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Coglianese, Cary, "The Law and Economics of Risk Regulation" (2020). *Faculty Scholarship at Penn Law*. 2157.

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The Law and Economics of Risk Regulation

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Abstract

Law plays a central role in the management of risk in society. The rules adopted by regulatory agencies now affect nearly every facet of the economy, and as such regulation has motivated a substantial body of academic research. Law and economics research on regulation has, first, demonstrated the normative justification for governmental intervention in the marketplace based on the concept of market failure. Second, political economy research on regulation has shown how, as a positive matter, interest groups, political movements, and public pressure affect the stringency of such regulation, sometimes more than any normative rationale for regulation. Third, risk regulation research has clarified the available normative principles that can guide the selection of regulatory stringency, from a zero-risk principle to cost-benefit balancing. Finally, the law and economics literature on risk regulation offers lessons about the form or design of regulatory instruments, from traditional “command-and-control” standards to more innovative possibilities, such as market-based instruments or management-based regulation.

Keywords: Risk regulation, law and economics, regulatory instrument choice, benefit-cost analysis

Forthcoming in James J. Cochran, ed., *Wiley Encyclopedia of Operations Research and Management Science*.

The Law and Economics of Risk Regulation

Cary Coglianese

From the origins of the common law era to the present-day regulatory state, governments have always used law as a means of risk management. Today law plays a central role in managing a variety of risks associated with the modern economy. The many laws governing financial institutions and investment practices seek to protect society from undesirable economic risks such as fraud or insolvency. Other laws regulate manufacturing operations in an attempt to protect workers from occupational risks and neighbors from environmental risks. Laws seek to protect consumers from injuries from unsafe products, travelers from transportation accidents, and all citizens from risks of criminal or terrorist violence.

Given law's important role in addressing risk in society, scholars have devoted considerable attention to risk regulation, with both normative and positive research. An initial normative question has centered on the justifications for governmental regulation of the marketplace [1]. Accepting the need for risk regulation, researchers have studied, as a positive matter, the process by which regulatory standards are established and implemented, as well as have evaluated whether alternative decision-making procedures achieve their intended objectives. A central substantive issue in risk regulation focuses on the proper level of risk protection that regulatory standards should strive to achieve. Whatever the level of appropriate risk protection, a final issue considers the form or design of risk regulatory instruments. Much research in recent decades on the regulation of health, safety, and environmental risks has focused on each of these issues in an effort to contribute policy-relevant knowledge for those officials who seek to use law as means of risk management.

The Basis for Risk Regulation

In theory, the common law of contracts, which allows the participants in market transactions to allocate economic risks between themselves, might initially be thought to be the only law needed for purposes of risk management. If individuals faced no transaction costs and possessed perfect information about the risks of different activities, they could presumably bargain with each other so that society's most valued economic activities would continue while taking optimal measures to protect those who would be harmed from such activities [2]. Those consumers who want to pay more for risk reduction can do so, and the market in principle should adjust to meet individuals' varied demands for safety. But "[t]he difficulty here, of course, is that markets are far from perfect" [3: p. 82]. Given the existence of transaction and information costs, contracting over risk does not occur as would be optimal. As a result, even at the common law, judges recognized that other legal principles, namely tort principles of nuisance as well as more recently through products liability, were needed both to provide compensation to injured individuals but also to serve as a disincentive for socially suboptimal risky activity [4, 5].

The threat of tort liability serves to deter risky behavior, especially given the size of some jury awards [6, 7], and in this way tort law can be said to serve a "regulatory" function by inducing more optimal levels of care. Tort law in principle holds certain advantages as a regulatory mechanism [8]. Unlike the often tightly defined prescription of contemporary regulation, the open-ended standards of the common law (such as "unreasonable" harm) makes liability more readily adaptable to changing circumstances. Rather than prospectively addressing sometimes speculative risks, common law liability applies only to harms that actually occur, and it also places principal decision-making authority in the hands of judges who may be far less subject to interest group pressures than legislators or regulatory officials. Finally, when liability

rules place no-fault responsibility on the least-cost avoider of the risk, this can induce firms to produce safer products and processes [9]. Insurance coverage can provide further incentives for risk reduction, both because insurance companies can set premiums based on risk levels as well as because they can condition coverage on compliance with basic safety principles [1].

On the other hand, some of these same purported advantages of tort law can be disadvantages [8]. For example, judges may well be more independent, but they are also much less knowledgeable about science and risk analysis than are experts within centralized regulatory agencies. More significantly, tort liability may provide less-than-optimal levels of deterrence for society. Despite their theoretical advantages for pricing risk, liability insurance markets may, like any market, operate imperfectly or may not cover all types of harms. The availability of bankruptcy may also blunt some of the deterrent effects of tort liability. Business decision makers may underestimate the probability that their activities will cause harm to others, thereby underestimating their liability for such harm [10, 11]. The litigation process itself can be slow and costly, both for society as well as for plaintiffs seeking recovery, which may keep some number of meritorious cases from being pursued. The injured party bears the burden of proof, and especially when injured parties are poor, they may not pursue litigation at a level needed to create a socially optimal level of deterrence. In addition, when there are many injured parties (such as in cases of pollution or major industrial accidents), these individuals will face collective action problems in organizing to seek recovery [12]. If many individuals are harmed only slightly, the overall level of harm to society may still vastly exceed the overall benefits from the underlying economic activity, but each individual will have little reason to pursue costly litigation. As a result of these limitations, the level of deterrence provided by tort liability will often prove to be much lower than is socially desirable [7].

For these kinds of reasons, regulation has been recognized as necessary to supplement, or even replace, common law liability [13]. Regulation – that is, imposing more specific, prospective risk reduction requirements -- is preventive rather than reactive. Regulatory intervention in the marketplace has been generally viewed as justified in instances of market failure such as information asymmetries (consumer product risks or workplace health and safety risks) and negative externalities (environmental risks or major industrial or nuclear power accidents) [14, 15]. As a result, although common law liability remains in place, the rate of regulation has grown dramatically over the last century and regulatory agencies, rather than courts, have today become the primary source of law affecting risk management.

The Process of Risk Regulation

Given the critical role of regulation, scholars have focused on how regulatory agencies make law. Although the normative case for regulation to address market failures has been generally accepted, this does not mean that all regulation is motivated by such public interested reasons or that adequate levels of regulation will always be put in place. On the contrary, positive research on the process of regulation has suggested that risk regulation can depart from normative ideals and instead fall prey to the dictates of interest group and electoral politics [16]. Businesses that would incur costs under regulation can be expected to oppose the establishment of stringent regulation, and they are better organized in the policy process than are the beneficiaries of regulation, who may be numerous but who have only diffuse interests at stake [17]. As a result, government may undersupply public regulatory protection just as with common law protection. The same collective action problems that serve as a barrier to tort litigation in cases of diffuse and unorganized victims of pollution or other harms may also dampen the

pressure for regulatory responses to such harms.

The close, interactive relationships that arise between government and industry can potentially lead to regulatory capture, a situation where government protects an industry's interests at the expense of the broader public's interests [18, 19]. In some cases, capture can be expected to lead to less regulation, or less stringent regulation, than would be optimal. In other cases, business interests actually may support stringent regulation in order to impose costs on new competitors [20, 21]. Risk regulation will sometimes include "grandfather" clauses that exempt existing uses or otherwise apply more stringent control requirements on new sources of risk, which can impose cost barriers to the entry of competitors [22, 23].

Despite the real pressures business organizations can exert on the regulatory process, the expansive growth of regulation over the past half-century cannot be easily squared with regulatory capture. If industry controlled the process of making regulation, developed countries presumably would not have witnessed as expansive a growth in regulation addressing consumer protection, workplace safety, and environmental protection [24]. As economies have developed and educational levels have increased, members of the public today are less tolerant of a variety of risks than were previous generations [25]. Industry no doubt remains a politically important force in regulatory policymaking, but the increased political demand for regulation generally, along with the development of well-organized labor, environmental, and consumer rights movements, has led to the creation of new regulatory agencies and greater levels of regulatory control over the last fifty years [26, 27]. Competition across different jurisdictions may also sometimes create a "race to the top" in regulatory protection, as politicians in states or nations with less stringent regulations try to emulate jurisdictions with more stringent regulations in order to satisfy the demands of an increasingly risk averse public [28].

Risk regulation in advanced economies like the United States has evolved through an interplay between the legislature and the bureaucracy. Legislatures pass laws that typically provide general frameworks for risk management, leaving responsibility for implementing those general frameworks to regulatory agencies. For example, the U.S. Clean Air Act instructs the Environmental Protection Agency (EPA) to set ambient air quality standards at a level “requisite to protect the public health” with “an adequate margin of safety,” but leaves it up to the EPA to decide what that actual level should be for a given air pollutant [29]. This delegation of regulatory authority from the legislature to the agency, especially under the terms of broad statutory language like that in the Clean Air Act example, create the conditions for a principal agent problem – that is, the likelihood that regulators will stray from what the legislature intended [30, 31]. In a democracy, who or what controls the unelected bureaucrats who establish risk standards?

Two complementary theories have emerged in the study of U.S. risk regulation, one that emphasizes control by the President and one that emphasizes ongoing control by the Congress. Presidents exert influence over regulatory agencies by appointing the individuals who run them, overseeing their budget requests, and reviewing their most significant regulatory proposals [32]. Congress can also continue to exert influence over regulatory agencies by calling their administrators to testify and, more significantly, using the appropriations process as a carrot or stick [33, 34]. Researchers find evidence that both Presidents and Congress affect the behavior of regulatory agencies [35, 36, 37, 38].

Some scholars emphasize the role of administrative procedure in affecting what bureaucrats do and in holding them accountable to the elected branches of government. For example, the U.S. Administrative Procedure Act of 1946 requires agencies to issue public notices

of proposed rules and to give the public an opportunity to comment on these proposals before enacting them. Procedural requirements like these can help ensure that the same interest groups that supported an initial legislative delegation to an agency will have continued influence over that agency's actions [39, 40]. Interest groups can serve as surrogate monitors for the legislature, pulling a "fire alarm" when an agency seems to stray too far from the direction the Congress intended [34]. At its extreme, the theory of procedural control posits that Congress uses administrative procedures to "stack the deck" in ways that ensure agencies will carry out legislative preferences [39, 40].

To date, the development of the theory of procedural control seems to have outpaced empirical support for the strong, stack-the-deck version of the theory [41, 42, 43]. But scholarly interest in administrative procedure has much deeper roots than just the recent theory of procedural control. Administrative law scholars have long posited that procedures could be used to advance a variety of desirable qualities in regulatory policy [44]. For example, they have favored opportunities for judicial review in order to encourage greater adherence to law and to promote better policy reasoning [45]. They have urged the use of innovations such as negotiated rulemaking to reduce regulatory conflict and speed up regulatory decision-making [46]. Both legal scholars and economists have advocated procedural requirements for economic analyses of proposed rules as a means of promoting more efficient regulatory outcomes [47]. A growing empirical literature tests the claims advocates make for various forms of administrative procedure, often finding mixed or even negative results [48].

Whether or not procedures achieve substantial benefits in terms of improved decision making, some scholars have expressed concern that the simple accretion of procedural requirements imposed on agencies has come to hamper their ability to enact needed regulatory

protections. Some have posited that a “paralysis by analysis” or “ossification” now grips the U.S. regulatory process [49, 50, 51]. As with the purported benefits of regulatory procedure, these purported costs are subject to empirical investigation. To date, however, no systematic research has confirmed fears that procedures have placed any discernible barrier in the way of new regulation [48, 52, 53, 54, 55].

Comparative research on risk regulation across different developed economies provides another way of assessing the effects that procedural or other institutional structures have on regulatory outcomes. The management of risk varies widely across jurisdictions [56]. Do the structures of regulatory policy making, or just more conventional political factors such as political parties or voter ideologies, explain differences in risk regulation across jurisdictions? Some countries in Europe have more “corporatist” regulatory structures that rely on formal collaboration between selected industry groups, labor representatives, and government officials; others like the U.S. are much more “pluralist” in allowing interest groups to compete against each other in an open, adversarial manner [57]. Although early work suggested that corporatist regulatory structures might lead to greater environmental controls [58], it appears that stringency of environmental regulation is not related to institutional structures but rather (and not surprisingly) to the political strength of green and left-libertarian political parties [59].

Setting Risk Standards

Regulatory stringency is the core substantive issue at stake in setting risk management standards. Put simply, the issue has often been characterized by the question: How safe is safe? Answering this question requires making a normative decision about how much risk members of the public should confront in their lives. Setting risk standards “necessarily requires the use of

value judgments on such issues as the acceptability of risk and the reasonableness of the costs of control” [60].

In making these value judgments about risk, decision-makers can adhere to one of four basic normative principles or approaches [61]:

- (1) Eliminate all risk – or at least all man-made risk (the zero-risk approach);
- (2) Reduce risk to an acceptable level (the acceptable risk approach);
- (3) Reduce risk until the cost of doing so reaches an unacceptable level (the feasibility approach); and
- (4) approach); and
- (5) Balance the benefits of risk reduction with the costs (the efficiency approach).

The zero risk approach appeals to an intuitive notion of safety that implies complete freedom from any potential harm. Some laws appear to require this approach, such as the Clean Air Act’s provisions calling for standards that “protect the public health” with “an adequate margin of safety.” The European Union’s precautionary principle could also be viewed as indicative of a risk elimination approach [62].

In the context of setting environmental risk standards, a zero risk approach would require standards set at levels below some exposure threshold at which adverse health effects occur. If, as seems increasingly the case for many chemicals, a given pollutant is non-threshold in that some adverse effects arise from even the lowest levels of exposure, a zero risk approach may require the complete elimination of the economic activity that relies upon or generates the chemical, even if doing so would create substantial, negative economic consequences. It is also possible, of course, that eliminating one kind of risk entirely will exacerbate another kind of risk. A standard that requires the removal of harmful substances from automobile brake pads may protect auto workers and mechanics but could very well increase the risks from automobile

accidents. In cases of such “risk-risk tradeoffs” [63], the zero-risk approach can at best become a minimize-risk approach under which the regulator sets a standard at the non-zero level at which the marginal adverse effects of an economic activity equals the marginal adverse effects from reducing or controlling that activity.

Rather than seeking to eliminate or minimize risk, a second principled approach would reduce risk to an acceptable level. For example, no matter how much transportation safety regulation exists, anything short of banning airplane flights will always leave some residual risk of injuries and fatalities from air travel. A transportation safety regulator could nevertheless act to reduce risks to an acceptable, even if non-zero, level. In other contexts, regulators have also followed this approach. The U.S. Occupational Safety and Health Administration (OSHA) uses a benchmark mortality level of 1 in 1,000 as the basis for its occupational health standards and the U.S. EPA has sometimes deemed individual mortality risks below 1 in 10,000 to be acceptable [61].

An acceptable risk approach has its limitations. For one, an acceptable risk approach needs benchmarks not just for mortality risks as EPA and OSHA have used but also for morbidity risks. A reason agencies have not developed as clear a set of benchmarks for morbidity risks is that it is much harder to determine what those appropriate benchmarks should be. Regulators also must grapple with the choice between individual risk and population risk, as even a tiny individual risk could lead to a large total public health effect if a vast proportion of the population is exposed to a risk [61]. Determining what level should be deemed “acceptable” will most likely call for difficult value judgments; it is far from self-evident whether 1 in 1,000 or 1 in 10,000 is the right level. Moreover, an acceptable risk approach disregards costs altogether, implying that regulators must act to reduce risks to an “acceptable” level even when

the costs of doing so are disproportionately (and unacceptably) high. Correspondingly, the acceptable risk approach directs regulators to avoid reducing risks below the acceptable level, even when the costs of doing so would be de minimus.

A third approach – the feasibility principle -- emphasizes costs in much the same way that the acceptable risk approach emphasizes benefits. The feasibility principle directs regulators to tighten the stringency of risk standards to the point at which the costs of complying with the standard reaches an unacceptable level. For example, the U.S. Congress has directed OSHA to develop toxic exposure standards that will protect workers from harm “to the extent feasible” – that is, up to the point at which costs become unacceptable [64]. Just as regulating to achieve levels of acceptable risk disregards costs, regulating to avoid levels of unacceptable costs disregards the benefits of risk control. A risk standard might be infeasible in the sense that it would force the shut-down of a major industry, but if doing so would save tens of thousands of lives, such economic disruption is almost surely worth it. The U.S. phase out of lead as an additive in gasoline seems a good example where high costs, even the significant contraction of a major industry, were clearly justified in order to secure significant public health benefits [65].

Cost-benefit balancing, the fourth principle for setting risk management standards, avoids the problems of the acceptable risk and unacceptable cost approaches [66]. By taking both costs and benefits into consideration, the balancing principle directs regulators to set risk standards at the socially efficient level, that is, the level that maximizes net benefits (i.e., benefits minus costs). If tightening a risk standard will generate high costs and deliver only few benefits, it should not be adopted. On the other hand, even if only a few benefits come from making a standard incrementally more stringent, doing so will be justified if the incremental costs are even lower than the incremental benefits. In the U.S., the efficiency principle has been not only

favored by economists [67] but has also been embedded in an executive order applied to regulatory agencies since the Reagan administration. The current order, Executive Order 12,866, requires agencies to “propose or adopt a new regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs” [68].

Those economists and legal scholars who favor cost-benefit balancing do so because they believe it can achieve the most risk reduction for the resources devoted to meeting risk standards [66, 67, 69]. Currently, the estimated net benefits of risk regulation vary markedly across, and within, policy areas. Some regulations have been estimated to cost only in the tens of thousands of dollars per life saved; others have been estimated to cost billions of dollars for each life saved [70].

Despite the attraction of cost-benefit balancing, many scholars and political officials have resisted its widespread application. Applying this approach requires converting the costs and benefits of risk regulation into a common metric, typically a monetary one. The monetization of benefits generates objections in particular when these benefits involve the protection of human life [71, 72]. Of course, even if benefits are not explicitly monetized, when regulators choose between policy alternatives with greater and lesser levels of risk control they are implicitly making value judgments about health and life. Additional value judgments must be made when the costs and benefits of control are not equally distributed, as frequently is the case.

Applying cost-benefit balancing also raises a series of other choices over how to estimate benefits and costs. One choice is whether to rely on estimates of how much individuals are willing to accept to forego risk reduction versus how much they are willing to pay to secure the same reduction. Although theoretically these two choices should lead to comparable amounts, willingness-to-accept amounts have sometimes been higher than willingness-to-pay amounts for

equivalent risks [73]. In practice, economists typically have relied on willingness-to-pay amounts.

Another choice centers on the methods for obtaining value estimates, primarily for benefits that do not normally have market prices associated with them. Regulatory analysts can try to extrapolate using revealed preference methods, such as those that use the differences in wages in jobs with different risk profiles to extrapolate a monetized value of a statistical life [74]. Alternatively, analysts can rely on stated preference methods, such as contingent valuation surveys that ask individuals how much they would be willing to pay (or accept) for certain levels of risk reductions (or risk exposures) [74].

A final choice in applying the efficiency principle involves the discount rate used to place all monetary estimates into present value [75]. Not all costs and benefits occur at the same time; regulations addressing health risks with long latency periods will incur immediate costs but will deliver benefits only on a longer time horizon. The choice of what discount rate to use may affect the determination of whether a new risk standard will yield positive net benefits, as higher discount rates will tend to make long-term benefits smaller in present value terms [76].

Designing Risk Regulatory Instruments

In addition to determining risk standards' stringency, regulators also must choose the form or design of risk regulation. Many environmental, health, and safety risk standards are designed to direct regulated firms to adopt specific means of risk control, such as by mandating the use of protective devices on machinery or the installation of specific pollution control techniques. Other risk standards impose an obligation on firms to meet a stated level of performance, such as when they prohibit pollution that exceeds specified emissions limits. Such

performance standards provide firms with more flexibility as each firm can choose its own means of meeting the required level of performance [77]. But both means-specific and performance standards – sometimes together referred to as “command-and-control” regulation – treat all firms equally, requiring each firm either to adopt the same type of risk control measures or achieve the same level of risk control. Since the costs of risk control can vary across firms, a one-size-fits-all approach can result in excessive overall costs from risk regulation.

A more cost-effective way of achieving the same level of aggregate risk reduction would have firms with lower costs of control reduce risk more than firms with higher costs of control. For this reason, market-based regulatory instruments have been long advocated, and occasionally implemented, because they allow firms to achieve different levels of control. Market-based instruments include taxes, ideally set equal to the costs that risky activity imposes on society [78], and tradable permit systems [79, 80]. With tradable permits, the regulator determines an overall level of aggregate risk (or a level of a proxy for that risk), issues individual output permits that add up to the desired aggregate level, and then allows firms to trade their individual permits with each other. In the environmental area where this approach has been most prominently used, tradable permits have been thought to be better suited for risks that arise from mixable pollutants than for those that arise from exposure to highly toxic chemicals. The flexibility tradable permits affords regulated entities can lead to concentrated “hot spots” with higher levels of pollution, even if overall levels decline. For risk problems where some variation in risky outputs is acceptable -- because it is the overall level of such outputs that matters -- market-based instruments can lower costs. With regulatory instruments like tradable permits, firms can have an incentive to make even greater reductions in risky behavior so they can sell their excess credits. Economists have analyzed the conditions for deploying either taxes or

tradable permits [81, 82], and a body of research on market-based risk regulation has development as governments have experimented with its use [83, 84]. The U.S. government has successfully deployed tradable permits both to phase out the use of lead additives in gasoline [65, 85, 86] as well as to reduce emissions of sulfur dioxide from coal-powered electric utilities [87].

To work effectively, market-based instruments require government regulators to monitor and measure outputs. But some risks – or precursors to risks – are quite difficult or costly to monitor. This may be because (a) they arise only from relatively low probability events, (b) the causal pathways to the risk are complex, or (c) a monitoring technology does not readily exist. In such circumstances, regulators have sometimes responded by adopting management-based regulations, mandating that firms themselves identify the risks posed from their own operations and develop internal policies and procedures to manage those risks [88, 89]. A well-known example is the application of Hazard Analysis and Critical Control Point (HACCP) requirements on food-processing facilities by governments around the world. Under HACCP, food processors are required to identify critical points where contamination could arise in their production processes, and then to develop their own measures for preventing such contamination from arising and ensuring that their employees carry out these measures [90]. Management-based regulation has been demonstrated to achieve reductions [91], but especially when it is used in situations where governmental monitoring is difficult, management-based regulation can never be said to guarantee that firms will invest the resources needed to make socially optimal risk reductions [92, 93].

Much the same can be said of other alternative regulatory responses. Governments sometimes impose information disclosure requirements, either providing consumers or the government information about the risks associated with their products or processes. Such

information-based strategies have long been a staple of financial regulation, but they have also been used in recent years to address health and safety risks in a variety of areas [94, 95]. Information disclosure appears more likely to prove effective when it actually can affect decisions by investors or customers, giving rise to other (non-regulatory) pressures for risk reduction.

The U.S. Toxic Release Inventory (TRI) program, adopted in the late 1980s, requires certain companies to disclose their emissions of toxic chemicals [96]. Some researchers have suggested that the pressures activated by TRI-reporting led firms to reduce their toxic emissions by substantial amounts [97, 98]. Of course, these studies have not adequately accounted for the contributions of more conventional regulation to this decline, which is important to consider given that nearly contemporaneous amendments to the Clean Air Act imposed new regulatory controls on the same hazardous air pollutants that would be reported under TRI. For this reason, TRI's unique impact on toxic emissions remains, "to date, unknown" [96: 242].

More research will be needed to assess the effectiveness of innovative regulatory designs like market-based instruments, management-based regulation, and information disclosure. Evaluation research can be conducted on their existing application to risk problems as well as the use to address new forms of risk. Governments are only likely to continue to experiment with these and perhaps new forms of regulatory instruments altogether in the face of pressing or emerging areas of risk ranging from global climate change to nanotechnology. Empirical evaluation of these new regulatory strategies should aim to compare the outcomes achieved under innovative policies with a realistic appraisal of more conventional forms of regulation [99]. Conventional regulation is certainly not immune from outcomes that are ineffectual or even counterproductive. Regulation of any kind can lead to adaptations in behavior that offset

the risk reductions intended to be achieved through regulation. If drivers in cars with seat belts or airbags end up driving faster [100, 101], or if parents are more likely to leave medications with child-resistant packaging in areas accessible to their small children [102], protective regulations will not reduce risk as much as their designers may intend and sometimes they may even create or exacerbate other kinds of risks.

Conclusion

Regulation provides a central means for government to manage the risks associated with today's global, industrialized economy. Markets themselves cannot adequately protect the public from hidden hazards or spillover harms. Ex post liability, while useful, does not always by itself provide a socially optimal level of risk control. As such, preventative risk regulation will be needed, and the core questions will remain ones of how stringent such regulation should be and what form such regulation should take. Risk regulation research will continue to be needed to provide conceptual clarity to the normative basis for risk standards as well as to generate better empirical evidence on the effectiveness, efficiency, and equity of applying particular regulatory instruments under varied risk conditions.

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