Recalibrating Risk: Crisis, Perceptions, and Regulatory Change

Introduction

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Crises punctuate our world. Their causes and consequences are woven through complex and interconnected social and technological systems. Consider these three recent events, each illustrating normality suddenly upset:

- In the fall of 2008, the global financial system experienced a full-blown panic. Credit flows seized up, ushering in the worst global recession since the 1930s.

Fig. 1: The impact of Lehman Brothers’ bankruptcy ripples through world markets, chronicled by the American business press.

- In April 2010, a blow-out at the British Petroleum Deepwater Horizon drilling platform killed eleven workers and triggered a three month-long oil spill, sending nearly five million barrels of crude into the Northern Gulf of Mexico, fouling beaches, estuaries, and fishing grounds.
In March 2011, an earthquake and resulting tsunami killed 20,000 people in Japan, and also caused reactor meltdowns at the Fukushima nuclear power plant, forcing the evacuation of tens of thousands of people and unleashing a long-term leak of radioactive water into the Pacific Ocean.

Each of these three recent crisis events attracted extraordinary attention from the media and the global public, raising concerns about dangers that may lurk within the complex
technological and social systems on which we depend to power and finance our economy and way of life. They also generated criticisms of the regulatory systems that were supposed to prevent such failures, as well as demands for new regulatory actions to reduce the risks that the crises had brought into sharp relief. In the aftermath of such disasters, people ponder their meaning and look for appropriate responses. Government agencies, official commissions, think tanks, citizens’ groups, and scholars investigate what caused the crisis, consider whether better policy might have prevented it, and debate what regulatory adjustments governments should adopt.

In this multidisciplinary volume, we examine how people and policy-makers respond to crises. After the immediate challenges of disaster management, crises may – sometimes – reveal new evidence or frame new normative perspectives that drive new policies designed to prevent future crises. These policy responses may vary widely – for example, tightening regulatory standards, creating stronger incentive systems, requiring greater transparency, reorganizing government institutions, or cosmetically masking inaction. We delve into a series of enduring puzzles about the relationships between crises and regulatory, exploring the following questions:

• When do crises change the risk perceptions of the general public, policy elites, or both?
• Do changes in the risk perceptions of policy elites result in different policy responses as compared to changes in risk perceptions that only occur among the broader public?
• How do the narratives that emerge about crises shape the policy response (or inaction) that ensues?
• When crises do generate regulatory responses, how and why do those responses vary? How do differing features of crises, and of the social and political systems in which they occur, influence the adoption of different policy instruments and strategies?
• To the extent that it is possible to tell, when do crisis-driven regulatory changes lead to desirable reforms, as opposed to hasty overreactions or policy mismatches? How might governments (both elected officials and regulatory policy-makers), businesses, citizens’ groups, and scholars do a better job of preparing to learn from and sensibly respond to crises?

We remain too close to the Global Financial Crisis of 2008, or BP Deepwater Horizon, or Fukushima to have a clear sense of their long-term implications for regulatory policy-making. But they collectively raise the sorts of questions that we identify above about the relationship between “crisis” and policy formulation. One common tendency in thinking about these questions, articulated by several observers in the wake of these recent disasters, is that crisis episodes can dramatically reconfigure perceptions of reality, which then at least sometimes, and perhaps often, drive major policy changes. One can certainly point to many examples that fit this pattern. Indeed, the history of regulatory governance has always been punctuated by crisis.
Historical Context

Over the last two centuries, and across the globe, significant turning points in regulatory policy often (though of course not always) represented responses to sudden, largely unexpected events. Exploding boilers on American river steamboats brought forth a federally mandated safety inspection regime as early as 1838 (Burke, 1966). On both sides of the Atlantic, the introduction of modern public health regulation during the nineteenth century ensued in the wake of infectious disease epidemics. (Rosenberg, 1987; Bourdelais, 2006). In late nineteenth-century Europe and the United States, the imposition of new safety protocols for coal mines followed mining disasters that dramatized the dangers of deep-level mineral extraction. (Reid, 1986; Aldrich, 1997). Governments tended to adopt tougher rules on corporate governance and accounting after well-publicized corporate scandals (the South Sea Bubble in the 1720s, the over-issue of stock at the New York and New Haven Railroad in the 1850s; the collapse of several American insurance companies in the early 1870s) (Harris, 1994; Shaw, 1979; “Life Insurance Question,” 1877). They similarly fashioned new schemes of financial regulation in the aftermath of economy-wide financial panics (as with much tighter capital requirements for American trust companies and the creation of the Federal Reserve after the Panic of 1907, and the dramatic refashioning of securities regulation in the wake of 1929) (Tallman and Moen, 1990;). Harrowing industrial workplace tragedies, like the 1911 fire at New York City’s Triangle Shirtwaist Factory, frequently gave rise to tougher safety rules and inspection regimes (Pool, 2012). Significant changes in the twentieth-century regulation of pharmaceuticals often occurred only after some vivid demonstration of an unsafe drug’s terrible impact (the American deaths caused by ethyl glycol-infused antibiotics in 1937; the European birth defects caused by Thalidomide in the early 1960s), or because of the widely covered death toll from a new disease (HIV/AIDS in the 1980s). In several countries, significant movement to limit industrial air pollution arose after dramatic episodes like the killer fogs that beset London in the 1950s. The Seveso dioxin accident of 1976 gave rise to new European directives on chemical facility safety, just as the discovery of hazardous waste at Love Canal, New York spurred the 1980 Superfund cleanup law, and the 1984 Bhopal, India chemical plant disaster encouraged the refashioning of safety regimes throughout the global chemical industry (Lenox, 2004; Hood, 2006). Also at the global level, the identification of the Stratospheric Ozone Hole in 1985-86 triggered the 1987 adoption of the Montreal Protocol to phase out chlorofluorocarbons.

The apparent connection among crisis events, reshaped risk perceptions, and regulatory policy change has continued over the last quarter century. One might point to American contexts such as the savings & loan crisis of the late 1980s, which led to a reversal of some banking deregulation; the fraud-related bankruptcies at Enron, Worldcom, and Tyco in the late 1990s, which engendered a new regime for corporate accounting (Rockness and Rockness, 2005); or the 9-11 terror attacks in the United States, which prompted a massive expansion of the national security apparatus, its reorganization into a new cabinet-level department, and two wars (Cohen, Cuellar, and Weingast, 2006). Similarly, one might look to European events such as a series of food safety crises in the late 1980s and 1990s, notably mad cow disease and foot and mouth disease, which undermined public confidence and added momentum for various food safety policies; or the volcanic ash crisis of 2011, which encouraged a centralization of air
traffic management. (Alemanno, 2011) Or one might stress events in emerging economies, including recent episodes in China concerning unsafe milk, toys, and other products that generated pressures for tougher regulatory oversight of manufacturing standards (Bamberger and Guzman, 2008); or even more recent accidents in South Asian clothing factories, that elicited new avenues of workplace safety regulation both nationally and through global supply chains (Venkatesan, 2013).

**Framing “Crisis” and the Desirability of Crisis-Driven Regulatory Response**

Scholars of regulatory governance have long noted the salience of crisis episodes in reshaping policy agendas and forging political environments conducive to significant regulatory change, especially once modern media outlets existed to spread public awareness of these events and to shape public perception of them. Graphic newspaper descriptions and mass-produced prints brought the human impact of nineteenth-century disasters to a wide audience. The advent of photography, radio, cinema, television, round the clock cable news networks, and then the internet only further expanded the avenues for conveying the social costs of crisis events in captivating, personal terms, such as the pictures in figures 2 and 3. This news coverage often generated compassion for innocent victims and outrage directed toward culpable villains. In democratic societies, such coverage can generate strong political pressures for governmental action – both to redress the wrongs already inflicted on victims, and to reduce the risk of reoccurrences. By galvanizing general public concern, crises can also curb the capacity of business interests to stymie policy changes that they viewed as inimical to their interests.

The desirability of crisis-driven regulatory change remains a hotly contested question. In the past decade or so, many scholars have depicted the role of media-driven crises in driving regulatory agendas as a problem. The emotional punch associated with crisis events, these scholars worry, too frequently has led to over-reaction or policy mismatches. According to this view, when legislators and regulatory officials face insistent popular demands to take action, whipped up by news coverage of some fairly rare event that brought harm to innocent individuals, they have frequently adopted aggressive policies that imposed heavy costs, induced new risks, and sometimes did little to prevent the risks at issue. A related concern is that policy-makers sometimes take advantage of public clamor to enact their own pet programs, largely unrelated to the risks exposed by crisis (Coglianese, 2012).

Scholarly critics of crisis-driven policy change often advocate reliance on strong regulatory oversight mechanisms to ensure deliberative analysis of the wide range of risks facing society, and the pros and cons of policy proposals (Breyer, 1993). Such oversight mechanisms include the United States Office of Information and Regulatory Affairs (OIRA) the European Union’s Impact Assessment Board (IAB), and a growing number of similar institutions around the world (Wiener, 2006; Wiener 2013). OIRA and the IAB can serve as institutional brakes on hasty regulatory decision-making, using regulatory impact assessments (RIAs) to facilitate sober evaluation of both the risks highlighted by a crisis event and the advisability of proposed reforms. Conceptually similar “think before you act” laws have also been enacted to protect
the environment against hasty construction projects via environmental impact assessments (EIAs). Analogous proposals have called for regulations to undergo multiple stages of legislative scrutiny, so that final passage of new regulatory constraints only occurs well after crisis-related passions have cooled; or even for automatic sunset provisions, so that crisis-generated regulations later require legislative reaffirmation, presumably on the basis of a considered evaluation of policy impacts. (Romano, 2012). Some scholarly critics of crisis-driven regulation also argue that policy-makers too often neglect needed regulation of important risks that do not come to the fore because of dramatic episodes that attract the media’s cameras and emotion-laden narratives of avoidable suffering. (Graham, 1996; Weber, 2006; Slovic et al., 2013). Everyday risks that take many lives, such as tobacco smoking, traffic accidents, gun violence, influenza and malaria, or slow-developing harms such as climate change, may receive far less notice than immediate crisis events – from the news media, the public, legislators, and regulators – and yet may deserve greater regulatory attention.

On the other hand, some observers of regulatory governance argue that crises can present rare opportunities for needed reform. They stress the capacity of concentrated interest groups to resist regulatory proposals during ordinary times, and of policy-makers to deflect the popular pressures created by a crisis event. As a result, they contend that bold new policies need to be adopted in the wake of crisis, to seize the political opportunity created by public outcry, and to overcome the foreseeable moderation of these policies as powerful interest groups later influence the less well-covered details of bureaucratic implementation (Coffee, 2012). Relatedly, some scholars point out that good policy analysis and centralized oversight mechanisms such as OIRA, the IAB, and executive orders can be used not only to brake but also to prompt new regulatory policies (Kagan 2001; Graham, 2007), as when accumulating evidence or a sudden crisis strengthens the case for new policies that regulatory agencies had not yet pursued.

To be sure, the historical record also makes clear that crises do not necessarily motivate significant regulatory responses or shift political agendas and the parameters of policy debates. In retrospect, for example, the oil crises of the 1970s did not generate new regulatory policies to foster American investment in alternative energy. Hurricane Katrina similarly prompted no major efforts to regulate greenhouse gases to mitigate global climate change. In some instances, policy-makers defuse popular demands through study commissions or minor concessions, perhaps rearranging institutional deck chairs or adopting new rules without much attention to enforcement. In still other contexts, governments implement new policies without crises, such as the pioneering sulfur dioxide (SO2) allowance trading system enacted in the US in 1990 to reduce acid rain, and the major reforms to the American Safe Drinking Water Act, enacted in 1996.

The reality is that the desirability of crisis-driven policy change is highly variable. Sometimes such policy change is hasty and misguided. But other times it reflects justified and well-conceived boldness. Often it incorporates both problematic and effective features. In at least some instances, crises reveal new dimensions of a complex problem, create channels for overcoming seemingly intractable political impasses, and lead to sensibly crafted regulatory
policies that mitigate risks at reasonable cost. Such laudable reforms might occur either by creating new political support for long-germinating policies with much to recommend them, or by spurring policy learning -- genuine reconsideration of strategic approaches and the appropriate mix of policy tools -- which leads to well-designed and effective regulatory innovations.

In short, we are skeptical of attempts to identify a simple crisis-regulatory response dynamic. Instead, we remain impressed by the variety of regulatory responses to moments of crisis – both in terms of the degree of policy change, and the diverse array of policy mechanisms and strategies that policy-makers have adopted when they choose to respond to crises. We are struck by the dearth of research about precisely which events receive the label of regulatory “crises,” exactly how those crises shape new regulatory agendas, how the specific characteristics of crisis influence the selection of differing regulatory reforms, and whether those reforms achieve their intended goals.

The Plan of the Book

This volume reconsiders the links among crisis, public perceptions, and regulatory policy. We wish to draw a better analytical map of crisis-driven risk regulation, achieving greater clarity about when and especially how “crisis” generates regulatory change. This endeavor begins in Part I with several conceptual essays that convey the most recent multidisciplinary knowledge about risk perceptions, risk analysis, and institutional responses to the sorts of disasters that shake up political debate and policy agendas. The book then proceeds to case study clusters (Parts 2-4) about policy responses to the sorts of crises highlighted at the outset: offshore oil spills, nuclear accidents, and financial crashes. Our case studies, written by leading experts, examine several incidents of each of these types of crisis, comparing policy responses in the United States, Europe, Japan, and elsewhere. In Part 5, we distill an agenda for further research, especially with regard to how crises influence choices among regulatory options. We attempt to distinguish contexts in which crises distort regulatory responses and yield dysfunction, from those that encourage reflective understanding and policy improvement.

Thus, we hope to unpack the black box of crisis-driven regulation: we examine not just whether crises spur policy change, but which kinds of regulatory responses policy-makers adopt, why they make those choices, and what consequences those choices have. Hence the cases that we study all involve crises that have generated policy responses; we are not testing whether crises always spur policy responses, or whether all policy change requires a crisis. We focus on what goes on at the regulatory institutions – the complex interactions among expert analysis, interest group pressures, political pressures, legal rules, turf, prior history, preparedness (including policy ideas already “on the shelf”), agility to learn, institutional culture, and other factors. We examine which regulatory responses officials choose when crises suddenly disturb the pre-existing institutional ecosystem. We then assess, where sufficient time has passed, how these choices among different policy options yield different outcomes.
In two concluding chapters (Part 5), we put specify broader patterns that emerge from our various case studies. We further explore the normative implications of our findings, especially regarding how policy-makers might seek to anticipate and prevent crises, and how they might prepare to learn from unexpected disasters.

Part I -- The Conceptual Terrain of Risk and Risk Perceptions

In recent decades, scholars from across the social sciences have learned a great deal about risk assessment and risk perceptions, while also making progress in understanding some aspects of how policy-makers respond to crisis. But scholars have tended to examine these vital questions in isolation from one another. In the first part of our volume, five conceptual essays convey the most recent scholarly findings about these issues, furnishing an analytic foundation for the detailed case studies that follow.

The extensive literature in this arena addresses several key lines of inquiry. One concerns how experts should undertake risk assessments and policy analyses, and how government officials should use them as a basis for decision-making. A second investigates how private firms, markets, and related actors make sense of and respond to risk. A third examines how individuals in the general public form risk perceptions and how those perceptions change over time. And a fourth considers the role of crises in the news media and the policy process, both in terms of influencing what gets on the policy agenda and in shaping the narratives that frame public appraisal of events and subsequent policy responses.

The first conceptual essay, written by Duke environmental economist and co-editor Lori Bennear, examines scholarship on the use of risk assessment and economic analysis in regulatory policy-making, and on the impact that shifting risk perceptions have on such analyses. Risk assessments are critical components of Regulatory Impact Analysis (RIA), which the US federal government has required in some form since the 1970s, and which governments across the globe have increasingly required as well (Copeland 2011; Wiener, 2013). Traditional risk assessment requires an informed estimate of the probabilities of various outcomes when some hazard threatens a population. (Renn, 2008). Economists have done extensive work to determine how best to elicit these probabilities when the distribution of outcomes is difficult to characterize (Helmer-Hirschberg 1967; Dalkey 1969) and how to perform statistical analysis to incorporate uncertainty in such probability distributions, developing statistical techniques that are now fairly standard in RIAs (OMB 2003). But rare extreme events pose risks whose probabilities are particularly hard to assess. More recent scholarship has challenged some of the underlying components of the neo-classical model of economic analysis under uncertainty, by examining hyperbolic discounting (Laibson 1997), fat-tailed risks (Weitzman 2011, 2009a, 2009b) and discounting under long time horizons (Weitzman 2010; Newell and Pizer 2003). Economic sociologists have further emphasized the importance of holistic approaches to risk assessment that take account of how multiple risks interact within complicated systems, such as financial networks, or tightly coupled, complex technologies such as off-shore oil drilling or nuclear power plants (Perrow, 2007; Renn, 2008; Schnieberg and Bartley, 2010). These features further complicate efforts to anticipate crises.
A second essay, written by the economist Carolyn Kousky of Resources for the Future, reflects on the role of private market actors, particularly insurance and re-insurance companies, as alternatives or supplements to risk regulation. Insurance plays a critical role in catastrophe management. But as our understanding of risks improves, particularly with regard to fat-tailed or tail-correlated risks, insurance becomes more complicated. Many natural disasters have been shown to exhibit fat-tailed risks (e.g., Schoenberg et al. 2003; Newman 2005). As a result, managing “value-at-risk” requirements to prevent insurance company insolvency requires charging large premiums (Jaffee and Russell 1997) and for many catastrophic risks, premiums would need to be so high that nobody would insure (Kousky and Cooke, 2012).

Together, these two chapters offer analytical tools for making sense of how policy makers develop baseline risk assessments, analyze rare extreme risks, and allocate risk management between public institutions and the private sector. They also raise a crucial issue for regulatory officials who confront a crisis: how does one tell if the crisis event represents an unfortunate outcome within the range of prevailing risk estimates (a “bad draw”), or if represents an unanticipated disaster that reveals new information and demands that we recalibrate the relevant risk profile?

We next turn to public perceptions of risk. Cognitive psychologists have closely scrutinized the nature of human risk perception. One important finding has been that public perception of risks often differs from expert appraisal of risks (Slovic 1987; Slovic 2010). Notably, the public may be less concerned (than experts) about familiar frequent risks (Slovic 1987) and about potentially catastrophic risks that are too rare or novel to be memorable in recent experience (Weber, 2006; Gilbert & Wilson 2007), while the public may be more concerned than experts about unfamiliar but occasionally occurring events that remain salient –or in the terminology of cognitive psychologists, “available”– in recent memory (Sunstein & Kuran 1999). Non-experts also tend to pay greater attention to risks associated with events that involve clearly identifiable individual victims or villains, rather than large but largely anonymous groups (Small & Loewenstein 2003).

The important question of what drives changes in risk perceptions, however (either increasing or decreasing concern, and whether among policy elites, the general public, or both), remains less well understood. The third conceptual essay in our volume, written by Elke Weber, assesses what we know about cognitive perceptions of societal risks, focusing especially on how people process new evidence that some activity entails much greater risk than they previously assumed. Weber, a professor of psychology and co-director of the Center for Decision Sciences at the Columbia Business School, has been a leading scholar in this area for more than two decades. Her chapter draws extensively on the literature in psychology and neuroscience. It considers important differences between the ways that individuals process new information about personal risks, and how organizations process new information about societal risks. A key point raised by Weber’s chapter is the role of highly visible or salient events in influencing public perception of risks. She discusses cognitive decision research showing that experienced events have a larger influence on public attitudes than descriptions of potential future events. This finding helps to explain the public outcry that follows so many crisis events and the relative
public passivity in the face of many expert warnings. It also helps to account for the greater political impact of crises closer to their geographic epicenter.

Weber’s chapter also explains the brain’s different modes of processing alarms (quickly) versus making decisions (more slowly), and the corresponding implications for public acceptance of familiar risks but public demand for prompt policy responses to shocking events. She further comments on research that explores the magnitude of alarms needed to be perceived as shocking, against the backdrop of other risks. This essay shows how the dynamics of human risk perception inform public and political reactions to the case studies addressed later in the book, including oil spills, nuclear accidents, and financial crises, as well as other events such as terrorist attacks and natural disasters.

Dramatic shifts in risk perceptions neither guarantee significant shifts in regulatory policy, nor predetermine specific choices when policy-makers choose to respond substantively to crisis. Over the past decade, a number of political scientists have closely examined the dynamics of “focusing events,” occurrences that profoundly command the attention of policy elites and the broader public. Our volume’s fourth conceptual essay, authored by Thomas Birkland, offers a trenchant overview of this scholarship. A political scientist at North Carolina State University, Birkland invokes Kingdon’s “streams metaphor” of the policy process to highlight the factors that contribute to policy change. These include: “the Problem Stream,” which contains ideas about policy problems; the “Politics Stream,” which contains the ebb and flow of electoral politics, public opinion, and the like; and the “Policy Stream,” which contains the set of ideas about how problems might be addressed. (Kingdon, 1984; Sabatier, 1988; Birkland, 1998).

Birkland observes that opportunities for policy change tend to emerge when events bring two or more of these streams together in a way that makes the matching of solutions with problems more likely. He also details a number of more specific factors that typically influence the path from “event” to “regulatory change”: the magnitude of the event (defined as the extent to which it aggregates harms in one place and time (this point overlaps with Weber’s stress on the relative significance of emotional baselines in determining what shocks the conscience); its rarity; and the presence of policy entrepreneurs, who can build constituencies for change, not least through the marshaling of cultural symbols that shape media coverage and commentary. These observations from political science offer our case study authors several dynamics to consider as they evaluate evidence from particular crises.

The “focusing event” literature helps to explain how crises can overcome policy inertia to spur regulatory change. But it does not fully predict which regulatory strategies officials will select or develop in response to crises, nor the particular bundle of regulatory instruments and policies that they will adopt. Frederick Mayer’s essay, on framing techniques and moral narratives, presents some potential avenues of explanation for such policy choices. Mayer, a professor of public policy at Duke University, examines how framing techniques and moral narratives mediate focusing events. He stresses that moral framing, often in the form of stories, powerfully shapes the public definition of events as crises (or non-crises), influences the resulting adjustment (or non-adjustment) of risk assessments, and guides the decision-making of policy elites charged with formulating institutional responses to such events (Satterfield,
Slovic, and Gregory, 2000; Jones and McBeth, 2010). His chief example, the public discourse about how to evaluate and respond to climate change, emphasizes the role that narratives can play in deflecting regulatory action. But this methodological approach also promises to elucidate how political entrepreneurs build support for particular regulatory solutions – especially how they translate policy learning into salient and persuasive arguments for new approaches (Sabatier and Jenkins-Smith, 1993; Carpenter, 2001).

Each of the literatures discussed in these conceptual chapters offers crucial insights about the nature of risk regulation before the advent of particular crises, and the patterns of policy responses to crises. Through the clusters of case studies on nuclear accidents, oil spills, and financial crises, our project builds on these scholarly frameworks and links them together to develop a richer understanding of how past crises have influenced redirections of regulatory policy. We study how crises affected the choice among alternative policy responses, when policy innovations effectively achieved their objectives (or did not), and what other outcomes ensued. The case study authors apply these various conceptual frameworks through their examinations of how regulatory officials in a variety of societies and policy arenas responded to several major crises.

**Parts 2 through 4 -- Case Studies on Offshore Oil Spills, Nuclear Accidents, and Financial Crashes**

The three types of crises that we have chosen for our case studies—offshore oil spills, nuclear accidents, and financial crashes—all involve industries characterized by tightly coupled complex systems, in the sense discussed by the sociologist Charles Perrow. In the case of deep sea oil drilling and the production of electricity through nuclear fission, complexity and tight coupling result from a mix of technological and social parameters. These businesses depend on sophisticated engineering, with interconnected technological sub-systems that relate to one another in complex, non-linear ways, and that rely on complicated monitoring systems that allow human operators to see developments within sub-systems, but that sometimes obscure how events are affecting the technological system as a whole. Technology, primarily in the form of complex computer securities platforms and trading algorithms, also has contributed greatly to the risks in modern financial systems. Here a great deal of risk also resides in the dense networks of credit that link so many far-flung financial institutions, which create the possibility of a chain reaction of debt defaults, bank runs, and collapsing asset values.

Our three clusters of case studies, however, also include a number of instructive variations. These include differences in: industry structures (e.g., degree of vertical integration, outsourcing, globalization); dominant regulatory tools (e.g., prescriptive, performance-based, self-regulatory); significant political institutions (e.g., regulatory agencies, legislative committees); and relevant non-governmental actors (e.g., environmentalists, consumer protection advocates, corporations, insurance companies). These areas also raise complex dilemmas about how to balance conflicting policy goals — the trade-offs among economic growth, energy independence, worker safety, national security, and environmental
protection; or among economic growth, public confidence in financial institutions, the protection of taxpayers, and stability of the financial system.

We might have included a wider range of substantive policy arenas and truly transformative “focusing events,” such as chemical safety and the Bhopal disaster, food safety and disease outbreaks, or homeland security and the terrorist attacks of 9-11. Similarly, we might have incorporated contexts in which scientific uncertainty, ferocious political opposition, a lack of a sufficiently damaging event, or some combination thereof, has stymied or delayed consensus for regulatory action (e.g. global climate change). Alternatively, we might have zeroed in on just one policy arena, digging in even more deeply to historical context and comparative/transnational experience. We have sought to strike a balance among these various alternatives, thereby gaining more than just one view of risk recalibration in a given policy arena, comparing across diverse policy contexts, and yet limiting the number of variables at play to enable us to draw more robust inferences.

Through the narrative analysis of these case studies, we investigate the regulatory changes spurred by a given crisis event. Figure 1 offers a stylized depiction of these potential

![Recalibrating Risk: The Analytical Terrain](image)

**Figure 4: Map of potential pathways from crisis to policy change**

consequences – with regard to risk perceptions, policy debates, adoption and implementation of new regulatory policies, and the ramifications of those new policies.

The overarching goal of each set of cases studies is to illustrate how regulatory institutions in different countries made sense of and responded to different crises. Figure 5 depicts an
analytical framework for the policy choices evident in the various case studies. These three schematics lay out a range of options for crisis-driven policy change. They distinguish between strategic posture, tactical posture, and the menu of more particular policy instruments that makers may adopt, which tend to cluster around particular strategic and tactical orientations. The case studies additionally take note of the outcomes of crisis-driven regulatory policies, especially when sufficient time has passed to make evaluations of those outcomes plausible. Pivotal issues about outcomes include whether such policies prove to be durable or ephemeral; whether they appear to produce their intended results, and/or unintended consequences of significance; and whether policy institutions effectively learn from these impacts.
Offshore Oil Spills

Offshore oil production began off the coast of California in the late nineteenth-century when oil speculators invested in oil drilling rigs that extended along a long wooden pier extending out into the Pacific Ocean (see Figure 6). Since that time, offshore oil production has grown steadily and now constitutes a little over a third of all global crude production. In addition, over two-thirds of the world’s hydrocarbons are transported from the point of extraction to the refining or consumption location by ship. As a result, large quantities of extracted crude oil, natural gas, and natural gas liquids are now always present in the ocean environment.

The policies that govern offshore oil and gas production and oceanic transportation of hydrocarbons must consistently balance tensions between multiple competing policy objectives. On one side, lie the goals of economic growth (spurred by lower fuel prices), energy independence, political security, and free enterprise, which tend to align with increased oil and gas production. On the other side lie the goals of worker safety, environmental protection, and the conservation of scarce resources, which generally suggest the need for caution and restraint.

Despite the best efforts of policy-makers to balance these often conflicting aims, the history of offshore oil production and oil transport has been characterized by several major accidents, which have resulted in injuries, loss of life, and/or damages from spilt crude oil. Figure 7 provides a timeline of these incidents. These accidents frequently though not always attract public attention and expose the inherent tensions in energy policy, often leading to
significant regulatory change. In order to better understand how these accidents affect risk perceptions and how these changes in perceptions affect regulatory policy, we commissioned three case studies that collectively examine accidents in American waters and the North Sea, two especially significant contexts for oil and gas extraction and transport.

The political scientist Marc Eisner’s essay focuses on American policy responses to a pair of accidents in U.S. waters -- the 1969 drilling blowout in Santa Barbara Bay and the 1989 Exxon Valdez oil spill that resulted from a tanker grounding off the coast of Alaska. Eisner traces the immediate impact of these events on public perceptions and policy, while also analyzing the evolution of policy between these two extreme events, which developed in response to the dynamic growth and expansion of the U.S. offshore oil and gas industry. Thus his essay combines analysis of accident-driven policy with analysis of policy evolution that is not directly tied to a specific crisis, but remains informed by policy choices made in prior crises.

The chapter by Ole Andreas Engen, a safety engineer, and Preben H. Lindøe, a sociologist, investigates policy responses to accidents in the North Sea by the major European oil producers—the U.K. and Norway. Engen and Lindøe show that early policy in Europe was powerfully influenced by three accidents in the North Sea – the 1965 collapse of the Sea Gem, a BP-owned platform; the 1980 collapse of the Norwegian drilling rig, the Alexander Kielland, off the Norwegian continental shelf; and the 1988 explosion that occurred on the Alpha platform operating in the Piper oil field (and so referred to as Piper Alpha) off the U.K. Continental Shelf. In response to the Sea Gem accident, the U.K. began promulgating new command-and-control regulations for offshore oil and gas drilling and production. The Kielland disaster resulted from gale force winds that caused one of the rig’s legs to give way. The platform tilled to 35 degrees and capsized within one minute, killing 123 of the 212 people onboard. This accident prompted significant reforms in Norway, although these reforms differed substantially from the command-and-control approach that had been used in the United States and the U.K. The Piper Alpha explosion killed 167 of 229 men onboard, and remains the deadliest accident in offshore oil/gas history. Following this accident, the U.K. government commissioned an investigation that produced in the Cullen Report, which recommended significant changes to the U.K. regulatory regime for offshore oil/gas facilities and moved this regulatory regime closer to the approach adopted in Norway after the Kielland accident. Engen and Lindøe examine the policy responses to each of these accidents (and other smaller ones) and highlights how these accidents shaped policy in Europe in ways significantly different from how policy developed in the United States. The essay also examines the robustness of the European approach to regulation of offshore oil and gas.

The third chapter, by the political scientist Christopher Carrigan, explores responses to the most recent large-scale offshore oil disaster, the 2010 explosion at the BP Deepwater Horizon drilling rig, which killed eleven workers and dumped nearly 5 million barrels of oil into the Gulf of Mexico. Like Exxon Valdez, this accident prompted enormous public concern, because of
intensive news coverage and the visible nature of the spill’s environmental impacts. But with Deepwater Horizon, the drama of attempts over several months to plug the underwater gusher accentuated public interest. Carrigan focuses particularly on the subsequent institutional reorganization of American regulatory agencies after Deepwater Horizon, as policy-makers sought to heighten safety without curbing oil and gas output.

Several themes emerge from these three cases. First, regulatory policy in this domain has been significantly shaped by crises that changed risk perceptions both among the policy elite and the broader public. This is evidenced by significant reforms following the Santa Barbara accident, the Exxon Valdez, and the accidents in the North Sea. These events precipitated paradigm shifts in how risk was perceived and managed in both the U.S. and Europe. However, the response to the Deepwater Horizon blow-out has, at least thus far, proved more limited in scope, perhaps because the this accident, while large, did not fundamentally change risk perceptions among the policy elite. Furthermore, regulatory responses to oil spills seem to be highly conditional on the geographic location of the accident, even though risks from offshore oil drilling are similar in different locations. European responses followed accidents in the North Sea, while U.S. responses followed accidents in the U.S. In this policy domain, the depth of political concern and policy response seem to vary directly with the distance from the location of the disaster.

**Major Nuclear Power Accidents**

After physicists in the 1930s recognized the possibility of chain-reaction nuclear fission and then deployed it in the 1940s to create atomic bombs, interest soon turned to designing slower controlled fission reactions that would generate electricity for civilian energy. The first commercial nuclear power plants began operation in the 1950s, when reactors were commissioned in the United States, the Soviet Union, the UK, and France, followed soon by Germany. Japan started its first commercial reactor in the 1960s. Over the subsequent two decades, the technology spread to several other countries, aided by technical and financial assistance from international agencies like the International Atomic Energy Agency and the World Bank.

Today there are just over 100 commercial nuclear power reactors in the US, providing about 19% of US electricity generation. Japan has just over 50 commercial reactors, which as late as 2011 generated about 30% of its electricity. In France, almost 60 reactors generate over 75% of the country’s power needs, while just under 20 German reactors generate about 30% of its electricity. [CHECK THESE NUMBERS – including to verify shares of electricity vs. shares of total energy use. We could also put these data in a chart rather than in the text.]

Nuclear fission promised a cleaner energy source, in the sense that, unlike fossil fuels, it would not emit air pollutants (such as sulfur oxides, nitrogen oxides, particulate matter, and mercury). These air pollutants (especially fine particulate matter) are associated with tens of thousands of premature deaths each year in the US, hundreds of thousands of premature deaths each year in Europe, and millions
Nuclear power emits no greenhouse gases and thus helps avoid climate change. But no fuel is zero risk; every energy choice confronts a risk-risk tradeoff. The nuclear power fuel cycle has posed concerns regarding, for example, uranium mill tailings, low-level radiation from power plant operation, disposal and leakage of spent fuel wastes, diversion of fissile material to make weapons, and the dispersion of radiation caused by reactor core meltdowns.

Advocates also hoped that nuclear power would generate electricity at very low cost, and could offer energy independence rather than reliance on imported fossil fuels. But high capital costs for plant construction, delays due to siting disputes and regulatory hurdles, and the question of waste disposal, as well as other factors, have kept prices higher than advocates anticipated. In the US, cheap electricity from coal, and more recently from shale gas fracturing, have garnered large shares of the electricity market, while the cost of renewable sources such as solar and wind continue to drop. US federal laws have attempted to reduce the costs of US nuclear reactors, such as by limiting the industry’s liability for a major accident (the Price-Anderson Act of 1957), and by designating a federal repository for commercial reactor waste (ostensibly at Yucca Mountain, Nevada, though still not approved to operate and still in continuing litigation).

Studying accidents at nuclear reactors can contribute in several ways to our understanding of crises, perceptions and policy change. A nuclear power plant accident raises the specter of radiation exposure to the surrounding, downwind and downstream population. Awareness of these risks may in turn arouse public concern and opposition in advance of plant construction, and public panic and outcry if an accident occurs. Nuclear power reactors are complex technological systems with myriad interconnections and potential causes of failure. They are managed and monitored by fallible human beings. Moreover, the regulatory institutions governing nuclear power may face limits on their personnel, expertise, funding, information, and legal authority; and they may harbor conflicting objectives such as promoting the industry while also regulating safety. If an accident galvanizes public opinion and yields policy change, it may drive several different types of response, including tightening regulatory standards, refocusing regulatory attention (such as from reactor design to reactor operation), reorganizing government agencies (such as by splitting promotion from oversight), and delegating monitoring and/or standard-setting tasks to industry.

Three case study chapters in this volume address nuclear power accidents. Each considers the influence on perceptions and policy responses of three major crisis events: the accidents at Three Mile Island (1979), Chernobyl (1986), and Fukushima (2011). Some key features of these three incidents, such as the magnitude of radioactive fallout and the resulting health effects (which remain highly contested questions) are sketched in Table 1. Each case study chapter examines the response to these three accidents (and others) in a different regulatory system(s). The chapter on the responses in the US authored by Elisabeth Paté-Cornell, a professor of management science at Stanford University, illustrates the strong US response to TMI (tightening standards for licensing, resulting in a de facto moratorium on new licenses for three decades, while also delegating some safety monitoring to an industry consortium, INPO); but less significant US policy responses to Chernobyl or Fukushima, and little reorganization of US agencies. The chapter on responses in Japan, authored by Atsuo Kishimoto, a risk expert at the national industrial safety institute, shows that significant policy changes were made in
Japan (notably large-scale reorganizations of regulatory oversight), mainly in response to accidents that occurred in Japan – smaller events in the 1970s and 1990s, and then Fukushima – but with little response to TMI and Chernobyl. A third chapter on nuclear policy in Germany and France authored by Ortwin Renn, Brooke Rogers, Kristian Krieger and Ragnar Lofstedt, recounts the major responses of German policy to Chernobyl and Fukushima (by adopting a phase-out of nuclear power, initially by 2030, then relaxed, and then after Fukushima accelerated to 2022), but meanwhile the relatively smaller response of French policy to these crisis events.

[Table One to Go HERE]

These case studies on nuclear accidents illustrate the varying influence that crisis events can have on public perceptions and policy responses. Not all the nuclear reactor crises affected all policymakers: some countries responded strongly to local accidents, others responded significantly to distant accidents, and still others did not respond much to any of the accidents. Some policy changes arose without crises. The degree of influence of a nuclear reactor crisis on policy appeared to depend, among other factors, on the magnitude of event, geographic proximity, public attention and framing, similarity of technology and accident cause, availability and cost of alternatives, confidence in elite leadership, and structure and role of governance institutions. These cases also highlight the tradeoffs involved in responding to a crisis in one technology (such as nuclear power) when key alternatives also pose risks (such as air pollution and carbon dioxide emissions from coal, groundwater pollution and methane releases from shale gas fracturing, dependence on imports of foreign fuels, and cost and reliability questions about renewables). And these cases indicate the variation in type of regulatory response, which ranged from agency reorganization, the adoption of a new scheme of industry self-regulation, and tighter standards, to a moratorium on new reactors and a phase-out of existing reactors.

**Financial Crashes**

Dozens of major financial panics have occurred since the advent of modern banking, public finance, and corporate securities markets, touching nearly every society that has embraced the basic institutions of capitalism. These events proved especially frequent in the nineteenth-century, before the introduction of publicly mandated deposit insurance, capital requirements, and schemes of prudential regulation, occurring somewhere in the North Atlantic world essentially every decade. These crises emerged from many economic markets, sometimes engulfing the market for sovereign debt, sometimes initially battering stock markets, sometimes centering on housing finance. The most affected financial institutions varied as well, ranging from commercial banks and insurance companies to trust companies and brokerage houses. In some cases, the reach of crises never extended beyond regional or national boundaries, but in others they cut a much wider geographic swath.

Nonetheless, as the economic historian Charles Kindleberger has argued, significant financial crises share some important characteristics, regardless of the type of market at the epicenter of crisis or the extent of its geographic reach. Financial panics typically occur after a period of
significant prosperity, which fosters extensive optimism among investors and business leaders and an associated ready supply of credit. Often a specific stretch of good times is bound up with extensive investment in emerging industries and widespread reliance on new financial instruments and strategies, whose complexities, especially concerning their implications for vulnerabilities in the overall financial system, were not well understood by the great majority of market participants. The onset of crisis almost always begins with some triggering event (or cluster of events) that leads investors and the managers of firms to reassess the risks that they face – to engage, in the modern language of risk analysis, in “Bayesian updating” – and therefore to sell assets.

Before the 1930s, this widespread reevaluation of economic prospects and values usually was triggered by the failure of a significant bank or other financial institution. After the American New Deal, and the subsequent global diffusion of public deposit schemes and government backstops of their nationally significant financial institutions, financial crises became far less common for several decades. But under the twin pressures of post-1975 globalization and financial deregulation, they have reemerged, with a much wider array of triggers. The key event in 2008, for example, was not so much the failure of a key financial institution – Lehman Brothers – as it was the realization that the American government would not bail it out (while the anticipated prospect of government bailouts may have encouraged greater risk-taking that helped cause the crisis).

Regardless of how financial crises begin, they typically unleash a rapid transition from free flowing credit to general distrust of counterparties. Fears of collateral bankruptcies produce a rush to liquidity, as firms, investors, and speculators seek to protect themselves from anticipated losses by calling in debts and selling financial instruments. This general chasing after cash then causes dramatic declines in asset values, exacerbating the pressures on debtors and generating a sharp spike in business failures as well as dramatic declines in economic output.

As is the case with each of the case study clusters contained in this book, one challenge faced by regulators in responding to financial crises stems from the competing policy goals at stake. Governments typically want to maintain public confidence in financial markets, protect investors (especially unsophisticated investors) from deception or imposition, and, if public insurance or implicit public guarantees exist as a means of forestalling bank runs, protect taxpayers from the costs of bailouts. But policy-makers also wish to facilitate innovation and protect the competitive position of financial centers. These competing goals are often in conflict. Legislators and financial regulators may seek to balance the desire to facilitate economic growth against the imperative to maintain systemic stability. Alternatively, policy-makers may weigh the need to facilitate innovation in financial products against the desire to protect investors from fraud, overreaching, or investments perceived as too risky or complex for many investors. And innovations in financial institutions, such as have occurred with the investment strategies and financial products used by hedge funds and other “shadow banking” institutions, may conflict with the imperatives to control systemic risk and protect taxpayers from bailouts.
These tensions are evident both before and after a crisis period. After a lengthy period of stability, financial regulations designed to promote the stability of the financial system may be seen as a burdensome and unnecessary impediment to growth. After a crisis, when economic conditions remain precarious, regulators may feel that they have to balance some of their preferred regulatory responses against fears that aggressive containment of important economic actors and markets will stifle recovery. Thus, the financial regulator’s job with respect to crisis avoidance is not simply to choose the policy option most likely to avoid a future crisis (a hard enough job, in most cases). Rather, the regulator must also weigh crisis avoidance against other competing policy goals, rendering the task both more substantively and politically difficult.

Further complicating policy-making with respect to crises is the need to address various affected constituencies. In the case of financial regulation, the financial industry represents a large, concentrated, and highly organized constituency that spends vast resources on influencing policy at the legislative, agency, and judicial levels, in both national and international forums. Although not a monolithic whole—the policy preferences of smaller, community banks, for example, may diverge from those of larger meta-banks—there are nonetheless many issues on which industry preferences largely converge. More importantly, perhaps, is the lack of a traditional constituency for whom financial stability is a high-salience issue. NGOs expressly dedicated to issues of financial stability are a relatively new phenomenon. Moreover, the causes of and cures for financial crises are often poorly understood or contested, even by experts. Educating the public and maintaining their attention to reforms centered on long-term stability can be a challenge.

Our case studies of regulatory responses to financial crashes consider three significant episodes of widespread financial instability. The historian Youssef Cassis’s chapter takes on the challenge of analyzing responses to the Great Depression, which was unleashed by the American stock market crash of 1929, as well as a slew of foreign currency crises in Europe and subsequent bank runs on both sides of the Atlantic. David Sicilia, also an historian, considers the policy impacts of a series of regional financial crises in the 1980s and 1990s, especially in Latin America and Asia, bound up with local currency collapses. Three chapters grapple with the regulatory consequences of the most recent Global Financial Crisis of 2007-08, which began in the American mortgage market before spreading to other American debt markets, housing markets in several other countries, and the market for European sovereign debt. In his essay, the sociologist Bruce Carruthers assesses the impact of the crisis on a key regulatory aspect of the modern financial system—the modes of valuing complex derivatives. The chapter by the economists Stijn Claessens and Laura Kodres survey the voluminous regulatory responses in Europe and North America. And the essay by the economist Barry Eichengreen explores the regulatory implications of the European sovereign debt crisis.

All of these episodes occurred after the creation of pivotal modern regulatory institutions such as central banks, and after the widespread recognition of the need for minimum capital reserves for financial institutions. Each episode engulfed several major economies, exposing global linkages in the financial system and prompting searching policy debates about the nature of systemic financial risks and the most appropriate means of addressing them. These
particular crises further reveal the contingent nature of policy responses. In each case, the experience gave rise to a policy trajectory rather than just an immediate, single set of legislative or administration actions. Debates over reform continued for some years, as did the jockeying of interest groups to define the meaning of the crisis, as well the process of adapting regulatory policies to perceived new realities. And in each case, affected societies often diverged significantly in their interpretations of the crisis, and thus the sorts of regulatory reforms that their leaders deemed appropriate.

Part 5 -- Agendas for Scholarly Research and Policy

In the first of two concluding chapters, the co-editors develop an overarching descriptive analysis of how crises (and associated changes in perceptions) influence the selection of regulatory responses. We also lay out a set of causal hypotheses about crisis-driven regulatory policy, distinguishing which factors lead to which kinds of responses. We hope that these hypotheses can help guide future research into a wider array of policy arenas.

In the second concluding chapter, we develop a normative analysis of crisis-driven regulatory policy. We attempt to evaluate when and how crisis-driven policy innovations are desirable, including whether they effectively address the risks highlighted by crisis events, impose acceptable costs, and induce other risks. Further, we suggest ways to improve the actual responses of policy-makers in the future – their responses to crises and the accompanying demands for regulatory reform that they tend to generate.

We have no pretension of being able to furnish policy-makers who might confront as yet unseen future crises with a formulaic handbook for crisis-related regulatory decision-making. But we do think that we can provide those officials with better historical understanding of the promise and pitfalls of past crisis-driven policymaking, and a more sophisticated and useful set of questions to ask themselves and the experts on whom they rely for analysis.

The provision of such guidance strikes us as of increasingly critical importance. As our technologies and economic systems become more complex and interconnected, even as ordinary risks are reduced and human longevity increases, extreme crises that impose large costs may become more common or more consequential – or at least more shocking against the backdrop of otherwise declining ordinary risks. Ironically, in a safer society, smaller events may be perceived as upsetting (than in a past riskier society), and so even more policy may become crisis-driven. We have good reason to think carefully about how governments have responded, are responding, and should respond to such events, so that policy makers can learn to prepare for crises and prepare to learn from crises – to reduce policy regret and increase policy resilience.