public goods problems, but that rulers and/or voters are not often motivated by such problems, per se, but rather attempt to use the capacities of government to eliminate, curtail, or ameliorate a wide range of risks that are not easily managed by smaller private organizations or individuals. There are economies of scale in the enforcement of risk reducing rules and also in risk pooling, the latter of which is the focus of this chapter.

That there are differences in the risks and uncertainties confronted by democratic and authoritarian governments have implications for shifts and policies that tend to occur during transitions from authoritarian to democratic governments, and vice versa. Dictators have strong interests to adopt rules that extend their time in office, which in turn tends to promote their own survival and prosperity. Democratic governments also attempt to prolong their time in office, but are constrained to win regular elections to do so. As a consequence, the rules adopted in democracies tend to advance voter interests, particularly those of

moderate voters. In this, it can be said that differences in particular rules and enforcement methods are indirect consequences of risks generated by their respective constitutional environments.

The previous chapter suggests that law itself is substantially a risk-management service provided by governments. It is not inherently a pure public good insofar as it can be and often has been less than uniform in its treatment of individuals and groups, and also enforced in less than a uniform manner. This is not to say that most persons in a society do not benefit from greater certainty, is it only to remind the reader that this statement is not the same as saying that "the law" is a public good in the technical sense used by economists. The end product of "the law" tends to broadly, if somewhat idiosyncratically, reduce both risks and uncertainties and this makes most persons--rulers included--better off.

That rules advance the objectives of those with the authority to make and enforce them is, of course, why laws are adopted and enforced by governments, organizations, and families. Rules, nonetheless, often advance the ends of individual and groups by solving coordination problems and social dilemmas, which improves average outcomes for those in situations that produce such problems.

If the world were simple enough rules could assure risk free outcomes that maximize average outcomes. Such simplicity is present in the illustrations used in this book and in essentially all economic textbooks (and most research papers).

However, an illustration is not the world. The problems confronted in real life are not entirely static or entirely predictable even in settings where many risk-reducing rules are in place. Unpleasant surprises, thus, occur both because of unanticipated natural events (storms, illness, human error, etc.) and because of unanticipated interactions among the rules themselves. Unpleasant surprises may also occur in cases in which uncertainty as considered to be productive and so is assured rather than reduced by the rules in place.

Because of natural and social uncertainties, unpleasant surprises continue to occur even in the best ruled of states.

When risks are confronted in spite of the best rules one can imagine, coping with, rather than avoiding them becomes the only possible strategy for reducing losses. With this in mind individuals purchase insurance (or self ensure) and adopt other routines for recognizing and adjusting to surprises as they occur. The question addressed in this chapter is the extent to which governmental policies may play role in assisting individuals to cope with risks that remain after all useful rules for curtailing risks have been adopted.

With respect to insurance, there are several steps that a government can take that individuals and private organizations can take because of their greater ability to impose binding rules and because of their ability to tax.

A. Rules to Improve Private Insurance Markets

To shed light on the role that public policy may play in insurance markets, consider first the role that government may play in individual decisions to join income security clubs or to purchase income insurance. First, there is, as described above, the government's role in characterizing and enforcing civil law. Contracts are not entirely a product of formal state laws, but clearly such laws reduce uncertainty about whether a formal insurance relationship will be carried out or not. In contrast, bankruptcy laws tend to reduce risks for insurance entrepreneurs while increasing them for their investors and member-customers. A bankrupt firm is freed from most of its contractual obligations, and apart from cases of fraud, the penalties for bankruptcy consists largely of reputational effects for the persons defaulting on their obligations.

Given this civil law framework, both reliable and unreliable income security clubs and insurance companies may coexist in the same markets for significant periods of times. To see how this affects the risk-limiting properties of private insurance, consider a setting in which there are three outcomes, a normal good outcome, a moderately bad outcome, and a disastrous loss. Three outcomes are sufficient to illustrate many of the key reasons why individuals purchase insurance. They could be, for example, outcomes associate with fluctuations in weather, health, asset market, and/or accidents. As in most insurance settings, assume that the probabilities and losses are known to everyone.

	Uninsured	Insured by Reliable Club or Company	Insured by Unreliable Club or Company
Table 6.1 **An Illustration of the Advantages and Risks** **From Income Insurance Clubs**			
Event X, Px = .1	-5	0.5 - C	-5 - C
Event Y, Py = .2	-2	0.5 - C	0.5 - C
Event Z, Pz =.7	2	0.5 - C	0.5 - C
Average Income	0.5	0.5 - C	-0.05 - C
Avg Utility (C= 0)	1.8	1.83	1.75
Avg Utility (C = 0.24)	1.8	1.81	1.77

Table 6.1 illustrates the case in which a risk averse person may choose to go without insurance or to be insured by reliable or unreliable insurance clubs or companies. The utility associated with that outcome will vary with the individual's utility function, which may reflect a variety of goals and degrees of risk aversion. For the purposes of this illustration, our representative person, Alle, is assumed to have the utility function $U = (X)^a$, where X is net wealth available for consumption (and reserves) and a is an exponent less than 1. Alle is assumed to have an initial reserve of W, which may be augmented or depleted by a random net income/loss generating process, less other costs.

To make the illustration concrete, suppose that a positive state is the most likely (p = 0.7), the moderate losses the second most likely (p=0.2) and the higher losses the least likely (p=0.1). The net income flows associated with these outcomes are represented with the numbers 2, -2, and -5, respectively, which may represent thousands of dollars of income or loss. The average net income is 0.5, given the assumed probabilities and net incomes flows. If we assume that $W = 7$ and $a = 0.3$, Alle's expected utility is 1.8 utils in the uninsured natural environment.

The first column of outcomes represents the uninsured, natural, state. Given the probabilities and income flows assumed, the average income flow of 0.5 units of income per year. To smooth out the income of subscribers requires an administrative structure of some kind, the cost of which is necessarily shared among the members of the club or among insurance subscribers. Insurance is useful for individuals when it can reduce the volatility of net income flows. Given a strictly concave utility function, a perfectly smooth flow of income always generates a higher expected utility than a random series of income flows with the same average result.

The second column illustrates the effects of a reliable insurer that provides the smoothest possible flow of income for a cost of C for each subscriber. Because this fee has to be paid in every case, it necessarily reduces the average outcome for each subscriber. However, if C is relatively low, it may still increase the expected (average) utility of potential subscribers. The lowest two cells of the second column denote Alle's expected utility for costless insurance and insurance costing 0.24 units of income. Note that in each case the expected utility is higher than that in the natural state. At those prices, Alle would happily purchase insurance from such an insurance company.

The third column represents one possible characterization of unreliable insurance. Such companies carry reserves that are sufficient for ordinary losses but not for disasters. Thus the income smoothing is limited to that which occurs in the moderate loss settings. When disaster strikes, the company declares bankruptcy and no coverage is provided. Note that the smoothing associated with such companies is more limited and the average outcome is below that of both the natural state and the reliable insurance company. It is also lower in terms of expected utility at both the free insurance and costly insurance cells at the bottom right.

If the choice were between the natural state and unreliable insurance companies, Alle would choose to self insure. Alle would, however, be willing to pay up to 0.4 units of income to secure reliable insurance.[57]

The possibility of bankruptcy creates problems for both those wishing to purchase insurance and the reliable companies that wish to provide it, because it is difficult to know whether one has joined a prudent well run club or firm or one that tends to carry inadequate reserves. In the illustration, the reliable and unreliable firms do exactly the same things in ninety percent of circumstances experienced. If the probabilities represent decadal frequencies, there is a nearly fifty percent chance that one would never experience such a disaster in a lifetime [$p = (.9)^7$].

Given the higher profit rates of the firms with inadequate reserves in the short and medium term, they may well displace all the prudent firms during periods in which no disastrous outcomes occur. However, once it becomes known that only non-prudent firms exist, the demand for insurance will disappear, at least as far as Alle is concerned. She would in the case self insure. It bears noting that even if both sorts of firms can potentially coexist in the market, this may also undermine the demand for insurance. For example, if seventy percent of the clubs are reliable ones, and thirty percent are unreliable ones, Alle will only be willing to pay only up to 0.16 to join a club or purchase insurance, sixty percent less than she would be willing to pay if there were only reliable clubs and insurance companies.

In some cases, this would eliminate the feasibility of prudent insurance companies, insofar as the smallest feasible administrative cost per client exceeds 0.16. In others, it would simply reduce profits that both reliable and unreliable firms might have been able to obtain.

Risk averse potential subscribers, and both prudent and non-prudent companies have an interest in reducing the number of unreliable clubs in such cases. (The unreliable clubs have an interest in eliminating their unreliable competitors, because this increases the price potential subscribers are willing to pay for those that remain.)

Rules that reduce the risk of joining clubs and companies with inadequate reserves would advance the interests of the reliable firms and their members (and

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[57] This and most other numbers are slightly rounded off to simplify exposition. Expected utility of the natural and insured states are (approximately) equal when C = 0.4009 in the circumstances characterized by the table.

also the unreliable clubs that remain). In principle, insurer or consumer groups may tackle the job of determining the "prudence" (reserves and honesty) of every insurance company, but it is difficult to do on a completely voluntary bases, because funding such groups often creates conflicts of interest often are associated with such group appraisals. Moreover, insurer groups might tend to become cartels rather than bodies that assure the prudence of their members.

As a consequence, supplemental rules and regulations that might improve the performance of insurance markets and thereby reduce downside risks faced by ordinary consumer-voters are difficult to obtain through private means.

There is, of course, no guarantee that the adoption and similar rules by a government--whether democratic or authoritarian--would avoid all such problems. However, democratic states would at least not confront the economic conflicts of interest or propensity to cartelize associated with many "self-regulating" organizations. Thus, it may well be the case that voter-consumers would encourage the government to tackle such problems. Well-enforced general rules that characterize fiduciary duties and/or that assure "reasonable reserves" are held could advance the interests of both consumers and the regulated firms.

Note that such regulations do not address the first order risks from nature or social risks, but indirectly rather address second order risks that facilitate private efforts to limit their losses from natural and social risks that have not been or cannot be eliminated through rules or other means. Rules that encourage prudence from insurers address what Akerlof (1970) refers to as the "lemons problem," the propensity for poor products to crowd out higher quality products in markets in which quality is difficult for consumers to independently appraise.

Of course, inducing governments to create the right rules is a non-trivial problem. However, to the extent that such rules can be recognized by voter-consumers, electoral pressure to adopt such rules would clearly exist. In addition, prudent companies might lobby behind the scenes to reduce the number of firms with inadequate reserves. So, such rules are not impossible to imagine being adopted in reasonably competitive and honest democratic states. How constitutional designs encourage governments to adopt broadly useful rules is taken up in chapter 9.

B. On the Limits of Rules and Support for Governmental Insurance

For voter-consumers to favor interventions beyond insurance regulation requires other problems that governments may be able to fix. Three other problems may add to those of ordinary private insurance for income and health variations, as opposed to fire or liability insurance. The first is the adverse selection problem. Consumers will be inclined to purchase such insurance when they expect to have financial or health problems. If they can estimate the likelihood of such personal problems better than insurance companies, this tends to increase the cost of private insurance. Such problems may not be insurmountable insofar as companies add a "bias" or fudge factor to their estimates of payments to their customers, but it tends to make broad coverage more expensive and less attractive, in part because those with lower risks will be less likely to subscribe. Second, there

is the moral hazard problem. The behavior that insured persons may undertake may increase their risks. Those with complete income or health insurance may take up activities that increase their health risks, as with speculating in futures markets or with skiing and smoking, which increases the cost of insurance, which again implies that even relatively low-risk prudent persons may find insurance too expensive, since their true risks are over priced.

Third, there is the problem of large correlated risks that may make it very difficult for private firms to have sufficient reserves to cover all losses. In the case of income insurance, the existence of business cycles and their correlation with asset markets implies that huge numbers of claims may be filed at the same time that private reserves--no matter how prudently managed--are depleted by asset price movements. Again, such problems can be finessed by placing relatively large reserves in low return safe assets, as with insured accounts and short term US treasury notes and bonds, but again this has the effect of increasing the cost of insurance and reducing the range and type of persons who purchase insurance.

The net effect of these three factors s that there tends to be a larger latent demand for income and health insurance than markets are likely to satisfy. In such cases, voter-consumers may ask their governments to directly provide insurance if they expect costs for equivalent coverage to decline. Many of these price increasing problems can be addressed, at least in principle, through government provided insurance.

Income Insurance from Private Clubs and Governments					
Degree of Risk Aversion		**A** a = 0.3	**B** a = 0.5	**C** a = 0.7	**D** a = 0.9
Event X, Px = .1	-5	0.5	0.5	0.5	0.5
Event Y, Py = .2	-2	0.5	0.5	0.5	0.5
Event Z, Pz =.7	2	0.5	0.5	0.5	0.5
Average Income	0.5	0.5	0.5	0.5	0.5
Avg Utility (priv)		1.813	2.694	4.005	5.954
Avg Utility (gov)		1.815	2.739	4.017	5.977
Avg Utility (none)		1.8	2.689	4.038	6.095

Table 6.2 illustrates the manner in which a cost reducing government insurance program may attract support over a private plan, although not universal support. The support varies both with the perceived risk and the perceived cost advantage (if any) of the government program. For the purposes of the illustration, table 6.2 uses the same utility function as in 6.1 to calculate the expected utilities, U $= (W - C + Y)^a$, with the same value for W and the same probabilities and range of Y outcomes as in table 6.1. The cost of the private insurance is again assumed to be C = 0.24 and the new government program is assumed to be less 12% less expensive, with C = 0.21. Columns 2 shows the risk environment and columns 3-6 show the result under income smoothing income insurance programs for persons with decreasing degrees of risk aversion, and therefore willingness to pay for insurance of any kind.

Table 6.2
An Illustration Risk Aversion and the Demand for

The assumed lower cost of the government program implies that anyone that would have purchased private insurance now favors government insurance. The lower price also implies that at least a few persons, such as B, who would have gone without insurance (or self insured) in the private insurance case will now support government insurance. However, only if the government price is very low, or the distribution of voter-consumer risk aversion all quite risk avers, would there be universal support for the switch. With only moderate savings relatively less risk averse persons may still prefer to self insure over the government plan as C and D.

If government is far better able to address moral hazard, self selection, and correlated risk problems than the private sector, possibly because of better credit ratings, it can do so on a voluntary basis without relying on its coercive or tax authority. Nonetheless, if voters vary in their risk aversion, the savings would be very large to have essentially unanimous among consumer-voters. For example, if such programs reduced the overhead cost of public programs to C < 0.05, the most risk averse persons in table 6.2 would favor the insurance (ignoring any associated new risks from such governmental policies).

If moral hazard and adverse selection problems are very large, and can only be solved through mandated programs and other rules, support for such programs may be broad, not because of equity concerns but simply because in that case government insurance is economically more efficient than the feasible private alternatives. In such cases, a welfare state may be liberal in the sense that it has essentially universal support.

C. Tax Finance and Majoritarian Social Insurance Programs

It bears noting government insurance programs are rarely purchased through market-like transactions, in which prices vary according to the risks insured. Instead, they normally provide relatively uniform services in exchange for tax payments which vary by income rather than risk. The latter are often separate earmarked taxes which allows voter-consumers to estimate their personal cost for public programs and their marginal cost for different degrees of coverage.

The most common means of payment is a tax on labor income. This implies that a voter-consumer's prices are not directly connected with his or her own risk characteristics and moreover, as one's income and risk depart from the average ones, implicit subsidies take place. Persons with higher than average income or lower than average health risks, in effect, subsidize those with below average income or above average health risks. This is not an explicit subsidy or transfer, but simply a consequence of the funding method used and the generality of the benefits provided to all those covered.

Income and risk differences clearly reduce the appeal of such programs for persons with above average health and income and increases it for those with below average health and income. Table 6.3 illustrates how the income-tax based financing of government insurance affects the demand for such insurance. The middle income persons is the person used in the previous table, with income 7 and risk aversion parameter 0.3 (exponent). In this case, persons with income 5, 9, and 11, are also included in the table, with the same degree of risk aversion as Alle. The tax cost of the program is assumed to be 3% of income (W). In the absence of this

method of finance, all these persons would have preferred government insurance at the previously assumed price of .21.

Table 6.3
An Illustration of How Tax Financing Affects the Demand for
Insurance from Private Clubs and Governments

		Lower Income (W=5)	Middle Income (W=7)	Higher Income (W=9)	High Income (W=11)
Event X, Px = .1	-5	0.5	0.5	0.5	0.5
Event Y, Py = .2	-2	0.5	0.5	0.5	0.5
Event Z, Pz =.7	2	0.5	0.5	0.5	0.5
Average Income	0.5	0.5	0.5	0.5	0.5
Avg Utility (priv)		1.645	1.812	1.949	2.068
Avg Utility (gov)		1.654	1.815	1.948	2.063
Avg Utility (none)		1.533	1.801	1.947	2.069

In the case where there is a choice between a tax-financed government system, a private insurance program providing the same coverage at a higher cost and self-insuring, the two lower wealth (income) persons will favor the government program, the above average person private insurance (which now costs less than the income tax-financed government program) and the richest person in the table prefers to self insure, given the risks confronted and insurance programs available.

Wealth-based tax-financing of the government income security systems has direct effects on support which are independent of economic efficiency and differences in risk aversion. (The government program is still assumed to be the

most efficient.) By making the more efficient program more expensive for those with above average income, it reduces support for even efficient programs, when choices are based on narrow self interest. Similar differences would also be found if the risk (probability or associated losses) varied systematically among persons of similar income, but payments did not vary by risk.

It also bears noting that had the government program been less efficient than the private one, rather than more efficient as assumed, the "discounts" available to lower income persons may have been sufficient to induce their support, even though there were no efficiency gains, as would be the case if reduced competition among suppliers tended to increase administrative costs more than the savings associated with reducing problems associated with moral hazard, self selection, and correlated risks.

Given a distribution of wealth or income in which the median voter has less than median level of the taxed resource and average risks, tax-based financing of government insurance tends to make government sponsored insurance more likely to secure majority approval, other things being equal, regardless of its efficiency effects. Government provision of a risk reducing service does not have to be more efficient than private alternatives to be chosen through electoral procedures, although such efficiency adds to the fiscally generated support.

D. Beyond Insurance, The Ongoing Majoritarian Politics of Government Insurance

Electoral support for rules assuring prudence in insurance markets and for insurance in cases in which governmental insurance is less expensive than private insurance is clear. However, support for even relatively efficient systems of governmental insurance may diminish when essentially uniform insurance is provided at various tax-based prices. The demand for government provided insurance, as true of the demand for private insurance in general, tends to increase with risk aversion, with the magnitude of losses relative to income (even relatively rare events). Electoral support would also tend to increase as governmental cost advantages increase or when cost sharing rules become more generous to a majority by shifting part of the overhead expenses to a minority.

Other things being equal, the demand for government insurance (or supported insurance) increases as risk aversion increases or as income falls relative to the risks insured. The magnitude of losses from many risks, as with floods and stock market panics, are highly correlated with income and wealth, rather than independent of them as characterized in the illustrating tables. Nonetheless, higher income tends to make private or self-insurance more attractive for above average income voter-consumers when government insurance is paid for via an income tax.

Ongoing governmental insurance programs may also expand as new unpleasant surprises are experienced (or imagined and thereby brought into consideration). New generally rare catastrophic events may be experienced, for which existing private and/or government insurance fails to provide coverage. Indeed such events, as with the Great Depression in the U. S., may generate sufficient support for government insurance programs to be initiated rather than simply expanded. In this manner, unpleasant surprises tend to increase the demand for government insurance.

Table 6.4 illustrates the effect of a somewhat larger disaster on the demand for private insurance (a maximal loss of 7 rather than 5) and tax financed government insurance. Note that in all cases, the difference between both insured cases and the uninsured case increases, which implies that the demand for all sorts of insurance has increased. In this case there is unanimous agreement for government insurance over the self-insured (uninsured) natural state. The tax-based pricing of the government insurance, however, still leads those with above average income to prefer private to government insurance, if reliable private insurance is available.[58] Only if equivalent private insurance were unavailable, would the above average income voter-consumers favor government provided insurance for prudential reasons.

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[58] The utility of the lowest income person in the natural state cannot be defined in this case, because the loss generates a negative income or net worth. Only positive numbers can be raised to fractional powers (here, 0.30). If below zero are ruled out, then the expected utility of the lower income person would be the same as in the previous table, $U^e = 1.533$.

Table 6.4
An Illustration of the Risk of Greater Losses Affect the Demand for Insurance from Private Clubs and Governments

		Lower Income (W=5)	Middle Income (W=7)	Higher Income (W=9)	High Income (W=11)
Event X, Px = .1	-7	0.5	0.5	0.5	0.5
Event Y, Py = .2	-2	0.5	0.5	0.5	0.5
Event Z, Pz =.7	2	0.5	0.5	0.5	0.5
Average Income	0.3	0.5	0.5	0.5	0.5
Avg Utility (priv)		1.645	1.812	1.949	2.12
Avg Utility (gov)		1.654	1.815	1.948	2.115
Avg Utility (none)		not def	1.677	1.919	2.106

Of course, not all voter-consumers are prudent pragmatists. Beyond the core private demands for insurance, many government programs also advance other ethical or ideological goals as well. For example, the breadth of coverage usually associated with major government insurance programs advances social norms that value fairness or which take account of the losses of others. For example, utilitarian norms often imply that broad insurance programs are advantageous insofar as standard utility theory implies that losses impose greater subjective losses than the equivalent gain produces in benefits. Paternalistic theories also often imply that many consumers underinsure, possibly because they underweight the future, and so face greater losses than a prudent person would or should. As

such normative theories gain adherents within the population of voter-consumers, this may also increase the demand for social insurance. Conversely, normative theories that emphasize self-reliance may oppose even efficient government insurance programs because they undermine incentives for individuals to be responsible for choosing their own personal life-strategies. As the mix of social normative theories change, so will electoral support for government provided insurance.

It bears noting that If citizens ask their government to provide income security services, it is entirely appropriate that those commitments be put into a form that cannot be entered or exited at will for reasons noted above, nor altered unilaterally by one of the contracting parties. It is, thus, entirely appropriate that constitutional or quasi-constitutional guarantees be provided for income security programs for which the natural period of coverage is relatively long, much as private insurance provides for long term commitments (automatic extensions) among existing clients.[59]

Such long term contracts are not necessarily constitutional in the formal sense, but have to be stable and durable in order to provide long term income security. Many quasi-constitutional laws are adopted as ordinary legislation, yet treated as more or less permanent policies. In the United Kingdom, essentially the entire body of constitutional law is quasi-constitutional in this sense. Examples within the

[59] Natural period of coverage again means that the time period (sample) is long enough that the average outcome is close to the expected value of the random event of interest. In the sickness and health case modeled, the time period was sufficiently long that the anticipated income realized (sample average) approached the asymptotic statistical average for the illness of interest.

United States include the fundamental structure of income tax schedules, election law, and the extent of decentralization. Such policies have quasi-constitutional status insofar as the basic structure of those public policies is taken for granted and widely believed to be beyond the scope of ordinary legislation. Such rules are durable not because of formal constitutional protections, but rather because a durable consensus exists concerning the main features of such policies. The illustration in table 6.3 suggests that a consensus for income security programs can exist for nonredistributive income security programs, because of agency costs and adverse selection.

E.   Conclusions

This chapter has sed a series of tables to demonstrate some important comparative statics of the demand for government interventions in private insurance markets and for the government provision of insurance. To do so in a more general mathematical manner would involve not only a good deal more mathematics than most readers would like to see, but also require the use of Kuhn-Tucker conditions of sufficient complexity, that they would shed little light beyond those provided in the tables. They would simply characterize sufficient conditions for shifts from self-insurance to private insurance and/or to governmental insurance programs.

The illustrations demonstrate that the case for government intervention in insurance markets is straightforward in cases in which private insurance consumers and income security club members cannot easily appraise the relative quality of insurance companies and clubs, yet generally believe that the government is approximately as reliable a provider of rules and/or insurance as the better private sector firms and clubs. No complex redistributive schemes or self-agrandizement by governments are necessary to demonstrate why prudent, well-informed voter-consumers might prefer to have their governments regulate private insurance markets and/or to directly provide a variety of insurance products in cases in which costs are lower than those from private organizations.

Although specific parameters were assumed for the tables, the same qualitative results would occur for other parameters and for other function forms that preserved the risk aversion of individuals and a known range of loss associated with a stochastic phenomena.

Note that considerable trust in government, at least relative to private insurers and rule makers, is necessary for this analysis to go through. Had the relevant government been considered as unreliable as the worse private organizations, the efficiency gains from collectivization would have be very large for voters to prefer universal coverage from a unreliable monopolist to at least some chance of gaining coverage by a reliable private firm. Indeed, in most cases, government would not be asked to provide insurance at all, and might not even be asked to provide specific regulations for insurance markets.

The almost mystical regard that proponents of democracy have for majority rule, aided by Condorcet's jury theorem and prudent constitutional designs, tend to make voter-consumers trust their governments to tackle both tasks, and to expand them as risk increase relative to income, as new risks are experienced, and as ideological support for broad programs and trust in government increase.

Note that all of these phenomena were occurring in the late nineteenth century in the West, as governments generally became more democratic and the specialization associated with industrialization tended to increase both incomes and income risks from business cycles. During the course of the twentieth century, there were both major and minor unpleasant surprises and new nasty possibilities that were taken seriously: the deep recession of the nineteen teens, the great depression of the nineteen thirties, a devastating world war, nuclear weapons and new subtle environmental and health risks. All these would tend to expand the government's role in insurance markets.

Indeed, what most people refer to as the rise of the welfare state is simply the expansion of government insurance programs. These became the largest areas of expenditures by all OECD governments by the year 2000. However, electoral demand for risk management, e.g. demand for the nanny state, also includes the rules and regulations designed to limit risk generating behavior discussed in chapter 5, the management of crises, discussed in chapter 7, and the design of governments themselves, discussed in chapter 9.

Appendix: The Mathematics Behind the Tables: A Generalization

This appendix simply shows some of the mathematics behinds the tables of chapter 6 and also shows that it can be generalized in several ways. Congleton (xxxx), Congleton and Bose (xxxx), xxxx include somewhat richer political economy models that the appendix, the conclusions and estimates from which play a role in several chapters in part II of this book.

The model used in tables in chapter 6 can be generalized by assuming that the stochastic event space is uniformly distributed between L and H, with L less than zero. Average income in this case is $L+H/2$. Given this and the utility function $U = (W + Y - C)^a$, a pragmatic individual will be indifferent between insurance and the natural uninsured state when they generate the same expected utility:

$$H \equiv (W + [(L+H)/2] - C)^a - {}_L\grave{\partial}^H (W + Y)^a [1/(H-L)] \, dY = 0 \qquad (6.1)$$

The implicit function theorem, thus impies that the reservation price for insurance varies with the initial reserves and parameters of the utility and distribution of net income functions:

$$C^{max} = c(a, W, L, H) \qquad (6.2)$$

The implicit function differentiation rule can be applied to determine how the extent of reserves, W, the maximal loss L, and risk aversion parameter, a, affect Alle's reservation price for insurance. Derivatives of 6.1 can be written as H_X / -H_C, where X is the parameter of interest, W, L, or a. In this case H_C is always negative, which allows us to focus on the numerators.

$$H_W = a(W + [(L+H)/2] - C)^{a-1} - {}_L\grave{\partial}^H a(W + Y)^{a-1} [1/(H-L)] \, dY < 0 \ ?$$

$$H_L = \qquad\qquad\qquad\qquad\qquad\qquad\qquad < 0$$

$$Ha = \qquad\qquad\qquad\qquad\qquad\qquad\qquad < 0$$

Chapter 8: On the Demand for Governmental Crisis Management: Coping with Large Scale Crises

> Democratic government has the innate capacity to protect its people against disasters once considered inevitable, to solve problems once considered unsolvable. (F D Roosevelt, inauguration speech 1937.)

A. On the Demand for Governmental Crisis Management

As in the case of individual choices, rules and insurance can reduce but not eliminate losses from unpleasant surprises. Some nasty events will be unplanned for by both private and public rules, and unaddressed through existing private and public insurance programs. A subset of these crises may be said to generate correlated losses, e.g. losses for millions of persons simultaneously. In many such cases, there are advantages to coordinated responses or economies of scale in the responses themselves, and insofar as these are recognized by voters, electoral pressures for governments to intervene will naturally exist. In other cases, the manner of cost sharing may also produce majority support for interventions by government.

Note that the nature of surprise does not imply that one is completely blind-sided by an event, it simply means that many of the relative factors required for an adequate response are not or cannot be known beforehand. Thus no loss-conditioned insurance funds can be assembled, because either the probability of events or the events themselves are not completely known. Nor are even general rules likely to be sufficient to prevent such occurrences or reduce their losses.

A crisis occurs when a less than fully unanticipated event requires a rapid revision of existing plans and programs to avoid large losses. Large scale surprises are commonplace in history as with floods, earthquakes, and invasions. Addressing such crises have also long been at least partly the responsibility of governments. Even leviathan has good reason to minimize average losses from such events, because this maximizes his or her net tax revenues--assuming that he or she can hold on to power after the crisis is over.[60]

Democracies differ from leviathan in that the median voter's interest in crisis management concerns not average losses, but his or her own losses and the losses of others insofar as his or her social norms and altruism takes account of them. As a consequence of both factors, democratic governments tend to be tasked with broader responsibilities for crisis management than authoritarian regimes. For example, during poor weather agricultural output tends to fall, as will average food consumption in a manner that cannot be directly affected by government policy. However, the distribution of food can be affected in a manner that limits losses for those with below average income. Democracies evidently have electoral pressures to undertake such policies, which, as Sen (xxxx) suggests, is the reason that there are fewer famines in democracies than in dictatorships.

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[60] .For threats that threaten a ruler with loss of office or life, such efforts would be taken only insofar as they enhance his prospects for continued authority.

B. Is Crisis Management a Pure Public Good?

The fact that governments often address broad loss generating surprises does not imply that such efforts are efforts to produce pure public goods. Neither the losses nor the crisis management undertaken are necessarily shared by everyone. For example, during a flood, those on high ground are essentially unaffected by the rising water itself, whereas those on low ground are. If the government coordinate or provides methods for persons to leave the flooded areas, most of the methods used affect one person or small groups at a time, as with buses or mass-transit tickets. Similarly, programs to limit the losses of those already harmed during a crisis, by, for example, handing out food, clothing, and tents, are providing private goods rather than public goods.

If in the future, large new capital structures (dikes) are built to limit future losses those services, in contrast, often resemble classic public goods. These are not crisis management, but loss reducing services analogous to rules and regulations discussed in chapter 5. The breath of benefits associated with such programs usually reflects economies of scale associated with some risk reducing services. (Its often far less expensive to build one large dike system than dikes around each house).

C. Standing Routines for Governmental Crisis Management

Particular surprises are normally new in many ways, yet often similar in other aways to crises dealt with in the past. The latter often allows past methods to be

revised and applied to the new event, rather than requiring an entirely new approach to be worked out. This allows governments, as individuals, to have standing routines for addressing classes of crises already tasked to them. For example, each new fire or automobile accidents presents new challenges. Yet they are similar enough to past fires that existing routines can be modified by persons on site to address the new problems.

The common elements of many unpleasant surprises allows standing, but flexible, routines to be worked out to address broad classes of similar crises. As a consequence, efforts to limit losses from fire and other accidents are normally responses of specialized agencies (often called first responders), who devise effective methods that can be easily be adjusted to cope with the novel elements of "ordinary" surprises as they occur. And, with experience, the adjustments tend to become almost automatic as the range of losses and possible responses becomes better understood.

Nonetheless, applying old routines to entirely new problems, as with the fires in the World Trade Center associated with the 9-11 attack, may fail completely, because major innovations rather than refinements of existing methods may be required, innovations that are too great to be generated in the time available. Necessity is the mother of invention, but necessity alone is not sufficient to generate success, as the victems of many life-threatening crises would attest, if they could. For example, had the fire teams been able to put out the burning jet fuel as easily and quickly as ordinary fires are addressed, the two tallest buildings in New

York City would not have collapsed and nearly three thousand additional persons would have survived the surprise attack to tell their stories.[61]

D. A Model of Survival Maximizing Response to a Crisis

Suppose that all individuals confront the same loss-generating function in which losses are generated by combinations of stochastically generated exogenous factors, F1 and F2, and policies, P1 and P2, in place at the time of interest.

$$Lt = l(F1t , F2t , P1t , P2t) \tag{1}$$

Assume that the first derivatives of L are positive, the cross partials positive, and the second derivatives negative. This assures that L is concave.

Suppose also that there is a parallel wealth- or reserve-generating function driven by the same variables:

$$Wt = w(F1t , F2t , P1t , P2t) \tag{2}$$

Assume that W also has positive first derivatives and cross partials and negative second derivatives. Net additions to individual and social reserves at time t are thus:

$$Rt = w(F1t , F2t , P1t , P2t) - l(F1t , F2t , P1t , P2t) \tag{3}$$

Reserves are accumulated when Rt > 0 and depleted when Rt< 0.

The total reserves at time T, RT, reflect initial endowments and past accumulations and losses:[62]

$$RT = R0 + 0 \text{ ò } T \text{ Rt dt} \tag{4}$$

The initial endowment of reserves, R_0, may reflect environmental resource conditions at the place of interest at the point when a settlement begins, as in Diamond's discussion of the various Pacific Island settlements. Or, it may simply be the existing reserves moment at which the analysis begins or a problem is confronted. Social reserves in this first model are simply N times those of the average individual.

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[61] See Eagar and Musso (2001) and National Institute of Standards and Technology (NIST, 2002) for analyses of how fire weakened the structure of both buildings leading to their collapse. An overview of the NIST study can be found at: http://www.nist.gov/el/disasterstudies/wtc/.

[62] It is interesting to note that the reserve accumulation functions can be strictly concave at the same time that the process generating the exogenous state variables may be neither concave nor concave, as with the processes that produce the power density of solar radiation at a given location on earth, which resemble sin waves. As a consequence, cyclic time series for reserves are commonplace in agriculture and in many other areas of life, as illustrated in figure 1.

In the case in which reserves and the reserve-generating functions are identical among individuals, anything said about individuals applies equally to society. In this setting, both individuals and society are assumed to be nonviable at time T, if their reserves fall below zero in a period of reserve depletion. Given this survivorship threshold (0) and an assumption that the relevant functions are partly driven by stochastic exogenous factors, an individual and an individual's and community's survival-maximizing policies at time t are those that maximize the accumulation of reserves.

The time series of best policies (strategies) for doing so can be characterized by differentiating equation 3 with respect to P1 and P2 and setting the results equal to zero.[63] These first order conditions, together with the implicit function theorem, imply that the survival-maximizing policy combination at each moment in time can be characterized as:

$$P*1t = f1(F1t, F2t)$$

(5a)

$$P*2t = f2(F1t, F2t)$$

(5a)

In this setting, there is a survival-maximizing policy response for all possible states of the world and an ideal policy path for every sequence of states of the world. In a well-run, well-informed community that aims only for long-run survival, it is the policies described by equations 5a and 5b that we would observe to be in place.

Even with such perfectly robust plans, however, it bears noting that there are catastrophic states of the world in which even the best possible responses do not produce sufficient reserves to survive. One may ride a tiger for a while, but eventually tire (deplete reserves), lose control, and be mauled by the tiger. The sun may explode, a large asteroid may land on one's village. There are no guarantees that solutions exist for every problem. However, given the assumed partial derivatives, communities with the above plans survive a wider range of calamities than those with suboptimal policy-response rules. Communities with the best possible plans may be said to be robust communities.

Within the "non-catostrophic" or normal range of crises, the time path described by the policy response rule[$P*1t = f1(F1t, F2t)$, $P*2t = f2(F1t, F2t)$] achieves viability (positive reserves). This is the optimistic universe characterized by Diamond toward the end of his book.

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[63] The assumption of positive derivatives for the policy variables in the loss- and wealth-generating functions neglects cases in which the same policies may have opposite effects on wealth and losses (over some range). These sorts of policies tend to imply corner solutions. For example, a policy that increases wealth and diminishes losses over the entire range of interest should be set at infinity. A policy that diminishes wealth and increases losses over the entire range of interest should be set at zero, or if feasible, negative infinity.

E. Limits in Feasible Responses: Surprises and Imperfect Policy Choices

Unfortunately, such perfectly robust policy rules are rarely possible in a world in which crises are possible. Social and physical systems are complex and may also be partly stochastic. Some exogenous causal factors may not be fully understood. Some of the effects of policy may not be fully understood. In such cases, the future is not completely known and unpleasant surprises may be confronted by individuals, organizations, and societies.

Some unpleasant surprises generate short-run crises (emergencies), in which rapid changes in plans are necessary to avoid exhausting existing reserves. Other unpleasant surprises may induce long-run crises, in which significant damages (reductions in one's health and/or wealth) are likely to emerge under current policies, but rapid responses are not required. Although reserves are disappearing, depletion rates imply that reserves will last for a longer period.

There are a number of reasons why communities may fail to adopt policies that maximize survival prospects. They may not know or be able to observe the causal factors (state variables) on which the best policy choice depends. They may not be able to fully control all the relevant policy variables, because of institutional or technological constraints. They may have other goals that conflict with survival.

In a two-factor, two-policy world, it is plausible that all decision makers completely understand their wealth- and loss-generating functions: the exogenous processes that generate the state variables, the range of exogenous factor values that they may confront, the entire range of policy responses that may be adopted,

and the effects of those policies on states of the world for all possible values of the exogenous factors. Such settings are the ones normally examined in economic and game-theoretic models. In such cases, all decision makers have complete and optimal plans of action that specify the best possible response for every possible situation, as described in equations 5a and 5b.

However, perfectly robust policy response rules are less likely to be feasible in settings in which the number of exogenous causal factors is very large, the process generating them complex, and the number of possible policy responses is also very large. Information and planning costs and/or the nature of processes generating the states of the can rule out the existence of completely robust plans. Some of the processes generating state variables may be non-ergodic or very long term phenomena, and therefore many possible states of the world and losses associated with them would not been experienced and may not have been predictable ex ante.

Decision makers may, for example, have experienced many spring floods, but not a 200-year flood (one taking place only once every 200 years). In such circumstances, both surprises and crises may occur. Indeed, they may be commonplace, rather than the exception. New plans may have to be devised and adopted rapidly, without much preparation, as the water rises to levels never before experienced.

Social Dilemmas: Commons Problems and Coordinated, Managed, Solutions

The crises analyzed above are exogenous ones in which all persons in a community confront similar losses and can independently address the crisis through their own policy choices. We now shift to cases in which addressing a crisis requires some coordination or management, such as required by a variety of social dilemmas. In most social dilemmas, the crisis is at least partly endogenous in the sense that extraordinary losses are partly the consequence of the joint decisions (policy rules) of the individuals in the community of interest.

This shift in focus allows us to explore the importance of governmental institutions for recognizing and coping with crises. The analysis continues to assume that individuals are all interested in maximizing prospects for survival, but in the context of social dilemma, even such persons may adopt policies that place themselves and their community at greater risk than necessary. Governments may also induce crises, but this possibility is not taken up until section III of the paper.

The dilemma of greatest relevance for the resource management and environmental issues focused on in Diamond's book is the classic commons problem. The above net-reserve accumulation functions can be used to analyze commons problems by interpreting the known causal factor (F1) as the total use of some common resource by other persons in the community of interest and the policy decision as an individual's own use rate of the commons. In a two-person society, the exogenous factor confronted by person A is the use of the commons by person B and vice versa. Policy 1 is each person's own use rate. In a larger N-person community, the exogenous factor would be the use rates of the N-1 other persons in the community.

The nature of a commons problem is such that beyond some collective use rate U*, the total output of the commons falls, although the typical individual's own harvest increases, if other users do not increase their usage. Although problems are not associated with every commons setting, there are many in which the Nash equilibrium use rates are excessive and net output from the commons is below the maximal output.

At the symmetric Nash equilibrium each person in a community of size N chooses:

$$P'1t = f1((N-1)P'1t \mid P02t, F02t)$$

(7a)

and, when there is a problem, the total usage is:

$$N\ P'1t > U^* \tag{7b}$$

Modest overusage problems reduce the accumulation of reserves, which places the society at somewhat greater risk of failure than it needs to be, but not at an existential risk. However, there are clearly cases in which a commons problem can completely undermine a society's prospects for survival, as when the resource in question is the only source of food or water in the region of interest. The result in either case is similar to that depicted in figure 2 in which the reserve accumulation function is reduced for each individual (and thus the community as a

whole) and reserves may be depleted, rather than accumulated, over the period of interest.

Because such commons problems are themselves relatively common, a variety of methods for addressing resource overuse problems have been adopted by societies throughout history, as indicated by Ostrom's case studies and analysis (1990, 2005). Most require collective action of some kind to create standing institutions for limiting access or otherwise changing incentives to overuse the commons of interest.

One widely used solution is the introduction of formal use rights of various kinds, as with rights "to use and exclude." In addition to privatization, communities may regulate access through resident user fees, permits, and norms of various kinds. These may be applied uniformly, so that individual use rates falls from P'1t to U*/N, or they may be applied in an asymmetric fashion in which some users receive greater access than others, with a total usage equal to or below U*.

Which type of solution is chosen, if any, will vary with the process through which policies are chosen in the community of interest ¾ that is, with the type of government in place, and whether the government recognizes the overuse problem and adopts policies to address it.

F. Crisis and Collapse

Jared Diamond (2011) does an excellent job of reminding us that societies do not last forever. They may be destroyed or undermined through war, a dearth of resources, and unsustainable political decisions. By doing so, he reminds us that long-term survival should not be taken for granted, although he regards himself to be an optimist by suggesting that long-term survival is possible. As a professor of physiology and geography, his book naturally tends to focus on physical causes of collapse, although he acknowledges many other possibilities. Other possibilities somewhat neglected in his book include exogenous meteorological shocks (changing climate and/or unusually bad weather), institutional competition, and changes in economic circumstances.

His narrative centers on natural resource constraints and resource management problems. The Greenland case was evidently largely induced by northern hemispheric cooling.[64] After more than three centuries of life in Greenland, farm crops became even less certain than usual and emergency supplies from other communities were limited by ice flows, reducing both the average standard of living and reserves for withstanding unusually bad years. Although temperatures warmed in the following century, the colony evidently never recovered. A more dramatic, albeit smaller and less famous, instance of collapse

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[64] Diamond mentions the fact that the Inuit survived through this period, although they faced similar difficulties. However, even if the Norwegian-Icelandic settlers had mimicked the Inuit, it could still have been said that the original Scandanavian–based society collapsed largely as a result of climatic change.

occurred 30 miles from where this piece is being written, where a small prosperous town was erased by rare, very strong, river floods, and fires between 1886–88 and never recovered. The flood destroyed a good deal of the capital stock of the town, which undermined its economics (milling, logging, and tourism), and evidently the capital could not be easily replenished in the post-flood economic environment, in part because the perceived risks in that particular valley had been reassessed.

In both cases, an exogenous natural shock (the Little Ice Age and floods) may be said to have undermined the sustainability of a community by depleting reserves (food stocks and other capital) and increasing perceived risks associated with particular places. This paper attempts to shed some light on these and other similar cases in which communities are undermined by exogenous shocks and policy choices.

This chapter develops a relatively lean model of collapse and uses it to analyze the institutions and economics of surviving crises. Space considerations necessitate a somewhat brisk and tight analysis. Section I develops a model that provides economic and informational foundations for crisis, crisis management, and collapse. The analysis provides a framework for analyzing crisis and collapse from a rational choice perspective. The model focuses on the accumulation and depletion of reserves in settings in which the choice environment is not fully understood. The analysis generates a number of general conclusions and provides a useful point of departure for additional research. Section II briefly describes social dilemmas that require organized responses. Overcoming such problems requires governments or similar organizations. Section III suggests that governing decisions can cause crises in cases in which the interests of government officials are not well aligned with those of "their" communities. Section IV suggests that some governmental institutions are likely to be relatively more effective at promoting the accumulation of reserves; detecting, addressing, and surviving crises; and thereby avoiding collapse. Section V summarizes the results of the analysis.

The analysis suggests that political institutions for ameliorating short-run and long-run crises share a number of properties, as do many of the standing policies for avoiding a collapse. Although crisis and collapse may occur even when a society's political institutions and policies are perfectly robust, a society is far more likely to survive unpleasant surprises, if it has institutions in place that encourage the accumulation of reserves and assures an early detection of and effective response to crises.

To provide a bit of structure for the analysis of crisis and crisis response, a model is often useful. A model focuses on a subset of factors thought to be important so that relationships among factors can be better understood. The model below focuses on a choice setting that is prone to exogenous shocks of various kinds that require reserves to survive. The analysis focuses on informational problems and other policy problems that affect the probability of survival in such settings; however, as a point of reference it first analyzes a setting in which there are no policy mistakes.

Reserves are stocks of natural and/or accumulated resources that can be drawn on for sustenance during difficult times. "Difficult times" may be generated by exogenous factors that cause unusual losses, unusually poor conditions for producing goods and services that can be used for reserves, or a combination of the two. During most of human history, winter has been a period in which reserves were depleted and summer is a time in which they are replenished in communities located well north or south of the equator. Many firms in the West, similarly, have seasonal sales that account for the bulk of their profits and hope to weather the remainder of the year on reserves accumulated during that period.

In principle, each person or organization in such communities may have different wealth- and loss-generating functions, and those functions may each be driven by a large number of exogenous factors and control variables. Nonetheless, a model that includes uniform wealth- and loss-generating functions with just two exogenous factors and two control variables sheds light on many key issues and can be easily extended to account for greater complexity.

G.   Conclusions: Robust Routines for Dealing with Crises

Sensible policies for democratic crisis management are essentially similar to those for individuals. Policy makers should attempt to avoid big mistakes. A well-designed constitution should be crisis proof. It should be designed to handle the urgent unforeseen problems in a manner that does not threaten its fundamental decision procedures and constraints. Urgency implies that streamlined decision processes can be productive during times of crisis. However, emergency powers should not used as a method of circumventing normal constitution practices. The standing procedures of crisis management should also allow persons other than those charged with crisis management to determine when the crisis has ended so that the normal decision processes are reinstated. (An example of such an architecture is provided by the U. S. constitution, which gives Congress the power to declare war, but makes the President the commander in chief. Moreover, a war can only be continued with Congressional, approval insofar as Congress controls funding for the military on a year to year basis.)

Obviously, it is sensible to investigate and plan for crises before they happen. Although surprise is a fundamental characteristic of crises, ignorance about crisis scenarios and possible policy responses to them can be reduced by creative analysis and planning. One can never fully anticipate the exact time and place of an earthquake, flood, contagious disease, or terrorist attack, but many responses to such crises are similar regardless of specific details. A careful analysis of real and imagined crisis scenarios allows rapid policy responses to be chosen from a menu of well-understood policy options. For example, an individual crime or fire remains a crisis in the sense that each case is a surprise and calls for an immediate response. However, responses to individual crimes and fires have long been routinized, and, thus, "normal" crimes and fires are no longer regarded to be crises. In this manner, policy research can reduce losses associated with mistakes made during times of crisis; although it cannot entirely eliminate crises or mistakes.

Second, because policy mistakes are unavoidable during times of crisis, the standing procedures for dealing with crisis should allow policy mistakes to be discovered and corrected at relatively low cost. This is, of course, one reason for having regular and routine popular elections rather than electing persons for lifetime terms of office. It is also the reason why emergency policies should have "sunset" provisions so that they expire or are carefully reviewed after the immediate crisis has passed and better information becomes available.

Third, because not all crises can be eliminated, some of the downside risks can be eliminated through insurance like policies. A common method for addressing losses associated with a crisis and with the mistakes of crisis management is ex post social insurance, in which taxpayers "bailout" those whose losses are greatest or deemed most likely to lead to subsequent crises. These programs are not always trivial in size, as evident in the most recent financial crisis. Moreover, ex post insurance, but its nature is a product that is difficult for private markets to provide since the payments go to those damaged by events that were not widely anticipated and so could not be prepaid in the normal way with insurance fees.

Fourth, robust institutions for addressing crises should be crisis proof. It should be designed to handle the urgent unforeseen problems in a manner that does not threaten its fundamental decision procedures and constraints. Standing procedures should allow times of crisis to be identified so that streamlined decision processes are put in place only temporarily. The streamlined decision making should be narrowly focused on the crisis at hand to reduce agency problems and

the magnitude of policy mistakes. There should be clear lines of responsibility so that mistakes, malfeasance, and incompetence can be readily identified and punished. The standing procedures of crisis management should also specify persons (other than those charged with crisis management) to determine when the crisis has ended so that the normal decision processes are reinstated. (Emergency powers are less likely to threaten the constitution in this case.) This is, of course, one reason for having regular and routine popular elections rather than electing persons for lifetime terms of office. All emergency policies should have explicit "sunset" provisions so that policies are carefully reviewed after the immediate crisis has passed and better information becomes available

Chapter 9: Constitutional Design and Risk Management

A. Risks and Crises Can Also Be Generated By Governments

The logic of crisis management implies that constitutional amendments during times of crisis should be avoided to the extent possible, because changes in the fundamental procedures and constraints of governance are difficult to reverse; thus, constitutional mistakes can be far more costly than ordinary policy mistakes. To avoid fundamental mistakes, procedures for dealing with crises should be designed, implemented, and revised during times that are relatively free of crisis. Even during an extraordinary crisis in which constitutional procedures fail, temporary rather than permanent changes to decision-making processes are preferable to constitutional reforms to avoid costly mistakes that tend to be very difficult to correct.

B. Governance, Narrow Interests, and Survival

Having established a model of crisis and the need for coordinated responses to cope with a subset of crises, we next analyze whether some forms of government select policies that are systematically more favorable for survival than others. In a perfectly informed setting with an effective, survival-oriented government, collapse can only occur if an overwhelming loss-increasing or wealth-reducing event occurs. Such policy choices cannot be taken for granted

both because of the informational reasons discussed above and because governments may not always have interests that are strongly aligned with community survival.

The existence of a government is not a sufficient condition for avoiding all crises. Less ideal governments may use procedures or have interests that reduce their ability to detect and respond to crises or may themselves induce crises through policy decisions. Diamond, for example, notes several cases in which government policies created crises, as with his Tokugawa and Rwanda case studies. Indeed, with respect to environmental crises, it can be argued that once an environmental "problem" is identified, it only continues to exist because of government failures of one kind or another. The proximate cause of such crises are not exogenous shocks or private social dilemmas but that governments or other organizations fail to adopt and implement policies to address those shocks or dilemmas.

The remainder of this section of the paper attempts to characterize political institutions that align the interests of policy makers with the survival interests of their communities. The advantages of centralized information collection and/or response depends partly on the nature of the crises confronted and partly on the efficiency of the government and its alignment with general interests in the community of interest.

There is a broad public choice and constitutional political economy literature on the effects of institutions on public policies, on which the following

analysis draws heavily. In addition, there is an economic growth and development literature in which an active debate on the effects of institutions on economic growth rates is taking place. On balance, that literature suggests that the quality of political and economic institutions contributes to economic growth and development. Such macro-insititutional analysis is consistent with the above model of survivorship insofar as prosperous societies tend to have relatively large reserves.[65]

Institutions that encourage the development of better policies, by definition, tend to reduce losses and increase growth, and thereby promote the accumulation of survival-relevant reserves, including both biological and economic resources. A robust society, however, requires more than the accumulation of wealth. A robust society also requires institutions that reduce the number of crises confronted, and governments that are able to recognize crises, to devise and implement solutions, and also policies that ameliorate the effects of a crisis in a timely manner at a relatively low cost.

Overly narrow governmental interests as a cause of collapse

To analyze problems associated with misaligned or narrow government interests, it is useful to drop the assumption that crises and policy responses have the same effects on all persons in the community of interest. With that in mind, assume that there are three roughly equal-sized groups of persons [i, j, k] with different loss- and wealth-generating functions. In this case, a crisis may affect only a single group, two groups, or all three groups according to assumptions made about the three sets of functions. A broad crisis may have larger effects on some groups than others. Similarly, the government may be controlled by one group, two groups, or all groups, and its crisis-moderating and/or -avoiding policies (P1) may be targeted at one, two, or all groups.

In cases in which a subset of the community controls policy choices, communities will often fail to address a crisis or will inappropriately address a crisis, in the sense that risks are increased for a significant subset of community residents.

In order to analyze how different types of governments address crises, some assumptions about how crisis prevention and amelioration are paid for are also necessary. A slight modification of the most common financing assumption used in political economy models is adopted. Suppose that government reserves and policy responses to a crisis are financed through a uniform proportional tax on individual net reserves (wealth). The government is also assumed to be constrained to spend the revenues from that tax entirely on crisis prevention or amelioration activity P1 at a cost of c(P1); that is, crisis prevention and insurance is paid for through a simple, broadly based, earmarked tax on wealth.

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[65] Useful windows into those literatures are provided by Mueller (2003), Congleton and Swedenborg (2006), Knack and Keefer (1995), Rodrik et. al. (2002), and La Porta et. al. (2006). Institutional quality is often measured in a way that historically tends to be associated with prosperity—that is as indices of liberalism, an assessment further supported by this paper.

The conventional financing assumption has several implicit effects. First, it facilitates modeling policy choices by simplifying mathematical representations of the policy decisions. Second, the uniform tax assumption implies that governments cannot use Lindahl or Pigovian pricing for risk-management services. Third, the uniform tax and earmarking assumptions reduce downside risks for persons outside government by eliminating the possibility that special taxes can be imposed on groups not represented in government and simply kept by the groups controlling the government. It also implies that governments are not residual claimants on "their" societies.

Minority Rule

As a point of departure, assume that one of the groups, k, initially controls the government and can choose any policy that it wishes subject only to the fiscal constraint. If the group (or its leadership) has pragmatic survival interests, it will be inclined to focus anti-crisis measures on itself (P1k'), using tax revenues raised from the entire community to pay for them. The tax rate t* required to do so satisfies: $t^* \sum_{ijk} RT = c(P1k')$.

Such focused responses tend to protect or reduce losses for the group receiving the crisis-management services, here the ruling group, while increasing risks for those taxed to pay for it. Such crises as floods, famines, and banking crises may be addressed with dikes, food banks, emergency reserves, and other forms of crisis insurance, all of which can be targeted at specific regions or industries and generate only modest direct benefits for persons located in other regions or industries. Insofar as both losses and taxes deplete reserves in the unserved parts of the community (groups i and j), such policies lesson survival prospects for members of those groups.

Extreme cases of such governments include Diamond's Rwanda case study, South Africa in its apartheid period, or contemporary Zimbabwe. Other examples include most medieval European governments and many contemporary Middle Eastern governments, where religious and/or sex differences imply significant difference in legal rights and public services.

Insofar as the three groups in the model form a self-sustaining (complementary) community, the community itself will be at somewhat greater risk from such policies, although the ruling group is likely to survive and will to some extent take account of the complementary effects when choosing policies. Such problems are also smaller if anti-crisis measures are necessarily communitywide public goods and so reduce losses for all groups in a community. Such cases may include steps to reduce military threats and those associated with large-scale environmental, weather, and economic problems. However, these better outcomes are the result of the nature of the policy instruments used, rather than the institutions of governance per se.

The authoritarian case (single-group government) examined above is an instance of what might be called the "extractive state" or what North, Wallace, and Weingast (2009) call the "natural state." Such governments maximize their own

reserves, and thereby prospects for survival, by extracting maximal rents from the policies under their control.[66]

Majority Rule

Majoritarian states have broader interests than minority states, because they must, by definition, advance the interests of a majority of their communities to remain in authority. If the groups in the community (polity) are about equal in size, a government would have to provide crisis management services for at least two of the three "i, j, k" groups.

A pragmatic majoritarian government would be inclined to tailor crisis-avoiding infrastructure projects and crisis insurance programs to favor its electoral supporters alone, leaving one of the three groups without risk-reducing services. Again, if complementarity exists among community survival interests, a pragmatic majoritarian government would also take account of them. However, a majoritarian government's interests are too narrow to maximize community-wide survival prospects, although a smaller group's survival interests are neglected by a majoritarian government than a minoritarian one.

Majority Rule with Constitutional Protection of Minorities

If we rule out unanimous agreement as a feasible decision rule for large communities, an alternative to unconstrained majoritarian governments is majoritarian government with constitutional constraints that limit an elected government's ability to target government services or taxes at specific groups. For example, a government constrained by a takings rule (Epstein 1985) and a generality rule (Buchanan and Congleton 1998) would tend to use its existing authority to provide risk-reducing and risk-management policies to all persons in the community.

The result would not necessarily be survival maximizing, because risk-management services would be more nearly optimal for risks faced by the majority than the minority. Moreover, risks may differ among the communities and most effectively addressing them might require difference in crisis management services. Nonetheless, the minority's risks are likely to be moderated by the policies adopted.

It also bears noting that not every alignment of voter interests has a stable majority or median voter equilibrium associated with it. In the absence of a stable majority, majoritarian cycles are likely and shifting proposals over how the potential surplus may be divided would produce an endless cycle of proposal and counterproposal, with the result that the some crises may not addressed and a good deal of resources may be wasted in policy deliberation (Congleton and Tollison 1999). Such cycles are also reduced by takings, generality, and universality norms under which all members of the community are assured equal protection of

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[66]   Among the group-specific crises managed would be risks associated with overthrow, which may require a variety of "loyalty" increasing policies, large loyal armies (possibly with officers chosen from its own group), castle walls, a secret police, and emergency reserves in gold or foreign bank accounts (Wintrobe 1998, De Mesquita et. al. 2005).

the law and equal fruits of collective action (Buchanan and Congleton 1998, Weingast 1979).

Together, these points suggest that constitutionally constrained majoritarian states are more likely to survive in the long run than unconstrained ones. The use of majority rule together with constitutionalizing "equality before the law" tend to align a government's interests better with community survival prospects than unconstrained majoritarian and minoritarian governance.

An illustration: Governance and choice of commons solutions

We now return to the case of the commons problem, which may exist for the entire territory governed by each of the three above governmental types.

With respect to internal commons problems, a minority government may simply privatize the commons by taking it under state control, taking all the surplus for itself. This solves the overuse problem, but reduces survival prospects for other former users of the commons. A somewhat less grim solution for an extractive state would be to impose a monopoly user fee (or rental rate) on all users of the commons. Such a monopoly price would induce usage somewhat below the surplus maximizing level of U*, but allow residents to share in the output of the commons. The maximal rent, user-fee, or excise tax revenues could then be used to finance other crisis-management services for the group in power.

Note that roughly the same commons-management solutions may be adopted by majoritarian as by minority governments. The majority may quasi-privatize by limiting access to members of the majority and limit usage by

members through use rights or fees if they would otherwise overuse the commons. Alternatively, revenues from the commons may be maximized and the proceeds used to provide crisis-management services to the majority. Insofar as production from the commons is an important source of net reserves, a larger number of persons have their survival prospects increased than under the first arrangement. In both cases, however, the majority's survival interests are more advanced than those of the minority.

A majoritarian government constrained by a generality principle could not exclude the minority from the commons, nor could it use revenues generated from the commons to advance only its own narrow interests. Thus, a constitutionally constrained majoritarian regime will tend to advance the survival interests of the entire community, although it does not necessarily maximize communitywide survival prospects, because to the extent possible government policy will still favor the majority.

Moreover, if the commons problem is a serious one and there is no median voter or stable majority coalition, the majoritarian cycling problem implies that majoritarian governments are unlikely to survive in the long run in the absence of generality and takings rules. This provides a possible explanation for the rarity of majoritarian governments historically.

C. Divisions of authority within and among governments

Besides issues associated with how policies for a given community should be chosen, there are a variety of other institutional design issues associated with how authority should be divided within and among community governments to increase survival prospects.

The King and Council

A minority or a majority–based government could select or elect a single person to make all policy decisions for the community (a dictatorship or elected king). Alternatively a committee or council may be selected or elected and vested with policy-making authority (ruling council, junta, or congress). Various combinations of the two are also possible, as with the "king and council" system of governance. The latter has a variety of advantages that are outlined in Congleton (2010: ch. 2–4). The king and council system provides a relatively efficient solution to a variety of information, succession, and agency problems that the pure council and pure executive systems suffer from. The king and council template also provides a continuum of governmental types that can be fine tuned during a crisis to increase the effectiveness with which a particular crisis is addressed.

These features make that architecture more robust than most other systems of governance. Its robustness is evident in that this template is widely used by national and regional governments and by firms, churches, and universities as an institutional architecture for choosing and revising policies.

Dividing Authority among Levels of Governance

In addition to the internal structure of the policymaking system within government, there are also issues associated with the degree to which policymaking authority should be centralized. The latter varies by type of problem addressed and with the type of policy response to be adopted. In principle, centralization and subsidiarity issues span the gamut from individual to worldwide organizations and the optimal degrees of centralization and type of organization may differ for every component of policy according to the crisis at hand. Most large organizations use a variety of decentralized decision making procedures to address crises that occur on a more or less regular basis ("putting out fires").

A broad range of cases exist in which losses from crises can be most effectively reduced through a combination of centralized and decentralized policy responses. For example, a tsunami alarm can be maintained by a central government and flight to high ground after an alarm is sounded can be organized at the local government, family, and individual levels. Before and during a crisis, the informational problem associated with recognizing a greater-than-usual risk can also be done one person at a time, through centralized research and dissemination or through combinations of the two. After and during significant crisis, the affected persons and organizations may demand insurance to limit losses or other safety nets, which may be provided by cooperatives, commercial firms, and/or national governments.

Federalism and crisis management

Historically, community governments have often formed new higher levels of governments through treaties and mergers to address crises of various sorts, especially military ones. In such cases, federal or confederal institutions emerge from the bottom up rather than from the top down. Similar steps are taking place today with respect to international environmental problems, motivated partly by politically active groups that believe that international environmental problems are a long-term existential crisis that can only be addressed through policies that are coordinated at regional or global levels. A very large number of transnational organizations have been created in the past three decades, although most have to this point been delegated only very limited authority (Congleton 2001, 2006).

Given a federal or confederal institutional structure, policy responsibilities can be distributed among more or less independent central, regional, and local governments to solve a variety of political and economic problems, including those associated with overly narrow governance and those associated with externalities and economies of scale. The initial assignment of authority in federal systems normally reflects the interests of those who negotiated the original treaty or constitutional agreements, but they are often revised from time to time to address unanticipated problems and associated shifts in bargaining power.

When there are no coordination responses to be overcome or economies of scale in information gathering and policy response, the same subsidiarity principle implies that individual decision makers are the appropriate level for crisis analysis and response. Institutions that "localize" crises and crisis response, as with privatizing a commons, rather than using collective management methods, also facilitate the use of lower levels of government to address problems.[67]

When upper levels of government represent relatively narrow interests and the powerless or minority groups are clustered in particular regions, federalism provides a possible institutional solution to the institutional problem of overly narrow governmental interests. A regional crisis may not attract as much attention from a central government as it would from the communities directly threatened. In such cases, groups not served by the central government may have crisis avoidance and insurance programs provided by their own subnational regional or local governments. Moreover, to facilitate such responses, constitutional provisions may explicitly delegate authority to the lowest level of government that can address the crisis of interest in order to assure that relatively more homogeneous communities make the relevant tax and crisis amelioration decisions to address crises and reduce the likelihood of collapse.

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[67] The economics of decentralization are explored in the fiscal federalism literature. See, for example, Oates (1972) for a nice overview of core economic issues and for his hearly "decentralization theorem." The main political issues are the extent to which organized responses are more effective than uncoordinated responses, and the extent to which government at a particular level is likely to be better able to detect and implement policies. The main economic issues have to do with economies of scale and inter-district policy externalities.

It bears noting that even centrally organized responses do not always require very much centralization. Centralization of a subset of the policy response vector is often sufficient to realize the network and scale advantages of organized responses, as with centralization of flood alarms. Other parts of the policy response vector may remain largely decentralized, as with the organization of exit strategies from a flood or determining how to best use limited water rations during a drought.

D.   Centralized versus decentralized methods of crisis detection

However, during times of major emergencies, new advantages of centralization often arise, with the result that in some cases entirely new levels of governments are formed, as noted above. In cases in which policy coordination problems are significant, information gathering exhibits significant economies of scale, and government interests are well aligned with resident interests, centralization tends to be superior to fully decentralized information gathering and response systems.

For example, forecasting flood levels is not extremely difficult, having to do with rainfalls in the catchment basin and melting rates of winter ice packs, but there are clearly gains from specialization and economies of scale in the production of this information. Rather than have everyone in the community make daily trips to the catchment basin to check on their private rainfall tubes and measure snow-melt rates, a single individual (or small number of individuals) can do this

and share their information with those downstream. There tends to be a free-rider problem in attempting to do this privately in that a single subscriber might share his information with friends and families and so on who fail to subscribe to the service. So, this kind of information might not be adequately provided through single-purpose informational subscriptions, and so it may be provided via community or a catchment area cooperatives or community governments. The service might also be provided by general purpose local newspapers insofar as readership increases sufficiently by including such reports to attract additional advertisers.

On the other hand, information about many threats appears sporadically and is subject to a variety of interpretation, which often makes decentralized modes of crisis detection not only relatively efficient, but the most likely mechanism to be in place for detecting true surprises.

Institutional designs can increase the effectiveness of decentralized crisis detection systems by increasing the extent to which individual-level information is aggregated or used to coordinate decisions. The use of private markets (including futures markets) and majority-based elections tend to promote information aggregation (Hayek 1945; Fama 1970, Jensen and Meckling 1990; Grofman, Owen, and Feld 1983; Congleton 2007). Under such institutions, decentralized information gathering and individual responses can be more effective than a panel of government experts, because relevant data may be far easier to gather at the

individual level and may be better aggregated through market and electoral processes than by small groups of government employees.

Emergency powers, crisis invention, and crisis response lags

In many short-term crises, organized policy responses dominate those made by individuals acting independently or decisions at local levels. As noted above, centralized management is useful in situations in which significant economies of scale in gathering information about future and current crises exist and/or when significant advantages to coordinating crisis responses exist. In many cases, the need for rapid policy responses appears to require delegating additional discretion (emergency powers) to policy makers to both detect and manage major short-run crises (emergencies).

Similar delegation may also occur for long-run crises, although to a lesser extent, because the period of detection and policy analysis for long-term crises extends over several election cycles, giving voters time to assess the merits of arguments regarding the existence of a crisis and appropriate policy responses.

The "boy who cried wolf" and optimal policy responsiveness

Unfortunately, emergency powers also increase the ability of policy makers to pursue their own interests, which salary and status systems many not perfectly align with the relevant community's or organization's survival interests. Within democracies, the electoral constraints on government officials tend to align their interests with those of the median voter or with those of pivotal members of a stable majority coalition. This, as noted above, tends to increase prospects for

community survival by assuring somewhat broader reserves and crisis-avoiding or -ameliorating policies than narrower forms of government.

However, during emergencies, asymmetries in information possessed by government officials relative to voters tend to reduce that alignment, although not usually to that of authoritarian governments. The fact that increased governmental discretion in the short run can be used to advance narrow interests (narrower than majoritarian interests) as well as broad interests, together with governmental responsibility for detecting crises, can tempt elected (and appointed) officials to "manufacture" crises in order to increase their short-run discretion over policies. Similar proclamations of emergency are often useful for authoritarians facing constitutional or practical constraints on their ability to adjust policies in the short run. A proclamation that an emergency is at hand often produces support for emergency powers of various kinds.

When voters or other influential persons recognize that a governmental bias toward "crisis exaggeration" exists, they will be inclined to discount claims by government officials that a major crisis is at hand. This strategy allows them to reduce the costs of rent extraction through crisis invention by their governments. However, it poses the risk that a genuine crisis will be ignored or responded to more slowly than optimal.

This "boy who cried wolf" dilemma is a problem that cannot be easily avoided in such circumstances and implies that policy responses to short-run crises will tend to be slower than optimal, which tends to somewhat deplete social

reserves and reduce survival prospects. However, to immediately grant emergency powers to government officials after every claim of existential crisis would also tend to reduce the reserves of persons outside government and so reduce prospects for survival of individuals, families, and nongovernmental organizations that do not share in the rents extracted by governments able to obtain emergency powers under false pretenses.

This informational dilemma (excessive proclamation of emergencies and neglect of those proclamations) can also be moderated through institutions. For example, the over- detection of crises can be reduced to some extent through nongovernmental or other independent methods of crisis detection and ex post policy assessment, as with a free press, support for academic research, and think tanks.

These solutions, however, are not perfect, because nongovernmental organizations may also benefit from over-detecting crises. Relevant bureaucracies, private think tanks, news organizations, and academic research groups normally receive additional resources during times of emergency. "Crisis sells" because focusing attention on existential problems is widely recognized to improve survival prospects at the individual, organizational, and social levels. Fortunately, competition among bureaus, academics, and think tanks moderates this problem to some extent by assuring that alternative interpretations of the evidence reaches a broad audience (Breton and Wintrobe 1975).

Excess "crisis detection" is also moderated by the electoral process of majoritarian states, which to the extent that voters are "modestly" informed, tends to generate relatively accurate assessments of the existence of a crisis or not (via the Jury theorem).

E.   Institutional adjustment as a method of crisis management

Most of the problems discussed in Collapse are long-run rather than short-term crises; that is, they are cases in which circumstances are changing in a manner that makes existing policies suboptimal, but there is a good deal of time available before a lack of response produces a collapse. Long-run solutions thus do not usually require emergency powers, because the need for response is not immediate. However, solutions may require amendments of long-standing routines and institutions of various kinds, including political and legal ones. The policies in place, after all, reflect the political, economic, and environmental equilibria that emerge under the existing institutions, given the information available.

As discussed above, some institutional mixes and distributions of authority are more effective in particular environments than others, and survivorship implies that institutional structures have been adjusted to address the problems previously encountered. Dealing with new existential problems, however, may require significant adjustments to existing institutions that increase their ability to adopt and implement an effective crisis response.

Not all governmental institutions can be easily adjusted, but the ones that are likely to survive are those that can be adjusted at the margin to address real crises as they emerge. It bears noting that both "king and council" governance and federal systems are institutional structures that can easily be fine tuned to address a new crisis. These structures allow authority to be shifted incrementally between the king and council and between levels of government without the requirement for major institutional innovations that would be required by the polar versions of these systems (pure king or council, completely centralized or decentralized, systems).

It also bears noting that although formal written constitutions are a relatively recent invention, these tend to reduce institutional flexibility, while increasing predictability of policy choices and reducing opportunities for rent-extraction. Nonetheless, constitutional negotiators and designers realize that their institutions are likely to need fine tuning to survive in the long run. Thus, most written democratic constitutions include amendment procedures that allow reforms to be introduced when they appear to advance broad interests, as may be the case during an existential crisis.

Governmental templates that have stood the test of time, have avoided collapse by coping with crises large and small through the centuries, often by temporarily or permanently amending their policy making and implementation procedures.

Disappearance may be adaptation, rather than collapse

In the long run, it bears noting that this processes of amendment, policy reform, and adaptation can gradually produce quite new divisions of authority and quite new customs and culture.

The reform of existing political institutions, economic practices, and educational curricula can transform one culture or society into another. Such transformations may occur in response to a series of crises through innovation, exposure to superior practices, and through trial, error, and survival. Although it may be said that a society disappears in such cases, these are instances of adaptation, or partial collapse, rather than collapse in the Diamond sense.

Many of the societies, states, and towns that have disappeared in the past appear to be instances of survival-enhancing adaptation, rather than cases in which comfortable societies were undone through poor policy choices. Here, one may point to the pre-Roman cultures of England, France, and Spain; the pre-Moslem cultures of northern Africa; or the English culture brought to North America by English settlers. In these and many other cases, older societies, states, and towns have disappeared, because their institutions and standing policies were gradually adjusted to take account of new technological, environmental, economic, and/or military realities.

This, after all, is what modern Westerners largely mean by progress.

F.   Preliminary Conclusions: Political Institutions for Avoiding and/or Moderating Crises

All the above suggests that societies tend to become more immune to collapse through time, because both policy rules and institutions are gradually fine-tuned for their environments. Survivorship and adaptation imply that we have more robust institutions for avoiding crises, for recognizing them when they occur, and for ameliorating their worse effects after they arise tend to emerge through time than societies in the past. As a consequence, both individuals and their polities tend to become more adept at coping with the crises associated with particular physical and social environments.

This does not, however, imply that contemporary societies are entirely immune to crisis or collapse. Unknown unknowns continue to exist. Thus, an unfamiliar surprise can overwhelm standing routines and institutions for detecting and dealing with crises by posing problems never considered or responded to. In the contemporary U.S., the terrorist attacks on New York City using jet airplanes, the floods of New Orleans induced by Hurricane Katrina, and the financial crisis of 2007-09 are recent instances of surprise events that had to be quickly addressed by the U.S. government. Only the latter was an existential threat, but major policy innovations occurred in response to each case.

Collapse in contemporary societies may occur because new more subtle problems emerge in settings in which margins for error are small, and less than the best policy responses are chosen to address those problems. As a consequence,

avoidable losses may accumulate, reserves may be depleted, and communities may disintegrate as people leave for other places. Several contemporary regions of Africa seem to be prone to such problems. When exit is not possible, a community may literally fade away as it ceases to have the resources necessary to support human life.

Not all surprises are existential ones of the nature stressed in Diamond's book, but survival in the very long run requires addressing a long series of crises, and unfortunately past success is not a guarantee of future success, as many of Diamonds' case studies indicate.

Rules of thumb for robust societies

This paper suggests that there are a variety of institutions and routines that increase a society's prospects for long-run survival. These were not given much attention in Diamond's narrative, although various hints about the performance of institutions are provided in passing.

The analysis of this paper suggests that a community's political, legal, and economic institutions should assure that social (the sum of individual) reserves are substantial and should increase far more often than they decrease. History suggests that agricultural societies do this better than hunter-gatherer societies, that commercial societies with an honest, representative government do so better than societies based on agriculture alone, and that commercial societies that promote innovation and capital accumulation do this better than early commercial societies. An unusually cold or long winter is no longer an existential crisis in the West.

Differences in the robustness of societies are not merely technological, but also include facilitating legal and political institutions (North 1990, Congleton 2011). This paper suggests that a number of institutional features can help a community limit losses from crises. With respect to political institutions, the analysis suggests (1) that crisis reduction, management, and amelioration tend to be better within constitutional democracies than authoritarian governments, because more crises and more of the effects of crises will be addressed by governments with broad interests than narrow interests. In addition, the electoral process of democracies often, although not always, does a better job of detecting crises, because of the informational aggregation properties of elections (as per the Condorcet jury theorem). (2) The majoritarian governments that are most likely to survive have constitutional or other durable rules that limit rent-extraction possibilities of government officials and ruling coalitions. Such institutions include (3) generality rules and takings rules, (4) assigning responsibility to address crises at the lowest possible level of government (including individuals), and (5) relatively open markets for ideas (a free press, web, academia, and independent think tanks). Such standing rules and procedures reduce the likelihood and risks associated with policy mistakes, while moderating tendencies of majorities to exploit minorities through the use of emergency powers in a manner that undermines minority and community survival.

Although history suggests that not all crises can be survived by all communities, it also suggests that the probability of survival increases with reserves, the right institutions, and knowledge that improves the effectiveness of standing plans and institutions. Understanding how institutions operate during times of crisis helps to avoid future collapse by increasing a community's ability to effectively tweak (or not) existing institutions to increase survival prospects in response to long rune crises. To do this properly, institutions have to be flexible but not too flexible. Major institutional and policy reforms in response to false or modest alarms should be avoided, while true emergencies should be responded to with alacrity.

G. Agency Problems in Large Organizations: Crisis Management with Asymmetric Information

The above problems and solutions are ones that are confronted and can be adopted by individuals, small groups, and large organizations. Large organizations such as national governments often confront additional problems during times of crisis that occur because subsets of relevant decision makers may have substantially different information available to them. For example, information asymmetries allow elected governments to adopt policies that are not in the general interest or those of electoral majorities, because voters will not know every policy adopted. This allows governments to adopt policies that favor campaign contributors, friends, or favored regions of the country with little fear of electoral consequences.

Political agency problems tend to be larger during times of crisis, because most crises increase the knowledge asymmetries between voters and government experts. Increases in the speed of public policy formation to deal with a crisis implies that more policy reforms must be scrutinized by voters than in ordinary times and many of those policies will address unfamiliar problems. Crisis, consequently, tends to increase voter demands for policy-relevant information, which, as usual, will be supplied by organizations with relatively more information and expertise available to them. However, because voters have little direct experience with the problems and solutions analyzed during times of crisis, they are less able to judge the quality of the information supplied. Their relatively greater reliance on secondhand information makes them more susceptible to manipulation than in long-standing policy areas in which voter assessments of policy are more firmly rooted in their own independent observations and judgment. Being aware of their own relatively greater ignorance, voters are naturally more willing to defer to governmental and other experts during times of crisis.

All these effects tend to alter the informal balance of power between voters and elected officials in a manner that reduces voter control of public policy—at least in the short run. Bureaus may secure larger budgets and interest groups may be able to secure more favorable tax or regulatory

treatments than possible during ordinary times, because voters and their elected representatives are more willing to accept the arguments and assertions of agency experts in times of crisis than in ordinary times and less able to monitor policy decisions. "Ideological shirking" may also increase as elected politicians may advance policy agendas of their own with less fear of voter retribution (at least in the short run) (Kalt and Zupan 1984). Increased dependence on secondhand information tends to reduce the ability of majority rule to function as an efficient information aggregation process (Congleton 2004). (Indeed, the increased influence of interest groups during times of crisis provides them with an incentive to "manufacture" public policy crises.)

All these characteristics of urgent policy crises in a setting of asymmetric information increase the likelihood of policy mistakes (suboptimalities from the perspective of the median voter) relative to ordinary policies under asymmetric information and relative to crisis management in the symmetric information case.

Crisis and Scientific Progress

Urgency would not generate future policy problems without knowledge problems, but knowledge problems are an essential feature of all surprises and, therefore, much of the effort of crisis management is informational in nature. The demand for new information tends to induce

greater investments in both innovation (ignorance reduction) and ordinary scientific research. Insofar as scientific progress can be understood as a combination of increased sampling in known domains and expansions of the domains in which samples may be knowingly acquired, crises thereby tend to stimulate scientific advance. What Kuhn (1995) calls ordinary scientific progress is generally not a matter of the elimination of ignorance in the sense used here, but rather of gradual increases in precision.

A good deal of and perhaps most scientific progress results from gradually refining theories over event spaces that have been fully appreciated for a long time. Everyone knew there were stars long before the geocentric interpretation of stellar motion was replaced with heliocentric ones. The basic ideas of agriculture have been appreciated for millennia. Many manufactured products, such as pottery, clothing, or books, result from successful efforts to refine technologies and possibilities long acknowledged to exist. Such gradual learning is also clearly evident in the slow refinement of most methods for constructing bridges, buildings, gardens, jewelry, and pastries. In all such areas of progress, rational search and the Bayesian representation of learning are powerful and useful models of the incremental improvement in our understanding of familiar phenomena.

On the other hand, it must be acknowledged that technological progress can also result from genuine innovation and discovery. The Iron Age evidently replaced the Stone Age, because new possibilities for using particular kinds of rocks were discovered. Moreover, in many cases, reductions in one kind of ignorance lead to unanticipated increases in knowledge in other areas. For example, technological progress often reduces ignorance indirectly in other areas by allowing new, *previously unimagined* phenomena to be considered. The compass, the telescope, the microscope, probability theory, satellites, submersibles, and other recent information-gathering innovations have allowed previously unobserved—indeed unobservable—phenomena to be seen and analyzed for the first time.

New intellectual developments or theories—what Kuhn (1995) calls paradigm shifts—may similarly provide such radical reinterpretations of familiar data that entirely new issues and possibilities are brought to the fore; for example, modern chemistry has allowed previously unimagined materials to be developed. Such instances of intellectual and technological advancement both reduce ignorance and provide new processes by which ignorance—fundamental ignorance—may be reduced in the future. These processes are not directly amenable to Bayesian analysis, insofar as *new* phenomena or hypotheses are created rather than old ones reassessed.

The demand for insurance benefit levels, however, may vary considerably among citizens, and program support levels will necessarily be decided politically. The distribution of voter ideal income security programs can be determined by rank ordering individual ideal points—t*'s in the model above—from low to high and plotting the associated frequency distribution of citizen preferences for benefit levels. Figure 1 illustrates such a frequency distribution of citizen ideal points. As depicted, it is assumed that the ideal points are interior solutions to equation 14.3, although the existence of corner solutions would not materially affect the conclusions, as long as such interior solutions were sufficiently common that the median voter has an interior solution.[68]

If citizen preferences are approximately spatial (as they are in the model developed above), figure 1 can also be used to illustrate how different procedures for quasi-constitutional reform may affect the level of income security adopted under various decision rules. In the case depicted, unanimous support exists for a range of public insurance programs over the more expensive guarantees provided by private insurance clubs. Such programs characterize the liberal welfare state. Although this liberal range can be broad, the majoritarian range of acceptable programs tends to be wider. Thus, the program chosen may depart from the "liberal" range, although it need not.

First, it is clear that the level of political support *falls* as income support levels increase. The level of support for program t is characterized by the area under the frequency distribution to the right of $t/2$. Those citizens with ideal points to the left of $t/2$ prefer no government program, 0, to program t; those voters to the right prefer of $t/2$ prefer t to 0. Second, if an entirely new income security program is to be adopted, it is possible that quite large programs gain majority approval, because of the all-or-nothing nature of an initial proposal. Indeed, figure 1 demonstrates that the largest program with majority support relative to no income security program can even exceed t^{00}, the largest program that is ideal for an individual voter! Third, if instead of an single all or nothing offer, a sequence of votes ultimately determines program levels, in which each new proposal is judged relative to the last one to obtain majority approval, the median citizen's ideal program is adopted, t^{med}. No increase beyond t^{med} will secure majority support, although every increment up to t^{med} will receive majority support.

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[68]Figure 1 implicitly assumes that the cost savings of the public program are sufficient to cause all individuals to prefer some uniformly provided public provision to the available private clubs. This geometry is implied by the discussion of exit costs in the previous section of the paper.

A more expensive private income security program may be preferred to a less expensive governmental alternative by individuals who find the public program far too small. This problem can (and often is) be reduced by linking benefit levels and contributions to income levels. In such cases, support for public provision tends to increase insofar as desired benefit levels and income are positively correlated.

Fourth, if the status quo ante or initial point of negotiation is the maximal security program, $t = 100\%$, is unlikely to be adopted, because unanimous agreement will exist to adopt a less generous programs. Perhaps surprisingly, the smallest program that could secure majority approval over the maximal program can be below the smallest program considered ideal by any voter, t^0. Again, the all-or-nothing nature of an initial offer allows somewhat extreme policies to be adopted by majority rule. The smallest program that is preferred to the maximal program is approximately twice as far below the maximal program as is the median voter's ideal policy.

Fifth, a series of votes over successively smaller programs using majority rule would continue until t^{med} is reached, the same program as emerged when the status quo ante consisted of only private programs. For reasons related to the median voter theorem rather than the Coase theorem, an incremental decisionmaking procedure under majority rule reaches the same policy result regardless of the starting point. In the long run, the program adopted under majority rule would reflect *median* perceptions of risk and risk aversion, t^{med}, rather than the ideology of the initial agenda setter. This political outcome is not necessarily liberal in the sense used in this paper, but tends to be liberal if the costs savings of the public program are substantial.[69]

Sixth, under other decision rules, the starting point of constitutional negotiations will matter, as indicated by the two unanimity cases. For example, a series of small increases adopted by a two-thirds supermajority rule with 0 as the initial point of departure will yield an income security program that is smaller than that preferred by the median voter. This point is labeled t^{min} in figure 1, where area I is twice as large as area II. Similarly, a two-thirds rule will produce an income security program that is larger than that desired by the median voter if the status quo ante is initially above the median citizen's ideal and incremental reductions are voted on. In the case illustrated, the policy chosen will be t^{max}, where area IV is twice as large as area III.

Seventh, if supermajority decision rules are used to determine the level of income security constitutionalized, the political bargains struck in social welfare states and liberal welfare states differ, because the initial points of departure differ. In such cases, *a liberal welfare state tends to adopt a constitutional income guarantee that is below that preferred by the median voter, and a initially social democratic state will adopt one that is higher*. In the former case, however, local governments and private income security clubs would be free to provide additional support according to local circumstances and demand.

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[69] Low demanders of insurance in the liberal case receive (and pay for) more insurance than they would have purchased in the private market, but at a sufficiently lower cost to make them better off. High demanders may "top up" their public insurance by purchasing joining private supplemental insurance clubs.

Political procedures and starting points, as well as citizen demands for services both affect the bargain reached.

Chapter 10: Crises Induced by Government Policies

The man of system, on the contrary, is apt to be very wise in his own conceit; and is often so enamoured with the supposed beauty of his own ideal plan of government, that he cannot suffer the smallest deviation from any part of it. He goes on to establish it completely and in all its parts, without any regard either to the great interests, or to the strong prejudices which may oppose it. He seems to imagine that he can arrange the different members of a great society with as much ease as the hand arranges the different pieces upon a chess-board. He does not consider that the pieces upon the chess-board have no other principle of motion besides that which the hand impresses upon them; but that, in the great chess-board of human society, every single piece has a principle of motion of its own, altogether different from that which the legislature might choose to impress upon it. If those two principles coincide and act in the same direction, the game of human society will go on easily and harmoniously, and is very likely to be happy and successful. If they are opposite or different, the game will go on miserably, and the society must be at all times in the highest degree of disorder. (Adam Smith (xxxx), *the Moral Sentiments*)

A. Introduction

A crisis typically has three characteristics. First, a crisis is unexpected, a complete surprise.[70] Second, a crisis is normally unpleasant in that current plans are found to work less well than had been anticipated. Third, a crisis requires an urgent response of some kind. That is to say, an immediate change of plans is expected to reduce or avoid the worst consequences associated with the unpleasant surprise. These characteristics imply that not every public policy problem is a crisis. Many public policy problems are anticipated or long-standing. Some policy problems are clearly worsened rather than improved when current policies are abandoned.[71] Other policy problems lack immediacy, even when they are unanticipated. Crises are, nonetheless, common events for most people and political systems. Recent public policy crises include terrorist attacks, unexpected environmental problems, and outbreaks of new deadly contagious diseases. Although not every unpleasant surprise is a crisis, many are genuine emergencies.

This paper provides an overview of the politics of political crisis management using a minor, but significant extension of the core rational choice models of political decision making. The focus of analysis is crisis management within democratic polities, although much of it will also apply to crisis management within private organizations and indeed for personal crises. The analysis has several general implications for designing routine procedures for crisis management. As demonstrated below, an important property of crisis management

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[70] A previous version of this paper was presented at the 2004 meetings of the Japanese Public Choice Society at Senshu University. The current version of the paper benefits from comments made by Professors Harada, Kurokowa, and Yokoyama and several other participants—although they bear no responsibility for the use to which I put their good advice.

[71] The word crisis tends to be overused in public policy debates for various reasons. For example, advocates of reform often use the term "crisis" to encourage the rapid adoption of their preferred policies, whether circumstances are dire or not. See section V below.

is an unusually high propensity for making policy errors. Standing procedures for dealing with crises should be designed with such mistakes in mind.

A. Can There Be Crisis Management in a Rational Choice Model?

To analyze crisis management using our standard tools, it is first necessary to overcome a significant methodological problem. There is a sense in which "crisis management" is impossible within the most commonly used economic models of decision making. The usual model of rational decision making assumes that individuals possess sufficient information and imagination to evaluate every alternative course of action in every conceivable combination of circumstances. Preference orderings are complete and transitive for the full range of possible events and opportunities. Individuals know the full dimensionality of their opportunity sets and the conditional probability functions associated with them. Although random shocks of one kind or another may exist, there can be no surprises, no truly unanticipated circumstances calling for immediate decisions. Individuals, consequently, always perfectly optimize. They make the best possible plan of action, a plan that takes account of all possible events and all possible alternatives.

The standard assumptions thereby rule out crisis management, because they rule out unpleasant surprises calling for urgent responses. All circumstances are "ordinary" in the standard rational choice model. There are no emergencies, no sudden requirements to adapt to new and unforeseen circumstances. Given this, it might be reasonably concluded that crisis management is beyond the scope of

rational choice models of decision making. Such a conclusion, nevertheless, would be incorrect.

Analysis of crisis management from the rational choice perspective, however, does require us to move beyond the usual assumptions of rational choice models. Several approaches could be used to escape from the limits of the standard model. For example, one could introduce planning costs or arbitrarily assume that individuals are rational only within narrow limits. The approach taken in this paper is to focus attention on a neglected form of imperfect information.

B. The Search and Ignorance Characterizations of Imperfect Information

Economists have traditionally assumed that imperfect information takes the form of finite but complete data sets. That is to say, information is assumed to consist of data points, and each data point includes information about all relevant dimensions of the phenomena of interest. This characterization of information implies that decision makers can make unbiased estimates of all the parameters of their choice settings even with very limited data, although the precision of those estimates can be improved by increasing the sample size of their data sets (Stigler 1961). Modern Bayesian analysis reaches similar conclusions from essentially similar assumptions about information, although Bayesian analysis also specifies the process by which priors are updated as new data points become available (Hirshleifer and Riley 1992). The "finite data set" approaches can be easily incorporated into the standard rational choice methodology, because decision makers remain perfect optimizers—at least on average.

The approach taken in the present paper is to acknowledge the existence of another form of imperfect information, namely, ignorance. Ignorance is not caused by having too few data points in one's sample, but rather by observing too few dimensions (characteristics) from the data points that are available. That is to say, the existence of ignorance implies that information about some dimensions of choice is simply unavailable to individuals at the time that they adopt their plans of action. In effect, individuals have a sample of size zero for such "missing" variables (Congleton 2000a and 2000b; Fremling and Lott 1996).

Most ignorance is "natural," because most missing dimensions or possibilities have never been imagined or confronted by the individual. We are born into the world knowing almost nothing. Our ignorance is reduced by personal experience and knowledge imparted to us by our families, friends, and teachers, but a penumbra of ignorance always remains. Part of the ignorance that remains is the result of individual decision making. Individuals are "rationally ignorant" when they realize that unknown dimensions or parameters exist, but decide not to learn anything about those unknown dimensions or parameters. Continued ignorance might be chosen for dimensions thought to be unimportant or too complex to be readily understood, as might be said of modern tax laws, trade regulations, most foreign languages, Chinese cooking, economics, and many scenarios that lead to unpleasant policy surprises. However, most of our ignorance remains unconsidered, a natural residual of our initial ignorance.

Ignorance, Mistakes, and Surprise

Although finite samples and ignorance have many similar behavioral implications, important differences between these two types of imperfect information also exist. Two of these are relevant for the analysis of crisis management. Given even a small sample of complete information, individuals can make the "right" decision (the expected utility- maximizing ones) on average. There can be unlikely events, but not complete surprises, because there are no "unknown" possibilities in the search or Bayesian representations of imperfect information. Ignorance implies that "unknowns" are associated with every decision. Rational individuals can make the right decisions in the areas in which they have sufficient data (experience) to make unbiased estimates, but they can make systematic errors in areas where missing variables are important. Consumers may, consequently, choose the wrong products, vote for the wrong candidate, and well-meaning elected representatives may adopt the wrong policies. That is to say, individuals and groups may adopt plans or policies that are less effective at advancing their aims than other possibilities of which they are partly or totally ignorant.

Ignorance also implies that entirely unforeseen events may arise that call for immediate attention, which is what we normally mean by the term "crisis management." That is to say, ignorance is a sufficient condition for crises to emerge within a rational choice framework. When individuals are ignorant about

relevant possibilities or causal relationships within their decision environment, both systematic errors and surprises are possible.

However, ignorance does not rule out rational behavior during ordinary times or during times of crisis. It simply rules out perfect optimization. Rational choices remain possible in the sense that all the information available to decision makers is taken into account and the best of all known possibilities is chosen.[72] Ignorance does imply, however, that the list of possibilities considered may be very incomplete and our understanding of causal relationships (the conditional probability distributions between current actions and future events) may be erroneous in many respects. Together, these imply that systematic mistakes will be made by even the most careful and forward-looking decision makers.[73]

Consequently, crisis managers might honestly regret their past policy decisions in light of knowledge that becomes available after a crisis is over, but insist that their mistaken choices were the best that could be made given what was known at the time of the crisis.

An Illustration: Optimization with Missing Variables

Some essential features of crisis management can be illuminated with the following model. Suppose that individuals maximize a strictly concave utility function defined over their own private consumption, C, and personal health, H,

$$U = u(C, H)$$
(1)

Suppose that an individual's health is affected by private expenditures on health care, E, and government public programs that reduce known health risk, R. In addition to these two readily observable control variables, suppose that an individual's health is also affected by risk factor Z, which is initially unobserved. Z could include such factors such as contagious disease, diet, environmental pollution, terrorist attacks, and earthquakes,

$$H = h(E,R,Z)$$
(2)

Private income Y is assumed to decline as government regulations increase or as other health-improving programs increase at the margin because of increases

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[72] The quality of individual decision making may also be affected by intense emotions, such as fear or anger, that reduce the quality of rational decision making, but these effects are neglected in the present analysis.

[73] Such decisions might be said to be instances of "bounded rationality" in the sense that they are informationally bounded. However, they are not "bounded" because of lack of computational power or systematic failures of the mind, as is sometimes implied by the researchers who employ the bounded rationality concept (Conlisk 1996), but rather because much is unknown to decision makers at the moment that choices are made.

in regulatory or tax burden.[74] An individual's personal opportunity set for private consumption and health care in this case can be written as $C = Y(R) - E$.

In their roles as private citizens, individuals select their health-care expenditures to maximize utility,[75] which can be written as

$$U = u(Y(R)-E, h(E, R, Z)). \tag{3}$$

Differentiating equation 3 with respect to E and setting the result equal to zero allows the utility-maximizing level of private health care expenditures to be characterized as:

$$U_H H_E - U_C = 0 \tag{4}$$

Equation 4 in conjunction with the implicit function theorem implies that the private demand for demand for private health care can be written as

$$E^* = e(R, Z) \tag{5.0}$$

with

$$E^*R = [U_H H_{ER} + U_{HC} Y_R - U_{CC} Y_R]/ -[U_{HH} H_E 2 + U_H H_{EE} - 2U_{HC} H_E + U_{CC}] < 0 \tag{5.1}$$

$$E^*Z = [U_{HH} H_{EZ}]/ -[U_{HH} H_E 2 + U_H H_{EE} - 2U_{HC} H_E + U_{CC}] > 0 \tag{5.2}$$

The government demand for the regulation of health risks can also be determined from the same model. Within a democracy, citizens also affect public policy parameters, at least indirectly by casting votes for politicians who may propose alternative policies for affecting health. A typical voter will favor the level of regulation that maximizes

$$U = u(Y(R)-E^*, h(E^*, R, Z)) \tag{6}$$

which requires:

$$U_C (Y_R - E^*R) + U_H (H_E E_R + H_R) = 0 \tag{7}$$

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[74] Across some range, personal income may increase as R increases, insofar as improved health improves productivity in the workforce. However, when R is set at approximately the level that maximizes median voter utility, R will be increased until it is in the range in which R decreases personal income (see below); thus, for expositional and analytical convenience, Y_R is assumed to be less than zero across the range of interest.

[75] Sufficient conditions for strict concavity are $U_C > 0$, $U_H > 0$, $U_{HC} > 0$, $U_{CC} < 0$ and $U_{HH} < 0$. In addition to the strict concavity of U, it is assumed that the marginal return from private health care is reduced by effective regulations, $H_{ER} < 0$, and increased by risk factor Z, $H_{EZ} > 0$.

Recall that E*R (UHHE - UC) = 0 at E* ; thus, equation 7 can be simplified to:

$$UCYR + UH\ HR = 0$$
(8)

Together with implicit function theorem, equation 8 implies that the political demand for regulation is a function of the unknown variable, Z,

$$R* = r(Z)$$
(9)

The individuals of interest, however, are assumed to be naturally ignorant about risk factor Z, so r(Z) cannot directly determine policy in this case. Z can only indirectly affect the public demand for health care by its observed effects on the marginal returns to private and public health expenditures, HE and HR. These returns may be known with certainty as long as Z remains at a steady state, Z = Zo, and policy R* = r(Zo) would be adopted without any knowledge of Z. In this case, ignorance does not reduce the effectiveness of private or public plans.

Policy Crises from Changes in Unknown Variables

Ignorance of Z, however, can be a significant problem that leads to systematic errors in both public and private decision making if Z is not completely stable. For example, suppose that Z increases from Zo to Z' and produces an unobserved increase in the marginal returns from government policies and private

health expenditures. Such changes might go unnoticed if data on HE and HR are collected infrequently, or if function H is considered to be stochastic and thus minor fluctuations in the effectiveness of health policies are discounted as unexplainable random effects. As long as the changes generated by the new level of Z are not recognized, the original policy remains "optimal" given the information available to decision makers.

A change in Z, however, implies that equations 4 and 8 are no longer be satisfied at E* and R*. Losses accumulate, but there is no crisis because no urgent attention is focused on policy reform. People are less healthy and/or comfortable than they would have been with more complete information, but they do not yet realize this. The unnoticed losses that accumulate under the existing public policies can be characterized as:

$$U = u(Y(R')-E',\ h(E')) - u(Y(R*)-E*,\ h(E*, R*, Zo)\ )$$
(10)

where $R* = r(Zo)$, $E* = e(R*, Zo)$, $R' = r(Z')$, and $E' = e(R', Z')$.

Consider now the consequences of a scientific breakthrough that allows data on Z and the relationship between Z and H to be collected for the first time. Three related crises can be generated by the discovery of Z as a risk factor. First, there is the immediate policy crisis. Previous private plans and public policies are now revealed to be suboptimal. New plans and new policies become necessary. Adopting an effective new policy, however, may be a nontrivial matter, both

because major policy changes may be required and because it may take time before the effects of Z are completely understood.[76] The "urgency" of the policy crisis varies with the perceived magnitude of the losses (suboptimality) that accumulate because of improperly accounting for Z. The higher the rate of perceived loss is, the greater is the urgency of policy change.[77]

Knowledge Crises

Second, unpleasant surprises create a variety of "knowledge crises." Policy makers become more aware of their own ignorance and suddenly demand new policy-relevant information. For example, the effect of Z on the marginal productivity of private and public expenditures will not immediately be understood, because previous experience involved only changes in E and R. New data and new analysis will be necessary to understand the effects of Z on health.

Moreover, the future time path of Z becomes a topic of research if capital investments are necessary to address risks associated with changes in Z. If Z simply moves to a new steady state, $Z = Z'$ and the relationship between H and Z comes to be fully understood, the new optimal steady state patterns of regulation and private expenditure can be determined as above, $R' = r(Z')$, and $E' = e(R', Z')$. Unfortunately, neither scientists nor policy makers can initially be sure that Z has simply moved to a new steady state. Has Z temporally increased, moved to a new steady state, or begun a new process of increase? Perhaps Z is a stochastic variable. If so, how is it distributed? The initial temptation will be to ignore the change in Z or extrapolate from the two available observations, $Z = 0$ and $Z = Z'$. Either approximation, however, may imply future levels of Z that are very wide of the mark. Having neither observed nor studied Z through time, little will be initially known about Z's behavior through time.

Once the risks and time path of Z are understood, there may be efforts to control or at least to influence the future course of Z. Completely new dimensions of policy may be added to the political agenda. This may require new "crisis" research on Z policy to be produced and evaluated.

Policy mistakes are likely to continue until both Z and policies for addressing Z are well understood, and this may take a long time. Here, one might consider the wide range of public health problems that have plagued mankind for most of human history. Many solutions were tried and much analysis was undertaken, but truly successful policies were adopted only in the past century or so as knowledge of bacteria, viruses, and other hazardous materials improved. Few plagues occur in developed countries these days, but this is a fairly recent state of

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[76] For example, Bayesian adjustment converges on the true underlying distribution of Z in the long run, but remains inaccurate, indeed biased, in the short run for cases such as the one postulated here.

[77] Urgency may exaggerated in cases in which panic or terror is generated by the sudden changes in perceived health risks associated with disease or attacks. In effect, Z' may be mistaken for Z'', with $Z'' \gg Z$, or relationship $H_Z < 0$ may be misestimated because of the scarcity of information about current and past values of Z.

affairs. Similarly efforts to control crime and fire, which are as old as civilization itself, have become increasingly effective as better organizations, equipment, and materials became available.

Crisis Cascades

Third, mistaken policies can generate new crises as unanticipated effects emerge. In the model above, secondary crises might arise when the relationships between R and Y or between Z and H are not fully understood. For example, increases in R beyond the range of experience might reduce Y by far more than anticipated, requiring a new round of emergency policy formation, hasty scientific research, and policy analysis. In this manner, urgency in combination with ignorance implies that one policy crisis may generate many others.

Urgency does not generate future policy problems without knowledge problems, but knowledge problems are an essential feature of all surprises and, therefore, all crisis management is prone to policy mistakes.[78]

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[78] This is not to say that crisis cascades necessarily escalate out of control. Long-standing political systems have faced many crises, and their survival implies that policy-induced crises and corrections eventually "damp out" rather than explode. Within a democracy, this dampening process is a joint consequence of voter responses to new information and constitutional design. In those rare cases in which crisis escalation occurs, however, a polity's constitutional design may itself become an area of crisis management.