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In a column last spring, the economist Paul Krugman observed that “liberals don’t need to claim that their policies will produce spectacular growth. All they need to claim is feasibility: that we can do things like, say, guaranteeing health insurance to everyone without killing the economy.”² Krugman’s belief that providing everyone with health insurance is desirable unless doing so would “kill the economy” expresses a familiar, if debatable, position. Even in a society as unequal as ours, some goods should be provided to everyone and they should be provided even if their provision comes at a cost in economic efficiency. The underlying belief is that some goods are essential to leading decent, independent lives and their provision therefore has a special priority.

Like health, physical safety is a strong candidate for inclusion on a list of the essential conditions of a decent and independent life. Indeed, the two are related. Health injuries are a form of physical harm. Accidental injury can impair basic powers of bodily agency as much as disease can. You might, therefore, expect to find a debate in the legal literature on risk and precaution over whether or not safety, too, should be prioritized over efficiency and secured to the extent that it is feasible to do so. Prominent federal statutes take this very position. Indeed, they echo Krugman’s exact word choice in requiring that the risks of certain activities be reduced as far as it is “feasible” to do so, and they mean the same thing that he does in choosing this word. “Feasible risk reduction” requires that the risks in question be reduced as far as possible without “killing the activity” in question.³ A chorus of contemporary commentators, however, insists that feasible risk reduction is not just normatively mistaken; it is indefensible. Jonathan Masur and Eric Posner, for example, argue that statutes prescribing feasible risk reduction have no defensible normative underpinning. Feasibility analysis, they write, “does not reflect deontological thinking . . . [does not] reflect welfarism in any straightforward sense,” and “no attempt to reverse engineer a theory of well-being that justifies feasibility analysis has been successful.”⁴ Apparently, the thought that safety, like health, is especially important and might warrant special protection is untenable. Efficiency is the only plausible standard of precaution, and its handmaiden cost-benefit analysis is the only plausible test.⁵

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² Paul Krugman, *Mornings in Blue America*, N.Y. TIMES, March 27, 2015.

³ See, *infra* Section III.B.

⁴ Jonathan S. Masur & Eric A. Posner, *Against Feasibility Analysis*, 77 U. CHI. L. REV. 657, 707, 709 (2010).

⁵ Cost-benefit analysis is phrased in different ways including cost/benefit analysis and CBA.

Professors Masur and Posner are not alone in contending that “cost/benefit analysis is currently the only game in town for determining appropriate standards of conduct for socially useful but risky acts.”⁶ Indeed, that particular turn of phrase belongs to Barbara Fried. Fried’s target was not feasibility analysis in particular, but all self-described alternatives to cost-benefit analysis. Cass Sunstein—perhaps the most influential legal academic of our time—asserts that “[u]ncontroversial” considerations “suggest” that “[i]t is not possible to do evidence-based, data-driven regulation without assessing both costs and benefits, and without being as quantitative as possible.”⁷ Cost-benefit analysis is necessary to bring discipline, reason and rigor to our thinking about risk and regulation.⁸ Unless and until we embrace cost-benefit analysis, our thinking about risk and precaution will be ruled by rank sentimentality and cognitive error. Lately, courts have joined the chorus. The most recent Supreme Court decision on point asserts that—absent specific statutory instruction to the contrary—regulatory agencies must engage in cost-benefit analysis the moment that they contemplate regulating a harmful substance. It is irrational even to *contemplate* reducing harm without considering costs.⁹

My aim in this paper is to challenge this consensus. Descriptively, the claim that cost-benefit analysis is the only game in town is controverted by the fact that standards of precaution other than cost-benefit analysis are common in our law. Normatively, the claim that cost-benefit analysis is the *only* rational way to think about risk and precaution is controverted by the fact that eminently defensible normative arguments can be marshalled in support of the safety and feasibility standards. Broadly speaking, the conflict here is a familiar conflict between welfarist (or utilitarian) and deontological (or liberal) positions.¹⁰ Cost-benefit analysis has its home in a framework which supposes that welfare is the ultimate or master value and that promoting welfare is the proper end of political and legal institutions. Risks to health and safety should be managed by minimizing the

⁶ Barbara Fried, *The Limits of a Nonconsequentialist Approach to Torts*, 18 LEGAL THEORY 231, 231 (2012).

⁷ Cass R. Sunstein, *Humanizing Cost-Benefit Analysis*, Remarks Prepared for American University’s Washington College of Law *Administrative Law Review* Conference, February 17, 2010, p. 13. 20 (“... it would be premature to say that CBA has received the kind of social consensus now commanded by economic incentives and deregulation of airlines, trucking and railroads. I believe that CBA should command such a consensus, at least as a presumption, and that the presumption in favor of CBA should operate regardless of political commitments.”). See also CASS R. SUNSTEIN, *THE COST-BENEFIT STATE* ix, 19 (2002); Cass R. Sunstein, *Essay: The Real World of Cost-Benefit Analysis*, 114. COLUMBIA L. REV. 167 (2014); Cass R. Sunstein, *Thanks, Justice Scalia, for the Cost-Benefit State*, BLOOMBERG VIEW 19 (Jul. 7, 2015) (praising the Supreme Court’s decision in *Michigan v. EPA* “as a ringing endorsement of cost-benefit analysis by government agencies.”).

⁸ See SUNSTEIN, *RISK AND REASON* 7 (2002). In *The Real World of Cost-Benefit Analysis*, Sunstein explains (at p. 170) that in this role he helped to implement Executive Order 13,563 “an exceedingly important document that places a high premium on analysis of costs and benefits.” Under that order, “agencies may proceed only if the benefits justify the costs and only if the chosen approach maximizes net benefits (unless the law requires otherwise).” Sunstein, *The Real World of Cost-Benefit Analysis*, *supra* note 7.

⁹ See, *infra* note 23 (discussing *Michigan v. EPA*, 135 S.Ct. 2699, 2707-08 (2015)).

¹⁰ Welfarism holds that human well-being is the only end worth pursuing in itself, and that everything else matters only insofar as it contributes to or detracts from well-being. LOUIS KAPLOW & STEVEN SHAVELL, *FAIRNESS VERSUS WELFARE* (2002) assumes both that welfare is the touchstone of economic analysis and that welfare is the only ultimate value. Most proponents of cost-benefit analysis identify it as welfarist. See e.g., Michael A. Livermore & Richard L. Revesz, *Rethinking Health-Based Environmental Standards and Cost-Benefit Analysis*, 46 ENVIRONMENTAL LAW REPORTER 10674, 10675 (2016). (“Cost-benefit analysis . . . places both costs and benefits along a common metric and supports the standard that maximizes net benefits (the difference between benefits and cost). As practiced in the United States . . . cost-benefit analysis is grounded on a welfare economic conception of social good . . .”); PETER SCHUCK, *WHY GOVERNMENT FAILS SO OFTEN*, 45 (2014) (“CBA is a welfarist decision-making tool, focusing on the actual consequences of policies for human well-being.”). Shuck cites Kaplow and Shavell in support of his account of cost-benefit analysis.

combined costs of avoiding and suffering the harms in question, thereby maximizing the net benefit extracted from the activities responsible for those risks. The liberal position holds that values are plural and incommensurable; that the basic role of the state is not to pursue welfare, but to enable people to pursue their own good as they conceive it; that harm and its avoidance have a special moral significance; and that the fundamental moral questions raised by issues of risk and precaution are questions about what people owe to each other.¹¹ This normative outlook justifies assigning special priority to avoiding harm. Our law reflects the conflict between these competing normative frameworks. It is torn between standards of cost-justified precaution and norms of safe and feasible precaution. There is more than one game in town.

The paper proceeds as follows. Section I summarizes the three standards of precaution and the differences that divide them. Section II focuses on the importance of the distinction between persons and the harm-benefit asymmetry. Cost-benefit analysis models social choice on individual choice and treats harms and benefits as symmetrically important. Both of these commitments are problematic. When some people have their lives devastated by harms issuing out of risk impositions—while others profit from the imposition of those very same risks—it is a mistake to model social choice on individual choice. We must take the distinction between persons seriously and adopt principles which are justifiable from the standpoints of both the potential victims and the potential beneficiaries of the practices in question. When physical harm is at issue, treating costs and benefits as symmetrically important is likewise mistaken. Our moral intuitions and our legal institutions treat the avoidance of harm as more important than the conferral of benefit. This asymmetry makes sense within a framework which places persons and their essential interests at its center. When we focus on the essential conditions of effective agency, harms and benefits are not symmetrically important. Physical harms—death, disability, disease, and the like—rob us of normal and foundational powers of action. Few benefits, by contrast, comparably augment our basic powers of agency. Indeed, unsought benefits often diminish our autonomy by imposing upon us.

Sections III & IV dig into the safety and feasibility standards, as interpreted by the courts and as applied by regulatory agencies. They aim to show that coherent alternatives to cost-benefit analysis are, in fact, present in our law. Section V summarizes why the safety and feasibility standards constitute reasonable attempts to give the avoidance of harm its due.

I. THREE STANDARDS OF PRECAUTION

In legal discourse, the claim that cost-benefit analysis is the only plausible way to think about risk and precaution is articulated as a criticism of two other standards of precaution—namely, the “safe level” and “feasibility” standards.¹² Federal statutory standards governing health, environmental and safety regulation often insist that some activity be made “safe,” or that some risk be reduced to the point where further reduction would be “infeasible.” The regulation of air, food, and water quality is the principal habitat of the “safe-level” standard and the regulation of occupational health and safety is the principal habitat of the feasibility standard. The three standards

¹¹ For criticism of the idea that welfare is a master value and argument that values are irreducibly plural, see T.M. SCANLON, *WHAT WE OWE TO EACH OTHER*, 1–108 (1998).

¹² Michael A Livermore & Richard L. Revesz, *Rethinking Health-Based Environmental Standards and Cost-Benefit Analysis*, 89 N.Y.U. L. REV. 1184 (2014) refers to what I call “safe level” analysis as “health-based analysis.” I shall sometimes refer to the “safe-level” standard as the “safety” standard.

identify distinct levels of permissible risk imposition. Normally, they stand in linear, vertical relation to one another, with the safety standard tolerating the least risk and the cost-justification standard tolerating the most.¹³

A. Safe, Feasible and Cost-Justified Precaution

The two standards of most interest to us—the safety and feasibility standards—deploy a relatively well-integrated set of concepts. The concepts of “safe level,” “feasible risk reduction” and “significant” risk that form the core of both statutory standards are terms of art. The feasibility standard, for its part, is further broken down into technological and economic prongs. The legal regimes that the standards establish need to be understood in terms of these concepts; in relation to one another; in relation to the idea of cost-justified risk reduction; and in light of their usual domains of application. The best way to begin these tasks is with simple summaries of the standards.

1. The Safe-Level Standard

The Food Quality Protection Act of 1996¹⁴ embodies the safe-level standard. It requires that pesticide residue on fresh and processed foods be reduced to a “safe” level.¹⁵ “Safe,” in turn, means “there is reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all dietary exposures and all other exposures.”¹⁶ This standard is made even more stringent by instructions to regulators to set limits that provide for an additional margin of safety in light of the special susceptibility of infants and children to harm from toxic substances.¹⁷ Pesticide residue on food is thus acceptable only to the extent that it is reasonably certain to harm no one—not even those unusually vulnerable to harm. Applying the safe-level standard therefore does not require any inquiry into the costs of risk reduction. All that it requires is a determination of the level at which the risk created by exposure to the regulated substance ceases to be significant.

Among the three standards, the safe-level standard tolerates the least risk. Safety-based regulations require risk to be reduced to a point where no “significant risk” of devastating injury remains. This may well require moving beyond the point of cost-justified precaution. If efficient precaution is taken and significant risk still remains, the safe level standard requires further reduction.¹⁸ The standard may therefore require precaution which presses beyond the point of maximum net benefit, as cost-benefit analysis conceives that point.

¹³ It is debatable whether this relation is necessary. Arguably, there are circumstances where it is not cost-justified to engage in an activity in the first place and where the activity is also governed by feasibility analysis. In this circumstance, feasible precaution will be less protective of safety than cost-justified precaution. None of the circumstances discussed in this paper fit this template. Examples that might fit the template involve freely chosen, but very risky activities. Some people might argue that it is foolish to engage in some such activity (e.g., in “free solo” rock climbing). At the same time, it will be true that the risks of such activities cannot be reduced to insignificance because that would destroy the value of the activity.

¹⁴ The Food Quality Protection Act of 1996, Pub. L. No. 104–170, 110 Stat. 1489 (codified as amended at 7 U.S.C. § 136, and in scattered sections of 21 U.S.C. (2000)). Clean air statutes also incorporate safety-based regulation. The Clean Air Act, Pub. L. No. 101-549, 104 Stat. 2399 (codified as amended at 42 U.S.C. §§ 7401–7671 (2000)).

¹⁵ 21 U.S.C. § 346a(b)(2)(A)(ii).

¹⁶ *Id.*

¹⁷ § 346a(b)(2)(C)(ii)(II).

¹⁸ Efficient precaution is taken when the marginal cost of the next increment of precaution would exceed its marginal benefit (i.e., when a dollar more in precaution would yield less than a dollar’s worth of harm avoided).

2. The Feasibility Standard

The feasibility standard is at least as salient in federal risk regulation as the “safe-level” standard. The Clean Air Act, for example, provides that standards for hazardous air pollutants “shall require the maximum degree of reduction in emissions” that the EPA, “taking into consideration the cost of achieving such emission reduction” determines to be “achievable.”¹⁹ Feasible risk reduction does not require the elimination of all significant risk. It is less stringent than the “safe-level” standard but more stringent than cost-justified precaution. Feasible precaution calls for reducing an activity’s risks as far as possible consistent with the long-term flourishing of the activity. Because it requires that significant risks be reduced until they are either (1) insignificant or (2) further reduction would jeopardize the long-run health of the activity whose risks they are, feasible risk reduction may require pressing precaution beyond the point where a dollar more spent on the prevention of harm yields more than a dollar’s worth of harm prevented, and to the point where further risk reduction would endanger the activity.

3. The Cost-Benefit Standard and Its Claims

The basic idea of cost-justified risk imposition is easy to state, perhaps deceptively so. Cost-justified precaution requires risks to be reduced to the point where the costs of further precautions exceed their benefits. Cost and benefit, for their part, are all-encompassing concepts. In a well-known defense of cost-benefit analysis, the economist Robert Solow explained that “the cost of the good thing to be obtained is precisely the good thing that must or will be given up to obtain it.”²⁰ “Cost,” then, is anything given up to obtain something else. “Benefit” is the flip side of the coin—anything worth attaining whose attainment requires giving something up. An ideal cost-benefit analysis takes all costs and all benefits into account and identifies the point at which costs and benefits are balanced so that net benefit is maximized. In practice, almost all cost-benefit analyses take more restricted sets of costs and benefits into account. In the context of accidental injury, for example, the criterion of cost-justification is usually said to require minimizing the “sum of precaution, accidental harm, and administration costs.”²¹

For our purposes, the important issue is not exactly how cost-benefit analysis is practiced, but why the cost-justified level of risk imposition is claimed to be the correct level of risk imposition. The answer to that question is straightforward. When we minimize the combined costs of preventing accidental harms (precaution costs) and paying for those harms that we do not prevent (accident costs), we maximize net benefit (benefit minus cost). We diminish net benefit if we take either more or less precaution. If we take more precaution, the increased marginal spending on precaution costs exceeds the increased marginal savings in accident costs. If we take less precaution, the marginal savings in precaution costs are exceeded by the marginal increases in accident costs. Benefit, thus, diminishes if either more or less precaution is taken. This is why law and economics

¹⁹ 42 U.S.C. § 7412(d)(2). This requirement is part of the 1990 Amendments to the Clean Air Act. Feasible risk reduction is a statutory standard in the Occupational Health and Safety Act of 1970, and it is in this context that it has received its most extensive application and articulation. See, *infra* note 97.

²⁰ Robert Solow, *Defending Cost-Benefit Analysis*, 5 REGULATION 40, 40 (1981). Solow’s is one of several comments responding to Steven Kelman, *Cost-Benefit Analysis: An Ethical Critique*, 5 REGULATION 33 (1980). This debate between Kelman and Solow is helpfully reviewed in Douglas MacLean, *Cost-Benefit Analysis and Procedural Values*, 16 ANALYSE & KRITIK 166 (1994).

²¹ COOTER & ULEN, LAW AND ECONOMICS, 237 (6th ed. 2016).

scholars like Masur and Posner conceive of the cost-justified level of precaution as *the* rational level of precaution. This conclusion is common. In a recent book, for instance, the legal scholar Peter Schuck writes:

Cost-benefit analysis posits that policy A is more desirable than policy B if and to the extent that the net benefits (i.e., benefits minus costs, including opportunity costs) that flow from A are larger than the net benefits that flow from B. So stated, CBA is simply rationality in the service of sound policy, a call for policies that maximize net benefits, a principle to which seemingly no sensible person could object.²²

Many courts, including the Supreme Court, seem persuaded. In its recent decision in *Michigan v. EPA*, the Court appears to create a presumption that cost-benefit analysis is a requirement of a rational regulatory process.²³

From the point of view of orthodox cost-benefit analysis, the safety and feasibility norms *are* fundamentally irrational.²⁴ By design, these standards prescribe levels of precaution which go beyond the cost-justified level of safety. The safety standard requires eliminating all significant risks and the feasibility standard requires eliminating significant risks up until the point where further risk reduction would jeopardize the long-run health of the activity. From a cost-benefit vantage point both approaches are foolish. Safety comes at a cost and its value is not infinite. The benefits of achieving a particular level of safety must be traded off against the costs of doing so. The rational way to trade costs off against benefits is to balance them so that we maximize net value and thereby make ourselves as well off as we can be. We should spend on safety up to the point where a dollar more spent on preventing accidents yields less than a dollar's worth in the way of accidental harm avoided. Spending beyond this point—beyond the point of efficient precaution—yields less value not more value. Preferring less value to more value is simply illogical.²⁵

²² PETER SCHUCK, *WHY GOVERNMENT FAILS SO OFTEN* 45 (2014).

²³ See *Michigan v. EPA*, 135 S.Ct. 2699, 2707–08 (2015); See also Lisa Heinzerling, *Power Canons*, forthcoming WILLIAM & MARY L. REV., 2017. But see Amy Sinden, *A Cost-Benefit State?* 46 ENVTL. L. RPTR 10993 (2016) (arguing that recent case law does not embrace CBA to the extent commonly assumed). *Michigan v. EPA* embraces the proposition that when an agency charged with administering a statute interprets an ambiguous provision to permit the agency not to consider costs before deciding to regulate, the agency will likely lose because ignoring costs is irrational, and impermissible absent specific Congressional authorization to do so. See also, *MetLife, Inc. v. Financial Stability Oversight Council*, CA No. 15-0045, 2016 U.S. Dist. LEXIS 46897 (D.D.C. March 30, 2016) (citing *Michigan v. EPA* in holding that the FSOC *must* consider cost when making a determination of a systematically important financial institution (SIFI)—in other words in determining that a financial institution was “too big to fail” and therefore subject to heightened government oversight).

²⁴ Orthodox cost-benefit analysis embodies the Kaldor-Hicks or potential Pareto-superiority criterion of efficiency. That criterion maximizes net benefit. See Matthew D. Adler, *Cost-Benefit Analysis*, 1 ENCYCLOPEDIA OF LAW AND SOCIETY: AMERICAN AND GLOBAL PERSPECTIVES 304 (David S. Clark ed., 2007); MATTHEW D. ADLER, *WELL-BEING AND FAIR DISTRIBUTION* 98–99 (2012) (defining Kaldor-Hicks efficiency). In the context of health and safety regulation, orthodox cost-benefit analysis recommends monetizing all of the costs and all of the benefits of a regulation in order to compute net benefit. Heterodox forms of cost-benefit analysis make various allowances and adjustments. See, e.g., ADLER & POSNER, *NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS* (2006).

²⁵ The proposition that it is irrational to act in ways which do not maximize net benefit is a piece of the thesis of KAPLOW & SHAVELL, *supra* note 10. In a representative passage, they write “[u]nder any method of evaluating social policy that accords positive weight to a notion of fairness, there must exist situations in which all individuals will be made worse off.” KAPLOW & SHAVELL, *supra* note 10, at xviii. Maximizing net benefit makes it possible for everyone to be better off than they would be in a world with less net value. There is more value to go around. Some of the time, it should be possible to distribute a share of that increased value to everyone.

On its own terms, this is a knockdown argument. The terms of the argument, however, are problematic. Though cost-benefit analysis sometimes claims the mantle of common sense,²⁶ it is in fact the child of a theory and the theory on which it rests makes a controversial assumption about the fungibility of everything that might be gained or lost. Cost-benefit analysis of risks to health and safety is an attempt to extend a market mode of valuation and choice to areas where actual markets fail—where actual markets either do not exist or are incomplete and imperfect. The safety and feasibility norms address risks to life and limb. By name, there are no markets in people’s lives, and the markets that do exist are, at best, badly incomplete.²⁷ Even so, we might think about risks to life, in market terms. Thomas Schelling inaugurated the modern cost-benefit analysis of risks to life and limb not by discovering markets that no one had previously noticed, but by pointing out that we can view the question of “what it is worth to reduce the risk of death” as a “consumer choice.” “We nearly all want our lives extended and are probably willing to pay for it.”²⁸

When we think of risk and precaution as “consumer choices” we do indeed compare costs and benefits and seek to maximize net benefits. And we try to make our thinking more rigorous and precise by quantifying it, by putting prices on the various costs and benefits.²⁹ In deciding whether or not some automobile safety improvement—backup cameras which avert a certain number of deaths per year, say—is worth installing, cost-benefit analysis asks us to figure out if the lives saved are worth the costs of saving them. The dominant approach to doing this is to construct a value of life figure (e.g., \$5,000,000) and then to estimate how many lives the safety device would save.³⁰ That benefit—the monetary value of the lives saved—is then compared to the cost of the safety device to see if the installation of the safety device is net beneficial or not. Conceptually, the lives of potential victims (ideally, as valued by the victims themselves) are an economic resource, properly traded on the market and properly sacrificed when the benefit of saving life is less than the cost of doing so.

The conceptual and practical problems of pricing lives and other nonmarket goods are substantial. Our concern, however, is with why the argument for efficient precaution is not the knockdown that it seems to be. The reasons why have to do with CBA’s normative arguments, and not with its operational intricacies. The hidden normative weaknesses in the apparently knockdown case for cost-justification as a uniquely rational standard of justified precaution are the conflation of individual choice with social choice and the assumption that all costs and all benefits are fungible in the way that all goods on a market are fungible. Because cost-benefit analysis aspires to mimic the market it treats *all costs and benefits as fungible at some ratio of exchange*. “[E]conomics . . . envisages rational man as seeking many goals, all substitutable at the margin. On the margin, economic man is

²⁶ See e.g., Peter Shuck, *supra* note 10; Robert H. Frank, *Why Is Cost-Benefit Analysis So Controversial?*, 29 J. LEGAL STUD. 913, 913 (2000) (noting that many find it “hard to imagine” that anyone could disagree with the “commonsensical” principle that we should take only those actions whose benefits exceed their costs). Another proponent of cost-benefit analysis is eager to repudiate “reductionist utilitarianism,” and concedes that it is not easy “to put dollar values on noneconomic benefits,” but defends cost-benefit analysis and its commitment to pricing as “an effort to find some common measure for things that are not easily comparable.” Doing so is a pragmatic necessity “when, in the real world, choice must be made.” James DeLong, *Defending Cost-Benefit Analysis*, 5 REGULATION 39 (1981).

²⁷ As has long been recognized. See GUIDO CALABRESI, *THE COSTS OF ACCIDENTS* 205–08 (1970).

²⁸ THOMAS SCHELLING, *The Life You Save May Be Your Own*, in CHOICE AND CONSEQUENCE, 113, 114, 115 (1984). See also, Gary Schwartz, *The Myth of the Ford Pinto Case*, 43 RUTGERS L. REV. 1013 (1991).

²⁹ See, e.g. Sunstein, *Humanizing Cost-Benefit Analysis*, *supra* note 7.

³⁰ See, W. Kip Viscusi & Ted Gayer, *Rational Benefit Assessment for an Irrational World: Toward a Behavioral Transfer Test*, J. BENEFIT COST ANALYSIS 1 (2016).

prepared to trade off some freedom for some security, some privacy for some wealth, some freedom for some paternalism, and vice versa”³¹ There is always some rate of exchange at which a rational person is willing to accept less of some good in exchange for more of another.

The safety and feasibility standards presuppose a perspective which recognizes the separateness of persons, and denies the fungibility of all costs and all benefits. From one angle, this denial rests on a claim about people’s interests. The safety and feasibility standards presume that the people have an especially urgent interest in safety, because the physical integrity of one’s person is an essential precondition of effective agency and a decent life. From another angle, the safety and feasibility standards are making an assertion about value. Their implicit value commitment received its most famous explicit formulation in Kant’s hands. Kant claimed that rational beings have dignity and that beings which have dignity are “above all price, and therefore [admit] of *no equivalent*”³² Perhaps because the phrase “above all price” is subject to more than one interpretation, this statement is sometimes to be taken to mean that human lives have infinite value, economically speaking. Hard-headed people scoff at this idea, and rightly so. There is, however, a better way to read Kant’s remark. That better way is to take it to mean that each human life is unique and therefore irreplaceable. Human lives are not fungible with each other at some ratio of exchange. Consequently, it is a mistake to subject risks to human life to the metric of the market. Registering the distinctive value of human lives is a desideratum that acceptable principles of risk imposition must meet. The question facing the safety and feasibility standards is whether or not they register properly the distinctive value of human life in the contexts to which they apply.

B. Do the Standards Really Identify Different Levels of Precaution?

The safety and feasibility standards were born in the 1960s and 70s, in the last great flowering of liberal legal reform, and are championed by the political left. They have their roots in the founding of the Environmental Protection Agency in 1970 and the founding of the Occupational Health and Safety Administration in 1971. They dominated the regulatory landscape into the 1980s, and they received important legislative reaffirmation during the 1990s—as the Food Quality Protection Act of 1996 itself shows.³³ Early in the 1980s, however, the political right began championing cost-benefit analysis and cost-justified precaution as its preferred alternative to safe and feasible risk-reduction. In 1982, the Reagan Administration put into place an executive order requiring cost-benefit analysis for all “significant” federal regulations unless conducting such analysis was prohibited by law—if, for example, the authorizing statute itself forbade consideration of cost.³⁴ Since the early 1980s the two approaches have been engaged in a prolonged tussle.

³¹ Harlod Demsetz, *Professor Michelman’s Unnecessary and Futile Search for the Philosopher’s Touchstone*, in NOMOS XXIV: ETHICS, ECONOMICS AND THE LAW 41, 44 (J. Roland Pennock & John W. Chapman eds., 1982).

³² IMMANUEL KANT, GROUNDWORK FOR THE METAPHYSIC OF MORALS 33 (1785). In *The Basic Liberties and Their Priority*, Rawls explains that the priority of the basic liberties rests in part on the premise that not all interests are fungible at some ratio of exchange. JOHN RAWLS, JUSTICE AS FAIRNESS 105 (2001).

³³ Only two of “ten major regulatory statutes enacted in the 1960’s, 1970’s and 1980’s . . . expressly authorize the balancing of benefits and costs for core agency actions.” Jonathan Cannon, *The Sounds of Silence: Cost-Benefit Canons in Entergy Corp. v. Riverkeeper, Inc.*, 34 HARV. ENVTL. L. REV. 425, 426 (2010).

³⁴ Exec. Order No. 12,291, 3 C.F.R. 127 (1982) (repealed 1993). The courts have long held that the major environmental and occupational safety statutes forbid consideration of cost. In 2001, a unanimous Supreme Court held that the EPA “may not consider implementation costs” in setting ambient air quality standards under the Clean Air Act. *Whitman v. American Trucking Associations*, 531 U.S. 457 (2001). Writing for the court, Justice Scalia observed: “Were it not for the

This struggle is worth continuing only if the standards really do identify different levels of required precaution. Ultimately, that question can only be answered by detailed examination of the safety and feasibility standards as they have been articulated by courts and administrative agencies. It is, however, plain from what has been said so far that the standards express different normative judgments. With luck, these examples will show that these three standards identify different levels of precaution in important and familiar cases. There are, to be sure, costs to using examples drawn from other domains. The circumstances to which the safety, feasibility and cost-justification standards apply in these examples differ from the circumstances contemplated by federal health and safety statutes in various ways. Liability under the common law, for instance, is *ex post* whereas regulation is *ex ante*. This is an important difference. The differences in circumstances of application, however, have their benefits as well as their costs. The standards of precaution remain the same across domains. The differences in context therefore cast the distinctive demands of the standards themselves into sharp relief.

1. The Safety Standard: Consumer Expectations

In the United States, the two most common tests of product design defectiveness are the risk-utility test and the consumer-expectation test. Law and economics scholars usually take the risk-utility test to be an application of cost-benefit analysis to product design.³⁵ By contrast, in some applications the consumer-expectation test in products liability law works as a “safe-level” standard. Whereas the risk-utility test focuses on product design from the perspective of a product engineer, the consumer-expectation test focuses on product performance from the perspective of a product user. Sometimes people expect products to be safe—not perfect, but safe. And sometimes a product which passes muster under the risk-utility test is not safe. *Green v. Smith & Nephew AHP, Inc.*, illustrates this kind of circumstance nicely.³⁶ Plaintiff Green worked as a medical technologist in a hospital.

Her job required her to wear protective gloves while attending patients, up to 40 pairs of gloves per shift. She wore powdered latex gloves manufactured by [the defendant. After a period of prolonged use] Green experienced increasingly severe health problems – cold-like symptoms, wide-spread rash, acute shortness of breath. She was hospitalized four times. In 1991 Green was diagnosed with latex allergy. Given her allergy, Green must avoid contact with latex. So she had to change jobs and must limit the items she buys, things she eats, and activities she pursues. On account of the allergy, Green developed asthma.³⁷

In some people's bodies exposure to latex proteins triggers a certain immune system response, and these persons become “sensitized” to latex. Green turned out to be one of those

hundreds of pages of briefing respondents have submitted on the issue, one would have thought it fairly clear that this text does not permit EPA to consider costs in setting standards. . . . The EPA . . . is to identify the maximum airborne concentration of a pollutant that the public health can tolerate, decrease the concentration to provide an ‘adequate’ margin of safety, and set the standard at that level.” *Id.* at 465. *Entergy Corp v. Riverkeeper, Inc.*, 556 U.S. 208 (2009) may represent a slight retreat from this position. See Cannon, *Sounds of Silence*, *supra* note 33.

³⁵ See e.g., Alan Schwartz, *Products Liability Reform: A Theoretical Synthesis*, 97 YALE L.J. 353 (1988); see also, Alan Schwartz, *The Case Against Strict Liability*, 55 FORDHAM L. REV. 819 (1992).

³⁶ *Green v. Smith & Nephew AHP, Inc.*, 629 N.W.2d 727 (Wis. 2001).

³⁷ KEETON, SARGENTICH & KEATING, *TORT AND ACCIDENT LAW* 975–76 (4th ed. 2004). See also, *Green*, 629 N.W.2d at 732 (summarizing the facts of Ms. Green’s case).

people. Subsequent exposure of a sensitized person to latex may produce progressively worse allergic reactions including irreversible asthma and life-threatening anaphylactic shock (which Green suffered). Since latex allergy is caused mainly by use of latex gloves, it disproportionately afflicts health care workers. According to the evidence that Green put on at trial, the frequency of latex allergy among health care workers in the United States is 5 to 17 percent. At the time that Green became sensitized to latex the medical community was unaware of the possibility of latex allergy. Because latex allergy was unknown until the use of latex gloves became widespread, if Green's claim were judged by the risk-utility test it almost surely would have failed.³⁸ The cost of discovering the defectiveness of latex gloves years before that defect manifested itself in health injuries to regular users was surely high. Indeed, it might have been impossible to discover the hazardous effects of long-term use of latex gloves in any way other than through widespread use of such gloves over a prolonged period of time. Under the risk-utility test, the marketing of the gloves was almost surely justified.

When Wisconsin evaluated the gloves under the expectation test, however, plaintiff's claim prevailed. The consumer-expectation test measures product defectiveness by asking if a product is "dangerous to an extent beyond that which would be contemplated by the ordinary consumer."³⁹ That defendant's latex gloves were defective under the expectation test seemed self-evident to the court. The users of defendant's gloves reasonably expected that they would not suffer injury from normal use of the product. Consequently, the court did not bother to state the relevant expectation precisely.⁴⁰ It does not seem difficult, however, to do so. The implicit chain of reasoning is roughly as follows. All of us reasonably expect that wearing ordinary clothing will not put us at significant risk of serious physical harm. Rare cases of severe allergic reaction to a fabric may exist, but normal people's health is not usually seriously endangered by wearing clothes made with that fabric. Analogously, health care workers in Green's position reasonably expected that wearing protective gear would not put them at significant risk of disabling physical harm. Plaintiff might reasonably have said "when I was using these gloves, I expected that their normal use would not cause me, a normal user, to become severely ill."

Generalizing, we may say that clothing is a simple and familiar example of a product that we normally expect to be safe. In saying that, we mean that we believe that the clothes we ordinarily

³⁸ See *Morson v. Superior Court*, 90 Cal. App. 4th 775 (2001) for an example of a case with virtually identical facts where the court refused to apply the expectation case and refused to impose liability under the risk-utility test.

³⁹ *Green*, 629 N.W.2d at 735.

⁴⁰ The *Green* opinion would have been better if the court had discussed just what kind of expectation was disappointed by the product failure. Not every consumer expectation is reasonable. On the one hand, some expectations are mere wishful thinking. It would, for example, be wishful thinking to expect that no user would ever have an allergic reaction to a product. Idiosyncratic reactions exist. A one-in-a-billion susceptibility to illness does not impugn a product's safety under the expectation test. We take the one-in-a-billion reaction to reflect a rare sensitivity on the part of the victim. What's surprising and disappointing about latex gloves is that *so many* users (5 to 17 percent) suffer severe harm. On the other hand, it asks too much to expect consumers to form expectations about underlying mechanisms of possible product malfunction. Green would not have been in a position to say "At the time of use, I expected that wearing gloves containing high levels of latex proteins would not exacerbate a user's prior susceptibility to allergic reaction." The *Green* court agreed with the defendant that "most consumers ... generally do not have expectations about ... technical or mechanical design aspects of the product." It disagreed over whether such expectations are necessary. What it found necessary was a secure and reasonable expectation about product performance. See the discussion in the TEACHER'S MANUAL TO KEETON ET AL. TORT AND ACCIDENT LAW 20-1 to 20-5 (4th ed. 2004).

wear do not put us at significant risk of physical harm. The question of whether this expectation is cost-justified never arises.

2. The Feasibility Standard: Rescues

The literature on “statistical lives” is haunted by the apparent irrationality of many rescues.⁴¹ Money seems no object when miners are trapped in a mine or when children are trapped in a burning building. From an economic perspective this seems foolish and extravagant. The rational way to budget our “rescue money” is to spend it in the way which maximizes the number of lives saved with the least sacrifice of other objectives. It is irrational to treat identified lives as more valuable than statistical ones. Lives are lives and the extra money spent rescuing identified persons might be better spent on safety measures which would save more lives. This, of course, is simply an application of the standard argument for cost-justified precaution to the special case of rescues.⁴² When actual lives are endangered, however, we think it would be unseemly, and probably morally wrong, to undertake a cost-benefit analysis of the value of the lives at stake and the cost of saving them. We rescue the victims if we can, and rescuers often take great risks upon themselves in the course of rescues and attempted rescues.⁴³ Generally speaking, our rescue practices appear to be governed by a norm of possibility (or feasibility) not by a norm of efficiency.

A particularly striking example of this practice is the military tradition of undertaking rescues to recover the *corpses* of slain soldiers. We regard this practice as noble and heroic, not as foolish. In the introduction to his book on the American war in Vietnam, Philip Caputo observed:

⁴¹ The term “statistical lives” was coined by Schelling, *The Life You Save May Be Your Own*, *supra* note 28. Schelling distinguished statistical lives from “identified” ones. Identified lives are actual persons who will live if certain steps are taken and die if they are not. Statistical lives are abstract lives; they are the lives that will be saved down the road if some precaution is taken, or some safety program is implemented. Statistical lives are not identifiable at the time a precaution is taken, and may remain unidentifiable even after a precaution has been implemented and has saved lives. The term was coined by Schelling, but the phenomenon had been recognized before it was named. *See* Guido Calabresi, *The Decision for Accidents: An Approach to Nonfault Allocation of Costs*, 78 HARV L. REV. 713 (1965). For valuable discussion *see* CHARLES FRIED, AN ANATOMY OF VALUES, 207–33 (1970); Johann Frick, *Contractualism and Social Risk*, 43 PHILOSOPHY AND PUBLIC AFFAIRS, 175, 181, 212–218 (2015); Kenneth W. Simons, *Statistical Knowledge Deconstructed* 92 B.U. L. REV. 1 (2012).. *See also* Dan Brock and Daniel Wikler, *Ethical Challenges in Long-Term Funding for HIV/AIDS*, HEALTH AFFAIRS 28 (2009); GLENN COHEN, NORMAN DANIELS, AND NIR EYAL, IDENTIFIED VERSUS STATISTICAL LIVES: AN INTERDISCIPLINARY PERSPECTIVE (New York: Oxford University Press, 2015).

⁴² The questions raised by the distinction between “statistical” and “identified” lives in the rescue context are multiple and difficult. For one thing, if we suppose that even the best of precautions will not prevent all accidents, it may be eminently rational in even a cost-benefit sense to commit ourselves in advance to rescue practices which look extravagant at the time we undertake them. For another, *contra* Schelling the distinction between identified and statistical lives may make a major moral difference. Obligations may be owed to actual persons, but not to theoretical constructs. *See* Frick, *supra* note 41. These complexities are beyond the scope of this paper.

⁴³ Rescues give the question of appropriate precaution a particular posture. The question is not what risk some people may impose on others, but what costs—including risks of death—rescuers may reasonably take upon themselves to save the lives of others. The important common law case *Eckert v. Long Island RR* has this posture. Here, too, the court’s analysis of whether the rescue was prudent appears to be governed by a norm of possibility or feasibility. *Eckert v. Long Island RR*, 57 Barb. 555 (N.Y. 1870).

Two friends of mine died trying to save the corpses of their men from the battlefield. Such devotion, simple and selfless, the sentiment of belonging to each other, was the one decent thing in a conflict noted for its monstrosities.⁴⁴

It is hard to believe that the actions Caputo so admires were cost-justified. Losing a life to save a corpse seems like a bad trade. It seems correct, however, to say that the economic mind set of cost-benefit analysis is out of place here. There is something morally obtuse—perhaps even grotesque—about trying to figure out if losing one’s life trying to rescue a corpse is a potential Pareto improvement or not. Rescuing the bodies of one’s fallen comrades is not about improving one’s own welfare. Such rescues are about solidarity and sacrifice. Attempting them in the face of great danger is a way of honoring a deeply-held value.

The rescue of corpses on the battlefield is, of course, an extreme example, even among rescues. Yet it teaches important lessons about less extreme cases. For one thing, all rescues involve the affirmation of a common value. Solidarity may be as good a name as any for that value. The plight of trapped miners differs from the plight of fallen comrades, but it too implicates solidarity. The fate of trapped miners moves us in part because we are all in this together. We are all vulnerable to accidents and premature death. Honoring the value of solidarity does not deny the value of efficiency; it merely asserts that solidarity matters more in this context. That is hardly surprising. The goods intrinsic to military excellence can only be realized if solidarity is valued very highly. And it is eminently rational to believe that some very valuable human goods cannot be realized unless we recognize that “no man is an island” and when the bell tolls for one of us, it tolls for all of us.

It is, no doubt, romantic to extend the ideal of solidarity from the battlefield to the ordinary workplace but it is on point to say that the adoption of the feasibility standard in the context of workplace safety is a way of valuing the lives of those who are exposed to serious occupational hazards. And the military rescues of corpses appear to be governed by a standard of feasibility in an instructive way. It is heroic to attempt such rescues only if there is some chance of success. Without that possibility, an attempted rescue may be foolish or tragic (or both), but it is not noble or heroic. Like feasible risk reduction, rescue is governed by a norm of possibility.

1. Cost-Justification and Commensurability: Private Necessity

The flip side of the coin that the criterion of cost-justified precaution is not the proper principle for regulating serious harms to persons is that the criterion of cost-justification is a proper criterion for regulating harm to goods which are fungible and replaceable. The doctrine of private necessity articulated in the famous case of *Vincent v. Lake Erie* illustrates this point nicely.⁴⁵ There are two issues in *Vincent*. The first is whether the ship owner should be given a privilege to tie up at the plaintiff’s dock in order to avoid near certain destruction at the hands of a sudden and fierce winter storm. The second is whether such a privilege should be conditional or unconditional. If the

⁴⁴ PHILIP CAPUTO, *A RUMOR OF WAR*, vii (1977). I owe the Caputo example to Douglas MacLean, *Cost-Benefit Analysis and Procedural Values*, 16 *Analyse & Kritik* 166, 172 (1994). A more recent example can be found in *Black Hawk Down* (book written by Mark Bowden in 1999, film released in 2001). During the Battle of Mogadishu in 1993 the United States sent soldiers to rescue the crews of downed Black Hawk helicopters, notwithstanding the enormous risk involved. A number of soldiers have been posthumously awarded the Medal of Honor—the highest military honor in the United States—for sacrificing their own lives in such rescue attempts.

⁴⁵ *Vincent v. Lake Erie Transp. Co.*, 124 N.W. 221 (Minn. 1910).

privilege is conditional, the defendant must make good any harm that it does to plaintiff's dock in the course of saving its ship. The court answers both questions affirmatively.⁴⁶

For our purposes the significance of *Vincent* is twofold. First, *Vincent* is a case where efficient precaution is the proper standard of precaution. The dock and the ship are fungible pieces of property. The metric of money is well-suited to measuring both the damage done by bashing the dock and the damage avoided by keeping the ship out of the storm. Because the goods involved are fungible the rational course of action is to minimize combined harm and maximize combined benefit. Second, because the case involves property which can be repaired or rebuilt, the question of who should bear the cost of the ship's salvation—the ship owner or the dock owner—can be addressed after the harm has been done. Who should bear the cost of the damage to the dock is a question of fairness, not efficiency, and it can be addressed after injury is inflicted. The court concluded (rightly, I think) that fairness required the ship owner to bear the costs of its ship's salvation. That fair distribution could be effected after the dock was damaged simply by requiring the defendant to pay appropriate money damages to the plaintiff. As we shall see, matters are different when serious harm to persons is involved because such harm is not fully repairable. Fairness must be done *ex ante*.

The standards applied in these examples value the avoidance of harm differently. The application of the consumer-expectation test to latex gloves in *Green* is the most stringent. *Significant* risk of harm to normal users is unacceptable. Latex gloves are not defective because they precipitate severe allergic reactions in a few, idiosyncratic users; they are defective because they precipitate severe allergic reactions in a significant number of users. This is the safety standard, in common law guise. It is very demanding, but it does not demand absolute safety. Rescue cases, for their part, are implicitly governed by a standard of possibility. It is noble and heroic to try to save the corpses of your comrades only if it is possible to succeed in doing so. Mere suicide is neither heroic nor noble. Eliminating significant risks of harm to the extent possible (that is, without crippling the activity which generates the risk) is the basic commitment of the feasibility standard. On the one hand, this feasibility standard tolerates more risk of harm than the safety standard does. On the other hand, it tolerates less risk than the norm of cost-justification implicitly applied in *Vincent* does. The norm of cost-justification assigns no priority to avoiding harm. It trades harm (here, in the form of property damage) off against other goods in a way which maximizes net benefit.

In short: the safety standard insists on the lowest level of risk; the cost-justification standard accepts the highest level; and the feasibility standard falls in the middle. None of the standards insists on absolute safety. All three standards specify permissible tradeoffs. They vary significantly, however, in the tradeoffs that they license.

II. THE SEPARATENESS OF PERSONS AND THE ASYMMETRY OF HARM AND BENEFIT

⁴⁶ *Id.*

A. Individual and Interpersonal Choice

Implicit in both Thomas Schelling's observation that we can view the question of "what it is worth to reduce the risk of death" as a "consumer choice," and in his general thesis that "the life you save may be your own," is an invitation to think about matters of risk and precaution as individual choices.⁴⁷ Examples where this way of thinking seems apt come readily to mind. Consider the purchase of a new car. It seems perfectly prudent for a prospective purchaser to evaluate the desirability of purchasing an optional accident avoidance system by comparing the value of the accidents avoided to the value of the other goods one might purchase with the money it costs to add the option. In other cases, however, treating safety decisions as wholly individual would strike us as wildly inappropriate. Imagine for example, a peculiar person who is attracted to the idea of exposing himself to the level of risk involved in climbing K2, but utterly averse to the deprivation and intense exertion of mountaineering. To tailor his life to his special taste for both risk and indolence, he hits on the idea of rigging up his car with an external gas tank so that even a minor fender bender might prove fatal. Because this way of pursuing his preferences for his own life seriously endangers others, we do not think the decision is properly treated as a purely individual one.

The cost-benefit analysis of risk of death is far from indifferent to the distinction between these cases. It is keenly aware that the second case involves a major negative externality whereas the first does not. But it responds to the difference between them in a distinctive way. Cost-benefit analysis instructs us to think about circumstances where the actions of some negatively impact the lives of others by incorporating the benefits to some and the costs to others into a single calculus of risk and benefit. It balances costs to some people and benefits to others together in a single calculus. In doing so cost-benefit analysis models social decision on an intuitively appealing conception of individual rationality. In many circumstances, the prudent thing for each of us to do is to balance the costs and benefits of alternative courses of action and choose the action that is most net beneficial. The extension of this conception to the circumstances of social choice, where costs and benefits fall on different people, is much less attractive. By combining all costs and all benefits into a single calculus of risk cost-benefit analysis eclipses "the distinction between persons."⁴⁸

Taking the distinction between persons seriously directs our attention not to overall welfare, but to interpersonal fairness. Fairness is a distinct domain of political morality, different from both the domain of rights and the domain of efficiency. Efficiency is primarily concerned with overall welfare; rights are primarily concerned with protecting individual interests.⁴⁹ Fairness is concerned with the distribution of burdens and benefits—"with how well each person's claim is satisfied compared with how well other people's [claims] are satisfied."⁵⁰ Even absent irreparable injury, fairness looms large when the imposition of risk is at issue, because risk impositions pit the claims of those who impose the risks and stand to benefit from them against those who are exposed to and

⁴⁷ See Schelling, *supra* note 28.

⁴⁸ Here, cost-benefit analysis inherits the weakness of utilitarianism, its parent philosophy. For the pertinent criticism of utilitarianism, see JOHN RAWLS, *A THEORY OF JUSTICE* 24 (rev. ed. 1999).

⁴⁹ See THOMAS M. SCANLON, *WHAT WE OWE TO EACH OTHER* (1998).

⁵⁰ John Broome, *Fairness*, 91 *PROC. OF THE ARISTOTELIAN SOC'Y* 87, 94–95 (1990-91). See also, Johann Frick, *Contractualism and Social Risk*, *supra* note 41. See also, Dov A. Waisman, *Reasonable Precaution for the Individual*, 88 *ST. JOHN'S L. REV.* 653 (2014); Kenneth W. Simons, *Tort Negligence, Cost-Benefit Analysis, And Tradeoffs: A Closer Look at the Controversy*, 41 *LOYOLA OF LOS ANGELES L. REV.* 1171 (2008).

endangered by those risks. Treating people fairly generally requires us to align burden and benefit proportionally and to treat competing claims in ways that can be justified to those whose claims they are.

Serious, irreparable injuries raise special challenges. When harms are fully repairable, as they are in *Vincent v Lake Erie*, we can achieve efficiency *ex ante* and fairness *ex post*. Damaging the dock to save the ship is efficient; it minimizes the total property damage done by the storm. Requiring reparation after the fact is fair; the ship owner who benefits from saving the ship also bears the cost of its salvation. Matters are different when the harms suffered by one individual are serious impairments of normal agency and even death. These harms are beyond repair. We know how to rebuild a dock so that it is as good as new, but we simply do not know how to restore the victims of crippling latex allergy or brown lung disease to good health and normal powers of physical agency. Fairness cannot be achieved after these risks have ripened into injury. It must be done *ex ante*, by ensuring that the terms on which the risks in question are imposed are justifiable to those on whom they are imposed. When the burdens of risk imposition are borne by some people in the form of serious, irreparable harm and the benefits of imposing those risks are reaped by others, the distinction between persons looms especially large.

The safety and feasibility standards address severe and irreparable physical harms—premature death, serious disability and devastating disease. The stringent precautions that they prescribe find their justification in a point of view which takes persons and their essential interests—not populations and their overall welfare—as its fundamental object of concern.⁵¹ Populations are not persons writ large. A single person may rationally choose to bear some burden to achieve an end she values, but a plurality of distinct persons lacks the unity necessary to make the imposition of significant harm on one person straightforwardly offset by the conferral of benefits on other people. Accidental injuries devastate the lives of some people while the activities responsible for those injuries benefit other people. The terms on which some suffer terrible harm at the hands of imposed risks and others profit from the imposition of those risks stand in need of justification and that justification cannot be given by pretending that a circumstance where some stand to be devastated while others stand to profit is identical to as circumstance where one person stands both to win and to lose.

⁵¹ This implicates an entire position in political philosophy, one which holds that political institutions and practices must be justifiable to those they govern. See JOHN RAWLS, *A THEORY OF JUSTICE*, *supra* note 48. The view has been given further articulation in the writings of others including, THOMAS NAGEL, *EQUALITY AND PARTIALITY* (1991) and THOMAS M. SCANLON, *WHAT WE OWE TO EACH OTHER* (1998). It now marches under the banner of “contractualism.” A number of writers have made important contributions extending this approach to problems of risk. See, e.g., James Lenman, *Contractualism and Risk Imposition*, 7 *POL., PHIL. & ECON.* 99 (2008); Rahul Kumar, *Contractualism and the Roots of Responsibility*, in RANDOLPH CLARKE, MICHAEL MCKENNA, AND ANGELA M. SMITH, *EDS. THE NATURE OF MORAL RESPONSIBILITY, NEW ESSAYS* (2015); Johann Frick, *Contractualism and Social Risk*, 43 *PHIL. & PUB. AFF.* 175 (2015). There is vigorous debate over whether contractualism can adequately address the imposition of risks of serious harm and death. Elizabeth Ashford and Barbara Fried have argued that it cannot. See Elizabeth Ashford, *The Demandingness of Scanlon’s Contractualism*, 113 *ETHICS* 273 (2003); Barbara H. Fried, *Can Contractualism Save Us from Aggregation?*, 16 *J. ETHICS* 39 (2012). Aaron James, Johann Frick, Rahul Kumar, and Dov Waisman have argued that it can. See Aaron James, *Contractualism’s (Not So) Slippery Slope*, 18 *LEGAL THEORY* 263 (2012); Rahul Kumar, *Risking and Wronging*, 43 *PHIL. & PUB. AFF.* 27 (2015); Dov A. Waisman, *Reasonable Precaution for the Individual*, *supra* note 50; and Dov Waisman, *Equity and Feasibility Analysis*, 50 *U. RICHMOND L. REV.* 1263 (2016). I believe that “*ex ante* contractualism” as developed by James, Frick, Kumar, and Waisman is a powerful framework for analyzing risk. I shall deploy an *ex ante* contractualist framework in this paper, but I shall not attempt to develop the philosophical side of *ex ante* contractualism’s approach to risk.

The proper test of principles of risk imposition is not whether they maximize net benefit, but whether they are justifiable to those whose lives they govern. A “significant” risk of serious harm is most fully justified when those who are likely to suffer from the risks would be acting unreasonably if they were to object to the imposition of the risk. Reasonable principles of risk imposition protect the essential interests of those affected by the risks in question. Doing so may well conflict with promoting overall welfare.⁵² The claims of those whose lives are at risk of accidental destruction and devastation at the hands of valuable activities may require that the rest of us accept standards of safety which require more than efficient precaution.

B. The Priority of Avoiding Harm

Harm has no special significance in cost-benefit analysis, and its avoidance has no special priority. Harm is just one possible cost in a calculus of cost and benefit, and costs and benefits are minuses and pluses on the same scale. “From an abstract perspective there would seem to be little reason for harms and benefits to be treated differently. Decades of cost-benefit analyses suggest that the two categories are interchangeable: reducing by one dollar damage that would otherwise occur is equivalent to providing a dollar’s worth of new goods or services.”⁵³ This claim of symmetry is true to cost-benefit analysis, but at odds with our ordinary intuitions and our law. In both morality and law our obligations to avoid harming others are stronger than our obligations to benefit them. In law the asymmetry of harm and benefit is vivid and pervasive. We can be compelled to refrain from battering our neighbors, but we cannot be compelled either to love or to help them. Tort is robust whereas restitution is anemic. The Constitution contains a takings clause but it does not contain a “givings” clause. Understanding just how pervasive the harm-benefit asymmetry is—and why the avoidance of harm has special priority—will dispel the illusion that it is irrational to take more than cost-justified precaution.

Many examples of the harm-benefit asymmetry manifesting itself in our law might be given,⁵⁴ but the following should suffice:

⁵² This is clearest in the case of relatively pure forms of utilitarianism. See RAWLS, *A THEORY OF JUSTICE*, *supra* note 48, at 23–24 (noting that under classical utilitarianism there is “no reason in principle why . . . the violation of the liberty of a few might not be made right by the greater good shared by many.”).

⁵³ Wendy T. Gordon, *Of Harms and Benefits: Torts, Restitution and Intellectual Property*, 21 J. LEG. STUD. 449, 451 (1992).

⁵⁴ For example, if I pollute your water when working on my own property, I am likely to be liable in nuisance for the harm that I do. By contrast, if I purify your water in the course of purifying my own, my unjust enrichment claim is likely to fail. Businesses can normally “free ride” off of the positive externalities of other business without doing any legal wrong. A story, popular in property circles, about Disneyland and Disneyworld is illustrative. When Disney built Disneyland, it acquired just enough land for its theme park. The park conferred a major windfall on neighboring landowners and businesses. Lured by Disneyland, customers came from all over the world and the value of neighboring land soared. Several decades later, when Disney built Disneyworld, it purchased much more land than it needed for its theme park. The strategy worked, but imperfectly. Disney kept more of the total value added by its theme park, but the Park’s positive externalities also expanded into a larger geographic area. See Richard A. Epstein, *A Conceptual Approach to Zoning: What’s Wrong with Euclid*, 5 N.Y.U. ENVTL. L.J. 277, 289 (1986). “Rescue cases” afford another important example. In the course of performing a rescue a rescuer may inflict lesser harm to avoid greater harm, but people may not inflict harm merely in order to confer benefit. For perceptive discussion of this example see Seana Shiffrin, *Harm and Its Moral Significance*, 18 LEGAL THEORY 357, 363–65 (2012). LEO KATZ, *ILL-GOTTEN GAINS*, at 197–203 (1996) discusses interesting and related asymmetries in the rules of praise and blame.

1. *Endangering and Rescuing*. In the law of torts, there is a general duty not to impose unreasonable risks of physical harm on others. There is no parallel general “duty to act”—no general duty to prevent others from coming to harm, or to mitigate harm that others are in the process of suffering.⁵⁵
2. *Tort and Restitution*. The law of torts, whose province is liability for harm done, is robust. The law of autonomous unjust enrichment—whose province is liability for benefit conferred—is much smaller.⁵⁶
3. *Fraud and Failure to Volunteer Information*. We all have various obligations to not commit fraud—obligations not to manipulate other people through the provision of false information. We are not under a parallel obligation to step forward and affirmatively provide information to others.

In economic terms, all of these examples involve differential treatment of negative and positive externalities. Imposing a risk on a stranger subjects her to a negative externality; rescuing a stranger in peril confers a positive externality upon her. The law of torts is largely about harms; harms are negative externalities. The law of restitution is about un-bargained-for benefits, benefits are positive externalities. When the government takes property to build a freeway, it creates a negative externality; when it builds a freeway and brings new customers to a mall, it creates a positive externality. Misinforming my customers by disclosing false information to them is a negative externality; educating them by disclosing valuable information is a positive externality.

From an economic point of view, negative and positive externalities are pluses and minuses on the same scale. They are symmetrical. Presumptively, the law should care as much about promoting positive externalities as it does about correcting negative ones. Unsurprisingly, therefore, the harm-benefit asymmetry has attracted attention from legal economists. Explanations have been offered, but the depth and pervasiveness of the differential treatment of positive and negative externalities is simply not what one would expect if efficiency were the master value of the law.⁵⁷ The plain fact is that “other things being equal, harms, harming events, and opportunities to harm are more important morally [and legally] than benefits, benefitting events, and opportunities to benefit.”⁵⁸

⁵⁵ “If A saw that B was about to be struck on the head by a flowerpot thrown from a tenth-story window, and A knew that B was unaware of the impending catastrophe and also knew that he could save B with a shout, yet he did nothing and as a result B was killed, still, A’s inaction, though gratuitous (there was no risk or other nontrivial cost to A) and even reprehensible, would not be actionable.” *Stockberger v. U.S.*, 332 F.3d 479, 480 (7th Cir. 2003) (Posner, J.).

⁵⁶ See, e.g., Saul Levmore, *Explaining Restitution*, 71 VA. L. REV. 65, 71 (1985) (“[T]he legal remedies available to victims of harms are far superior to those enjoyed by analogous providers of nonbargained benefits.”); Scott Hershovitz, *Two Models of Torts and Takings*, 92 VA. L. REV. 1147 (2006).

⁵⁷ See, e.g., Oren Bar-Gill & Ariel Porat, *Harm Benefit Interactions*, 16 AMERICAN LAW & ECONOMICS REV. 86 (2014); Ariel Porat, *Private Production of Public Goods: Liability for Unrequested Benefits*, 108 MICH. L. REV. 261 (2009) (arguing that liability for unrequested benefits often enables production of public goods which would not otherwise be created). Levmore, *supra* note 56, is particularly focused on the comparatively feeble state of the law of unjust enrichment in comparison with the law of torts. The economic theory of property law has had significant success in arguing that property law responds to the problem of positive externalities. See, e.g., Harold Demsetz, *Toward A Theory of Property Rights*, 57 AM. ECON. REV. (PAPERS AND PROC.) 347, 348 (1967) (“[A] primary function of property rights is that of guiding incentives to achieve a greater internalization of externalities.”). Economic explanations for other instances of the asymmetry have also been offered. See, e.g., William M. Landes & Richard A. Posner, *Salvors, Finders, Good Samaritans, and Other Rescuers: An Economic Study of Law and Altruism*, 7 J. LEGAL STUD. 83 (1978).

⁵⁸ Shiffrin, *supra* note 54, at 361. Shiffrin describes this as the “first” and “principal” harm-benefit asymmetry. There are two subordinate asymmetries. First, lesser harm may be inflicted to avoid greater harm but harm may not be inflicted

It is tempting, and not wrong, to invoke rights at this point. Plaintiffs cannot usually recover unless they can show that their rights were violated. What needs explanation, however, why our negative rights not to be harmed are more extensive than our positive rights to recover when we benefit others. The diverse legal rights at issue in cases where the harm-benefit asymmetry manifests itself pose the problem, they do not resolve it. The order of explanation works the other way around. Harm is the common ground of these diverse rights and the priority of avoiding harm explains and justifies the rights that we have. In all four of these cases, the infliction of harm gives rise to legal obligation whereas the conferral of benefit does not.

1. Autonomy and Asymmetry

For cost-benefit analysis the harm-benefit asymmetry is a puzzle at best and an irrationality at worst. If avoiding a dollar's worth of damage "is equivalent to providing a dollar's worth of new goods or services," then we ought to treat harms and benefits symmetrically.⁵⁹ If we take off the lenses of cost-benefit analysis, however, we can see the sense in the asymmetry. Harm is a morally-freighted word, more so than benefit. It is presumptively wrong to harm someone and presumptively bad to suffer harm. In most circumstances, it is not presumptively wrong to fail to benefit someone. Benefits are presumptively good things, but they are also often trivially good things, or good things we cannot put to good use. Harms impair essential conditions of human agency. Physical harms—death, disability, disease, and the like—rob us of normal and foundational powers of action. Physical harm comes close to being unconditionally bad.⁶⁰

Few benefits, by contrast, are unconditionally good. Benefits enhance lives, but their power to do so usually depends greatly on the details of the life in question. Extraordinary visual-spatial processing skills, for example, are of great value to football quarterbacks and of little use to lawyers. Unusually low levels of anxiety may be indispensable to elite mountaineers and an impediment to more ordinary lines of work. Whether some benefit—great wealth, or great musical talent, or great athletic skill, or great mathematical brilliance, for example—plays a valuable role in someone's life depends heavily on her aspirations and projects. Even great wealth is not an unalloyed good. Great wealth is necessary to major philanthropy, but it may impair the pursuit of authentic relationships. And the capacity of wealth and its pursuit to get in the way of pursuing valuable ends should not be underestimated. It is well-known that winning the lottery is anything but an unalloyed good.⁶¹

simply in order to bestow benefit. If you are drowning, I may break your arm to save your life. I may not, however, knock you unconscious in order to operate on you and endow you with encyclopedic knowledge of the works of Shakespeare, or the athletic prowess of Michael Jordan. Second, there is an asymmetry between what others may do and what a person may do to herself. Others may not knock someone out to perform an operation which will endow the victim with great knowledge or skill, but someone may themselves elect to submit to such a procedure. *Id.*, at 363–66. Other complications or qualifications are sometimes necessary. For example, some failures to benefit are harms because the victim has a right to the benefit. If USC fails to pay my salary its failure to benefit me is a harm because I have a right to be paid.

⁵⁹ Wendy T. Gordon, *Of Harms and Benefits: Torts, Restitution and Intellectual Property*. 21 J. LEG. STUD. 449, 451 (1992).

⁶⁰ In some cases, the physical harm suffered may avoid a greater physical harm. In others, the harm may enable the realization of some value or good to whose realization the harmed person is deeply committed. These are exceptional cases, however, and even in these cases the harm suffered is still, in itself, bad. A broken arm may be worth suffering if it avoids death by drowning, but it is still a harm.

⁶¹ See, e.g., Philip Brickman et al., *Lottery Winners and Accident Victims: Is Happiness Relative?* 36 J. PERSONALITY & SOC. PSYCHOL. 917 (1978).

Harms and benefits stand in very different relation to autonomy because they stand in very different relation to our wills. Harms compromise our autonomy by impairing our normal powers of human agency. Benefits enhance our lives only if they are congruent with our wills. To thrust an unsought benefit upon someone and demand compensation from them for the value conferred is to impose upon them.⁶² Unsought benefits stand in the same relation to our wills—to our autonomy—as harms do. They subject us to conditions which we have not chosen; they sever the link between our wishes, our wills and our lives and enlist us in other people’s projects. If I play beautiful music outside your open bedroom window and then stick you with a bill for my services, I determine the use to which you must put some of your time and some of your money. You are presumptively entitled to determine those things and your ability to do so is an important aspect of your autonomy.

The fact that both harms and obligations to benefit can undermine autonomy helps to explain the asymmetry between our stringent obligation not to commit fraud and our permission not to volunteer useful information. Fraud is deception and deception is wrong because it unjustifiably undermines autonomy. By manipulating the reasons available to those on whom it acts, fraud severs the link that normally exists between a person’s reason and their will. Fraud makes its victims the unwitting instruments of its perpetrators’ wills. A duty not to commit fraud is a duty not to undermine the autonomy of others in a particular and important way. A duty not to commit fraud protects autonomy. An obligation to volunteer information for the benefit of others merely because it is beneficial to them, by contrast, would be an imposition on our autonomy. We would be required to work for the benefit of others whether or not we chose to do so and whether or not we were compensated for so doing. A *general* obligation to volunteer information for the benefit of others would be a significant burden to our autonomy.

2. Interests and Impairment

The claims that harms impair autonomy—and that the conferral of benefit does not necessarily enhance autonomy—presuppose an account of harm and benefit. The concept of a benefit, for its part, is broad, straightforward and relatively uncontroversial. A benefit is an advantage, something that promotes or enhances well-being.⁶³ The concept of “harm,” by contrast, is contested. The philosophical literature is divided between dueling conceptions. The dominant conception is broad and comparative in nature; it conceives of harm as a setback to an “interest,” with an interest being something in which someone has a “genuine stake.”⁶⁴ Harm so conceived is a comparative phenomenon, a worsening of one’s position. To be harmed is to have one’s well-being significantly diminished, either historically or counterfactually. Either one is made worse off than one was (the historical account), or one is made worse off than one otherwise would have been (the counterfactual account). For example, a college football player with aspirations to a professional career is harmed historically if he is injured, loses his starting position to another player and is

⁶² See, e.g., Lee Anne Fennell, *Forcings*, 114 COLUM. L. REV. 1297 (2014) (discussing forced ownership of property by the government).

⁶³ See, Shiffrin, *supra* note 54

⁶⁴ JOEL FEINBERG, SOCIAL PHILOSOPHY 26 (Pearson 1973) (“A humanly inflicted harm is conceived as the violation of one of a person’s interests, an injury to something in which he has a genuine stake.”). The idea of a setback can be developed either counterfactually or historically. Feinberg develops it counterfactually. See Joel Feinberg, *Wrongful Life and the Counterfactual Element in Harming*, FREEDOM AND FULFILLMENT, 3, 4 (1992). Hershovitz draws upon and modifies Feinberg’s account of harm. See Hershovitz, *supra* note 55.

subsequently cut from the team. He is harmed counterfactually if his professional aspirations are thwarted because he is never drafted.

A competing conception of harm understands harms to be any condition one would not desire to suffer.⁶⁵ The focus is on the condition or state itself, not on its relation to an antecedent or alternative condition. Suffering excruciating pain, for example, is harm—even if the alternative is death and even if you prefer agonizing pain to death. Being enslaved is harm whether or not one was born free. Core harms in this conception are conditions of impairment, conditions which compromise normal functioning. Blindness, for example, is a harm for a human being because sight is a normal human power, a part of normal human functioning. This is true even if the person in question is born blind and so never suffered the loss of sight—never underwent any worsening of position.

The concept of an “impaired condition” is a broad one. Anything that can function normally can have its proper functioning impaired. Damage to a butterfly’s wings disturbs the functioning of the wings and harms the butterfly. Harm in this broad sense need not impair autonomy; many things that are not autonomous have functions that can be impaired. The core cases that concern law and morality—cases such as physical disabilities, broken, deformed and lost limbs, chronic pain and serious developmental disabilities—constitute a narrower set of impaired conditions. In these core cases, *basic powers of normal human agency are seriously compromised*. The harms that matter most in law and morality rob people of normal and essential powers through which they shape their lives and their worlds in accordance with their wills.⁶⁶ These harms deprive us of normal forms of mastery over ourselves, our experience, and some portions of the external world by driving a wedge between our wills and our lives. They thrust upon us “conditions that generate a significant chasm” between our wills and our experiences.⁶⁷

3. The Importance of Impairment

Both the interest and the impaired condition accounts can be mapped onto American law, but the “impaired condition” conception of harm fits the law of torts more precisely. Tort law distinguishes between a broad conception of tortious wrongdoing as conduct, which invades “legally protected interests” (or rights), and a narrower conception of physical harm as the suffering of an impaired condition.⁶⁸ The *First Restatement of Torts*, for example, defined bodily harm as “any

⁶⁵ Preeminently, this conception is advanced by JUDITH THOMSON, *THE REALM OF RIGHTS* 262–68 (1990), and by Shiffrin, *supra* note 54. See also Judith Thomson, *More on the Metaphysics of Harm*, 82 *PHIL. & PHENOMENOLOGICAL RESEARCH* 436 (2011). In *The Metaphysics of Harm*, Professor Hanser develops a third conception of harm. That conception takes harms to be events that injure basic human goods, not the ensuing conditions of impairment. Basic goods are “those goods [the] possession of which makes possible the achievement of a wide variety of the potential components of a reasonably happy life. . . . [The] basic goods . . . include certain fairly general physical and mental powers and abilities. The power of sight, for example, is a basic good for human beings.” Matthew Hanser, *The Metaphysics of Harm*, 77 *PHIL. & PHENOMENOLOGICAL RESEARCH* 421, 440–41 (2008).

⁶⁶ See Shiffrin, *supra* note 54, at 383. In sharpening the concept of harm in this way Shiffrin is, in part, criticizing Raz’s conception as too broad. See Shiffrin at 389, n. 48. By contrast, she is further articulating Thomson’s conception, though Thomson might not accept the sharpening. See JUDITH THOMSON, *THE REALM OF RIGHTS*, 227–48, 250–51, 253–71 (1990); Judith Thomson, *More on the Metaphysics of Harm*, 82 *PHIL. & PHENOMENOLOGICAL RES.* 436 (2011).

⁶⁷ Seana Shiffrin, *Wrongful Life, Procreative Responsibility, and the Significance of Harm*, 5 *LEGAL THEORY* 117, 123 (1999).

⁶⁸ See, e.g., *Restatement (Second) of Torts* § 7, 15 (1965).

impairment of the physical condition of another's body or physical pain or illness.”⁶⁹ The *Second Restatement* refined this definition. “Bodily harm” was defined as “any physical impairment of the condition of another's body” and “an impairment of the physical condition of another's body [exists] if the structure or function of any part of the other's body is altered.”⁷⁰ The *Third Restatement* now defines “physical harm” as “the physical impairment of the human body (‘bodily harm’) or of real property or tangible personal property . . . [such impairment] includes physical injury, illness, disease, impairment of bodily function, and death.”⁷¹

Broken bones, severed limbs, disabilities of sight and hearing, diseased organs and disfigured body parts all compromise the capacities through which we act. Those capacities play central roles in normal human lives. When we are seriously ill—or disabled or in serious pain—we are denied our normal lives. This is explicitly recognized in statutes and cases. Michigan's codification of the standard common law rule in the automobile accident context, for example, defines “serious impairment of bodily function” to mean “an objectively manifested impairment of an important body function that affects the person's general ability to lead his or her normal life.”⁷² A body of case law grappling with the slowly unfolding consequences of exposure to asbestos overwhelmingly holds that identifiable subclinical damage to human cells will not support a tort claim. “The threat of future harm, not yet realized, is not enough.”⁷³ Functional impairment must be shown.⁷⁴ Without such impairment there is no physical harm even though there are very real financial and psychic costs imposed by subclinical cellular damage caused by exposure to asbestos.⁷⁵

⁶⁹ *Restatement (First) of Torts* § 15 (1934).

⁷⁰ *Restatement (Second) of Torts* § 15 *cm. a* (1965). Section 7 distinguishes “bodily harm” from “injury” with “injury” covering cases in which a “legally protected interest” is invaded, but no harm is done. A harmless trespass would be an injury in this sense. *Id.* at § 7.

⁷¹ *Restatement (Third) of Torts: Liability For Physical & Emotional Harm* § 4 (2010). The *Third Restatement* extends the idea of harm as an impaired condition to include the impairment of property. The philosophical conception of harm is concerned only with harm to persons. The question of how to account for the importance of property damage to tort is peripheral to the concerns of this paper. Offhand, the easiest way to make the extension would appear to be to draw upon the fact that we have rights in property. Those rights give rise to claims against others that they not damage our property, and make impairment of our property a harm to us.

⁷² MCL 500.3135(1) (“A person remains subject to tort liability for noneconomic loss caused by his or her ownership, maintenance, or use of a motor vehicle only if the injured person has suffered death, serious impairment of body function, or permanent serious disfigurement.”). A recent Michigan Supreme Court case, *McCormick v. Carrier*, 795 N.W.2d 517 (Mich. 2010), applies this concept of impairment in an instructive manner. Plaintiff's foot was broken and bruised when defendant's truck ran it over. The foot healed, though it continued to ache occasionally. With the healed foot the plaintiff could perform the same work he performed prior to the injury but the post-injury foot hampered his fishing and other recreational activities. The court found impairment because plaintiff's ability to lead his normal life was adversely affected.

⁷³ *Burns v. Jaquays Mining Corp.*, 752 P.2d 28, 30 (Ariz. Ct. App. 1987) (quoting PROSSER & KEETON ON THE LAW OF TORTS, § 30, at 165 (5th ed. 1984)). Pleural thickening, a condition in which the lining of the lung thickens, may be the most common form of cellular damage which does not, by itself, count as physical harm. Because the harms of asbestos exposure are progressive, pleural thickening is a harbinger of asbestosis and mesothelioma.

⁷⁴ In addition to *Burns*, supra note 73, illustrative decisions include *Owens-Illinois, Inc. v. Armstrong*, 604 A.2d 47 (Md. Ct. App. 1992); *In re Hawaii Federal Asbestos Cases*, 734 F.Supp. 1563 (D. Haw. 1990). *Verbryke v. Owens-Corning Fiberglas Corp.*, 84 Ohio App.3d 388 (1992) holds that pleural thickening does constitute bodily harm, but it is abrogated by *Ackison v. Anchor Packing Company*, 120 Ohio St.3d 228 (2008).

⁷⁵ Medical monitoring costs, for example, are very likely to be incurred if a patient presents with subclinical damage from asbestos. The psychic costs are even larger. Persons afflicted by such changes live under swords of Damocles that are beginning to drop. This is a real and serious psychic burden, as the U.S. Supreme Court notes in *Norfolk & W. Ry. Co. v. Ayers*, 538 U.S. 135, 150 (2003) (“In the course of the 20th century, courts sustained a variety of other “fear-of” claims. Among them have been claims for fear of cancer. Heightened vulnerability to cancer . . . must necessarily have a most

Because physical capacities play central roles in normal human lives, physical harm is the central case of harm under the impaired condition conception.⁷⁶ Blindness is, for example, serious harm because sight is a normal human capacity and its loss usually diminishes a person's life. Being blind denies someone access to an important range of normal human activities. Other things being equal, a person whose sight is normal has access to a richer life than a blind person does. A broken leg is a serious harm because a person whose leg is broken is unable to engage in a range of normal activities, beginning with walking. Loss of a leg is a more serious harm than a broken leg, because loss of a leg is permanent whereas a broken leg, properly treated, will heal.⁷⁷ On an impaired-condition conception, then, the gravity of harm is usually a function of the importance to the victim's life of the capacity that the harm impairs and the duration of the impairment.

Physical impairments are almost always bad for those who suffer them, but not all harms are equally grave. A gangrenous limb, for example, is both a serious impairment in itself and a threat to the life of the person whose limb it is. Losing a gangrenous limb is also bad, even though the person whose limb is lopped off is better off than he would be if it were left attached. To live without a limb is to live with seriously diminished capacities of agency. On the impairment account, lesser harms are still harms. From the point of view of the interest account of harm, by contrast, lesser harms are not harms. They are benefits. The person whose gangrenous limb is lopped off is better off than she would have been had the limb been left in place. Severing her limb improves her position. And, economically speaking, lopping off the limb is a Pareto-superior move. Amputation is preferable to keeping the limb and letting the gangrene spread. Both of these observations are correct on their own terms. But the terms are deeply misleading. It is not a benefit to live without a limb. Loss of a limb is both disabling and disfiguring. We are in the domain of impairment, not the domain of improvement.

When harm is conceived of as an impaired condition—and physical impairment is considered the core case—harm delineates a comparatively narrow domain of special concern. Harm so conceived is much narrower than cost. Cost is any value given up in order to obtain some good. It encompasses any disadvantage, anything which diminishes well-being. Ordinary losses—athletic, financial and romantic—are costs, but not harms.⁷⁸ Ordinary losses make their victims

depressing effect upon the injured person. Like the sword of Damocles, he knows it is there, but not whether or when it will fall.”) (internal quotations and citations omitted).

⁷⁶ Psychological harm follows not far behind. Impaired psychological capacities wreak similar havoc with normal lives. Child sexual abuse, for instance, usually leads to serious harm because it usually damages the capacity to trust other people and so impairs the formation of normal and valuable human relationships. Disfigurement is, intuitively, a core case of harm, but not an easy case to explain. The role of normal human appearance in social relations probably explains the importance of disfigurement as a harm. ERVING GOFFMAN, *STIGMA* 41–104 (1963).

⁷⁷ In *Davis v. Consolidated Rail*, 788 F.2d 1260 (1986), Judge Posner remarks that “the loss of a leg is a terrible disfigurement, especially for a young man” even if the victim “is able to walk with the aid of prosthetic devices, to drive, to work, and in short to lead almost a normal life.” The plaintiff had had one leg severed just below the knee and most of the foot on the other leg sliced off in a railroading accident. Precisely because the idea of harm as impairment is not a part of the economic theory to which Judge Posner subscribes, this appeal to ideas of disability and disfigurement is revealing. *Id.* at 1263.

⁷⁸ Influential psychological research by Daniel Kahneman and others has shown that people's ordinary judgments about gains and losses violate the prescriptions of expected utility theory because people treat financial losses and gains differently. Even controlling for wealth effects, people regard losing a sum of money as involving more disutility than failing to acquire an equivalent sum. See Daniel Kahneman et al., *Anomalies: the Endowment Effect, Loss Aversion, and Status*

worse off than they would otherwise be but they do not leave their victims with permanent physical or psychological damage. The prospect of loss to others does not usually give rise to strong reasons to avoid inflicting such loss. The prospect of harm does. A person is, after all, at liberty to beat a competitor out for a job by being better qualified, but she is not at liberty to break that competitor's arm. In competitive circumstances, risk of loss is usually inseparable from the good that the competition seeks to realize. Races that cannot be lost are not worth winning, and markets in which firms cannot fail do not realize the benefits of economic competition. And, in sports, business and love, the risk of loss is accepted when the enterprise is taken up. Losses suffered in these arenas cannot usually be counted as harms. This is so even though it is not always worse to suffer harm than loss. Most of us would rather, for instance, break our pinkies than see our business bankrupted by a competitor. The point is that it is presumptively wrong to do harm, whereas it is not presumptively wrong to inflict loss. It is not presumptively wrong for one businessman to drive another out of business, fair and square, but it is presumptively wrong for one businessman to break another's finger. Absent some further condition—such as a right to, or a legitimate expectation of, some benefit—losses are not harms.⁷⁹

In short, harm's special significance is a consequence of its intimate connection to autonomy. There is nothing special about harm from an efficiency perspective; harms are simply one kind of cost. Yet harm does have special significance in our ordinary moral thinking and in our law. To understand harm's special significance we need to step outside the framework of cost-benefit analysis and adopt a framework which takes our separateness and independence as persons as fundamental, and which understands us as agents who have a fundamental interest in authoring our own lives. Harm has special significance because harms compromise our autonomy by impairing our normal powers of human agency. Benefits, for their part, do not stand in the same relation to autonomy. Benefits enhance our lives only if they are congruent with our commitments. Unsought benefits imposed upon us diminish our autonomy by enlisting us in other people's projects.

Quo Bias, 5 J. ECON. PERSP. 193 (1991). The implication of this research is that people are irrational and intractably so. Sometimes, people's irrational aversion to loss is used to justify standards of precaution which require more than efficient precaution. See, e.g., David A. Dana, *A Behavioral Economic Defense of the Precautionary Principle*, 97 NW. U.L. REV. 1315 (2003). There is an obvious resemblance between the asymmetry of harm and benefit in law and morality and the asymmetry of gain and loss in observed human behavior. It is therefore tempting to regard the harm-benefit asymmetry as an instance of a more general psychological aversion to loss. There are a number of reasons, however, why it would be a serious mistake to conflate the argument of this paper with the lessons of this psychological research. The most important reason is the one being developed in the text. Harms and losses are different phenomena. Harms generally result in impaired conditions whereas losses generally do not. The two asymmetries are therefore importantly different. For another, insofar as the take home lesson of the psychological research is that people make irrational judgments, that lesson is at odds with the argument developed here. The argument developed here is that people have good reason to treat harms and benefits differently. Those reasons are rooted in considerations having to do with autonomy, not expected utility. Last, the aim of Kahneman's psychological research is to identify and understand the operation of various cognitive processes. The aim of this paper is to show that we have good legal and moral reasons to treat harms and benefits differently. Good reasons and psychological propensities are very different matters. Psychology can no more establish what we have good reason to believe than philosophy can determine how ordinary processes of cognition operate.

⁷⁹ See Fennell, *supra* note 62, and accompanying text.

4. Tying the Threads Together

The harm-benefit asymmetry manifests itself in differences in the stringency of our obligations. Our obligations not to harm others are more demanding than our obligations to benefit others. The safety and feasibility norms address a different problem, namely, the problem of how to trade safety off against other goods. The measure of their success is whether they register the disproportionate importance of avoiding harm in a persuasive way. To begin to answer that question we need to connect the priority of avoiding harm with the separateness of persons, and ask when benefits to some might justify imposing risks of harm on others. When we consider significant risks of serious harm, fairness forbids the unrestricted aggregation that is the hallmark of cost-benefit analysis. What it requires is that we compare the gains to those who stand to gain to the burdens to those who stand to lose.⁸⁰ Some gains—some benefits—are not comparable to serious harms. When serious harm is risked something of comparable importance must sit on the benefit side of the scale. Not all benefits will do. An example of Scanlon's brings this out.⁸¹ Scanlon supposes that a piece of transmitting equipment has toppled and pinned a television technician helping to broadcast a live sporting event to which tens of millions of viewers are glued. The technician is in agonizing pain and serious risk of further harm, including death. The only way to save the technician's life is to interrupt the broadcast for thirty minutes, by which time game may have ended. Unrestricted cost-benefit analysis holds that, if enough people stand to be disappointed by the termination of a television show, terminating the life of a television technician may be preferable to terminating the broadcast of the show. The net benefit to all of the viewers (measured by what they would be willing to pay to have the broadcast continue) might easily exceed the net loss to the technician (measured by what he would be willing to pay to have the transmission interrupted).

Our moral sensibility balks at the conclusion that net social benefit is dispositive in this case. We take the distinction between persons seriously. Taking that distinction seriously brings issues of interpersonal fairness to the fore. Although the number of viewers may be vast, the harm to them is not morally comparable to the harm that the technician stands to suffer. No amount of inconvenience and disappointment distributed across a population of distinct persons sums to the moral equivalent of subjecting someone to unendurable pain. Consequently, we should not decide how to proceed by measuring the victim's preference for having her agony alleviated in dollars and then comparing that sum to the price that the viewers would pay to have the broadcast continue. The cost to the technician and the benefit to the viewers are not substitutable at some ratio of exchange. The benefit to the viewers is, comparatively speaking, trivial and the harm to the technician is devastating. Aggregating harms and benefits does not make moral sense when the harms and benefits are not comparable.

Taking the distinction between persons and the priority of avoiding harm seriously, and situating them within the larger philosophical framework where they are at home, puts us in a position to understand the logic at work in the safety and feasibility norms. Health and physical integrity are kinds of primary goods. Values, for their part, are plural and incommensurable. The

⁸⁰ This involves evaluating risk impositions from "representative standpoints" and considering the "generic reasons" relevant to those standpoints. See Rahul Kumar, *Contractualism and the Roots of Responsibility*, and *Risking and Wrongs*, both *supra* note 51. The presumptively relevant standpoints are the standpoints of potential injurers and victims. Often these standpoints must be revised and refined to analyze a particular circumstance well.

⁸¹ See SCANLON, *supra* note 11, at 235.

point of protecting the essential conditions of agency for each person—and of providing them with the means to pursue their own ends—is to enable people to shape their own lives in accordance with their aspirations for those lives. Within a framework that prioritizes the protection of each person’s essential interests, the question of how to trade health or safety off against other goods requires making judgments of urgency (or need) not preference (or want).⁸² Health and safety should only be sacrificed in order to promote some even more urgent interest. The safety and feasibility norms are ways of articulating the priority of avoiding harm and they embody judgments of comparable value—judgments about just what goods are important enough to justify imposing significant risk of irreparable and serious harm.

III. COST-JUSTIFIED, FEASIBLE AND SAFE PRECAUTION

As we have seen, the “feasibility,” and “safe level” standards of acceptable risk imposition are well defined, and usefully understood in relation to the standard of cost-justified precaution.⁸³ The three standards identify distinct levels of permissible risk imposition. Normally, they stand in linear, vertical relation to one another.⁸⁴

Cost-justified risk reduction. Among these three standards, the cost-justification standard tolerates the most risk. Cost-benefit analysis aspires to mimic the market. It treats all costs and benefits as fungible at some ratio of exchange and holds that they should be traded off in a way which maximizes net benefit. In the context of accidental physical harm, the method usually focuses, more narrowly, on the costs and benefits of paying for and preventing accidents. Minimizing those combined costs maximizes the benefits extracted from the risky activities at issue. Cost-benefit analysis thus requires risks to be reduced to the point where the costs of further precaution exceed the benefit. If the marginal costs of eliminating significant risks exceed the marginal benefits, significant risks will continue to exist.

Feasible risk reduction. The feasibility standard tolerates less risk. Feasibility analysis looks to achieve the lowest level of risk practically attainable, not the level of risk that minimizes the combined costs of injuries and their prevention. Feasibility analysis requires the elimination of “significant” risks, when they can be eliminated without threatening the long-run health of the activity to which the risks belong. Significant cost-justified risks are eliminated so long

⁸² See T.M. SCANLON, *Preference and Urgency*, THE DIFFICULTY OF TOLERANCE, 70 (2003).

⁸³ My discussion here leans backwards a bit, in the sense that it places primary weight on somewhat older cases. There are two reasons for doing so. First, the earlier cases are foundational and in that way more important. Second, recent cases exhibit something of a tendency to reinterpret these standards through the lens of cost-benefit analysis. That tendency obscures the differences among the standards. Others, especially, David Dreisen, have interpreted these standards differently. For discussion of this disagreement and a qualified endorsement of the view I take here, see Dov Waisman, *Equity and Feasibility Regulation*, *supra* note 51.

⁸⁴ It is debatable whether this relation is necessary. Arguably, there are circumstances where it is not cost-justified to engage in an activity in the first place and where the activity is also governed by feasibility analysis. In this circumstance, feasible precaution will be less protective of safety than cost-justified precaution. None of the circumstances discussed in this paper fit this template. Examples that might fit the template involve freely chosen but very risky activities. Some people might argue that it is foolish to engage in some such activity (e.g., in “free solo” rock climbing). At the same time, it will be true that the risks of such activities cannot be reduced to insignificance because that would destroy the value of the activity.

as their elimination is compatible with the long-term flourishing of the activity at issue. Significant risks remain only if their elimination would threaten the survival of the activity.

Safe level of risk imposition. The safe-level standard tolerates the least risk. Safety-based regulations require risk to be reduced to a point where no “significant risk” of devastating injury remains. Applying the safe-level standard therefore does not require any inquiry into the costs of risk reduction. All that it requires is a determination of the level at which the risk created by exposure to the regulated substance ceases to be significant.

The two standards of most interest to us—the safety and feasibility standards—employ a relatively well-integrated set of concepts, and have their characteristic domains of application. The concepts of “safe level,” “feasible risk reduction” and “significant” risk form the heart of these statutory regimes. The feasibility standard, for its part, is further broken down into technological and economic prongs. The legal regimes that the standards establish need to be understood in terms of these concepts. The regimes themselves need to be understood in relation to one another, in relation to the idea of cost-justified risk reduction, and in light of their usual domains of application.

A. The “Safe” Level of Risk Imposition

The safe-level approach is adopted in some aspects of clean air, clean water, and pure food legislation, particularly regulation of toxic substances that may endanger public health. The Food Quality Protection Act of 1996 is one case in point.⁸⁵ Clean air statutes also incorporate safety-based regulation.⁸⁶ A provision of the Clean Air Act,⁸⁷ for example, focuses on cancer risks remaining after technology-based regulations for hazardous pollutants have been in effect for six years.⁸⁸ If a numerically defined level of cancer risk has not been achieved at that point, the EPA is directed to issue additional regulations that will “provide an ample margin of safety to protect public health.”⁸⁹ The regulatory aim behind these provisions is to “reduce lifetime excess cancer risks to the individual most exposed to emissions . . . to less than one in one million.”⁹⁰ Some residual risk thus survives safe-level regulation. Requiring that “lifetime excess cancer risks to the individual most exposed to emissions” be reduced “to less than one in one million” expresses a judgment of significance. A lifetime risk of cancer (from a regulated emission) that crosses the “one in a million” threshold crosses from the domain of insignificant risk into the domain of significant risk.⁹¹

⁸⁵ See, *supra* note 14.

⁸⁶ See *Union Elec. Co. v. EPA*, 427 U.S. 246, 258 (1976) (stating that the Clean Air Act's three-year deadline purposely “leaves no room for claims of technological or economic infeasibility.”).

⁸⁷ Clean Air Act, Pub. L. No. 101-549, 104 Stat. 2399 (codified as amended at 42 U.S.C. §§ 7401-7671 (2012)).

⁸⁸ 42 U.S.C. § 7412(f)(1).

⁸⁹ 42 U.S.C. § 7412(f)(2)(A).

⁹⁰ *Id.*

⁹¹ In a recent, important paper, Michael Livermore and Richard Revesz argue that this kind of regulation (which they call “health-based”) is fatally afflicted by two problems, the “stopping point problem” and the “inadequacy paradox.” The “stopping point problem” is that “when costs cannot be considered it is difficult to justify any stopping point other than zero.” The “inadequacy paradox” is that health-based regulation has not led to more stringent regulatory standards. See Livermore & Revesz, *Rethinking Health-Based Environmental Standards*, *supra* note 12, at 14-37, 44-54. This latter claim is meant to challenge the consensus of all the parties to the *Whitman v. American Trucking Associations, Inc.* decision. This paper takes no position on the “inadequacy paradox.” It does, however, offer an interpretation of safety-based regulation which is not subject to the stopping point problem. As the text explains, safety-based regulation stops when the remaining risk is insignificant. One can't help but wonder if the “stopping point problem” as Revesz and Livermore

The emphasis on protecting either those “most exposed” to risk, or those most susceptible to it, is a recurring theme in safety-based regulation. Clean water regulation supplies a closely related example: the court in *Hercules, Inc. v. EPA* insisted on especially stringent precaution against possible harm from toxins, even though the chance of that harm materializing could not be estimated.⁹² The Federal Water Pollution Control Act of 1972⁹³ authorized health-based regulation of toxic effluents without consideration of “feasibility, achievability, practicability, economic impact, or cost,” and addressed standards for determining permissible discharge levels for such toxins.⁹⁴ EPA discharge standards, the court ruled, must provide an “ample margin of safety” and “protect against incompletely understood dangers to public health and the environment, in addition to well-known risks.”⁹⁵

B. Feasible Risk Reduction

Clean air and water regulation also makes use of the feasibility standard. The Clean Air Act, as amended in 1990, for example, provides that regulatory standards for hazardous air pollutants “shall require the maximum degree of reduction in emissions” that the EPA, “taking into consideration the cost of achieving such emission reduction,” determines to be “achievable.”⁹⁶ Feasibility is also the touchstone of the Occupational Health and Safety Act of 1970,⁹⁷ and it is in this context that it has received its most extensive application and judicial interpretation. As articulated by OSHA and the courts, the feasibility norm has acquired a specialized technical meaning. Nonetheless, it helps to recognize that this specialized legal meaning is analogous with the ordinary meaning of the word. In ordinary usage “feasible” means, roughly, “achievable.” Something which is “feasible” is doable. In the remark quoted at the beginning of this paper, Paul Krugman used “feasible” to make the point that liberals do not need to claim that universal health insurance maximizes wealth or welfare, just that it is possible to provide universal health insurance and still have a healthy economy.⁹⁸

Feasibility analysis, as practiced by OSHA, is governed by the same basic thought. Feasible risk regulation is risk regulation that does not destroy the valuable activity whose risks it seeks to reduce. That said, feasibility-based regulation has a more complex structure than safety-based

conceive it is at least in part an artifact of their own commitment to think in terms of maximizing value. To maximize value you must pursue benefit up to the point where further pursuit no longer increases value. If you can never consider cost—and if risk-reduction is always beneficial—maximizing value requires reducing risk until there is no risk at all remaining and that is either impossible, or undesirable. The logic here is compelling only if you accept value-maximization as an ideal. This paper argues that safety-based regulation finds its justification in an alternative, non-maximizing framework. Within that framework “insignificance” makes sense as a stopping point and the pressure to reduce risk indefinitely does not exist.

⁹² *Hercules, Inc. v. EPA*, 598 F.2d 91 (D.C. Cir. 1978).

⁹³ Federal Water Pollution Control Act, Pub. L. No. 92-500, 86 Stat. 816 (codified as amended at 33 U.S.C. §§ 1251-1376 (2012)).

⁹⁴ *Hercules*, 598 F.2d at 111.

⁹⁵ *Id.* at 104.

⁹⁶ 42 U.S.C. § 7412(d)(2).

⁹⁷ Occupational Health and Safety Act, Pub. L. No. 91-596, 84 Stat. 1590 (codified as amended at 29 U.S.C. §§ 651-678 (2012)).

⁹⁸ Krugman, *supra* note 2.

regulation. Feasibility analysis requires the identification of “a significant [workplace] health risk,”⁹⁹ and an analysis of the feasibility of reducing that risk without crippling the activity that imposes the risk.¹⁰⁰ The “significance” requirement is one that feasibility analysis shares with safe-level regulation. The feasibility standard itself, however, is different from both the “cost-justified” standard and the “safe-level” standard. The cause of keeping ourselves oriented as we work our way through this thicket of legal regimes is best served by postponing detailed analysis of “significance” and first fleshing out the basic logic of “feasible risk reduction.”

1. The Two Faces of Feasibility

The determination of whether it is feasible to reduce a risk without crippling the activity that imposes it has two aspects—a “technological” one and an “economic” one. Technological feasibility analysis asks: What is the lowest level of risk technically attainable? How much could we reduce this risk if we single-mindedly set out to reduce it as much as possible?¹⁰¹ Economic feasibility analysis asks: What is the lowest level of risk whose costs can be borne by the activity that imposes the risk at issue?¹⁰² The aim of feasibility analysis is to protect “worker health and safety within the limits of economic possibility.”¹⁰³ “Congress itself defined the basic relationship between costs and benefits [when it enacted the Occupational Health and Safety Act of 1970 with its feasibility standard], by placing the ‘benefit’ of worker health above all other considerations save those making attainment of this ‘benefit’ unachievable.”¹⁰⁴ Feasibility analysis looks to achieve the lowest level of risk practically attainable.

2. Technological Feasibility

The technological side of feasibility analysis asks, as matter of engineering technique, what is the lowest level of risk achievable by a continuing activity. Any limit set on risk—a “permissible exposure limit” (PEL) for a toxic substance, for example—must be technologically attainable.¹⁰⁵ Technological achievability, however, is not fixed by the outer limit of technological possibility at a given moment in time, because the most advanced techniques of risk control in place at a given moment in time may fall short of the frontier of what might be achieved. The frontier of technological feasibility is fixed by the engineering practice that might be achieved through a dogged

⁹⁹ *Indus. Union Dep't v. Am. Petroleum Inst.*, 448 U.S. 607, 615 (1980) [hereinafter, *American Petroleum*]. The Court noted the importance of this threshold inquiry: “We agree with the Fifth Circuit’s holding that § 3(8) requires the Secretary to find, as a threshold matter, that the toxic substance in question poses a significant health risk in the workplace and that a new, lower standard is therefore “reasonably necessary or appropriate to provide safe or healthful employment and places of employment. Unless and until such a finding is made, it is not necessary to address the further question whether the Court of Appeals correctly held that there must be a reasonable correlation between costs and benefits, or whether, as the federal parties argue, the Secretary is then required by § 6(b)(5) to promulgate a standard that goes as far as technologically and economically possible to eliminate the risk.” *American Petroleum*, 448 U.S. at 614-15. The toxin in question was benzene.

¹⁰⁰ *Id.* at 639-40.

¹⁰¹ See KEETON ET AL., *supra* note 37, at 1238-39, 1252-53 (discussing the technological feasibility prong of feasibility analysis).

¹⁰² See *id.* at 1253-55 (discussing the economic feasibility prong of feasibility analysis).

¹⁰³ *United Steelworkers v. Marshall*, 647 F.2d 1189, 1263 n.102 (D.C. Cir. 1980).

¹⁰⁴ *Am. Textile Mfrs. Inst., Inc. v. Donovan*, 452 U.S. 490, 509 (1981) [hereinafter *American Textile*]. *American Textile* involved occupational exposure to cotton dust, which causes brown-lung disease.

¹⁰⁵ *American Textile*, 452 U.S. at 500.

commitment to feasible risk reduction. A regulatory agency promulgating a feasibility-based risk regulation may therefore specify an acceptable level of risk which is lower than the level attainable through the application of existing techniques, if the agency can reasonably predict that technical capability will advance sufficiently to make a lower level of risk imposition attainable within the time frame of the regulation.

In *American Iron & Steel Institute v. OSHA*, for example, OSHA's standard for coke oven emissions was upheld as technologically feasible even though "the most modern and clean coke oven battery operating" met the standard only one-third of the time.¹⁰⁶ Evidence of one-third compliance using less than all suitable technology—plus dramatic progress toward compliance at another plant after new engineering controls were implemented—showed sufficiently that the standard was not "impossible of attainment."¹⁰⁷ The question was not what could be done at the moment, but "what the industry could achieve in an effort to best protect its . . . employees," given a determination to exploit "technological potentialities."¹⁰⁸ The court therefore approved OSHA's reliance on "innovative technology currently in the experimental stage,"¹⁰⁹ and its faith in new techniques "looming over the horizon."¹¹⁰

In *United Steelworkers v. Marshall*, Judge J. Skelly Wright gave the following summary of the concept of "technological feasibility:"

The oft-stated view of technological feasibility under the [Occupational Health and Safety Act] is that Congress meant the statute to be 'technology-forcing.' This view means, at the very least, that OSHA can impose a standard which only the most technologically advanced plants in an industry have been able to achieve—even if only in some of their operations some of the time. But under this view OSHA can also force industry to develop and diffuse new technology. At least where the agency gives industry a reasonable time to develop new technology, OSHA is not bound to the technological status quo. So long as it presents substantial evidence that companies acting vigorously and in good faith can develop the technology, OSHA can require industry to meet [Permissible Exposure Levels] never attained anywhere.

....

As for [proof of] technological feasibility, we know that we cannot require of OSHA anything like certainty. Since 'technology-forcing' assumes the agency will make highly speculative projections about future technology, a standard is obviously not infeasible solely because OSHA has no hard evidence to show that the standard has been met. . . . OSHA's duty is to show that modern technology has at least conceived some industrial strategies or devices which are likely to be capable of meeting the PEL and which the industries are generally capable of adopting. Our view finds support in the statutory requirement that OSHA act according to the 'best *available* evidence.' OSHA cannot let workers suffer while it awaits the Godot of scientific certainty.¹¹¹

¹⁰⁶ *Am. Iron & Steel Inst. 1000 16th St. v. OSHA*, 577 F.2d 825, 832 (3d Cir. 1978).

¹⁰⁷ *Id.* at 834.

¹⁰⁸ *Id.* at 833, 834.

¹⁰⁹ *Id.* at 835.

¹¹⁰ *Id.* at 833 (internal quotation marks omitted).

¹¹¹ *United Steelworkers*, 647 F.2d at 1264–66 (internal citations omitted).

The requirement of technological feasibility is, thus, stringent. The technological side of feasibility analysis determines the presumptively appropriate level of precaution by reference to the best that *might* be done, given an unstinting commitment to the goal of feasible risk reduction—not by reference to what is customarily done, nor even by reference to the best that is now done.

3. Economic Feasibility

In *Portland Cement Association v. Ruckelshaus*, the court interpreted language in the Clean Air Act of 1970 requiring “a standard for emissions of air pollutants which reflects the degree of emission limitation achievable . . . taking into account the cost of achieving such reduction.”¹¹² It held that this language did *not* direct the EPA to undertake “a quantified cost-benefit analysis” in order to justify its air pollution standard for new or modified cement plants.¹¹³ The EPA’s conclusion that the cement industry could absorb the cost of control devices without detriment to competition between cement and substitute products, even though some plants might have to close, sufficed to answer the “essential question” under the Act: “whether the mandated standards can be met by a particular industry for which they are set.”¹¹⁴ Judgments of economic feasibility require “tak[ing] into account the costs,” but they do not require “cost-benefit analysis.”¹¹⁵ Indeed, insofar as the criterion of cost-justified precaution requires less precaution than the criterion of economic feasibility does, the criterion of economic feasibility rejects the criterion of cost-justification outright.

Provisions of the Clean Water Act that mandate pollution control to the extent “technologically and economically achievable” also illustrate the economic prong of feasibility-based regulation.¹¹⁶ The Clean Water Act subjects water pollution sources to two different sorts of effluent limitations: those based on “the best practicable control technology currently available” (BPT),¹¹⁷ and those based on “the best available technology economically achievable” (BAT).¹¹⁸ The BPT standard generalizes “the best existing performance” in an industry—control practices in “exemplary plants”—despite an expectation of “economic hardship, including the closing of some plants.”¹¹⁹ The BAT standards are more stringent. They require “a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges.”¹²⁰ The setting of BPT standards involves “cost-benefit analysis,” but cost-benefit analysis is not part of BAT determinations.¹²¹ In determining the economic achievability of a technology, “the EPA must consider the cost of meeting BAT limitations, but need not compare such cost with the benefits of effluent reduction.”¹²²

¹¹² *Portland Cement Ass’n. v. Ruckelshaus*, 486 F.2d 375, 378 (D.C. Cir. 1973) (internal citation omitted).

¹¹³ *Id.* at 387.

¹¹⁴ *Id.* at 389.

¹¹⁵ *Id.* at 387 (internal quotation marks omitted).

¹¹⁶ 33 U.S.C. §§ 1311(b)(2)(A), 1314(b)(2)(B), 1317(a)(2).

¹¹⁷ 33 U.S.C. § 1311(b)(1)(A).

¹¹⁸ § 1311(b)(2)(A).

¹¹⁹ *EPA v. Nat’l Crushed Stone Ass’n*, 449 U.S. 64, 76, 79 n.15 (1980).

¹²⁰ *Id.* at 74.

¹²¹ *Id.* at 71 n. 10 (internal citation omitted).

¹²² *Rybachek v. EPA*, 904 F.2d 1276, 1290–91 (9th Cir. 1990) (internal quotation marks omitted).

For “economic feasibility” analyses, then, the ultimate question is not whether costs are outweighed by benefits, but whether the industry is able to bear the cost. Economic feasibility regulation by OSHA means “protecting worker health and safety within the limits of economic possibility.”¹²³ Again, Judge Skelly Wright explains:

The most useful general judicial criteria for economic feasibility come from Judge McGowan's opinion in *Industrial Union Dep't, AFL-CIO v. Hodgson*. A standard is not infeasible simply because it is financially burdensome, or even because it threatens the survival of some companies within an industry:

“Nor does the concept of economic feasibility necessarily guarantee the continued existence of individual employers. It would appear to be consistent with the purposes of the Act to envisage the economic demise of an employer who has lagged behind the rest of the industry in protecting the health and safety of employees and is consequently financially unable to comply with new standards as quickly as other employers.”

A standard is feasible if it does not threaten ‘massive dislocation’ to, or imperil the existence of, the industry. No matter how initially frightening the projected total or annual costs of compliance appear, a court must examine those costs in relation to the financial health and profitability of the industry and the likely effect of such costs on unit consumer prices [T]he practical question is whether the standard threatens the competitive stability of an industry, or whether any intra-industry or inter-industry discrimination in the standard might wreck such stability or lead to undue concentration.

. . .

. . . [A]s for [proof of] economic feasibility, OSHA must construct a reasonable estimate of compliance costs and demonstrate a reasonable likelihood that these costs will not threaten the existence or competitive structure of an industry, even if it does portend disaster for some marginal firms.¹²⁴

In *American Textile*, both the court of appeals and the Supreme Court upheld OSHA's assessment of economic feasibility.¹²⁵ OSHA had concluded that “compliance with the standard [was] well within the financial capability” of the cotton industry.¹²⁶ The agency noted that “although some marginal employers may shut down rather than comply, the industry as a whole will not be threatened”¹²⁷ Both courts agreed that OSHA had shown that the industry would be able to absorb the projected costs.¹²⁸ Regulatory requirements remain economically feasible, the court of appeals wrote, even though they “impose substantial costs on an industry . . . or . . . force some employers out of business,” as long as they are not “prohibitively expensive” and do not make

¹²³ *United Steelworkers*, 647 F.2d at 1263 n.102.

¹²⁴ *Id.* at 1265, 1272 (quoting *Indus. Union Dep't, AFL-CIO v. Hodgson*, 499 F.2d 467, 478 (D.C. 1974)).

¹²⁵ *AFL-CIO v. Marshall*, 617 F.2d 636, 662 (D.C. Cir. 1979), *aff'd in part and vacated in part by sub nom. American Textile*, 452 U.S. 490 (1981).

¹²⁶ *American Textile*, 452 U.S. at 531 (internal citation omitted).

¹²⁷ *Id.*

¹²⁸ *Id.* at 530–36.

“financial viability generally impossible.”¹²⁹ Controls on cotton dust fit “the plain meaning of the word ‘feasible,’” the Supreme Court wrote, given OSHA’s conclusion “that the industry will maintain long-term profitability and competitiveness.”¹³⁰

OSHA makes the standards articulated by the courts more concrete in the course of applying them. Its assessment procedures approach the question of whether a particular standard of precaution will threaten the competitive stability of an industry by conducting an industry-by-industry analysis. The aim of that analysis is to determine the percentage of the industry’s revenues and profits that compliance will consume. One OSHA report explains the agency’s practice as follows:

While there is no hard and fast rule, in the absence of evidence to the contrary OSHA generally considers a standard economically feasible when the costs of compliance are less than one percent of revenues [P]otential impacts of such a small magnitude are unlikely to eliminate an industry or significantly alter its competitive structure particularly since most industries have at least some ability to raise prices to reflect increased costs. . . . There is an enormous variety of year-to-year events that could cause a one percent increase in a business’s costs, e.g., increasing fuel costs, unusual one-time expense, changes in costs of materials, increased rents, increased taxes, etc.¹³¹

Thus, in a case where the costs of complying with a particular standard came to less than both one percent of an industry’s revenues and ten percent of its profits, implementation of the standard did not threaten the competitive stability of the industry.¹³² The logic here is instructive, as Dov Waisman says.¹³³ OSHA’s approach assumes that revenue and profits normally fluctuate within certain limits. If an industry is able to absorb fluctuations within certain limits without seeing its competitive stability undermined, then a regulatory standard that has an impact in the same range will not threaten an industry’s competitive stability.

Of course, not every standard necessary to eliminate significant risk falls into this sweet spot of acceptable impact. Where an industry’s compliance costs considerably exceed these thresholds, OSHA makes industry-by-industry determinations of whether complying with a particular standard will threaten the industry’s competitive stability. In these cases, the inquiry is centered on continued profitability. In analyzing the economic feasibility of a permissible exposure limit of 1 [μ] g/m and whether it would affect the electroplating industry OSHA concluded, “the costs associated with such a PEL, could alter the competitive structure of the industry.”¹³⁴ The cost of the standard came to 65% of profits, though only 2.7% of revenue. After considering demand elasticity for electroplating,

¹²⁹ *Marshall*, 617 F.2d at 655, 661 (internal citations omitted).

¹³⁰ *American Textile*, 452 U.S. at 530 n.55 (internal citations omitted).

¹³¹ Occupational Exposure to Hexavalent Chromium; Final Rule, 71 Fed. Reg. 10099-10385, Supplementary Information, Section VIII.E [hereinafter OSHA report] (“OSHA’s obligation is not to determine whether any plants will close, or whether some marginal plants may close earlier than they otherwise might have, but whether the regulation will eliminate or alter the competitive structure of the industry.”). I am grateful to Dov Waisman for calling this report to my attention. My discussion follows his. Waisman, *Reasonable Precaution for the Individual*, *supra* note 50.

¹³² OSHA report, *supra* note 131. The standard at issue determines a permissible exposure limit for a particular toxic substance.

¹³³ Waisman, *supra* note 50.

¹³⁴ OSHA report, *supra* note 131.

OSHA concluded that “a price increase that would assure continued profitability for the entire industry would require almost tripling the annual nominal price increase. . . . That would represent a significant real price increase that might not be passed forward, particularly by older and less profitable segments of the industry.”¹³⁵ Requiring a PEL of 1 [[μ] g/m] might therefore make the activity of electroplating unprofitable. Making an industry unprofitable is, for OSHA, an unacceptable threat to its “competitive stability.”

Under OSHA practice, then, the “economic feasibility” prong of feasibility analysis requires the reduction of significant risk up until the point where risk reduction threatens the competitive structure or competitive stability of an industry. Proposed risk reducing regulations reach the point at which they threaten the continued profitability of a business.

C. “Significant” Risk

Feasibility analysis, like safety analysis, requires the identification of “significant risks” of “health injury.”¹³⁶ What makes a risk significant and why should significant risks be singled out for special treatment? The significance requirement receives its canonical exposition in *American Petroleum*.¹³⁷ Writing for the Court, Justice Stevens agreed with the Fifth Circuit's holding that § 3(8) of the Occupational Health and Safety Act of 1970 requires the Secretary to find, as a threshold matter, that the toxic substance in question (here, benzene) poses a significant health risk in the workplace and that a new, lower standard is therefore “reasonably necessary or appropriate to provide safe or healthful employment and places of employment.”¹³⁸ Unless and until such a finding is made, the requirement that the risk be reduced as far as technologically and economically feasible is not triggered.¹³⁹ Justice Stevens thus rejected OSHA’s contention that no significance requirement was necessary:

If the purpose of the statute were to eliminate completely and with absolute certainty any risk of serious harm, we would agree that [OSHA’s approach] would be proper But we think it is clear that the statute was not designed to require employers to provide absolutely risk-free workplaces whenever it is technologically feasible to do so, so long as the cost is not great enough to destroy an entire industry. Rather, both the language and structure of the Act, as well as its legislative history, indicate that it was intended to require the elimination, as far as feasible, of significant risks of harm. . . .

By empowering the Secretary to promulgate standards that are ‘reasonably necessary or appropriate to provide safe or healthful employment and places of employment,’ the Act implies that, before promulgating any standard, the Secretary must make a finding that the workplaces in question are not safe. But ‘safe’ is not the equivalent of ‘risk-free.’ There are

¹³⁵ *Id.*

¹³⁶ Safety-based risk regulation requires the elimination of significant risks, whereas feasibility-based regulation only requires the elimination of such risks if feasible. There has been some retreat from this requirement of late. *See* Dov Waisman, *Equity and Feasibility Regulation*, *supra* note 51.

¹³⁷ *American Petroleum*, 448 U.S. 607, 639–59 (1980).

¹³⁸ *Id.* at 614–15. Section 3(8) of the Act provides: “The term ‘occupational safety and health standard’ means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.”

¹³⁹ *Id.* at 615.

many activities that we engage in every day—such as driving a car or even breathing city air—that entail some risk of accident or material health impairment; nevertheless, few people would consider these activities ‘unsafe.’ Similarly, a workplace can hardly be considered ‘unsafe’ unless it threatens the workers with a significant risk of harm.¹⁴⁰

Therefore, before she can promulgate *any* permanent health or safety standard, the Secretary is required to make a threshold finding that a place of employment is unsafe because significant risks are present.

1. The Significance of a Risk: Quantity and Quality

“Significance” is an underspecified term of art. We can begin to clarify it, however, by noting that some risk of accidental harm is the price of activity itself.¹⁴¹ We cannot farm, build, drive, or fly—or mill cotton and refine benzene—without taking and imposing risks of devastating injury. We cannot help but eat and drink, yet eating and drinking expose us to risks of death and disease. We cannot help but travel, but traveling by whatever means we can devise—foot, car, horse, or rickshaw—puts both us and others in physical peril. Some risk is therefore unavoidable in two senses of the word. Some risk *cannot* be avoided without bringing activity to a halt, and some risk *should* not be avoided because it is better to bear the risks than to forego the activities that spawn them. Risks that cannot be eliminated without ceasing the activity that engenders them are both endemic, if slight, and the background against which all other risks arise. The fact that a low level of risk of devastating injury—the background level of risk—is an inescapable price of activity explains why a significance requirement must be introduced, implicitly or explicitly, into even the most stringent standards of risk regulation. Before we attempt to reduce a risk we must first conclude that it crosses the threshold that separates eliminable risks from ineliminable ones. We must decide if the risk in question crosses a threshold of significance.

“Significance,” thus, has much in common with the idea of “characteristic risk” found in common law strict liability doctrines. A “characteristic risk” of an activity is a risk whose long-run incidence is increased by the presence of the activity in the world. Increased incidence of drunken sailors stumbling around on shore leave is a characteristic risk of operating the Coast Guard.¹⁴²

¹⁴⁰ *Id.* at 641–42.

¹⁴¹ The impossibility of preventing *all* accidental injury is a fundamental fact that any approach to accident law must acknowledge. James M. Buchanan, for example, begins his defense of caveat emptor in products liability law with the following comment:

It is useful to note at the outset that *accidents cannot be prevented*, in the sense that the probability of occurrence cannot be reduced to zero. We live in an uncertain world, whether we like it or not, and the working properties of either human or material agents cannot be completely specified. Any discussion of products liability, therefore, involves only the possible modification in the probability distribution of accidents.

James M. Buchanan, *In Defense of Caveat Emptor*, 38 U. CHI. L. REV. 64, 64 (1970). From a very different perspective, Ernest Weinrib gives a Kantian explanation of negligence law from the ground up by noting that everyone must act in the world and accord an equal right to others to do so. See Ernest J. Weinrib, *Toward a Moral Theory of Negligence Law*, 2 LAW AND PHIL. 37, 50 (1983).

¹⁴² *Ira S. Bushey & Sons, Inc. v. United States*, 398 F.2d 167 (2d Cir. 1968) (Friendly, J.). See also, *Taber v. Maine*, 45 F.3d 598 (2d Cir. 1995) (Calabresi, J.)

Increased risk of inadvertent explosion is a characteristic risk of using dynamite in construction.¹⁴³ Increased risk of rape is a characteristic risk of the authority vested in police officers.¹⁴⁴ Similarly, increased risk of brown lung disease is a significant risk of milling cotton, increased risk of mesothelioma is a significant risk of occupational exposure to asbestos dust, and exposure to benzene in refining petroleum poses a significant risk of leukemia. “Significance” in this sense has a pronounced quantitative dimension. It is a matter of the correlation between some form of harm and an activity. The flip side of this coin is that the elimination of “significant” risk is a matter of reducing the incidence of some harm. The 1990 amendments to the Clean Air Act, for example, aim to “reduce lifetime excess cancer risks to the individual most exposed to emissions . . . to less than one in one million.”¹⁴⁵

Judgments of significance have an important quantitative aspect but the concept of significance is not reducible to quantitative considerations. Judgments of significance are also inescapably evaluative. To be significant, a risk must ripen into serious harm—the kind of harm that severely compromises normal physical capacities. For example, occupational exposure to “cotton dust” can lead to acute byssinosis (commonly known as “brown lung disease”), to permanent disability in the form of reduced breathing capacity, and to premature death. This progression marks out a sequence of increasingly profound impairment. The relation of significance to serious harm builds qualitative evaluation into the concept of significance. The diseases and disabilities that the norms of safe and feasible precaution address are diseases and disabilities that deprive their victims of normal lifespans and normal capacities. The harms are devastating. They impair normal functioning in ways that cannot be repaired. The judgments of severity involved are inescapably evaluative because they measure the seriousness of harm against a baseline of normal life.

Moreover, significant risks are salient ones, and salience is a matter of standing out. Salient phenomena stand out in a *context—against a background*.¹⁴⁶ Salient risks are prominent risks, risks which jut out in the setting of the activity subject to regulatory scrutiny. *Probability* of harm can be expressed by a purely quantitative measure—by a number—but the importance of a particular probability of harm depends in part on the background against which that probability is framed. Even the purely quantitative criterion of significance employed by the 1990 Amendments to the Clean Air Act operates against a background that fixes the acceptable level of risk. The salience of the risk of cancer addressed by those amendments depends on the background risk of cancer. Discussion of “excess cancer risks” presumes a preexisting risk of cancer—a risk independent of exposure to the particular emission being appraised. The Clean Air Act's one-in-a-million threshold for “excess risk” thus defines an acceptable level of increased risk for a harm whose gravity we can largely agree upon, and of which there is a preexisting incidence.

Why settle on “one in a million” as the threshold separating acceptable increases in excess risk from unacceptable ones? Four reasons come readily to mind. First, that threshold defines a negligible level of risk, a level of risk that we might reasonably disregard entirely. Reducing a risk to

¹⁴³ *Exner v. Sherman Power Construction Co.* 54 F.2d 510 (2d Cir. 1931).

¹⁴⁴ *Mary M. v. City of L.A.*, 54 Cal. 3d 202 (1991).

¹⁴⁵ Clean Air Act, 42 U.S.C. § 7412(f)(2)(A); *See, supra* notes 86–90 and accompanying text (describing the regulatory aims of the Clean Air Act).

¹⁴⁶ As Lewis Sargentich puts it: “The risk to be averted must be . . . noteworthy in comparison with other risks of the same activity that might also be reduced further by costly measures.” KEETON ET AL., *TEACHER'S MANUAL TO ACCOMPANY TORT AND ACCIDENT LAW* 20–27 (4th ed. 2005).

the point where it might reasonably be disregarded entirely is, presumably, reducing it to the point where it is no longer significant. Second, we already face greater threats in our daily lives—the annual risk of death by automobile accident, for example is approximately 1 in 9,600,¹⁴⁷ and the annual risk of death from cancer is approximately 1 in 540.¹⁴⁸ Given these other threats, we may feel justifiably comfortable in *entirely* disregarding excess risks of cancer of less than one in a million—in treating them as functionally equivalent to no risk at all.¹⁴⁹ Third, we might choose to tolerate excess risks of cancer less than one in a million—but not risks greater than that—because the background risk of cancer is alarming, and we are eager not to see it increase. Fourth, “one in a million” has a natural prominence—a salience—as a measure of significance arbitrary in its exactitude but sensible in its general order of magnitude. Who would fix on 1 in 997,832?¹⁵⁰

2. Salience and the Significance of Context

The natural prominence of the “one-in-a-million” threshold as a test of significant risk can create the impression that the salience of a risk really is a quantitative matter. This is mistaken. Consider the phenomenon of sudden acceleration, which arose most recently in connection with cars manufactured by Toyota. We reasonably expect that a car will not accelerate unexpectedly and uncontrollably. Against the background of that reasonable expectation, *any* perceptible association of sudden acceleration with particular vehicles is a salient, and unacceptable, increase in risk. The risk of gas tank explosions in automobile accidents—the subject of the famous Ford Pinto case—is also instructive, and perhaps richer.¹⁵¹ Intuitively, risks of gas tank explosion strike us as prominent risks of driving. Among the myriad risks of automobile accidents, the dangers of fire and explosion stand out. The explosive properties of gasoline make it especially dangerous. Most of us imagine that it is particularly horrible to be burned to death, and many of us may think it worse still to survive a terrible fire horribly disfigured. These judgments involve assessments of magnitude that might be expressed quantitatively: people might be able to rank injury by gasoline explosion on a scale with other possible injuries from automobile accidents, and we might be able to assign a number to the relative disvalue that they place on such injuries. But a judgment that the risks of gasoline tank failure are a significant risk of driving is both evaluative to its core and inherently comparative. And comparison cannot be made without attending to context, a point illustrated by the difference in significance of risks of gas tank explosions in motorcycles and cars, respectively.

The numerical risk of gasoline tank explosions is equal in motorcycles and in passenger cars, and the risks of gas tank explosions may well be more dangerous in motorcycles, since riders are

¹⁴⁷ In 2013, there were 10.35 automobile accident fatalities for every 100,000 people. *Fatality Analysis Reporting System (FARS) Encyclopedia*, National Highway Traffic Safety Administration, <http://www-fars.nhtsa.dot.gov/Main/index.aspx>.

¹⁴⁸ In 2010, the death rate for all cancers was 186.2 for every 100,000 people. Sherry Murphy et al., *Deaths: Final Data for 2010*, 61 National Vital Statistics Reports No. 4, 5 (May 8, 2013), available at http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf.

¹⁴⁹ See, e.g., S. REP. NO. 103-349, at 76 (1994) (“[T]he term ‘reasonable certainty of no harm’ means an increased risk of cancer to an individual exposed over a lifetime of no more than one in one million.”).

¹⁵⁰ Kathryn A. Kelly and Nanette C. Cardon's critical account of the origins of the one-in-a-million standard lends some support to this hypothesis. Two scientists randomly chose a safety standard of one in one hundred million in a 1961 article attempting to define when exposure to a substance could be considered “safe.” The FDA adopted that number in a 1973 notice in the Federal Register, and changed it to one in one million by the time that final rule was issued in 1977. Kathryn A. Kelly & Nanette C. Cardon, *The Myth of 10⁻⁶ as a Definition of Acceptable Risk*, EPA WATCH, at 5 (Sept. 15, 1994).

¹⁵¹ *Grimshaw v. Ford Motor Co.*, 174 Cal. Rptr. 348 (Ct. App. 1981).

both closer to and less protected from their gas tanks.¹⁵² Of course, the tanks are also smaller. But suppose, for the sake of argument, that risks of gas tank explosion are more dangerous in motorcycles. Does it follow that the risk of gas tank explosions is as significant for motorcycles as it is for passenger cars? It seems unlikely to me that it does. Even if gas tank explosions are equally frequent and more dangerous in motorcycles than in passenger cars, the risk of gas tank explosion is qualitatively more significant in passenger cars. The risks associated with motorcycle gas tanks are framed by the heightened risks characteristic of motorcycles. The relatively small size of motorcycles in comparison with cars and trucks and the exposed nature of riding on a motorcycle subject motorcyclists to a host of other substantial risks. Motorcyclists bear greater-than-normal risks of being crushed in collisions with other vehicles, greater-than-normal risks of being thrown from their cycles, and greater-than-normal risks of severe head trauma, to name just three. Risks of gasoline tank explosion do not stand out as especially salient—especially significant—in such company.

The heightened risks of gas tank explosion in sedans stand out more simply because sedans are safer. Purchasers of subcompact sedans seek a higher level of safety than motorcyclists (though not as high a level of safety as the purchasers of some luxury vehicles). They do not choose to forego the protections of a passenger compartment for themselves and their offspring in exchange for the thrills of immediate exposure to both road and machine. Implicit in the purchase of a subcompact family sedan is a desire for reasonably safe transportation, consistent with the constraints imposed by the fact that the car being purchased is a comparatively inexpensive subcompact. In this context, the risks of gas tank fires stand out, quite independent of any hidden flaw in the car. For people who are trying to keep their children safe, the risks of an automobile's gas tank are especially salient. Gasoline explosions threaten horrible deaths, horrible disfigurements, and terrible psychological trauma.¹⁵³ These characteristics make the risks of gas tank explosion in subcompact cars qualitatively significant in a way that risks from motorcycle gas tanks are not, even if the risks of motorcycle gas tanks are quantitatively much greater.¹⁵⁴

The *significance* of a risk, then, is not simply a matter of quantity, understood as statistical probability and magnitude measured numerically. Significance depends on both gravity and salience. Determining the gravity of a risk requires evaluative and qualitative judgments—judgments about how much we should fear a particular kind of harm or harms, how much a particular harm impairs the pursuit of a normal life, how bad it would be to live with that harm, and so on. Determining the salience of a risk requires not just an appraisal of the risk's numerical probability, but also an evaluation of how prominent the risk is in comparison to other risks of the activity responsible for the risk at issue.

¹⁵² In 2011, fires occurred in 0.1% of the vehicles involved in all traffic crashes. U.S. Dept. of Transportation, *Traffic Safety Facts 2011*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION 61 (2013), <http://www-nrd.nhtsa.dot.gov/Pubs/811754AR.pdf>.

¹⁵³ Aspects of the Pinto's design made the failure of its gas tank even more salient. In comparison with other subcompact cars, the design of the gas tank was substandard. Gary Schwartz, *The Myth of the Ford Pinto Case*, 43 RUTGERS L. REV. 1013, 1027–28 (1991).

¹⁵⁴ Some readers may worry that what is at work here is simply an “availability heuristic,”—a form of irrationality made famous by Kahneman & Tversky. See A. Tversky & D. Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, 5 COGNITIVE PSYCH. 207 (1973). In some cases, this worry may be well-founded. In other cases, the framework deployed by the “availability heuristic” literature may be guilty of reductionism—of treating qualitatively different risks as if they were identical. The only way to settle the matter is by determining if we have good reasons to fear some risk (e.g., gas tank explosions) more than another risk.

IV. SAFETY, FEASIBILITY, AND SIGNIFICANCE

These standards and concepts constitute reasonably coherent, reasonably well-developed legal regimes. However, the concepts and structure of safety and feasibility analysis also raise three basic questions. First, when we push beyond the cost-justified level of safety, why should we eliminate only significant risks of serious physical harm? Why not eliminate all risks of physical harm? Second, why should we sometimes require the elimination of all significant risks of injury and other times require only the elimination of those significant risks whose elimination is feasible? Why are we prepared to shut down some activities that cannot be made safe, but not others? Third, what kind of connections are there between the priorities these standard place on avoiding harm and the harm-benefit asymmetry?

The first question raised by these standards is why even the more stringent “safe-level” standard requires something less than absolute safety. Both the 1990 Amendments to the Clean Air Act and the Supreme Court's opinion in *American Petroleum* make clear that the elimination of significant risk is not the same as the elimination of all risk.¹⁵⁵ So the “safe level” of risk is not the same as “no risk.” Second, safety-based regulation is all risk evaluation and no cost assessment. Significant risks must be reduced until they are insignificant—without regard to cost—but insignificant risks are tolerated, also without inquiring into the cost of eliminating them. Why draw the line at significance? Why not eliminate all risks of devastating injury? Why ignore all of the costs of eliminating significant risks? If we are prepared to eliminate significant risks without regard to cost, why should we refrain from eliminating insignificant risks without so much as inquiring into the costs of doing so? We shall take these questions up in turn.

A. Why Leave Insignificant Risks Of Devastating Injury Untouched?

Safety-based risk regulation is both strikingly stringent and surprisingly lax. As familiar as we are with cost-benefit analysis and its insistence on balancing costs and benefits so as to extract the greatest possible net benefit from risky but valuable activities, we can hardly help but be struck by the fact that categorical judgments of significance push risk-reduction beyond the point of maximal benefit, economically conceived. But the doctrine has a lax side as well—it leaves insignificant risks entirely untouched—and this lenient side is equally noteworthy. Why should a standard that forbids trading safety against costs above some threshold level of risk have a threshold to begin with? Even insignificant risks of devastating injury are risks of devastating harm. A lifetime cancer risk of less than one in a million is still a risk of a devastating disease, and devastating disease, when it materializes, wreaks havoc in someone's life. Even an insignificant risk of devastating disease can end a life prematurely and traumatically. At best, being afflicted with a devastating disease impairs life severely, foreclosing the pursuit of certain activities and ways of life, seriously hampering the pursuit of others, and often leaving us with enduring, agonizing pain and suffering. Why should we tolerate any risk of such harm?

An answer to that question lies in the fundamentals of the predicament with which the law of accidents must grapple. We each have various aims, ends, and aspirations to pursue over the course of our lives. We may each expect, with decent luck, to pursue our aims and aspirations over the course of normal life spans. In order to pursue our aims and aspirations effectively over the course of complete lives, however, we need both the freedom to act (liberty) and physical integrity

¹⁵⁵ See, *supra* notes 96, 99 and accompanying text.

(freedom from physical harm, or security). Liberty and security are preconditions of rational agency. Like Rawls' "primary goods," liberty and security are things that we each need if we are to realize any aims or aspirations.¹⁵⁶ Liberty is essential because we can neither survive, nor realize much of anything of value, unless we are free to engage in a wide range of activities. But security is equally essential. Physical injury can end our lives prematurely or leave us permanently impaired in ways that prevent us from pursuing many valuable ends and aspirations. Indeed, even injuries that do not kill or permanently harm us may disrupt our lives in ways that utterly upend our life plans.

Our predicament is that liberty and security conflict. Perfect safety is unattainable. Risk of physical harm—diminished security—is the byproduct of action. Diminished liberty is the price of increased security. We cannot farm, build, drive, fly, eat and drink, or mill cotton and refine benzene without taking and imposing risks of devastating injury. Foregoing all activity would itself be a short path to death, and even if death could somehow be avoided, foregoing all activity would cripple the pursuit of our aims and aspirations as surely and severely as devastating physical injury does. A world in which no one moves is a world in which few, if any, aims, ends, and aspirations can be realized, and few, if any, lives can be led. We must therefore bear the level of risk that this paper earlier called the background level of risk. Background risks are acceptable—worth bearing—because eliminating background risks does even more harm to our ability to lead the lives we wish to lead than does bearing those risks. This is true even though the risks are sure to result in some devastating injuries. The background level of risk must be accepted despite the fact that level results in some devastating injuries, because some risk of devastating injury is the price of activity and activity is worth having. Without a "significance" requirement, one essential condition for leading a worthwhile life—the freedom to act in the world—would be destroyed in the name of another essential condition, namely, safety. The elimination of *all* discernible risk requires the elimination of all discernible activity. And the elimination of all discernible activity is a cure worse than the disease it treats.

B. Why Exclude Costs Entirely?

The threshold of significance is the first distinctive feature of safe-level analysis. The second is its disregard of the costs of reducing risks to the point of insignificance. Consider, for example, the determination in the Food Quality Protection Act of 1996 that tolerances for pesticide residue must be set at a level that is safe, where "safe" means that "there is a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information."¹⁵⁷ This determination expresses a legislative judgment that the costs of reducing pesticide residues to safe levels not only *may* be disregarded entirely, but *must* be disregarded entirely. Structurally, then, safety-based regulation is radically different from cost-benefit analysis. To determine an appropriate level of safety, cost-benefit analysis insists on balancing all relevant considerations (as it conceives them) in a comprehensive calculus. Safety-based regulation insists on *excluding* an entire class of arguably relevant reasons—namely, costs—from the exercise of fixing an acceptable level of risk.¹⁵⁸

¹⁵⁶ See, e.g., RAWLS, *POLITICAL LIBERALISM* 181 (1993) (listing five primary goods: basic rights, freedom of opportunity, participation in political and economic institutions, income and wealth, and self-respect).

¹⁵⁷ Food Quality Protection Act, 21 U.S.C. § 346a(b)(2)(A)(ii) (2012).

¹⁵⁸ The "exclusionary" character of safety-based risk regulation is not odd in an important sense. Most norms of practical reason instruct people to disregard some relevant reason(s). See JOSEPH RAZ, *PRACTICAL REASON AND NORMS* (Princeton Univ. Press 1990). We're investigating something more particular here: why exclude costs entirely?

Why—or in what contexts—should we disregard entirely the costs of eliminating significant risks, pursuing risk reduction until we have cut the risk to the point at which it is no longer significant? In answering this question, it helps to realize that the safety norm defines an attractive social world so far as risks of physical injury are concerned. The risks that it tolerates are ones whose probability is so low that we may reasonably ignore them, even though someone will be unfortunate to be harmed by them. A social world sufficiently safe that each of us might reasonably expect to live a life of normal length—secure in the knowledge that we can reasonably expect that our lives will not be cut short by death or devastating injury—is an immensely attractive social world. The basic premise of the safety norm is that we should not sacrifice such a world unless we stand to gain something of comparably great value. We should, therefore, eliminate significant risks of injury when the costs of doing so are not comparable to the devastation that significant risks are sure to inflict. This deceptively simple answer suggests a division of labor between safety and feasibility-based risk regulation. Safety-based risk regulation is appropriate when the costs of reducing risks of devastating injury to the point at which they are no longer significant are *not* comparable to the costs of bearing those risks of devastating injury. Feasibility-based risk reduction is appropriate where the costs of reducing risks of devastating injury to the point at which they are no longer significant *are* comparable to the cost of bearing those risks of devastating injury.

C. Comparability and Safety-Based Risk Regulation

The harms threatened by the risks that are subject to safety-based regulation are a particular sort of irreparable injury. The costs of unsafe food, air, and water include irreparable injury to health, and health is an essential condition of effective human agency—a kind of primary good. What about the benefits of bearing risks to health, or the flip side of the coin, the costs of reducing such risks? How should we characterize them? Pesticide residue on our crops is the byproduct of the pursuit of greater agricultural productivity. Toxins in our air and water are byproducts of ordinary, economically productive activities (ubiquitous byproducts, perhaps). The enactment of safety-based regulatory statutes expresses a categorical judgment that the costs these productive activities must bear in order to eliminate significant risks of devastating harm are acceptable. We need not inquire into the costs of eliminating significant risk on a case-by-case basis, and we need not attend to the marginal balance of cost and benefit in any particular case, because the benefits of significant risk are simply not comparable to the incidence of harm to human health that is their price. The safety-based regime in place for the regulation of the risks of pesticide residues on agricultural products, for example, expresses the conclusion that no amount of increased agricultural productivity can justify imposing a significant risk of devastating disease. The benefits of more risk—the increased yield in crops harvested per acre planted and the like—are not the kind of benefits that can justify the increased incidence of devastating injury that is their price.

Why might a reasonable legislature come to the conclusion that the benefits of increased agricultural productivity cannot justify imposing a significant risk of devastating injury? In part, because a reasonable legislature may reject the central idea of unrestricted cost-benefit analysis—that all goods are commensurable, fungible at some ratio of exchange. Laws like the Food Quality Protection Act of 1996 reject this assumption of fungibility. They single out health for special protection. Safety-based statutes assume that health—like the physical integrity of the person—is a kind of primary good, something that persons need in order to realize their aims and aspirations

over the course of a normal life span, whatever those aims and aspirations may be.¹⁵⁹ Health has a special urgency. It is part of a package of goods that are essential conditions of normally effective agency, and it takes priority over lesser, inessential goods. The harm-benefit asymmetry reflects this priority.

Within this framework, *foregoing* the benefits of the increased agricultural productivity that might be won by tolerating more risk than the safe-level standard tolerates might be justified by showing that increased productivity does not meet a need as urgent as health. Conversely, showing that satisfying the safe-level standard would prevent some citizens from securing adequate nutrition, and that adequate nutrition for all might be secured by tolerating more risk would show that increased productivity did meet a need as urgent as health.

1. Contingency and Comparability

A hierarchical view of human interests is one central piece of safety-based risk regulation, but not the whole of it. Individually and collectively, people exercise their agency by investing it in activities and projects. They thereby acquire more particular interests. In determining the appropriate level of safety, we must decide how important various investments of human agency are. Tacitly, safety-based risk regulation rests on particular historically and socially contingent facts, and on particular historically and socially contingent assessments about the importance of various interests. The Food Quality Protection Act of 1996, for example, rests implicitly on the claim that more yield per acre of crop planted is not a good able to be compared to a significant risk of irreparable health injury. Why? Because health is, for each of us, an essential condition of effective agency whereas the benefits of increasing the yield of crop per acre are not—for us, here and now—measured in the attainment of an equally essential condition of effective agency. The benefit of increased agricultural productivity is simply increased wealth, and the wealth obtained is not an essential condition of anyone’s agency. The benefits of increased agricultural productivity do not go to meet comparably urgent needs. We should not, therefore, treat risks to health and yield per acre as commensurable goods and let maximum overall benefit fix the proper balance between them. Were we poorer, matters might well be different. The benefit of increased agricultural productivity might be measured in our ability to provide adequate nutrition to each member of our society. Adequate nutrition *is* an essential condition of effective agency, one comparable to health in its urgency. Contingent social facts thus make the benefits of increased agricultural productivity not comparable to significant health risks.

The same combination of a hierarchical conception of human interests with historically and socially contingent facts is capable of explaining and justifying the application of safety-based risk regulation to air and water pollution. Air and water, like food, are necessities. Breathing and drinking, like eating, are unavoidable activities. Breathing the air and drinking water should not put our health in significant peril unless the cost of eliminating that peril threatens our agency in some comparable way. In an affluent society, the cost of eliminating significant health risks to the water we drink and the air we breathe is not comparable to the cost of bearing such risk. In poorer or less technologically advanced societies, matters might be different. In such societies, it might be

¹⁵⁹ See RAWLS, *POLITICAL LIBERALISM*, *supra* note 156, at 187–90 (describing primary goods as “citizens’ needs”). See generally, *id.* at 173–211. This conception of certain goods as primary is the flip side of the coin of the general badness of physical harm.

impossible to reduce the risks of air and water pollution to an insignificant level without seriously impairing basic agricultural production, or other essential productive activities. Impairing essential productive activities might threaten the health of those whose health we are attempting to protect more than the pollution that we are seeking to eliminate.¹⁶⁰ Safety-based risk regulation, in short, is justified when eliminating significant risks of devastating injury does not compromise, in a comparable way, a need or a good that is as important as health or physical integrity. Health is a need, not a want, and it should be compromised only in order to obtain some sufficiently valuable benefit.

When are burdens comparable? When bearing the precaution necessary to reduce a particular class of significant risk of devastating injury to the point of insignificance is a cure worse than the disease of bearing the burden of devastating injury that is the price of significant risk. Consider, for example, the significance requirement itself, and the burden of eliminating all risk including insignificant risk. The price of eliminating *all* risk (including, especially, insignificant risk) is the cessation of all activity. The elimination of all activity burdens an essential condition of agency—the freedom to act—even more than insignificant risk of devastating injury burdens the physical integrity of the person, another essential condition of human agency. The burden of eliminating *all* risks of devastating injury, for example, is greater than the burden of bearing insignificant risks, because the elimination of all risks requires the elimination of all activity.

Comparability with respect to effects on urgent human interests thus marks the point at which further reductions in risk may no longer be desirable. Within federal risk regulation, feasibility-based regulation of risks replaces safety-based regulation when the burdens of reducing significant risk do pose comparable threats to effective human agency. When are burdens to major, productive economic activities—the kind governed by both safety and feasibility-based risk regulation—comparable to significant risks of devastating injury? Feasibility-based risk regulation is constructed around an answer to that question: burdens to ordinary, productive economic activities—activities like milling cotton, refining petroleum, and growing crops—are comparable to significant risks of devastating injury when they threaten the long-run flourishing of those activities. Feasibility-based risk regulation supposes that the good realized by major, productive activities is comparable to, and generally greater than, significant risk of devastating injury. It is this claim and commitment that we must now examine.

D. Comparable Value and Feasible Risk Reduction

Workplace risks are the primary domain of feasibility-based risk regulation; OSHA is the primary practitioner of feasibility analysis; and workers are the primary beneficiaries of the feasibility standard. As practiced by OSHA, feasibility-based risk regulation presumes that the productive economic activities to which it applies are sufficiently valuable that shutting them down would cause greater hardship than will bearing the exposure to their significant risks of serious harm. Feasibility-based risk reduction supposes that allowing major productive activities to continue even when their continuation involves imposing significant risks of devastating injury is, at least, the lesser of two

¹⁶⁰ Both the safety and the feasibility norms are especially protective of those most imperiled by the risks that these norms regulate. When the distribution of burdens and benefits is at issue “our attention is naturally directed first” to the claims of those who bear the greatest burdens, “because if anyone has reasonable grounds for objecting to the principle it is *likely* to be them.” T.M. SCANLON, *Contractualism and Utilitarianism*, THE DIFFICULTY OF TOLERANCE, 124, 145 (2003).

evils. For example, shutting down major productive activities such as milling cotton and refining petroleum would work a greater long hardship to the workers who bear the brunt of the activities' risks than asking those workers to accept significant risks of devastating injury does. The burdens to workers are the natural focal point for appraising relative hardships, because workers are both the principal victims of the activities' risks and the principal beneficiaries of feasibility-based risk regulation. Because their lives and their health are endangered, and because increased safety competes with their job security, their claims have a special urgency and priority.

There is a strong resemblance between the view that feasibility-based risk regulation takes of the significant risks of major, productive activities, and the view that safety-based risk regulation takes of insignificant risk. Feasibility analysis tolerates significant risk when it is the price of particular major, productive activities. Safety-based risk regulation tolerates insignificant risk as the price of activity itself. Even under the best of circumstances, safety-based risk regulation supposes that a background level of risk of devastating physical injury must be accepted, because the cost of eliminating that risk is the prohibition of all activity, and the prohibition of all activity is a cure worse than the disease. The elimination of all risk of devastating physical injury paralyzes our lives, impairing our pursuit of valuable ends and activities more than the background level of risk itself does. Feasibility analysis applies these ideas in a more particular way. It holds that we are justified in accepting a level of risk greater than the background level of risk—a significant level of risk—when our only alternative is to shut down a valuable activity. The implicit judgment here is that shutting down the particular activities to which the feasibility norm applies does not further the fundamental interests of those that the activity most endangers but sets those interests back.

1. Feasibility Analysis as Practiced by OSHA

OSHA's judgments in *American Textile* nicely illustrate the application of feasibility analysis in both its technological and economic aspects, and the relation of feasible risk reduction to safety-based risk reduction. Cotton dust is the primary cause of byssinosis or "brown lung disease," a serious, potentially disabling disease.¹⁶¹ Because exposure to cotton dust is the primary cause of brown lung disease, the disease is "a distinct occupational hazard associated with cotton mills."¹⁶² At the time of *American Textile*, an estimated one in twelve retired cotton workers suffered from the most severe grade of byssinosis.¹⁶³ The best contemporary studies of the health effects of prolonged workplace exposure to cotton dust suggested that the exposure to "lint free cotton dust" could never be safe at any level higher than 0.2 mg of such dust per cubic meter, or 200 µg/m³.¹⁶⁴ OSHA concluded that this upper limit of safe exposure should be used to define the "permissible exposure

¹⁶¹ *American Textile*, 452 U.S. at 495 (1981). Byssinosis is a 'continuum . . . disease,' categorized into four grades '[k]nown generally as the Schilling classification grades.' *Id.* at 496, 496 n.8. These are:

[Grade] 1/2: slight acute effect of dust on ventilatory capacity; no evidence of chronic ventilatory impairment.

[Grade] 1: definite acute effect of dust on ventilatory capacity; no evidence of chronic ventilatory impairment.

[Grade] 2: evidence of slight to moderate irreversible impairment of ventilatory capacity.

[Grade] 3: evidence of moderate to severe irreversible impairment of ventilatory capacity.

Id. at 496 n.8. In 1970, an estimated 100,000 employed and retired cotton workers suffered from the disease, with an estimated 35,000 (or 1 out of every 12 of all employed and retired cotton workers) suffering from grade 3, the worst and most disabling form of the disease. *Id.* at 498.

¹⁶² *Id.* at 498.

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 499–500.

limit” (PEL) for exposure to cotton dust over the course of an eight-hour workday.¹⁶⁵ Attaining this PEL, however, was not always feasible. The “safe” level of 100 µg/m³ was thus technologically unattainable, and the best attainable level—the technologically feasible level—200 µg/m³, was economically infeasible.¹⁶⁶ Levels as high as 750 µg/m³ were accepted for weaving and slashing—one activity within the enterprise of milling cotton—because lower levels could not be achieved even with massive industry expenditures on safety.¹⁶⁷

The basic criterion of comparability employed by feasibility analysis is a localized and more relaxed application of the criterion employed by safety analysis. Safety analysis views the shutting down of all activity as a burden sufficient to justify bearing *insignificant* risk of devastating injury from any given activity. Feasibility analysis considers the crippling of major productive activities in our market economy as a burden sufficient to justify bearing *significant* risk of devastating injury from such activities. When it is technologically impossible to reduce some risk of an industrial activity, the only way to eliminate the risk is to eliminate the activity. When it is economically infeasible to do so, technologically feasible risk-reducing measures threaten the profitability of the activity and therefore call its long-term survival into doubt.

There are (at least) two different points of view from which the impact of shutting down significant productive activities in a market economy might be appraised. One point of view is that of those whom feasible risk-reduction seeks to protect, within the limits of economic possibility—namely, representative workers. From this perspective, the claim that shutting down the activity is a cure worse than the disease asserts that a representative worker would be done more harm by the cessation of the activity than they would be by bearing a significant risk of serious, debilitating harm. If the activity were to cease, workers would lose their jobs. For anyone who is not independently wealthy, a job is a primary good in its own right. The loss of that good might very well inflict more injury on their lives than continuing to work under significant threat of serious and irreparable physical harm. The counter-argument here, of course, is that just how bad it is to lose one job depends on just how hard it is to land another. Feasibility analysis does not engage in this kind of opportunity cost analysis, however, a fact that suggests that we should search for another line of argument. Before we do so, we should note the other point of view from which the impact of shutting down significant productive activities might be assessed. That point of view is not that of those most imperiled by the activities, but the point of view of the rest of us: those of us who reap the benefits of milling cotton and refining petroleum without having to bear the serious health risks

¹⁶⁵ *Id.* at 500.

¹⁶⁶ *Id.* at 502, 504.

¹⁶⁷ The court explained:

OSHA interpreted the Act to require adoption of the most stringent standard to protect against material health impairment, bounded only by technological and economic feasibility. OSHA therefore rejected the industry’s alternative proposal for a PEL of 500 µg/m³ in yarn manufacturing, a proposal which would produce a 25% prevalence of at least Grade 1/2 byssinosis. . . . Although recognizing that permitted levels of exposure to cotton dust would still cause some byssinosis, OSHA nevertheless rejected the union proposal for a 100 µg/m³ PEL because it was not within the ‘technological capabilities of the industry.’ Similarly, OSHA set PELs for some segments of the cotton industry at 500 µg/m³ in part because of limitations of technological feasibility. Finally, the Secretary found that ‘engineering dust controls in weaving may not be feasible even with massive expenditures by the industry,’ and for that and other reasons adopted a less stringent PEL of 750 µg/m³ for weaving and slashing.

Id. at 503–04 (citations omitted).

of those activities. The question from this point of view is whether the rest of us can do without these activities.

2. Justifying Feasible Risk Reduction

Courts have had relatively little to say about the justification for (as opposed to the application of) the feasibility standard. Features of the practice, however, prompt the following thoughts. First, the major, productive economic activities whose long-run flourishing feasibility-based risk regulation accepts as more important than the elimination of significant risks of devastating injury are more than net beneficial. We cannot really entertain the possibility of living without those activities. For all practical purposes, the outputs of these activities are indispensable. Life as we know it really does depend on refining petroleum. That our dependence on petroleum (or cotton) is historically contingent and transient does not diminish petroleum's present importance. If the price of eliminating their "significant" risks is the elimination of the activities themselves then the significant risks of these activities are risks that we cannot imagine avoiding. Second, the major productive activities to which feasibility analysis applies are not relevantly distinguishable from each other. The reasons that we have for putting up with the significant risks imposed by refining petroleum are the same reasons that we have for putting up with the significant risks of milling cotton. The case for shutting down one major productive activity is therefore a case for shutting down all similar activities. That price is too high to pay for the elimination of significant risk.

One claim implicit in the first point is that contingent social facts—accidents of history, if you like—can embed themselves so deeply in the structure of our social life that what once might never have taken root can now only be uprooted at enormous cost. We can readily imagine social worlds without cotton clothing or petroleum products. We know that such social worlds have existed in the past, and we expect a social world without petroleum products to exist at some point in the future. Those who have lived and who will live without cotton shirts or petroleum products surely have not suffered and will not suffer great hardship—hardship comparable to debilitating physical harm—because they are deprived of the fruits of these activities. For us, however, avoiding these activities is not a plausible option. Shutting down the activity of refining petroleum, for example, is essentially unthinkable. Petroleum products are knit so tightly into the fabric of our daily lives that we cannot simply decide to do without them.

The second idea applies a test of generalization and makes a claim about the outcome of that test. This criterion parallels and repeats, in a more localized manner, an important part of the argument for tolerating *insignificant* risks of devastating physical injury. Suppose that we chose to stop milling cotton or refining petroleum because these activities cannot be conducted without imposing significant risks of devastating injury. Fairness would then require us to stop all similar productive activities—all major, productive activities that cannot be conducted without imposing significant risks of serious impairment.¹⁶⁸ If milling cotton and refining petroleum are typical of the class of

¹⁶⁸ This kind of generalization test is common in ordinary negligence analysis. See, e.g., *Grace & Co. v. City of L. A.*, 168 F. Supp. 344, 349 (S.D. Cal. 1958) (holding that it would be unreasonable to rule that the defendant should have inspected a graphite water pipe that had not been inspected in 40 years and that damaged plaintiff's property when it burst, because the costs of unearthing and inspecting every buried pipe every 2 to 3 years "would be prohibitively expensive and economically unfeasible"); See also, *Clinton v. Commonwealth Edison Co.*, 344 N.E.2d 509, 515 (Ill. App. Ct. 1976) (holding that the plaintiff's proposed precaution of requiring the defendant utility to insulate the 720-volt power line that electrocuted a 15-year-old boy was unreasonable as a matter of law because it would be "tantamount to requiring defendants and all who are engaged in the business of supplying electrical service to insulate all of their lines").

productive activities to which feasibility analysis applies, this result is unacceptable. Perhaps the life prospects of those most endangered by cotton milling would be better if we eliminated that activity and no other class of persons would suffer a worse hardship than those most endangered by cotton milling now do. Perhaps the same is true if we ceased refining petroleum (although I doubt it), but the more activities we add to the list, the less plausible the claim is that we are avoiding greater threats to effective agency in exchange for lesser threats.

It is, in short, eminently reasonable to believe that shutting down most of the major productive activities in our economy would work more harm than bearing the significant risks of serious harm that these activities impose. And it is unreasonable to think that we can live without major productive activities. To return to the first of the two perspectives mentioned earlier, shutting down most of the major productive activities in our economy almost certainly would not create more favorable conditions for those employed by the activities (and most exposed to their risks) to exercise their autonomy.¹⁶⁹ Working is both a primary good essential for the exercise of agency, and a way in which people realize the ends and values that make autonomy something worth having.

V. THE SENSE IN SAFETY AND FEASIBILITY ANALYSIS

Cost-benefit analysis aspires to mimic the market, and the market treats everything, good or bad, as fungible at some ratio of exchange. In conceptualizing matters this way, cost-benefit analysis is starkly at odds with our ordinary moral intuitions. The health and physical integrity of our persons are not goods that we are inclined to regard as fungible with, say, fine jewels and expensive wines. We prioritize the protection of our lives and our limbs over our consumption of luxury goods. Desperation aside, no one sells parts of their physical persons and we would surely think that there was something wrong with someone who was prepared to part with a limb to pay for a luxury good.¹⁷⁰ Health and safety are needs, and needs have priority over mere wants. These convictions are controversial but they are also widely shared by people who consider themselves politically liberal. Unsurprisingly, these statutory standards were the product of liberal law reform in full flower and they rest on a political morality that is liberal in the philosophical sense. That political morality

¹⁶⁹ The Court considered this type of argument in *Whitman v. American Trucking Ass'ns, Inc.*, 531 U.S. 457 (2001):

(R)espondents argue . . . [that] the economic cost of implementing a very stringent standard might produce health losses sufficient to offset the health gains achieved in cleaning the air—for example, by closing down whole industries and thereby impoverishing the workers and consumers dependent upon those industries. That is unquestionably true, and Congress was unquestionably aware of it . . . Section 110(f) (1) of the [Clean Air Act] permitted the Administrator to waive the compliance deadline for stationary sources if, *inter alia*, sufficient control measures were simply unavailable and ‘the continued operation of such sources is *essential . . . to the public health or welfare.*’

Id. at 466–67 (emphasis supplied by the Court) (citations omitted).

¹⁷⁰ In India some beggars are purposefully disfigured in order to play on sympathies and make more money. Randeep Ramesh, *Indian doctors accused in ‘arms-for-arms’ scandal*, THE GUARDIAN (July 31, 2006), available at <http://www.theguardian.com/world/2006/jul/31/india.randeepramesh>. In Bangladesh, the “beggar mafia” will often “intentionally impair healthy children in various cruel methods and [force] them to get into beggary.” Abdullah Al Helal and Kazi Shahdat Kabir, *Exploring the Cruel Business of Begging: The Case of Bangladesh*, 3 ASIAN J. BUSINESS AND ECON. No. 3.1, available at <http://www.onlineresearchjournals.com/ajbe/art/79.pdf>. These examples show that there are social conditions under which people cannot live decent lives—not that physical integrity is just another commodity to be consumed.

supposes that the fundamental role of the state and, therefore, of the legal system, is not to promote social welfare, but to secure for every citizen the basic conditions for each citizen to pursue their own good—their own happiness—as they understand it.

This kind of view is neither welfarist nor consequentialist. It takes consequences into account in designing institutions and rights, but it does not take consequences in an end state of the world to be the sole or master value. In its most powerful contemporary form, this kind of view “takes as basic not the value of the state of affairs that an action or policy would lead to but rather the justifiability of [the] action or policy” to those that it governs.¹⁷¹ Its project is to devise laws and institutions which protect fundamental individual interests, especially freedom. It supposes that, in general, the best way to promote well-being is to leave it to individuals to pursue happiness as they see fit. The central value of the liberal tradition is not welfare, but freedom. The primary role of legal and political institutions, therefore, is not to promote social welfare, but to construct a framework in which the essential interests of each person are protected, and reasonably favorable conditions for people to lead their own lives are established.

Within a framework which takes our separateness and independence as persons to be fundamental, and which understands persons as agents who have a fundamental interest in authoring their own lives, harm has a special significance and its avoidance has a special priority. Serious harms—death, disability, disease, and the like—compromise a foundational condition of effective human agency. Impairing basic powers of human agency cripples the pursuit of a wide range of human ends and aspirations, and denies normal human lives to those whose powers are impaired. The imposition of physical harm is bad for those harmed no matter what particular aspirations and commitments they happen to have. Matters are different with respect to most benefits. Benefit, like happiness, is mostly for each of us to pursue as best we can. Each of us is presumptively the best judge of our own good and it is independently important that we choose our own good and author our own lives, even if we are not likely to choose as well as some benign despot might. Leading our own lives is an essential aspect of autonomy.

Harm’s special priority—in both our ordinary moral thinking and in our legal system—thus makes sense within a liberal philosophical framework. The question, then, is whether the safety and feasibility norms are plausible articulations of that priority. The burden of this paper has been to show that they are. First, the significance requirement found in both safety and feasibility-based risk regulation is warranted because some harm is unavoidable. The fact that freedom of action and freedom from harm conflict is an intractable feature of the human condition. Some risk of physical harm is the inescapable byproduct of action. The fact that a low level of risk of devastating injury (“the background level of risk”) is an inevitable price of activity explains why a significance requirement must be introduced, implicitly or explicitly, into even the most stringent standards of risk regulation. Before we attempt to reduce a risk we must first conclude that it crosses the threshold that separates eliminable risks from ineliminable ones. Without a significance requirement, safety-based risk regulation would be self-defeating. One essential condition for leading a worthwhile life would be destroyed in the name of another essential condition.

Safety-based risk regulation is justified when eliminating significant risks of devastating injury does not compromise in a comparable way a condition of human agency which is as important as

¹⁷¹ T.M. Scanlon, *Rights and Interests*, in ARGUMENTS FOR A BETTER WORLD: ESSAYS IN HONOR OF AMARTYA SEN: VOLUME I, 68, 71 (Basu & Kanbur, eds. 2009).

health or physical integrity. Health is a need, not a want, and it should be compromised only in order to meet another comparably urgent need. From a perspective which takes needs as its touchstone and urgency as its metric of comparison the stringent “safe level” prescriptions of the Food Quality Protection Act of 1996 are sound in principle. Requiring that tolerances for pesticide residue on food products be set at a level at which “there is a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information,”¹⁷² even in light of the special susceptibility of infants and children to harm from toxic substances,¹⁷³ is eminently reasonable. The harms being guarded against devastate people’s lives. Insisting on this kind of stringent precaution against them is reasonable unless attaining this level of safety will impose some burden comparable to a significant risk of devastating physical injury. Depressing agricultural productivity to the point of threatening malnutrition would be a comparable burden.

Feasibility-based regulation of risks of devastating injury replaces safety-based regulation when the burdens of reducing significant risk are comparable to the risks themselves. When are burdens to major, productive economic activities—the kind governed by both safety- and feasibility-based risk regulation—comparable to significant risks of devastating injury? Feasibility-based risk regulation answers that question by saying that burdens to ordinary, productive economic activities—like milling cotton, refining petroleum, and growing crops—are comparable to significant risks of devastating injury when the burden of the precautions necessary to reduce significant risks to the point of insignificance threaten the long-run flourishing of those activities. Those who depend upon the industries for their livelihoods are likely to lose more from the loss of their jobs than they gain from the elimination of its risks. And the rest of us cannot live without the activities, and must therefore accept their risks. This, too, is a plausible position. And insofar as it is, a reasonable legislature is free to do as Congress has and to enact feasibility-based risk regulation. Cost-benefit analysis is not the only game in town and cost-justified precaution is not the only plausible standard of precaution.

¹⁷² 21 U.S.C. §346a(b)(2)(A)(ii).

¹⁷³ 21 U.S.C. §346a(b)(2)(C).