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Predictable Punishments

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Economic analyses of both crime and regulation writ large suggest that the subjective cost or value of incentives is critical to their effectiveness. But reliable information about subjective valuation is scarce, as those who are punished have little reason to report honestly. Modern "big data" techniques promise to overcome this information shortfall but perhaps at the cost of individual privacy and the autonomy that privacy's shield provides.

This Article argues that regulators can and should instead rely on methods that remain accurate even in the face of limited information. Building on a formal model we present elsewhere, we show that variability in a defendant's subjective costs of punishment should be a key consideration in any incentive system, whether it be criminal law or otherwise. Our model suggests that this variability can be mitigated with some familiar and well-tested tools. For instance, in some situations, ex ante taxes on behavior that create a risk of harm can be preferable to ex post punitive regimes, such as the criminal law, that target primarily harms that actually arise.

Because of what we show to be the centrality of variation in subjective costs, we also argue that long-standing approaches to criminal theory and practice should be reconsidered. For example, economic theory strongly prefers fines over other forms of punishment. We argue that this claim is typically right—indeed, it is understated—when applied to firms. But fines can be the wrong choice for incentivizing most humans, while ex ante taxes are a promising alternative. We also show that this same analysis counsels that, if prison is the most viable punishment available, it can be more efficient to make prisons safer and less alienating.

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INTRODUCTION

When James pled guilty, everyone in the courtroom believed that James was a citizen.[1] The year was 2001, James was twenty years old, and he was accepting a sentence of thirty hours of community service in exchange for his guilty plea to a charge of receiving stolen property. What the sentencing court didn't know—couldn't know, given that James seemed to be a citizen—was that the plea deal would make James deportable. Fifteen years later, he was arrested on his way home from a Caribbean vacation, then later detained and placed into deportation proceedings. Though it was slow in arriving, James's "punishment"—or at the least the consequences he suffered as a result of his plea—ended up exceeding by several times over the sentence the court thought it was imposing.

This is an article about sentencing uncertainty and about uncertainty in the regulatory system more broadly. Thanks to the vast array of "collateral consequences" that now flow from a criminal conviction—deportation, eviction, disbarment, a permanently stained reputation—it can be difficult for a sentencing judge to predict just how severe the consequences will be for any given defendant.[2] Nor is uncertainty limited only to collateral consequences. A year in prison that might be bearable for some can be a special kind of torture for the defendant who

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1.   James's story is told in Steve Coll, *When ICE Tries to Deport Americans, Who Defends Them?*, NEW YORKER, Mar. 21, 2018.

2.   *See* Issa Kohler-Hausmann, *Managerial Justice and Mass Misdemeanors*, 66 STAN. L. REV. 611, 684–92 (2014) (surveying collateral consequences in the United States). Collateral effects are common in other punitive regulatory regimes in addition to the criminal law. Joshua D. Blank, *Collateral Compliance*, 162 U. PA. L. REV. 719, 728–44 (2014) (summarizing collateral punishments in tax system).

needs (but only irregularly receives) kidney dialysis daily. Much evidence now suggests that when a corporation is penalized for lawbreaking, most of the harms the firm suffers are not the government's official sanction, but reputational damage with its customers and business partners.[3] Often these harms are difficult for the regulator to predict in advance.[4]

As other writers have observed, uncertain punishments can seriously damage criminal justice—and, we'd add, other regulatory systems.[5] Economically speaking, the "optimal" punishment is the one that best balances the costs of wrongdoing against the cost of enforcement and compliance.[6] Under certain assumptions, this optimal sentence should be the same for everyone who commits the same kind of crime: injurers efficiently "internalize" the costs of their acts when they face an expected cost that mirrors the social impact of their deeds.[7]

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3.   *See* Anthony Bottoms & Andrew Von Hirsch, *The Crime-Preventive Impact of Penal Sanctions*, *in* THE OXFORD HANDBOOK OF EMPIRICAL LEGAL RESEARCH 96, 121 (Peter Cane & Herbert M. Kritzer eds., 2010); Michael P. Vandenbergh, *Beyond Elegance: A Testable Typology of Social Norms in Corporate Environmental Compliance*, 22 STAN. ENV'T L.J. 55, 125–26 (2003).

4.   Jonathan M. Karpoff & John R. Lott, Jr., *The Reputational Penalty Firms Bear from Committing Criminal Fraud*, 36 J.L. & ECON. 757, 763 (1993).

5.   *See, e.g.*, John Bronsteen, Christopher Buccafusco & Jonathan Masur, *Happiness and Punishment*, 76 U. CHI. L. REV. 1037 (2009); Adam J. Kolber, *The Subjective Experience of Punishment*, 109 COLUM. L. REV. 182 (2009); John R. Lott, Jr., *Do We Punish High Income Criminals Too Heavily?*, 30 ECON. INQUIRY 583, 584 (1992); *see also* Miriam H. Baer, *Evaluating the Consequences of Calibrated Sentencing: A Response to Professor Kolber*, 109 COLUM. L. REV. SIDEBAR 11, 12–14 (2009) (agreeing with Kolber about the subjective experience but recommending different solutions). Those who reject economic or incentive-based explanations for the criminal law may not be as troubled. *See* Dan Markel & Chad Flanders, *Bentham on Stilts: The Bare Relevance of Subjectivity to Retributive Justice*, 98 CALIF. L. REV. 907, 911–15 (2010) (arguing retributivists should not care that defendants' subjective experience of punishment varies).

6.   JONATHAN GRUBER, PUBLIC FINANCE AND PUBLIC POLICY 138–39 (2011); Isaac Ehrlich, *Crime, Punishment, and the Market for Offenses*, 10 J. ECON. PERSPS. 43, 50 (1996).

We acknowledge that an economic approach to crime will not appeal to all readers. We are welfarists, and so we believe that good policy should aim to maximize overall social well-being. In making those calculations, society's preferences for distributive or other kinds of justice are an important input. Louis Kaplow & Steven Shavell, *Fairness Versus Welfare*, 114 HARV. L. REV. 961, 990–91 (2001). Some theorists of crime, though, would elevate "retributive justice" over other moral considerations. *E.g.*, Michael S. Moore, *The Moral Worth of Retribution*, *in* RESPONSIBILITY, CHARACTER, AND THE EMOTIONS: NEW ESSAYS IN MORAL PSYCHOLOGY 179, 181–82 (Ferdinand Schoeman ed., 1987); Dan Markel, *Retributive Justice and the Demands of Democratic Citizenship*, 1 VA. J. CRIM. L. 1, 5–6 (2012). We don't ignore retributive justice, but we give it less weight than these other commentators. While retributivists may not accept all our analysis, we think it should be relevant to them at least for "regulatory" offenses and other crimes that are not ordinarily a source of moral opprobrium, if they agree those should be punishable at all. *See* Markel, *supra*, at 12–14 (arguing for retributivist approach to "mala prohibitum" offenses).

7.   *See* Maureen L. Cropper & Wallace E. Oates, *Environmental Economics: A Survey*, 30 J. ECON. LITERATURE 675, 678–80 (1992). Essentially, this statement in the main text holds whenever all defendants are equally likely to offend (or, put another way, receive the same "benefit" from non-compliance), to be detected, and to cause harm of a given level.

If the burdens of punishment were truly unpredictable, economics might have little complaint,[8] but the trouble is that instead defendants often have a better sense of their likely outcomes than the government can have. James knew that he didn't have any paperwork showing he was a citizen; corporations know how important their reputations are to a successful relationship with their customers. Defendants who know that they will suffer unusually heavy burdens will be more deterred than average, while those who believe themselves relatively less vulnerable will be less deterred. If the government or regulator has set the sentence at the level that provides for optimal deterrence of the *average* offender, those who are not average will be over- or underdeterred.[9] As we'll explain, the social cost of these errors rises steeply, so that even modest-sized mistakes can inflict serious societal harm.

As we said, uncertainty is not limited to what we traditionally think of as "collateral" or unintended sanctions. Again, the subjective experience of prison can vary widely from individual to individual. Even dollar incentives, such as fines, tort awards, or taxes, can arguably have an unpredictable impact. The burden of a few hundred-dollar fines might seem trivial to most people. But for the drivers of Ferguson, Missouri—and many other places in America—a few small fines quickly snowball into serious life trouble. People who live on the edge of financial catastrophe have a vastly different utility cost of a hundred-dollar payment than those who live on the edge of a cliff with spectacular ocean views.[10] There's no clear scholarly consensus on how economic analysis of regulation should reflect this reality.[11] We'll argue that several of the major rival approaches would require regulators to account for individual variation in the "marginal utility" of each dollar, and that this variation in fact is usually unobservable.[12]

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8. Holding the average sentence constant, an unpredictable sentence reduction actually increases welfare because it reduces the defendant's suffering without increasing crime. But the reverse is of course true about unpredictable sentence increases.

9. We explain this claim in more detail in Part II.

10. GRUBER, *supra* note 6, at 29–30.

11. *See, e.g.*, Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553, 1578–80 (2002); John Bronsteen, Christopher Buccafusco & Jonathan Masur, *Well-Being Analysis vs. Cost-Benefit Analysis*, 62 DUKE L.J. 1603, 1645–50 (2013); Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. ECON. PERSPS. 45, 46 (1994); W. Kip Viscusi, *Regulation of Health, Safety, and Environmental Risks*, *in* HANDBOOK OF LAW AND ECONOMICS 592, 621 (A. Mitchell Polinsky & Steven Shavell eds., 2007).

For discussion in the criminal law context, see David S. Abrams, *The Imprisoner's Dilemma: A Cost-Benefit Approach to Incarceration*, 98 IOWA L. REV. 905 (2013); Sonja Starr, *On the Role of Cost-Benefit Analysis in Criminal Justice Policy: A Response to the Imprisoner's Dilemma*, 98 IOWA L. REV. BULL. 97, 101 (2013).

12. W. Kip Viscusi, *The Heterogeneity of the Value of Statistical Life: Introduction and Overview*, 40 J. RISK & UNCERTAINTY 1, 7–11 (2010) (summarizing findings on ways in which wealth affects individuals' willingness to pay for safety); *cf.* Robin Boadway, *Cost-Benefit Analysis*, *in* THE OXFORD HANDBOOK OF WELL-BEING AND PUBLIC POLICY 47, 71–72 (Matthew D. Adler & Marc Fleurbaey eds., 2016) (arguing that uncertainty of project outcomes creates costs for risk-averse individuals that should be part of cost-benefit analysis but that doing so accurately is "difficult").

We aim to make several original contributions to the study of uncertain punishment (or rewards or other incentives). First, we set out in more detail than others have the sources and consequences of uncertainty. This establishes the groundwork for what we view as our most important additions: a series of proposals for how the criminal justice system (or other regulators) can either reduce uncertainty or use it to strategic advantage. Drawing on a formal economic model we set out elsewhere, we show that the most efficient regulatory system will typically aim to punish in ways that minimize the disparity in costs defendants suffer.[13] Since achieving that goal is costly along several dimensions, we also examine how to balance it against other important objectives, such as deterrence and administrative costs.

Of course, one natural way to minimize disparities between defendants is to observe the ways in which they are different and to adjust the formal punishment imposed to offset each defendant's unique circumstances. For example, John Lott, once the chief economist of the U.S. Sentencing Commission, has argued that fines should be lowered against corporations when those firms would suffer significant reputational damage as a result of the court's sentence.[14] Adam Kolber urges, perhaps tongue a bit in cheek, that those who take proportional retributive justice as the goal of punishment must individually examine and correct for the experience

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Proponents of cost-benefit analysis typically argue that the varying marginal value of a dollar does not interfere with the CBA project. Instead, regulators should maximize total dollar savings but use taxes and cash transfers to iron out any inequality that results. David A. Weisbach, *Distributionally Weighted Cost-Benefit Analysis: Welfare Economics Meets Organizational Design*, 7 J. LEGAL ANALYSIS 151, 161 (2015). For instance, if cost-benefit analysis counsels citing a power plant in a poor neighborhood because wealthier districts are willing to pay more to avoid pollution, the government could tax the wealthier district and use the resulting funds to pay the poor near the plant's location. *See* Boadway, *supra*, at 67–68 (explaining possibility of trades that make both parties better off). As long as this cash amount is less than what the rich would pay to escape pollution, and more than the poor would pay, everyone is better off. Bronsteen et al., *supra* note 11, at 1653.

Many other experts reject this approach. *See* Boadway, *supra*, at 58; Zachary Liscow, *Is Efficiency Biased?*, 85 U. CHI. L. REV. 1649, 1688–91 (2018) [hereinafter Liscow, *Is Efficiency Biased?*]. Empirically, we don't observe that such transfers take place. Lee Anne Fennell & Richard H. McAdams, *The Distributive Deficit in Law and Economics*, 100 MINN. L. REV. 1051, 1079–92 (2016); Zachary Liscow, *Are Court Orders Sticky? Evidence on Distributional Impacts from School Finance Litigation*, 15 J. EMPIRICAL LEGAL STUD. 4, 36–38 (2018). Other scholars note that such transfers would be impossible both politically and economically because of the large distortions that such transfers would impose. *See* Boadway, *supra*, at 60–61.

A major alternative is to incorporate so-called "welfare" or "distributional" weights. *Id.* at 63–67; Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 172 (1999). That is, the researcher adjusts the dollar costs and benefits she measures to reflect the varying value of a dollar (and of other impacts) across the population. This method necessarily requires that such values be observed at some level of generality. *See id.* at 189–90.

13.   Brian D. Galle & Murat C. Mungan, *Optimal Enforcement with Heterogeneous Private Costs of Punishment* (George Mason Univ. L. & Econ. Rsch. Paper, Working Paper No. 19-11, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3380273 [https://perma.cc/J5PH-GG6T].

14.   Lott, *supra* note 5, at 584.

of each defendant—in the future, for instance, by conducting brain scans of criminal defendants to measure their response to punishment.[15]

While we don't necessarily reject the possibility or appeal of these kinds of individualized adjustments, we argue that they are impractical in a wide variety of important settings. For instance, even if his sentencing court had known James would be subject to deportation, no reduction of his thirty-hour sentence could have come close to offsetting the impact of his later detention and potential deportation.[16] So, too, for Lott's corporations: since reputational damage is often several times larger than the formal sentence, courts would actually have to award money to defendant firms to offset their reputational harm.[17]

Individualized adjustment also demands credible information and that can be expensive or even socially painful to collect.[18] Perhaps a more feasible approach to Kolber's brain scans, but one arguably no less intrusive, would be to ask algorithms to collect everything that's observable about the people we regulate, so as to better know how they will respond when regulated.[19] "Big data"—along with other techniques for aggregating vast quantities of information about us—thus offers a tempting devil's bargain to modern governments, posing a stark tradeoff between privacy and other efficiency goals. If efficiency depends on panoptic surveillance of the regulated population, it comes at a steep, albeit currently unmeasured, price.[20]

There is a third option, which we view as our largest addition to the literature. It may be possible to select regulatory instruments that minimize the importance of heterogeneous individual responses, that is, of the subjective experience of the regulated.[21] We thus ask what regulators should do in the face of unobservable or otherwise *uncorrected* subjective experiences. And we propose that instead of adjusting each regulatory instrument in a thousand ways, regulators should choose

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15.   Kolber, *supra* note 5, at 220.

16.   *Cf.* Blank, *supra* note 2, at 756 (observing that personal burden of many collateral tax sanctions is often larger than any legally authorized monetary penalty).

17.   *Cf.* Jonathan M. Karpoff, John R. Lott, Jr. & Eric W. Wehrly, *The Reputational Penalties for Environmental Violations: Empirical Evidence*, 48 J.L. & ECON. 653, 655–56 (2005) (stating that reputational penalties are usually much larger than formal sanctions, but reporting evidence that shows this is not always true of environmental offenses).

18.   *See* Cary Coglianese, Richard Zeckhauser & Edward Parson, *Seeking Truth for Power: Informational Strategy and Regulatory Policymaking*, 89 MINN. L. REV. 277, 282–84 (2004) (describing costs to regulatory system of acquiring information held by private parties).

19.   Anthony J. Casey & Anthony Niblett, *The Death of Rules and Standards*, 92 IND. L.J. 1401, 1403 (2017) (arguing that "predictive technology" will allow law to "provide [rules] finely tailored to every possible scenario"); Omri Ben-Shahar & Ariel Porat, *Personalizing Negligence Law*, 91 N.Y.U. L. REV. 627, 629, 674–85 (2016) (calling for "customized standard of care" in tort law using "Big Data" and measurable characteristics of injurer). *See generally* Symposium, *Personalized Law*, 86 U. CHI. L. REV. 217 (2019).

20.   Ian Kerr & Jessica Earle, *Prediction, Preemption, Presumption: How Big Data Threatens Big Picture Privacy*, 66 STAN. L. REV. ONLINE 65, 66 (2013); Paul Ohm, *Sensitive Information*, 88 S. CAL. L. REV. 1125, 1149–70 (2015); Daniel J. Solove, *Data Mining and the Security-Liberty Debate*, 75 U. CHI. L. REV. 343, 354–61 (2008).

21.   We develop this argument in detail *infra* Section II.B.

instruments that need less adjustment. That is, government should aim to make everyone perceive one unit of its incentive—be that a dollar, a night in jail, or some combination—as equally pleasant or unpleasant across individuals.

Thus, our analysis suggests that safer and less alienating prisons can create benefits by reducing variance between prisoners. Prisons that don't protect prisoners from one another make those who can't defend themselves, or who are reluctant to commit violence against others, suffer more. Failing to provide adequate medical care punishes detainees with failing kidneys more than those who don't need dialysis. And when jail time severs a defendant's ties to family, job, and community, it is harshest on those who could work or who have people close to them. The good of eliminating these variances (even leaving aside their cruelty and injustice) should be balanced against the potential costs of providing safer and less alienating prisons.

Our model also suggests that government should prefer some incentives over others. To ground this point in a concrete example, we apply our analysis to one of the most celebrated results in the economic study of crime: the claim by Mitchell Polinsky and Steven Shavell that government should generally prefer fines over other forms of punishment.[22] Briefly, the duo show that fines are superior because fines serve to transfer resources instead of wasting them. That is, while twenty lashes might deter a pirate, the suffering that results benefits no one.[23] If the pirate instead is made to pay in doubloons, that wealth can pay for socially useful projects, which could potentially include compensating his victims.

In addition to this well-known "transferability" benefit, we show that fines have a second advantage over their alternatives, at least when it comes to regulating firms or other parties with a constant marginal utility of money (who are often referred to in the legal literature as "risk neutral"). For these defendants, a dollar really is a dollar, no matter who pays it. The theory Polinsky and Shavell offer does not distinguish between fines (or tort awards) and other instruments that could also transfer wealth. For instance, in competitive industries, a temporary ban on doing business enriches the banned firm's competitors. Our model suggests that fines are superior to these bans or other transfer alternatives because fines are more certain. For example, fines may be more certain because there is no variation across individuals in their valuations of money, but there is variation across individuals in how much they would profit or lose from a ban. Thus, in addition to enjoying a "transferability benefit" over other "sticks" (including imprisonment), fines also enjoy a "variance reduction" benefit over other sticks (which may or may not be monetary).

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22.   A. Mitchell Polinsky & Steven Shavell, *The Theory of Public Enforcement of Law*, *in* 1 HANDBOOK OF LAW & ECONOMICS 403, 420–21 (A. Mitchell Polinsky & Steven Shavell eds., 2007).

23.   *But see generally* MARQUIS DE SADE, JUSTINE, OR THE MISFORTUNES OF VIRTUE (John Phillips trans., Oxford Univ. Press 2012) (1791) (warning: not safe for work).

This previously underappreciated variance reduction benefit of fines implies important changes to how we usually regulate. For example, another key result in the economics of crime is that government should impose large fines on just a few people, in order to minimize the costs of detection and enforcement.[24] But the larger the fine, the more likely the defendant won't be able to pay. That means jail time instead. As Polinsky and Shavell have shown, the bigger the drop-off in efficiency between fines and the next-best choice, the worse it is for society when the defendant can't pay.[25] It follows that as fines become stronger options, we should be willing to pay more to track down more criminals, so that we can avoid having to send them to jail. In some cases, it might even make more sense to impose ex ante taxes on risks, rather than ex post punishments on realized harms.

Our advice looks very different when it comes to regulating individuals, however. Depending on how one accounts for the varying marginal utility of money, fines may also have important disadvantages that could weigh in favor of alternatives. In models that allow the same dollars to have varying impact depending on the available wealth the defendant has to draw on, fines are a relatively high-variance instrument.[26] This same criticism could be applied to similar dollar-denominated incentives, such as taxes imposed on bad behavior (often dubbed "Pigouvian" taxes after the economist who popularized them, A.C. Pigou).[27]

Yet another practical application of our project is to the burgeoning movement for "automatic" expungement of criminal records. California, Utah, and Pennsylvania have already adopted rules that make most criminal records secret without need for the lengthy and bureaucratic process that traditionally has accompanied expungement.[28] Our analysis suggests that expungements are often efficient for reasons commentators have not previously identified. But we also offer cautionary notes that would likely imply that expungements should not apply to every crime.

Part I of this Article will offer background on economic theories of regulation for readers new to that literature. In Part II we first provide a (relatively!) math-free explanation of the social costs of regulation under varying subjective valuation of the regulator's incentives.[29] As we acknowledge, this claim depends on a pair of key assumptions, and we detail what changes if those assumptions don't hold. We then argue that there are a few paths to minimizing the costs of subjective value, including by selecting less variant instruments, by engineering instruments to be less varying, by punishing more often in smaller amounts, and by using combinations of

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24. We summarize this literature *infra* Section III.A.
25. Polinsky & Shavell, *supra* note 22, at 419.
26. *See infra* Section III.A.
27. GRUBER, *supra* note 6, at 135.
28. Assemb. B. 1076, 2019–2020 Leg., Reg. Sess. (Cal. 2019); H.B. 431, 63rd Leg., 2019 Gen. Sess. (Utah 2019); H.B. 1419, 202d Gen. Assemb., 2018 Sess. (Pa. 2018).
29. Full disclosure: there's some math.

incentives. Part III offers our finer-grained analysis of fines, first with respect to people and then with respect to risk-neutral actors. We then conclude.

I. THE EXTERNALITY PROBLEM AND ITS SOLUTIONS

This Part reviews the economic approach to crime. Readers already familiar with these points can skip to Part II.

Criminal law is a form of regulation, and regulation is a balancing act, a tightrope walk in the dark. We regulate to change how others behave. Yet compliance is costly, and in deflecting private parties away from the path they would have chosen themselves, we may frustrate worthy goals and designs.[30] Eliminating even the worst pollutants is costly. Should government bankrupt coal producers, or is there a way to balance clean air against the costs of achieving it? A regulator who accounts for these losses must constantly weigh the gains that regulation offers against its costs.[31] Sometimes the left side of the scale outweighs the right, and we don't regulate at all. But balancing importantly informs not just whether to regulate but how.[32] What's the right fuel efficiency target for automobile fleets? How long should patents be? What's the right sentence for armed robbery?

A. Optimal Regulation

Modern economic theories of regulation formalize these problems and make them choices of the "optimal" design of the government's incentives.[33] The policy analyst measures the gains and losses each incremental change in policy would produce and tries to pick the spot on the continuum that best balances competing interests.[34] Under this "marginal" analytical approach, the policy maker asks herself, "on the margin—that is, for the very next unit of good or bad produced—what is the harm or benefit of that one unit for everyone in society?"[35] If increasing the amount of regulated activity would harm some people, we call this the "marginal social damage" (MSD) and "marginal social benefit" (MSB) for an improvement.[36] We then compare this harm or benefit against the marginal costs to the party being regulated, who we'll call here the "subject" of regulation.

Regulators usually set policy optimally when marginal social damage is equal to the subject's marginal cost of compliance.[37] Why equal? Well, we don't want the

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30.   GRUBER, *supra* note 6, at 138–39.

31.   Cropper & Oates, *supra* note 7, at 678–80.

32.   *Id.* at 680.

33.   GRUBER, *supra* note 6, at 137–39; Ehrlich, *supra* note 6, at 50.

34.   GRUBER, *supra* note 6, at 139.

35.   *See id.* at 126.

36.   *Id.* at 124–26.

37.   Gloria E. Helfand, Peter Berck & Tim Maull, *The Theory of Pollution Policy*, *in* 1 HANDBOOK OF ENVIRONMENTAL ECONOMICS 249, 253 (Karl-Goran Maher & Jeffrey R. Vincent eds., 2003). We're simplifying here for the sake of exposition. A more rigorous approach to setting the optimal quantity would also account for other factors that might affect the efficiency of the regulation. For example, if the regulation imposes costs, and the expectation of those costs changes behaviors other

costs of compliance to exceed the benefits: we might want the subject to reduce sulfur emissions, but it perhaps wouldn't make sense to spend, say, $100 million to extract one more ton of sulfur from the air.[38] What about when marginal social benefits exceed private compliance costs? Then we want to encourage more compliance, as otherwise we will have left cost-effective improvements on the table—if we can prevent a ton of sulfur for one dollar, we should do it.

One common way to encourage subjects to comply with regulation is by setting a price.[39] Suppose the EPA concludes that the optimal level of sulfur regulation falls at $1 million per ton of sulfur. At that point, the next ton of sulfur we prevent creates only, say, $990,000 worth of benefits for air-breathers but costs $1.1 million. We might then impose a one-million-per-ton tax on sulfur emissions.[40] Polluters that can reduce their sulfur for less than $1 million per ton will do so. Those who would have to pay more than $1 million will instead emit sulfur and pay the $1 million tax. No one will pay more to prevent sulfur emissions than the marginal social benefit EPA has calculated.

B. *Errors and Information*

Governments can use prices (among other tools) to convince private parties to set their production of good things or bad at optimal levels, but how does government know what the optimum is? Again, the optimum is the point at which public gains and private losses are exactly balanced. Determining benefits can be challenging because of difficulties of measurement or because they turn on value judgments, such as the moral importance of preserving endangered species, that the regulator must decide.[41] Private compliance costs are even trickier.[42] By definition, this data is typically in private hands. And the subjects of regulation often have every incentive to conceal or exaggerate their private compliance costs.[43]

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than the production of the externality, such as by distorting consumer choices among products, then the ideal regulation might balance disruption of these expectations against pollution control. Helmuth Cremer, Firouz Gahvari & Norbert Ladoux, *Externalities and Optimal Taxation*, 70 J. PUB. ECON. 343, 346 (1998).

    38.   Ehrlich, *supra* note 6, at 51. Note, importantly, that for simplicity we are assuming here that we should count the costs and benefits for the producer and everyone else equally. That's a controversial proposition, but our later claims apply whether or not one agrees with it.

    39.   GRUBER, *supra* note 6, at 135.

    40.   More technically, the standard recommendation is to set prices a bit below the point at which remediation costs and marginal social damage are equal. Enforcement is costly, and emissions at close to the intersection point impose only a tiny net social cost. Thus, it will typically be efficient to allow some degree of underenforcement. Polinsky & Shavell, *supra* note 22, at 410.

    41.   Cass R. Sunstein, *The Limits of Quantification*, 102 CALIF. L. REV. 1369, 1375–76 (2014).

    42.   GRUBER, *supra* note 6, at 142; Coglianese et al., *supra* note 18, at 278.

    43.   THOMAS STERNER & JESSICA CORIA, POLICY INSTRUMENTS FOR ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT 168 (2013). For a formal model of the underlying game theory, see Evan Kwerel, *To Tell the Truth: Imperfect Information and Optimal Pollution Control*, 44 REV. ECON. STUD. 595, 597 (1977).

Policy outcomes get worse and worse as regulators grow more uncertain about optimal behavior.[44] Again, if we set levels to be too high or too low, we have lost social welfare in either direction: either wasteful overregulation, or lost opportunities for efficient regulation. All else equal, these losses get bigger exponentially as the government's error increases.[45] That is, an error in which the government's regulatory target is ten percent off is, on average, four times as bad as one in which it is off by five percent.[46]

Why is that? Intuitively, the idea is that two things are happening as errors get bigger: First, every person affected is affected more. With a pollution tax that is $100 too high, each polluter wastes up to $100 overcomplying instead of just fifty dollars. Second, more parties are affected. A small error makes a difference for just a few subjects. But as errors get larger, there are more and more subjects for whom the difference in price actually matters to their behavior. Multiply these two factors together, and you get exponential increases. When the fine is fifty dollars too high, one factory overcomplies by fifty dollars; when it's $100 too high, two factories might overcomply by up to $100 each.

So when the government is unsure about private costs of compliance, it runs a risk that it will set its target "optimal" level too high or too low.[47] To be sure, regulators can hedge their bets. If the regulator knows that the costs of undercompliance are likely worse than the costs of overcompliance—nuclear power plant safety is a classic example—it can try to make sure it errs on the side of overregulating or vice versa.[48] Inevitably, though, the government's lack of complete information threatens to undermine the benefits of regulating.[49]

Very similar information problems can infect other parts of the regulatory system. As we've just seen, parties act optimally when they face a price for failure to comply that is set at the intersection of the private cost and marginal social benefit curves. But what if the parties get the price wrong? If the price of a speeding ticket is scientifically calculated to produce the socially efficient amount of speeding, but no one knows what the cost of a ticket will be, they are likely to speed more or less than would be optimal.[50] Drivers might also be unsure about the expected fine—that is, unsure not just of the amount of the fines, but also of the likelihood that they will be caught speeding.[51] The expected fine is just the product

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44.   Louis Kaplow & Steven Shavell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 HARV. L. REV. 713, 775–79 (1996).

45.   GRUBER, *supra* note 6, at 143–44.

46.   The math underlying this example assumes, as in conventional public finance economics, that there is a uniform and continuous distribution of prevention costs and regulatory benefits. *Id.*

47.   Nuno Garoupa, *The Theory of Optimal Law Enforcement*, 11 J. ECON. SURVS. 267, 274 (1997).

48.   GRUBER, *supra* note 6, at 144–46.

49.   STERNER & CORIA, *supra* note 43; Coglianese et al., *supra* note 18, at 282–85.

50.   *See* Polinsky & Shavell, *supra* note 22, at 439–40.

51.   *See* Lucian Arye Bebchuk & Louis Kaplow, *Optimal Sanctions When Individuals Are Imperfectly Informed About the Probability of Apprehension*, 21 J. LEGAL STUD. 365, 366–67 (1992).

of these two: ticket amount times the chance of being caught. As Lucian Bebchuk and Louis Kaplow have shown, private parties who are mistaken about the odds of being caught produce error costs exactly as though the government had set its optimal level incorrectly.[52]

To correct either of these problems—private mistakes about penalties and likelihood of detection—the government could adjust either of those variables to account for the errors. For instance, if drivers underestimate the likelihood of being caught speeding, we could patrol more or write bigger tickets.[53] But to do that effectively, the regulator must have a sense of who was making the mistakes, how often, and by how much.[54] If we instead change penalties for everyone, we will over- or underdeter those with accurate perceptions.[55]

C. Fines First

For simplicity so far, we've assumed that government regulates entirely through prices, but of course there are many other ways regulators can influence private behavior. Another common option, for instance, is to mandate a permissible level of activity and to impose severe sanctions (e.g., jail) on those who exceed it. Economists often call the first of these approaches a "price instrument"[56] and the second "quantity regulation."[57]

Most commentators strongly favor price instruments over quantity regulation, except in settings where special administrative considerations make prices impractical.[58] As Louis Kaplow and Steven Shavell show, prices can be used to duplicate most of the features of mandates.[59] Prices provide vital information to the government that regulation supposedly does not.[60] Further, prices are said to provide for revenues that the government can use for other projects.[61]

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52.   *Id.* Charles D. Kolstad, Thomas S. Ulen & Gary V. Johnson, *Ex Post Liability for Harm vs. Ex Ante Safety Regulation: Substitutes or Complements?*, 80 AM. ECON. REV. 888, 888–901 (1990), reach a similar result. They observe that tort defendants may sometimes be unsure if they will be found to have acted negligently, even where they were objectively negligent. This reduces the expected cost of the sanction, resulting in under-deterrence.

53.   *See* Polinsky & Shavell, *supra* note 22, at 439.

54.   Coglianese et al., *supra* note 18, at 282–85.

55.   *See* Brian Galle, *Carrots, Sticks, and Salience*, 67 TAX L. REV. 53, 74–76 (2013).

56.   GRUBER, *supra* note 6, at 139.

57.   *Id.* at 137.

58.   *Id.* at 140; Don Fullerton, Andrew Leicester & Stephen Smith, *Environmental Taxes*, *in* DIMENSIONS OF TAX DESIGN: THE MIRRLEES REVIEW 231 (James Mirrlees ed., 2011); Cropper & Oates, *supra* note 7, at 686.

For a more complete account taking into account political and other practical considerations, see STERNER & CORIA, *supra* note 43.

59.   Louis Kaplow & Steven Shavell, *On the Superiority of Corrective Taxes to Quantity Regulation*, 4 AM. L. & ECON. REV. 1, 7–10 (2002). *But see* STERNER & CORIA, *supra* note 43, at 149.

60.   Kaplow & Shavell, *supra* note 59, at 4.

61.   *E.g.*, Helfand et al., *supra* note 37, at 287; Ian Parry, Roberton Williams III & Lawrence H. Goulder, *When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets*, 37 J. ENV'T ECON. & MGMT. 52, 52 (1999).

Mitchell Polinsky and Shavell have developed these arguments in great detail in the criminal enforcement context, where they argue for the primacy of fines over all other forms of punishment.[62] In some ways, their argument is very straightforward. Fines, like other price instruments, generate funds that the government can use for constructive ends, such as compensating victims.[63] In contrast, most other forms of punishment are simply "deadweight loss": while they inflict suffering on the individual punished, they provide nothing to anyone else.[64] Since a fine can, in theory, be set at a level that replicates any given level of penalty and transfers the defendant's pain for the benefit of others, the fine is said to be always superior to other options.[65]

Of course, the problem with this prescription is that many wrongdoers cannot afford to pay a fine set at the optimal level.[66] For these judgment-proof defendants, some other incentive must be found. In our system, of course, the usual option is incarceration. Polinsky and Shavell concede this point but argue that fines should in most situations be set at the maximum level that any given individual can afford, so as to maximize the amount of the punishment that is transferred to others.[67] Other forms of punishment should be imposed only to the extent that individuals cannot be optimally deterred through fines.

Notice that fines differ from the pollution prices we've been describing in at least one important respect. Fines—or, equivalently, tort awards for damages—are typically imposed and collected after a defendant has caused a harm to others and been caught doing it.[68] In contrast, the typical pollution tax becomes payable when the party has undertaken an act that created a *risk* of harm.[69] These are sometimes described as ex post and ex ante versions of price instruments, respectively.[70]

Professor Shavell and others argue in favor of ex post instruments because predicting risks is usually harder than measuring real outcomes: after the fact, our information is better.[71] Yet we may sometimes be willing to accept the risk of limited

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62.   Polinsky & Shavell, *supra* note 22, at 420.

63.   *Id.* at 407.

64.   Ehrlich, *supra* note 6, at 63.

65.   Polinsky & Shavell, *supra* note 22, at 419.

66.   Garoupa, *supra* note 47, at 270–71; Polinsky & Shavell, *supra* note 22, at 407.

67.   Polinsky & Shavell, *supra* note 22, at 411. For more detailed treatment on the optimal combination of jail and fines, see Nuno Garoupa & Murat Mungan, *Optimal Imprisonment and Fines with Non-Discriminatory Sentences*, 182 ECON. LETTERS 105 (2019).

68.   Steven Shavell, *Corrective Taxation Versus Liability as a Solution to the Problem of Harmful Externalities*, 54 J.L. & ECON. 249, 255–56 (2011).

69.   *See* Jon D. Hanson & Kyle Logue, *The Cost of Cigarettes: The Economic Case for Ex Post Incentive-Based Regulation*, 107 YALE L.J. 1163, 1268–80 (1998).

70.   *Id.* Just to make things even more confusing, some things the legal system calls a "fine" would, in our framework, be ex ante taxes. Take speeding tickets. The ticket is officially labelled a "fine." But in fact, what's happening is that we are putting a small charge on the *risk* of a dangerous accident, rather than relying fully on tort awards after the accident occurs.

71.   Shavell, *supra* note 68, at 251–52; Donald Wittman, *Prior Regulation Versus Post Liability: The Choice Between Input and Output Monitoring*, 6 J. LEGAL STUD. 193, 200 (1977). For more

information in the case where fines are impractical, such as for judgment-proof defendants.[72]

An economic puzzle about the U.S. system of law enforcement, then, is its remarkable devotion to incarceration. Jail is an ex post remedy for defendants who can't afford to pay a fine large enough to provide optimal deterrence.[73] Jail time is, as readers surely know, incredibly widespread in the United States. But many other potential tools could also prevent crime—in particular, ex ante tools that aim to reduce the risks of criminal acts rather than punishing those that actually occur.[74] Then, too, there is the possibility that some actors could be rewarded for *not* committing crimes, an option that would not depend at all on whether the regulated parties can afford to pay fines.[75] None of these have received serious attention as alternatives.[76] In the next part, we offer new reasons for giving them a closer look.

II. The Problem of Subjective Incentive Value

In this Part, we examine another problem that can potentially foil government efforts at regulation: uncorrectable variations in the regulated party's subjective valuation of the government's incentive. In a separate project, we show through formal mathematical modeling that these kinds of variation can have the same unwanted impact on regulation as the other potential obstacles already familiar to the literature, obstacles we described in Part I.[77] Here we offer the underlying logic

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extensive review of the literature and arguments for its limitations, see Brian Galle, *In Praise of Ex Ante Regulation*, 68 Vand. L. Rev. 1715, 1725–48 (2015).

Shavell does argue that government should punish attempts. Steven Shavell, *Deterrence and the Punishment of Attempts*, 19 J. Legal Stud. 435, 436 (1990). But that is not precisely ex ante in the sense we intend it here. In our definition, an ex ante incentive is one that is both assessed and collected by the government before the risky activity actually results in any outcome. Shavell would still punish attempts after they are detected and have failed. Perhaps one could think of attempts as simply presenting a very high ex ante risk of causing the threatened harm. Arguably, it is easier for the government to determine the likelihood that an attempt will produce the harm than it is for other, lower-probability risks. But we leave to Shavell more complete efforts to reconcile these two strands of his theory.

72. *See* Jennifer Arlen & Reinier Kraakman, *Controlling Corporate Misconduct: An Analysis of Corporate Liability Regimes*, 72 N.Y.U. L. Rev. 687, 693 (1997) (discussing use of preventive measures in judgment-proof firms).

73. Again, punishment for attempts may fall into a gray area between ex ante and ex post incentives. Nothing in our analysis turns on the exact terminology.

74. *See generally* Murat C. Mungan, *Wrongful Convictions and the Punishment of Attempts*, 42 Int'l Rev. L. & Econ. 79 (2015).

75. Ehrlich, *supra* note 6, at 44; Brian Galle, *The Tragedy of the Carrots: Economics and Politics in the Choice of Price Instruments*, 64 Stan. L. Rev. 797, 834–36 (2012).

76. We will immodestly mention that among the few existing examinations are Galle, *supra* note 75, at 834–36; Brian Galle, *The Economic Case for Rewards Over Imprisonment*, 95 Ind. L.J. (forthcoming 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3575031 [https://perma.cc/DJ4G-KX2N]; Murat C. Mungan, *Positive Sanctions Versus Imprisonment* (George Mason Univ. L. & Econ. Rsch. Paper, Working Paper No. 19-03, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3317552 [https://perma.cc/3V8H-K9UP].

77. Galle & Mungan, *supra* note 13.

behind our claim and the assumptions it rests on. We'll then develop some important policy implications in Parts III and IV.

A. The Costs of Subjectivity

First of all, what do we mean by the "subjective valuation of the government's incentive"? We mean that the instrument the government uses to sway the public, be it a thousand-dollar tax or a one-year jail sentence, can have different motivating effects depending on whom it is imposed on. This same variance can apply to rewards, too, such as patents or copyrights to encourage innovation or tax credits for building solar energy capacity.

Here's an example. Suppose Wolf Securities, Inc. is caught engaging in shady brokerage practices. Let's say the SEC's standard penalty for these practices is a one-year ban on selling securities directly to the public—a penalty known as "debarment."[78] At Wolf, which is dependent on direct-to-consumer pitches, the one-year ban will cause lost profits of $2 million or so, about forty percent of its usual net. Let's take the same ban for Lamb, Inc., whose business is mostly aimed at institutional investors. Even with all else equal, the same one-year ban might cost Lamb only $1 million, twenty percent of its usual profits.

Knowing that the expected penalty is a one-year ban, which firm will take more care to avoid shady dealings? Which will spend more training its brokers? The answer, of course, is Wolf. If Wolf, which after all deals more frequently with vulnerable individuals, is the greater threat to the public, this is an efficient difference, as we'll soon see. But what if both Lamb and Wolf, on average, cause $1.5 million worth of consumer losses? Then the one-year ban misses the mark for both firms—overdeterring Wolf, underdeterring Lamb—even though its average value is spot on.

As prior authors have noted, prison offers a more common example.[79] Adam Kolber, John Bronsteen, Chris Buccafusco, and Jonathan Masur (collectively, BBM) emphasize differences in physical conditions.[80] The United States strives to make prison sentences uniform for each form of offense: everyone who sells five kilograms of cocaine is supposed to receive roughly the same federal sentence as everyone else, for instance.[81] Yet some individuals will suffer much more from a prison sentence than others.[82] Perhaps they are claustrophobes, perhaps they are

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78. Urska Velikonja, *Waiving Disqualification: When Do Securities Violators Receive a Reprieve?*, 103 CALIF. L. REV. 1081, 1088–93 (2015).

79. Kolber, *supra* note 5, at 190.

80. Bronsteen et al., *supra* note 5, at 1046–55; Kolber, *supra* note 5, at 190. Even critics of BBM and Kolber agree that "[i]t would be foolish to deny that persons experience punishment differently." Markel & Flanders, *supra* note 5, at 909.

81. U.S. SENT'G COMM'N, GUIDELINES MANUAL § 2D1.1 (2018).

82. E. Lea Johnston, *Vulnerability and Just Desert: A Theory of Sentencing and Mental Illness*, 103 J. CRIM. L. & CRIMINOLOGY 147, 158–82 (2013).

physically vulnerable, maybe they have a child who needs their care (and some will care more or less about their child's well-being), or maybe they could have earned more at a lawful job if not behind bars. If defendants know this about themselves, then the vulnerable will be more deterred, and the hardened or the low-wage earners less deterred, by sentences of comparable length.[83]

More technically, what these examples show is that government incentives whose subjective value varies can cause deadweight loss.[84] As we reviewed in Part I, matching private cost to social benefit is the key goal for corrective regulation. If any given producer subjectively expects that her punishment will be less costly than the optimal price, she will overproduce the damaging good.[85] If society relies on shame to police polluters, shameless manufacturers will freely emit toxins.[86] Likewise, those with subjective expectations that their personal costs will be higher than the government expects will be overdeterred. Threats of a lifetime ban from securities trading might lead a trader with unusually high expected earnings to overinvest in precautions, spending thousands of dollars on risk-reducing paperwork that would not be cost-justified from a social perspective.

Crucially, variance can be damaging even if *on average* the expected costs of a nonmonetary sanction are exactly the same as a fine would be. We saw in Part I that the social cost of mispriced enforcement typically rises exponentially with the size of the mispricing: one large error is usually much more harmful than two middling ones. Under some basic assumptions, this principle implies that, of two penalties set at the exact same average expected cost, the one with higher variance is the worse policy.[87] Here we mean variance in the mathematical sense, where variance is the sum of the deviations of each individual observation from the mean value.[88]

Subjective valuation often pops up when regulators use incentives that aren't priced in dollars, but dollar-based incentives can create variance too. In the standard

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83.   We should emphasize the importance of the assumption that defendants know or anticipate that their subjective costs will differ from what the regulator expects. If both regulator and regulated have identical beliefs about the cost of a future incentive, the incentive will still operate as the regulator expects (at least until the regulated party experiences the incentive and updates its beliefs). Bronsteen et al., *supra* note 5, at 1060–62.

84.   Kolber, *supra* note 5, at 217–18; *see also* Dan M. Kahan & Eric A. Posner, *Shaming White-Collar Criminals: A Proposal for Reform of the Federal Sentencing Guidelines*, 42 J.L. & ECON. 365, 373 (1999) (making this point about imprecise shaming penalties).

85.   Michael Faure, Anthony Ogus & Niels Philipsen, *Curbing Consumer Financial Losses: The Economics of Regulatory Enforcement*, 31 LAW & POL'Y 161, 167 (2009).

86.   Kahan & Posner, *supra* note 84, at 373.

87.   More formally, Kaplow and Shavell show that, when government has only one policy instrument and can set only one price for every producer, it should choose a price that minimizes the sum of the squared distances between the price each individual producer faces and the socially optimal price for that individual. Kaplow & Shavell, *supra* note 44, at 775–79. In a world with multiple possible price instruments, this same principle implies that government should choose the instrument with the least variance. Galle, *supra* note 71, at 1728.

88.   WILLIAM MENDENHALL, ROBERT J. BEAVER & BARBARA M. BEAVER, INTRODUCTION TO PROBABILITY AND STATISTICS 60 (14th ed. 2013).

economic account of regulation, which we sketched in Part I, the regulator wants a polluter or other externality creator to "internalize" or take full account of the costs or benefits she creates for others. The standard model typically measures those costs or benefits in dollars.[89] If my hobby creates widget sludge that causes my neighbors to incur a one-thousand-dollar plumber bill, theory says I should pay a one-thousand-dollar tax to engage in that hobby. The idea is I'll only pay the tax if the hobby earns me more than one thousand dollars

In some economic models, utility for this one thousand dollars could vary from person to person.[90] Would I be willing to pay one thousand dollars for the joy of a making a nice sludge-covered widget? That will depend on a lot of things, but almost certainly one of them will be my wealth. If I have millions, I'll happily fork over one thousand dollars for a jolly good widget.[91] That is, if the precaution or benefit the subjects of regulation are supposed to undertake is not *also* denominated in dollars, dollar incentives can have unpredictable effects.[92] The pain of paying one thousand dollars is very different if that is one week's wages or one hour's.[93]

The general idea of variable subjective valuation, and our model describing it, also relates closely at least two other possible ways in which incentives can go wrong. As we mentioned before, Bebchuk and Kaplow argue that regulation can be inefficient when wrongdoers guess wrongly about the likelihood that they will be detected. Their scenario and ours have much in common.[94] In both, the government has set an optimal expected incentive amount, but some actors believe that incentive is larger or smaller.

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89. Amartya Sen, *The Discipline of Cost-Benefit Analysis*, 29 J. LEGAL STUD. 931, 945 (2000).

90. To repeat our disclaimer from the Introduction, many commentators would likely reject the suggestion that the utility cost of $1,000 should be treated as varying in a model of enforcement. The reason is that utility is itself measured in dollars. *See* Boadway, *supra* note 12, at 52–53 (describing the money-metric approach); Adler & Posner, *supra* note 12, at 180–84. As implausible as this approach may seem to many readers, economist proponents view it as a less disabling assumption than the other challenges raised by interpersonal comparisons of utility. *Id.* at 190–94; Marc Fleurbaey, *Equivalent Income*, *in* THE OXFORD HANDBOOK OF WELL-BEING AND PUBLIC POLICY 453, 453–54 (Matthew D. Adler & Marc Fleurbaey eds., 2018). Others suggest money-metric utility is at least a useful approximation for social welfare. Kaplow & Shavell, *supra* note 6, at 997. Economists recognize that this approach results in potentially severe redistribution in favor of the rich, but argue that this should be corrected through lump-sum corrective taxes. *See* Adler & Posner, *supra* note 12, at 180–84, 186. As one Nobel-winning economist dryly notes, these transfers have never been observed in practice, Paul A. Samuelson, *Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization*, 18 J. ECON. PERSPS. 135, 144 (2004), but they nonetheless form a bedrock of standard analysis. We need not take a position on these debates here.

91. *See* Ronen Perry & Elena Kantorowicz-Reznichenko, *Income-Dependent Punitive Damages*, 95 WASH. U. L. REV. 835, 856–57 (2018). Miriam Baer helpfully calls this the "translation problem." Baer, *supra* note 5, at 13; *see also* Liscow, *Is Efficiency Biased?*, *supra* note 12, at 1701 (examining how willingness to pay can differ from dollars).

92. Galle, *supra* note 75, at 817–19; Perry & Kantorowicz-Reznichenko, *supra* note 91, at 861.

93. Blank, *supra* note 2, at 755–56.

94. The difference, though, is that in their model, the regulator's only response is to attempt to make enforcement more predictable. Since we consider many more sources of variation, regulators have many more potential solutions.

The third related case is one in which the regulated parties are wrong not about the likelihood that a sanction will be imposed but instead about their own subjective valuation of it. This is the scenario sketched by BBM: As they summarize, humans often mistakenly fail to anticipate our own resilience in adapting to new circumstances, and so we believe things will be worse (or, sometimes, better) than they turn out.[95] Again, assuming that adaptation is not uniform, and that the government cannot adjust its policy to correct these misapprehensions, the result will be that some individuals will be more or less deterred than optimal. The difference is that here it is the regulated party that is wrong, not the government. Of course, it could happen that both the government and the regulated party wrongly project how much the party will value an incentive. But unless these two errors exactly offset, the result will still be some variation from the optimal point.

Of course, a critical contributor to the inefficiency of a world in which subjective costs vary is that the government cannot readily measure and adjust for individual differences. For that reason, we emphasize that the problem we aim to address is unobservable or observed but *uncorrectable* variation. But this isn't an important caveat, we think, because we believe that a great deal of subjective variation is uncorrectable. At a minimum, instances where government can't account for variation present a number of interesting and important cases.

To be sure, some adjustment is possible, and many enforcement systems include adjustment mechanisms of this kind. The U.S. Sentencing Guidelines allow downward departures for individuals whose incarceration would create serious family hardship or expose the individual to risk of unusually serious physical harm, for example.[96]

One basic obstacle to this idea is that some adjustments are mathematically impossible. If the Guidelines recommend a $1 million fine, and a corporation is expected to suffer $2 million in additional idiosyncratic losses (say, because it depends on its good reputation), there is no Guidelines adjustment possible that will fully correct for the firm's individual circumstances.

Another difficulty is that most of the information the government needs to make these assessments is in the hands of the regulated party, who has obvious incentives to misrepresent it.[97] In many cases, a rational party with subjectively high costs of being punished should expect that it will not be able to provide *credible* information that will convince the government to adjust its penalty downwards (or its rewards upwards).[98] Likewise, producers with subjectively low susceptibility to

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95.   Bronsteen et al., *supra* note 5, at 1060–61.

96.   U.S. SENT'G COMM'N, *supra* note 81, §§ 5H1.4, .6; *see also* Kahan & Posner, *supra* note 84, at 373 (arguing that over time sentencing judges could learn to modulate Guidelines sentences to account for varying effects of shame).

97.   Paul J. Ferraro, *Asymmetric Information and Contract Design for Payments for Environmental Services*, 65 ECOLOGICAL ECON. 810, 811 (2008); Saul Levmore, *Changes, Anticipations, and Reparations*, 99 COLUM. L. REV. 1657, 1665 (1999).

98.   *See* OLIVER E. WILLIAMSON, MARKETS & HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS 20–40 (1975) (describing credibility problem in asymmetric information settings);

incentives are unlikely to volunteer that information.[99] For instance, even if patent protection produces no incremental incentives to invent for academic researchers who love knowledge for its own sake, we suspect few will turn down the money if it's offered to them.

Another way to put this is that variance is a consequence of asymmetric information. In essence, variance in the subjective cost of punishment affects incentives to comply whenever the producer is likely to have better information about those subjective costs than the government does. For instance, the private party may know or suspect they won't be affected by the government's sanction, but the government is unaware it needs to up the sanction amount. The overwhelming consensus in the choice-of-instruments literature is that this government information deficit holds true most of the time.[100]

It is thus here that we part ways with Kolber and Lott. Although we agree with Kolber, Lott, and BBM that subjective variation in the experience of punishment can lead to inefficiency, we are skeptical of arguments that this variation can often be *individually* corrected by the justice system.[101] Though Kolber acknowledges that "cost and administrability concerns present powerful impediments to the creation of a highly individualized system of punishment calibration,"[102] he nonetheless suggests that the existing structure of the legal system may be flexible enough to detect and account for personal experiences.[103] The tort system, he notes, tries to measure pain and suffering damages.[104] He adds that perhaps future advances, such as fMRI brain scanning, can help to identify individual mental states.[105]

Science fiction aside,[106] the costs of a system capable of such fine-grained measurements put enormous and undesirable pressures on a regulatory system.[107]

Henry Hansmann, *When Does Worker Ownership Work? ESOPs, Law Firms, Codetermination, and Economic Democracy*, 99 YALE L.J. 1749, 1769 (1990) (noting that workers cannot credibly disclose adverse information to employers).

99.   Baer, *supra* note 5, at 15.

100.   Fullerton et al., *supra* note 58, at 430; Kaplow & Shavell, *supra* note 59, at 4.

101.   We agree with Kolber that a legal system should account for fact that "there is a great deal of variation in easily observable, objective features of our punishments that are largely ignored at sentencing." Kolber, *supra* note 5, at 188. To the extent these differences can be cheaply and accurately accounted for, they should be. One way to understand our claim is that variance can be thought of as the degree of variation after cost-effective individualized adjustments are in place. We simply are skeptical that such adjustments will reduce variation meaningfully in many cases.

There also may be mechanisms the government can implement when it can observe subjective cost but only with some degree of error. *E.g.*, Galle, *supra* note 71, at 1730–34.

102.   Kolber, *supra* note 5, at 226.

103.   *See also* Baer, *supra* note 5, at 12 (describing how courts attempt to account for distinctiveness of individual defendants).

104.   Kolber, *supra* note 5, at 219–20. *But see* Perry & Kantorowicz-Reznichenko, *supra* note 91, at 869–70.

105.   Kolber, *supra* note 5, at 220.

106.   Thus far, empirical analysis suggests even "big data" perform poorly in predicting key components of criminal procedure. *See generally* Matthew B. Kugler & Lior Jacob Strahilevitz, *Assessing the Empirical Upside of Personalized Criminal Procedure*, 86 U. CHI. L. REV. 489 (2019).

107.   *Cf.* Adler & Posner, *supra* note 12, at 224.

Individual adjustments allow for the play of potentially biased judgments, often to the detriment of socially marginalized groups. Further, one standard result in the economics of enforcement is that the cost of enforcement should be treated as equivalent to other portions of the marginal social damage caused by "pollution" or other regulated activities.[108] So in a higher-cost criminal justice system, optimal sentences are longer.[109]

Similarly, enforcement theory counsels that when it is costly to detect and punish each individual, it is optimal to decrease the frequency of detection and increase the punishment: instead of catching 100 offenders and giving them each a $100 fine, catch one person and give her a $10,000 dollar fine.[110] Yet ratcheting up individual punishments puts a greater distance between "optimal" punishments and our sense of individual justice, and likely increases the costs of individual trials.[111] It often forces the government into using second-best deterrence options for defendants who cannot be punished more.[112] We cannot fine a defendant more money than she has, cannot sentence a human to more than one lifetime in prison. As punishments grow larger, we are more likely to hit these limits, making it more likely in turn that we must resort to incentive options that are otherwise less desirable but not subject to the same limits.[113] If individual-adjustment systems are costly and yet still imperfect, they therefore produce the worst of all results.[114]

Even if it were possible to fine-tune sentencing law, there surely are many other incentives that cannot practically achieve anything like full correction of existing disparities. How can the government know which cartoonists need a seventy-five-year copyright term to motivate their innovative doodling and which would be content with fifty?[115] Which smokers will be motivated to kick their habit when they see disturbing images on the side of their cigarette pack and which will instead (as an Australian study found of a small subset of puffers) smoke more in

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108.   Polinsky & Shavell, *supra* note 22, at 430.

109.   The general public may also be unwilling to make the kinds of adjustments Kolber calls for. *Id.* at 447–48. For experimental evidence to that effect, see Josef Montag & Tomas Sobek, *Should Paris Hilton Receive a Lighter Sentence Because She's Rich? An Experimental Study*, 103 KY. L.J. 95 (2015).

110.   Garoupa, *supra* note 47, at 268.

111.   Reinier H. Kraakman, *Corporate Liability Strategies and the Costs of Legal Controls*, 93 YALE L.J. 857, 881–82 (1984).

112.   Polinsky & Shavell, *supra* note 22, at 410.

113.   *Id.*

114.   We would respond similarly to the potential counterargument that incentive systems will correct themselves. Arguably, defendants with a higher subjective cost of being punished will work harder to avoid detection and conviction, so that in equilibrium, the expected penalty is the same for all defendants. John Lott considers and rejects this possibility, albeit with back-of-the-envelope calculations. Lott, *supra* note 5, at 603. Even if expected penalties do equilibrate, variance in sanctions would still be wasteful because they cause wasteful expenditures on avoidance and litigation.

115.   *See* Oren Bracha & Talha Syed, *Beyond the Incentive-Access Paradigm? Product Differentiation & Copyright Revisited*, 92 TEX. L. REV. 1841, 1856–57, 1881–82 (2014) (discussing the informational demands of setting copyright policy when some inventors are inframarginal).

defiance of the government Big Brother?[116] Even if we knew, how could we ensure that the defiant smokers alone don't see the pictures on their packs?[117] In short, regulators often must set mass policies that impact millions at a time, without any obvious method for assessing and modulating the impact on particular individuals.[118]

Individual adjustments are also difficult because the modern state is too complex to be centralized. This means that many aspects of the subjective cost of an incentive will be under the control of separate regulators who may struggle to coordinate.[119] The cost of a one-year debarment for a firm can vary not just because of its own inherent profitability, but also because of the tax rate the firm faces in all the jurisdictions it does business, the degree of anticompetitive scrutiny it faces, and so on. This is a well-known aspect of the "collateral sanctions" problem in criminal law, in which a conviction and sentence may trigger effects, such as deportation, that once triggered are outside the hands of judge or prosecutor.[120] Many consequences of enforcement, such as shame or reputational damage, may be imposed by private actors.[121] While one actor tries to adjust a sanction in one direction to make it more uniform, others may be working in the opposite direction.

None of this is to say that observing and correcting individual variations is impossible; the question is whether it is more efficient than the alternatives we shall propose. Indeed, the economic theory of price discrimination studies the mechanisms market actors can use to elicit subjective private costs, albeit usually at considerable cost.[122] We have each written that in some circumstances regulators can design instruments to lessen the impact of limited information.[123] Maybe one day "big data" techniques could gather everything knowable about an individual and use it to predict her subjective costs. But at what cost in time, computing power, and most crucially individual privacy?[124] Each of these alternatives has serious limits, and so we think it is essential to examine whether there might be a better way.

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116. ESSENCE COMMC'NS, EVALUATION OF EFFECTIVENESS OF GRAPHIC HEALTH WARNINGS ON TOBACCO PRODUCT PACKAGING 57 (2018).

117. Brian Galle, *The Problem of Intra-Personal Cost*, 18 YALE J. HEALTH POL'Y L. & ETHICS 1, 53 (2018).

118. *Cf.* Viscusi, *supra* note 11, at 609 (observing that it is difficult for government to regulate "decentralized behavior" directly); Victor Fleischer, *Curb Your Enthusiasm for Pigovian Taxes*, 68 VAND. L. REV. 1673, 1689 (2015) (describing limitations on ability of tax system to offer individualized rates).

119. *Cf.* John F. Stinneford, *The Original Meaning of "Cruel,"* 105 GEO. L.J. 441, 499–500 (2017) (noting that "compartmentalized" justice system diffuses responsibility for harsh punishments).

120. Issa Kohler-Hausmann, *Managerial Justice and Mass Misdemeanors*, 66 STAN. L. REV. 611, 684–92 (2014); *cf.* Kolber, *supra* note 5, at 195–96 (noting that judges do not control bureau of prisons or parole boards). To be sure, though, judicial actors can shape collateral consequences through their choices of what to charge and what information to reveal in court. Eisha Jain, *Prosecuting Collateral Consequences*, 104 GEO. L.J. 1197, 1200–02 (2015).

121. Kahan & Posner, *supra* note 84, at 372.

122. *See* STERNER & CORIA, *supra* note 43, at 168–69.

123. Galle, *supra* note 71, at 1729–33.

124. *See supra* note 20.

B. *A Simple Solution: Minimizing Uncertainty (or Its Costs)*

If government knows that regulated parties vary in their sensitivity to a regulatory instrument, and government can't make individual adjustments to correct for this variation, what should it do instead? Well, if the instrument is broken and can't be fixed, try another one. That is, the simplest version of our answer is that regulators should try to choose instruments that would minimize the variance of individual responses. We'll first defend that point, then add a couple of layers of nuance to it.

Our claim is that social welfare is usually highest when government makes maximal use of the instrument with the least amount of variance in individual sensitivity.[125] Even without math, the intuition for our result is straightforward. Not all instruments with varying responsiveness are equally bad. When an individual is more or less sensitive to the incentives a government offers, the result is mathematically no different than if the government had set an unvarying incentive too high or too low for that individual. As we've already seen, the social cost of government setting prices at the wrong level usually grows exponentially with the size of the mistake.[126]

To be sure, there is a potential tradeoff between the *size* of the government's mistakes and their number. Because large mistakes are worse than small ones, it usually is better to make many small mistakes rather than a few big ones, but that isn't an iron rule.[127]

The mathematical concept of variance captures this tradeoff. In technical terms, variance is the sum of the *squared* distance a group of numbers are from their mean value.[128] Thus, a set of data with a few distant outliers will typically have a much larger variance than one with many observations close to the mean. Variance therefore is an excellent proxy for the social cost of government errors. Variance counts big "mistakes" or departures from the mean much more than small departures, just as the social planner is far more worried about big mistakes than small ones. So a policy that minimizes the variance of individual responses is also minimizing the social cost of government's inability to correct for them.[129]

We tweak this basic prescription to account for possible correlations. That is, the model we just described presumes that there is no correlation between a given producer's subjective cost of a sanction and the social damage caused by that

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125. As we'll explain shortly, we modify this claim in several cases, including most interestingly the one in which the regulated party's subjective costs of being subject to one instrument are negatively correlated with the costs of another.

126. *See supra* text accompanying notes 45–48.

127. *See* Alan J. Auerbach, *Comment*, *in* TAXING CAPITAL INCOME 83, 86 (Henry J. Aaron, Leonard E. Burman & C. Eugene Steuerle eds., 2007) ("[A] lot of small tax wedges are better than a few large ones.").

128. MENDENHALL ET AL., *supra* note 88, at 60.

129. As we said, this claim is mathematically quite similar to the well-known observation that projects with more certain benefits are preferable, ceteris paribus, to less certain ones. GRUBER, *supra* note 6, at 223.

producer. Sometimes the damage caused by externalities varies from producer to producer. Widget sludge might be more harmful to young children, and so locating a widget factory next to a day care center might be especially bad. Or, in our Wolf and Lamb example, Wolf faced higher subjective costs and also caused greater social damage.[130] In those cases, what we'd want is a government policy that adjusted the price per unit of sludge to be higher for the day care–neighboring firm.[131] If by chance firms that sit next to day care facilities happen to be those that would experience a higher cost, that might actually be a better result than if every firm paid the same amount.[132] Our "tweak" is to recognize that in these situations variance is desirable. But in the usual course of things, we'd expect such happy accidents to be fairly rare.[133]

Theories of "asymmetric regulation" offer an important exception to that rarity.[134] In some cases, the factors that make a regulatory instrument have higher subjective costs are exactly the same factors that cause social harms in the first place.[135] If so, there will be a strong correlation between the subjective price and the need for correction, making the high-variance policy instrument potentially more efficient than a more predictable alternative.[136]

A classic example is default retirement savings plans.[137] Behavioral economists argue that some people don't save enough for retirement because they find filling out the requisite paperwork annoying.[138] These same people, the economists say, probably would find it more burdensome to fill out annoying paperwork to escape the default retirement contribution.[139] So the argument concludes that the costs of

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130. *See* STERNER & CORIA, *supra* note 43, at 148–49.

131. *Id.* at 151.

132. *See* Steven D. Levitt, *Incentive Compatibility Constraints as an Explanation for the Use of Prison Sentences Instead of Fines*, 17 INT'L REV. L. & ECON. 179, 181–82 (1997).

133. Of course, regulators could calibrate their own behavior in order to align expected sanctions with expected harms. *See* Scott Baker & Alex Raskolnikov, *Harmful, Harmless, and Beneficial Uncertainty in Law*, 46 J. LEGIS. STUD. 281, 283 (2017) (describing reasons why punishment may be correlated with harm).

134. The term originates with Colin Camerer, Samuel Issacharoff, George Loewenstein, Ted O' Donoghue & Matthew Rabin, *Regulation for Conservatives: Behavioral Economics and the Case for "Asymmetric Paternalism,"* 151 U. PA. L. REV. 1211, 1219, 1222 (2003).

135. *Id.*

136. Another potential example would be social stigma. It may be that society imposes greater stigma on individuals who are in a position to do the greatest harm so that variance in the stigmatizing effects of a conviction are efficient. Murat C. Mungan, *On the Optimality of Sealing Criminal Records, and How It Relates to Adverse Selection, Productivity Reduction, and Stigma* 3 (Fla. State Univ. Coll. of L., Pub. L. Rsch. Paper, Working Paper No. 709, 2015), https://papers.ssrn.com/abstract=2502919 [https://perma.cc/DV2F-TTT2].

137. Camerer et al., *supra* note 134, at 1227–29.

138. RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS 106–08 (Penguin Books rev. ed. 2009) (2008). We take no position here on whether these claims are either normatively or descriptively accurate.

139. *See id.* at 110–11; John Beshears, James J. Choi, David Laibson & Brigitte C. Madrian, *The Importance of Default Options for Retirement Savings Outcomes: Evidence from the United States*, *in* SOCIAL SECURITY POLICY IN A CHANGING ENVIRONMENT 167, 188 (Jeffrey Brown, Jeffrey Liebman & David A. Wise eds., 2009).

opting out are highest for those people where the social damage (failure to save for retirement) is highest.[140] If that is all correct, greater variance is useful, because it targets the instrument at the population where it can do the most good.

Does this same logic also imply that variance is desirable when the government's incentives are set at the wrong level? In other words, do our conclusions depend on the further assumption that government policy is optimal? No. Variance makes incentive systems worse, and this damage is even larger when the system is imperfect to begin with.

To see this, imagine that the government wants us to build widgets, but it's short of resources and so its widget-building rewards (favorable zoning for widget-producing businesses, say) are too small. With varying subjective value, some of the would-be widget makers will value zoning more than the average, bringing them to the optimal amount of widget production. But other businesses will value zoning *less* than the average. These companies will be even farther from the optimum than average. Once more, the social loss caused by these kinds of errors gets larger exponentially. The waste from under-incentivizing some businesses will outweigh the gains from getting others closer to the right level.[141]

C. More Complex Solutions

Although our basic advice to policy makers is to choose instruments with the smallest variance, there turns out to be a lot of different ways to get to that result. That's nice, because oftentimes the world is too complicated for simple solutions. Another reason to consider multiple avenues to our result is that some have tradeoffs. Several of our options run contrary to the standard advice other economists offer, implying that minimizing variance may often produce costs as well as benefits. Where possible, policy makers will want to choose the route to minimal variance that delivers the best combination of gains and losses.

1. Variance Engineering

When we say that government should choose the least variant incentives, we don't just mean that regulators should switch from, say, shaming to fines (more on that question in the next part), but also that government can shape the design of each incentive it employs to make that incentive less variant. There are probably countless ways to engineer variance, but we'll highlight a few here.[142]

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140.   *Id.*

141.   The argument we make in this sentence assumes that the distribution of errors is roughly symmetrical. It could instead be the case that the marginal costs of under- and overdeterrence are different. But that is another way of saying that the variance is correlated with the harm to be corrected. If the regulator sets incentives too low, and more parties over-value the incentive than undervalue it, then in fact there is a positive correlation between subjective value and social gains. We acknowledge that would be a scenario where variance can be efficient.

142.   Another notable option, set out by Baer, *supra* note 5, at 16–17, is to respond to variance using choices about policing (or other detection systems) instead of punishment. Baer's argument,

Governments can potentially increase efficiency by avoiding incentives whose severity depends on uncorrectable physical characteristics of the regulated party. For instance, holding average deterrence constant, safer prisons should be more efficient. Inadequate medical care will predictably make prison a deeper suffering for the afflicted,[143] but it is hard to say with specificity just how much worse off these prisoners are. What sentence equalizes the pain of a healthy inmate with one who develops serial kidney infections because he cannot obtain dialysis? Similarly, we know some prisoners are more or less vulnerable to physical abuse by others in the penal system,[144] but measuring how this vulnerability should affect sentencing is challenging.[145] In both cases, even leaving aside questions of morality and basic decency, it can be more economically efficient to better protect and care for prisoners so as to avoid the uncorrectable variance their vulnerabilities create.[146]

Likewise, prison could be less alienating.[147] Criminal defendants will vary widely in the depth of their connections to family, friends, their workplace, and society at large.[148] Many American prison systems seem to aim intentionally at depriving prisoners of these ties or at best give no real thought to preserving them.[149] While severing these essential elements of community is likely an intended component of a prison sentence, its extent will vary greatly and cannot be readily translated into higher or lower sentences for the less or more vulnerable.[150] Further,

which we find persuasive, is that some of the source of individual variation in responsiveness to threatened punishments is because of differences in how much people care about events far in the future. Four additional years of prison at the end of a long sentence is relatively meaningless to those whose "discount rate" is very high. Manuel A. Utset, *Hyperbolic Criminals and Repeated Time-Inconsistent Misconduct*, 44 HOUS. L. REV. 609, 657–58 (2007). By increasing policing, government can instead increase the likelihood of suffering a small near-term punishment, which should have more impact.

143.   Sharon Dolovich, *Cruelty, Prison Conditions, and the Eight Amendment*, 84 N.Y.U. L. REV. 881, 912–14 (2009).

144.   *Id.* at 915–17.

145.   A thoughtful approach, albeit one from a retributivist frame rather than our economic one, is E. Lea Johnston, *Modifying Unjust Sentences*, 49 GA. L. REV. 433, 452–77 (2015).

146.   Again, our claim that lower variance improves efficiency is based on an assumption that the average deterrent effect of a given sentence does not change. If one year of time in a safe prison is less of a deterrent than one year in a cruel one, then sentences may need to be longer or more common in order to keep incentives at their optimal level. The added costs of detection or incarceration may exceed gains from reduced variance.

147.   Some readers may argue that danger and alienation are so endemic to the experience of incarceration that it would be preferable simply to do away with prisons. These "abolitionist" claims are beyond our scope here, but they may well be consistent with our argument.

148.   *See* David S. Abrams & Chris Rohlfs, *Optimal Bail and the Value of Freedom: Evidence from the Philadelphia Bail Experiment*, 49 ECON. INQUIRY 750 (2011) (arguing wide range of economic costs of incarceration across defendants is likely attributable to differences in earning capacity); *cf.* Cass R. Sunstein, *Willingness to Pay vs. Welfare*, 1 HARV. L. & POL'Y REV. 303 (2007); Starr, *supra* note 11, at 104–05 (noting prison's effects on "separation from family and friends[,] . . . loss of subsequent earnings, social stigma, and other disadvantages upon release").

149.   Sarah Abramowicz, *Rethinking Parental Incarceration*, 82 U. COLO. L. REV. 793, 811–15 (2011).

150.   *See id.* at 817–23, 836–39 (describing judicial struggles to account for impact of sentencing on defendants' families); Jack B. Weinstein, *The Effect of Sentencing on Women, Men, the Family, and the Community*, 5 COLUM. J. GENDER & L. 169, 178–80 (1996) (arguing that alternatives to incarceration

sentencing reductions for defendants with deeper community ties often amounts to lighter sentences for those with more successful careers—a potentially troubling disparity.[151] From a variance perspective, it would be better instead if the prison system fostered and sustained existing relationships, and helped to replace prisoners' lost opportunities to build such ties.[152]

A third possibility is to better coordinate the legal aspects of overlapping incentives. As other writers have ably documented, "collateral" consequences plague the criminal justice system.[153] A hailstorm of civil consequences follows most convictions, randomly striking some otherwise comparable defendants with consequences both dire—deportation, loss of parental custody, voting, and firearm-bearing restrictions—and absurd, such as being shorn of a license to cut hair.[154] Because prosecutors typically cannot accurately assess these costs ex ante as well as defendants, allowing these consequences introduces unobserved subjective variance in deterrence.[155]

A final possibility that deserves some consideration is the publicity that attends government enforcement. As we mentioned, many collateral consequences are imposed by private actors, not the government. The consensus in the corporate-compliance literature, for example, is that the reputational effects of being identified as a wrongdoer are on average many times more costly than the accompanying official sanctions.[156] The value of a good reputation of course varies dramatically from firm to firm, with long-established and sterling brands typically standing to lose far more than an unknown start-up.[157] An individual-adjustment approach might therefore impose smaller sentences on firms that suffer the greatest reputational harm. It is unlikely, however, that we'd want a regulatory policy that systematically imposed smaller official sanctions on high reputation parties.

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are likely a better option for preserving family relationships than modified prison sentences, but embracing both).

151.   *See* DAN MARKEL, JENNIFER M. COLLINS & ETHAN J. LEIB, PRIVILEGE OR PUNISH: CRIMINAL JUSTICE AND THE CHALLENGE OF FAMILY TIES 49–52 (2009) (arguing against modified sentences for most family conditions). For suggestive empirical evidence finding that wealthier defendants receive more downward departures, see David B. Mustard, *Racial, Ethnic, and Gender Disparities in Sentencing: Evidence from the U.S. Federal Courts*, 44 J.L. & ECON. 285, 308–09 (2001).

152.   To repeat, this prescription assumes constant average deterrence, and might hold to a lesser degree or not at all if the costs of maintaining deterrence at the optimal level are substantial.

153.   Gabriel J. Chin, *Collateral Consequences and Criminal Justice: Future Policy and Constitutional Directions*, 102 MARQ. L. REV. 233, 237–41 (2018); Jain, *supra* note 120, at 1206–07.

154.   *Id.*

155.   *Cf.* Lott, *supra* note 5, at 584 (arguing that total punishment may be too high if it fails to account for defendant's lost earnings potential).

156.   Cary Coglianese & Robert A. Kagan, *Introduction* to REGULATION AND REGULATORY PROCESSES, at xi (Cary Coglianese & Robert A. Kagan eds., 2007); Michael P. Vandenbergh, *Beyond Elegance: A Testable Typology of Social Norms in Corporate Environmental Compliance*, 22 STAN. ENV'T L.J. 55, 117–28 (2003).

157.   Start-ups would like to have good reputations, but if they acquire a bad one, they just fold and . . . start up again.

Although the quality of a party's reputation can often be roughly observed by regulators, it will usually still hold true that a person or firm knows better than the government the *value* of that reputation. Worse, the policy would invite corruption, licensing regulators to mete out lighter penalties for the powerful and influential.

If variable reputational harms create inefficient incentives, and it is undesirable to adjust nonreputational sanctions in response, it could be optimal for government not to disclose violations it detects.[158] The downside, of course, is that disclosure can provide valuable information to the public,[159] but that cost could sometimes be small relative to the cost of varying sanctions.

Consider, for instance, the common practice of sealing court records for offenders under age eighteen.[160] The long-run reputational impact of a criminal record is hard to predict and highly varying, and the offender may have a better sense of the direction of the variance than the government—she may know, for instance, if she plans a career in a position of public trust. We might also think that people change and grow over time so that the informational value of an old conviction is minimal.[161] We could say something similar about expungements and other mechanisms for removing public record of minor offenses from which the offender seems thoroughly rehabilitated.[162]

On the flip side, many regulatory infractions should probably still be public. Some hazards can be easily detected by their users—the scalding-hot cup of coffee. Most cannot, even after a consumer has used the good many times.[163] Does your credit card have a hidden fee buried deep in its disclosures? Go check; we'll wait here.[164] The informational value of enforcement is high, in other words. Information about individual enforcement events may not only help consumers to

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158.   Mungan, *supra* note 136, at 2.

159.   Kahan & Posner, *supra* note 84, at 368–71. For analysis of the role information plays in the government's choice between a guilty plea and other forms of settlement, see generally Cindy R. Alexander & Jennifer Arlen, *Does Conviction Matter? The Reputational and Collateral Effects of Corporate Crime*, *in* RESEARCH HANDBOOK ON CORPORATE CRIME AND FINANCIAL MISDEALING 87 (Jennifer Arlen ed., 2018).

160.   RIYA SAHA SHAH & LAUREN FINE, JUV. L. CTR., JUVENILE RECORDS: A NATIONAL REVIEW OF STATE LAWS ON CONFIDENTIALITY, SEALING AND EXPUNGEMENT 9, 13–15 (2014), https://jlc.org/sites/default/files/publication_pdfs/national-review.pdf [https://perma.cc/942R-74FV].

161.   *See* NAT'L RSCH. COUNCIL, REFORMING JUVENILE JUSTICE: A DEVELOPMENTAL APPROACH 140, 144 (2013) (reporting consensus of literature that juvenile justice records cannot predict future likelihood of offending); Megan C. Kurlychek, Robert Brame & Shawn D. Bushway, *Enduring Risk? Old Criminal Records and Short-Term Predictions of Criminal Involvement*, 53 CRIME & DELINQ. 64, 72–80 (2007) (finding little predictive value in most old offense records).

162.   Mungan, *supra* note 136, at 2.

163.   John S. Applegate, *The Perils of Unreasonable Risk: Information, Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261, 264–66, 285–90 (1991).

164.   Spoiler: It does. Oren Bar-Gill & Elizabeth Warren, *Making Credit Safer*, 157 U. PA. L. REV. 1, 26–56 (2008). For more recent evidence, see, for example, Benjamin J. Keys & Jialan Wang, *Minimum Payments and Debt Paydown in Consumer Credit Cards*, 18 J. FIN. ECON. 58, 59–60 (2018) (finding that consumers respond less to less salient contract terms and that this costs them money).

avoid untrustworthy trade partners,[165] but may also help to shape policy.[166] Take the example, unfortunately not wholly hypothetical, of a financial regulator's string of undisclosed settlements with predatory banks. Unable to observe the repeated predation, the public may fail to understand the importance of the underlying legal regime, leading to its slow erosion.[167]

2. Smaller, More Frequent Incentives

A similar set of intuitions drive our last major category of policy options. Here, we propose that regulators make incentives smaller and more common. Once more, this advice runs contrary to the standard account, and we acknowledge that there are potential tradeoffs in adopting our recommendation.

In the standard model of enforcement sketched by Gary Becker, and then extended by Polinsky and Shavell, regulators should catch and punish only a few offenders.[168] Since the expected penalty for wrongdoing is the product of the probability of detection times the penalty, this means that the few who are punished will face very high penalties.[169] But, in the conventional account, punishing only a handful is more efficient because it saves on the costs of detecting and litigating with multiple defendants.[170]

Becker's account has some problems, as the economic literature later acknowledged.[171] It calls to mind Shirley Jackson's *The Lottery*: we have strong moral intuitions about equality, luck, and just punishments, which a scheme of maximal enforcement against only a few violates.[172] And because humans are risk averse

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165. Richard A. Posner & Eric B. Rasmusen, *Creating and Enforcing Norms, with Special Reference to Sanctions*, 19 INT'L REV. L. & ECON. 369, 375, 380 (1999).

166. *Cf.* Kahan & Posner, *supra* note 84, at 377–78 (suggesting that shaming penalties shape beliefs about wrongfulness of crime).

167. *See* Nicholas Lemann, *The Dangers of Undoing Dodd-Frank*, NEW YORKER (Apr. 29, 2018), https://www.newyorker.com/magazine/2018/05/07/the-dangers-of-undoing-dodd-frank [https://perma.cc/4ZFN-9WTA].

168. Polinsky & Shavell, *supra* note 22, at 420. Indeed, in some instances, the regulator does not even catch one person!

Polinsky and Shavell concede that Becker's approach cannot be implemented perfectly when some defendants would lack resources to pay a fine. *Id.* For example, in a setting where government is limited to using a single instrument, the presence of wealth-limited defendants forces the regulator to under-deter lower wealth individuals. A. Mitchell Polinsky & Steven Shavell, *A Note on Optimal Fines When Wealth Varies Among Individuals*, 81 AM. ECON. REV. 618, 620 (1991); *see also* Garoupa, *supra* note 47, at 270. We discuss the case in which regulators can add a second instrument, such as imprisonment, in more detail below.

169. Polinsky & Shavell, *supra* note 22, at 420.

170. *Id.*

171. A useful overview of the various situations in which minimizing detection may not be optimal is provided by Garoupa, *supra* note 47.

172. *Id.* at 267. On the comparison to Shirley Jackson, see Louis Michael Seidman, *Soldiers, Martyrs, and Criminals: Utilitarian Theory and the Problem of Crime Control*, 94 YALE L.J. 315, 348 (1984).

(more on that topic in a bit), a system that forces individuals to bear large risks is probably less efficient, all else equal.[173]

The benefits of reduced detection costs may also be somewhat overstated in Becker's vision. Detection costs seem trivial compared to the vast costs of crime and punishment. Still, we admit that at some point, detecting *all* crime is prohibitively expensive and not just in dollars. No one wants to live in a state of perpetual surveillance and suspicion.[174] But the optimal amount of detection is likely greater than is implied by Becker's simple equation.

Nonetheless, many current legal institutions seem to reflect Beckerian thinking. For the most part, we prefer to find and punish unwanted outcomes after they have occurred, rather than deterring the much wider universe of acts that pose a *risk* of bad results.[175] We therefore tend to rely on mechanisms such as sentence enhancements for attempted concealment, punitive damages in civil litigation, or treble damages in antitrust that expressly increase punishment to reflect failures to detect.[176]

Our model offers a new reason to detect more and punish less, and therefore perhaps to prefer ex ante efforts to discourage risk over these devices. Suppose that regulators cannot reach the optimal level of deterrence with an unvarying instrument—say, if defendants cannot afford to pay the optimal penalty amount. In that case, government is compelled to rely on an additional set of varying instruments.

One way to capture the intuition behind this result is that we expect that most of the time, the variance of an incentive is closely tied to its magnitude.[177] Larger fines will cause more dramatic swings in an individual's standard of living. Longer prison sentences make it more likely that those with unusual medical needs will experience some health crisis while behind bars. By reducing the magnitude of an incentive, we should reduce its variance. More frequent, and therefore smaller, awards should thus be more efficient, all else equal. [178]

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173.   Ehrlich, *supra* note 6, at 52–53; A. Mitchell Polinsky & Steven Shavell, *The Optimal Tradeoff Between the Probability and Magnitude of Fines*, 69 AM. ECON. REV. 880, 891 (1979).

174.   *But see* GEORGE ORWELL, 1984, at 376 (Penguin Classics ed. 1983) (1949) ("He loved Big Brother.").

175.   Steven Shavell, *Corrective Taxation Versus Liability as a Solution to the Problem of Harmful Externalities*, 54 J.L. & ECON. 249, 250 (2011).

176.   Catherine M. Sharkey, *Economic Analysis of Punitive Damages: Theory, Empirics, and Doctrine*, *in* RESEARCH HANDBOOK ON THE ECONOMICS OF TORTS 486, 488 (Jennifer Arlen ed., 2013). Alternately, we might use "technological" approaches that make concealment harder in the first place. Chris William Sanchirico, *Detection Avoidance*, 81 N.Y.U. L. REV. 1331, 1383–84 (2006). For discussion of whether it might be preferable to employ these other approaches, see *id.* at 1372–97.

177.   This is certainly the case in one of the scenarios related to our general framework: when individuals misestimate the likelihood, they will be caught. In that situation, as Bebchuk and Kaplow show, the variance of the expected sanction is directly tied to its magnitude. When you think you are twice as likely to get caught, the expected penalty is double whatever the penalty amount is. Bebchuk & Kaplow, *supra* note 51, at 367.

178.   Our point is even stronger in a world in which actors can take steps to conceal their conduct. Assuming that these "avoidance" activities are deadweight loss, Jacob Nussim & Avraham

As we said, this result could also support ex ante incentives. Ex ante incentives can be dramatically smaller than those that operate ex post, because ex ante incentives are applied to all the instances that risk the bad outcome, not just those bad outcomes that occur. So switching to an ex ante approach could be a way to increase frequency. Like many things in life, ex ante regulation does have tradeoffs,[179] and we return in Part III to this tradeoff in more detail.

Bringing more people into contact with the incentive system can reduce variance through another route, as well. Recall that, as Bebchuk and Kaplow showed, one way in which variance can arise is if actors are unsure of how likely they are to be caught (or, we'd add, how likely they are to win a prize contest).[180] To be sure, governments can—and in the real world, certainly do—attempt to influence the public's perception of how frequent or diligent its enforcement efforts are.[181] Possibly these information campaigns are more cost-effective than bringing additional enforcement actions. But information campaigns can backfire.[182] Much evidence also suggests that individuals are bad at interpreting events with very low frequencies.[183] So if enforcement events are more common, regulated parties may have better information about enforcement frequency.

In a similar fashion, making incentives common instead of rare may allow individuals to more accurately predict their subjective value. One way incentives can go off kilter is if the government sets its incentive optimally, but the regulated parties *wrongly* anticipate that they will value the incentive more or less than average. Repeated interactions will typically help correct these errors.

To be sure, there can be instances where systematic misperceptions are helpful to the regulator. If regulated parties think incentives are bigger than they actually are, a cash-strapped regulator can save money by making incentives smaller.[184] This

D. Tabbach, *Controlling Avoidance: Ex-Ante Regulation Versus Ex-Post Punishment*, 4 REV. L. & ECON. 45, 45 (2008), their wastefulness is likely to rise exponentially with the size of the sanction, Galle, *supra* note 117, at 50; *cf.* Garoupa, *supra* note 47, at 286. Small ex ante incentives thus can potentially reduce the social cost of avoidance overall. Further, increasing ex post punishments for defendants who have undertaken avoidance activities could actually worsen the problem: since the penalty is higher, defendants would have even larger incentives to avoid. Nussim & Tabbach, *supra*, at 46; Sanchirico, *supra* note 176, at 1367–68. More complex results are possible where avoidance responds more to frequency than to magnitude of punishments. Eric Langlais, *Detection Avoidance and Deterrence: Some Paradoxical Arithmetic*, 10 J. PUB. ECON. THEORY 371, 372–82 (2008).

   179.   *See, e.g.*, Murat C. Mungan, *Wrongful Convictions and the Punishment of Attempts*, 42 INT'L REV. L. & ECON. 79, 79–87 (2014).

   180.   Bebchuk & Kaplow, *supra* note 51, at 366.

   181.   *See* Joshua D. Blank & Daniel Z. Levin, *When Is Tax Enforcement Publicized?*, 30 VA. TAX REV. 1, 11–18 (2010) (analyzing use of tax enforcement announcements as a deterrence tool).

   182.   The best-known example is probably P. Wesley Schultz, Jessica M. Nolan, Robert B. Cialdini, Noah J. Goldstein & Vladas Griskevicius, *The Constructive, Destructive, and Reconstructive Power of Social Norms*, 18 PSYCH. SCI. 429, 429–34 (2007) (reporting field experiment in which providing information about energy-use by neighbors sometimes increased energy usage).

   183.   Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61, 70–83 (2002).

   184.   Galle, *supra* note 55, at 92; Lilian V. Faulhaber, *The Hidden Limits of the Charitable Deduction: An Introduction to Hypersalience*, 92 B.U. L. REV. 1307, 1339–40 (2012).

is an example of the correlations between subjective price and social damage we analyzed earlier.[185] When otherwise underdeterred defendants overestimate enforcement, variance is positively correlated with the harm that needs correcting.

Finally, we should mention again in this context a point that emerges from the existing literature: using more frequent incentives allows the government to rely more on its best policy option.[186] That is, suppose fines are the best choice but are limited by a defendant's net worth. Optimally, we could fine one person $10 million, or 1,000 people $10,000. Almost certainly, the one person we catch will not have $10 million in her pocket, forcing us to resort to something other than fines to punish her. By catching 1,000 people, we are more likely to be able to use fines exclusively.

3. *Combinations of Incentives*

Another method regulators can use to reduce the variance of their incentive system is to use combinations of incentives, instead of relying on a single instrument alone. Our model suggests several distinct ways in which multiple instruments can potentially improve over one alone, assuming that the regulator has no perfectly unvarying instruments available.[187] We'll focus here on what we think is the most interesting of these: the possibility that two instruments might offset each other's weaknesses.

Before detailing that approach, we should first distinguish our proposals from an existing and well-known feature of the standard economic approach. As Polinsky and Shavell detail, regulators *must* use two or more instruments when the best available instrument can't offer large enough incentives to achieve the optimum.[188] Recall that although Polinsky and Shavell favor fines over other criminal punishments, they acknowledge that most defendants cannot afford to pay fines large enough to provide optimal deterrence.[189] In that case, they recommend that the government resort to its next best option, such as prison.[190] What we propose instead is that, in the right circumstances, governments might deliberately make use of their second- or third-best options even before the most effective one has reached its maximum capacity.

One reason to reach for a less efficient (setting aside variance) instrument is if regulated parties' sensitivity to the second instrument is negatively correlated with

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185.   *See supra* text accompanying notes 131–142.

186.   Polinsky & Shavell, *supra* note 22, at 410.

187.   If the regulator has a perfectly predictable instrument available, our model predicts that utility is maximized by first exhausting that instrument before turning to others.

188.   Polinsky & Shavell, *supra* note 22, at 411.

189.   *Id.*

190.   *Id.* This assumes that the additional deterrence provided by imprisonment justifies its cost. *Id.*; *see* Ehrlich, *supra* note 6, at 63.

More formally, Polinsky and Shavell describe one instrument as superior to another when the total social cost of achieving optimal deterrence with that instrument is lower. Polinsky & Shavell, *supra* note 22, at 419–20.

their sensitivity to the first.[191] In other words, those who are unusually sensitive to Incentive *A* also tend to be unusually *in*sensitive to Incentive *B*. In that case, it is theoretically possible to construct a weighted combination of the two instruments—a little bit of *A*, a little bit of *B*—that eliminates all variance. Indeed, weighted combinations of what might otherwise have been only the fourth- and fifth-best choices could conceivably outperform the usual first choice.

A concrete example might be helpful. Individual brokers who abuse their customers' trust can be both fined and also see their license to sell securities suspended for a fixed time period.[192] These two penalties may well be negatively correlated for many defendants.[193] The more lucrative a dealer expects her business to be, the more she has to lose with each day she is sidelined. She also can likely borrow more cheaply, making it easier for her to pay off fines and still run her business. Thus, suspensions hurt her more than average, while fines hurt her less. By combining fines with suspension, the SEC might reduce the extent to which either one of these alone would tend to overdeter some dealers while underdeterring others.[194]

Combinations of instruments might have some downsides, however. For one, obviously, it might be more expensive to administer two or more distinct incentive systems.[195] Unless the same detection and enforcement system applies to both incentives simultaneously, dual-instrument approaches go in the face of Becker's advice: save on enforcement by using larger penalties. Dual-instrument tactics might be most appealing when Becker's approach is already constrained by other factors, such as a relatively low "ceiling" on the first-choice instrument; again, think of fines imposed on illiquid defendants.

D. *Potential Objections*

One possible criticism of our model is that we assume government can actually set an optimal level of the regulated activity. Many critics of the theory of optimal regulation argue government cannot have enough information even about publicly observable data, such as the harm caused by a regulated activity, to set the optimum accurately.[196] "Who knows how much damage global warming really will cause in

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191. This argument is akin to, but broader than, Shavell's discussion of pairs of instruments where each is practical only for distinct subsections of the population. Shavell, *supra* note 68, at 263–64; *see also* Paul Lehmann, *Justifying a Policy Mix for Pollution Control: A Review of Economic Literature*, 26 J. ECON. SURVS. 71, 80–86 (2012) (describing how instruments with differing transaction or monitoring costs for different settings can be complementary).

192. 15 U.S.C. § 78o(b)(4)(D) (suspension). Debarment sanctions are often waived, however. Velikonja, *supra* note 78, at 1118–32.

193. *See* Lott, *supra* note 5, at 585.

194. Again, we assume the SEC cannot fully forecast the dealer's expected per-day profits or net wealth, which would prevent it from correcting the resulting variance in either instrument.

195. *Cf.* David Gamage, *How Should Governments Promote Distributive Justice?: A Framework for Analyzing the Optimal Choice of Tax Instruments*, 68 TAX L. REV. 1, 32–34 (2014) (discussing overhead costs of implementing multiple taxes).

196. *E.g.*, THOMAS A. LAMBERT, HOW TO REGULATE 31–32 (2017).

the end?" these critics might ask. If so, do we care about variance in the incentive amount?

Assuming that we regulate at all, variance still matters. One of optimal theory's answers to the problem of low information is what we'll call the Eagle Scout method: dead reckoning.[197] The Eagle Scout doesn't always know where the next campground is, but he (or, recently, she) has a compass and knows its direction. Similarly, often regulators might not know precisely the optimal level of, say, carbon in atmosphere.[198] But we have a very good sense that current levels are far too high. Just about any policy we can implement will move us in the right direction.[199]

It's still important to minimize variance when using the Eagle Scout method. It's true that with highly variant incentives, some regulated parties will end up even closer to the optimum than others (assuming we are so far from optimum that no one will overshoot). But as we've mentioned already, the cost of these improvements is that others will lag even farther from the ideal point than the average. These laggards often do more harm than the highly responsive parties do good.

A second possible objection is that our proposal to limit variance is impossible to implement, because variance is unobservable. We argue that government usually cannot observe the subjective valuation of any particular person or firm subject to regulation. What makes us think that the regulator can know how much subjective valuation varies in the whole population? Isn't the population data just the sum of unobservable individual results?

An even stronger form of the objection might posit that the subjective valuation problem throws the whole project of government regulation into question.[200] Economists have argued that the government's information problem can usually be solved by observation,[201] and subjective valuation might interfere with accurate observations. As we've seen, optimal regulation requires data on the private costs of compliance, which are usually not directly observable. In the standard account, though, government can infer private costs by using price instruments.[202] If there is an inevitable $100 tax on emitting carbon, and a factory

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197.   William J. Baumol, *On Taxation and the Control of Externalities*, 62 AM. ECON. REV. 307, 307–08, 319 (1972).

198.   *Id.* at 307–08.

199.   *Id.* at 308. This may no longer be true for some pollutants, of course, but economic analysis still provides "at least a rough sense of the relative magnitudes at stake." Cropper & Oates, *supra* note 7, at 730.

200.   This is not a hypothetical. Very respected commentators, such as Alan Schwartz of Yale Law School, have raised a version of this information argument as a reason to reject "nudges" and other kinds of regulatory interventions. Alan Schwartz, *Regulating for Rationality*, 67 STAN. L. REV. 1373, 1377–78 (2015); Claire A. Hill, *Anti-Anti-Anti-Paternalism*, 2 N.Y.U. J.L. & LIBERTY 444, 445–48 (2007).

201.   *See supra* text accompanying note 199.

202.   Fullerton et al., *supra* note 58, at 430.

chooses to keep polluting, we can infer that it must cost more than $100 to abate a unit of carbon at that factory.[203]

The strong form of the objection argues that subjective value would make this simple inference problematic.[204] Suppose that the government's instrument is not a $100 per ton tax, but instead a one-week ban on production. What can we infer from a factory's decision to emit a ton of carbon? We know that the cost of the one-week ban must be less than the cost of preventing the carbon emission. But is the cost of the ban one dollar and the cost of carbon abatement two dollars? Two hundred dollars and $300, respectively? Once we introduce uncertainty about the price the government is offering regulated parties, the objector might argue, we no longer can be certain that we are learning private costs of compliance.[205] Yet private costs of compliance are vital to deciding whether regulation is cost justified.

We have two main responses to the weak form of the objection. First, government can simply pay for good data, such as by rewarding whistleblowers, or acquire it through audit.[206] In addition, it is easier to measure population- or industry-level data than it is to measure the same outcomes on an individual level.[207] Many factors contribute to that difference. Just as a statistical matter, the law of large numbers dictates that predictions about groups will always be more reliable than predictions about individuals.[208]

Many prosaic data-collection practicalities also make population data more reliable. In the United States, tax and census data provide in-depth snapshots of private behavior, without revealing details about any individual.[209] How? While firms are reluctant to disclose data on their private cost structures in ways that are individually identifiable, they often will readily respond to anonymous industry-wide surveys.[210] The firm doesn't want to give its competitors or regulators detailed

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203.   *Id.*

204.   Schwartz, *supra* note 200, at 1377–78.

205.   *See* Jacob Goldin, *Which Way to Nudge? Uncovering Preferences in the Behavioral Age*, 125 YALE L.J. 226, 246–47 (2015) (describing this potential problem).

206.   *See* Coglianese et al., *supra* note 18, at 299; Thomas O. McGarity & Ruth Ruttenberg, *Counting the Cost of Health, Safety, and Environmental Regulation*, 80 TEX. L. REV. 1997, 2038 (2002) ("In undertaking prospective assessments of the costs that will likely result from proposed rules, agencies typically possess fairly broad-ranging powers to conduct investigations of existing facilities and to audit company financial records.").

207.   *See* Baer, *supra* note 5, at 16 (making this point about policing data).

208.   WILLIAM H. GREENE, ECONOMETRIC ANALYSIS 1042–43 (6th ed. 2008).

209.   INTERNAL REVENUE SERV., INTERNAL REVENUE MANUAL § 10.5.1 (2018); U.S. CENSUS BUREAU, U.S. DEP'T OF COM., A HISTORY OF CENSUS PRIVACY PROTECTIONS, https://www.census.gov/history/pdf/history-privacy-protection102019.pdf [https://perma.cc/3BSQ-H6JP] (last visited Nov. 8, 2020).

210.   Coglianese et al., *supra* note 18, at 299; McGarity & Ruttenberg, *supra* note 206, at 2045. *But see id.* at 2029, 2038 (noting that self-reported cost information in one survey, in which firms were not required to provide any supporting documentation, was considerably higher than government estimates).

        This empirical observation can also be explained through basic game theory. In general, firms do not want to disclose their subjective costs because those with low subjective costs will likely be punished more, while those that claim high subjective costs will likely not be believed. Coglianese et al., *supra* note

information about itself, but this danger doesn't really arise when the publicly reported data will be aggregated together with many other firms.[211] At the same time, firms typically benefit from and want to support information systems that collect information about their industry as a whole, as these offer them guidance about whether their own costs and processes are over- or underperforming the market.[212] Indeed, firms regularly pay management consultants to provide these kinds of data.[213]

There is more to be said about the strong form of the objection, but in many ways, we have already said it elsewhere. As Galle discusses at length in earlier projects, there are many settings in which regulators confront the problem of potential uncertainty about private costs of compliance and many sets of common solutions.[214] Among others, regulators can run small-scale experiments or can use statistical techniques to extrapolate information about firms with less observable data from those whose data are more easily measured.[215] For example, regulators can reliably observe compliance costs for firms whose subjective valuation of a regulatory instrument is known to be relatively predictable.[216] Using well-known instrumental-variables statistical approaches, regulators can compare the common traits of the predictable and unpredictable firms to extrapolate unpredictable firms' likely costs.[217]

III. AN APPLICATION: THIS IS FINE?

To show the theoretical and practical significance of our contribution, we now want to apply our theory to one of the bedrock results in the modern economics of crime. We mentioned in Section I.C that it's a well-established principle that regulators should prioritize fines over other alternatives. Of all the incentives

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18, at 288–89. Firms may desire that their industry collectively will report high costs, so that sanctions will be lower in the future. But firms face a collective action problem in maintaining silence: silence provides positive externalities to rival firms. *Id.* at 290–92; Galle, *supra* note 75, at 822–23. If silence is costly, therefore, firms will have a tendency to disclose. Coglianese et al., *supra* note 18, at 292. For instance, inflating cost reports is likely to carry some risk of detection, and probably some penalty for lying. Maintaining a reputation for honesty is very important to firms with long-term relationships to regulators. *Id.* at 311, 333–34. Alternately, disclosing might provide an opportunity to hurt rivals, as in the famous case of the tobacco litigation of the 1990s. *Id.* at 293. If firms even suspect that rivals might disclose, they have an incentive to disclose first to get the most credit from the government—a classic prisoner's dilemma. *Id.* at 295. Where the government offers no inducements and allows unverified ad hoc estimates, however, it may well observe inflated costs.

    211.   Coglianese et al., *supra* note 18, at 299.

    212.   *See* Merritt B. Fox, *Retaining Mandatory Securities Disclosure: Why Issuer Choice Is Not Investor Empowerment*, 85 VA. L. REV. 1335, 1357–58 (1999) (summarizing positive externalities from firm financial disclosures).

    213.   Andreas Werr, *Knowledge Management and Management Consulting*, *in* THE OXFORD HANDBOOK OF MANAGEMENT CONSULTING 247, 248 (Matthias Kipping & Timothy Clark eds., 2012).

    214.   Galle, *supra* note 117, at 21–29.

    215.   *Id.* at 25–29.

    216.   Goldin, *supra* note 205, at 260–69.

    217.   *Id.*

governments can offer, fines (or, in a civil context, tort judgments) are said to offer better information, and, crucially, to make the best use of society's resources.[218] That is, although both fines and prison can make a defendant regret her choices, the fine transfers resources to other productive uses, while prison simply imposes suffering.

Our model offers some additional considerations. In some cases, these added considerations will weigh against fines, while in others they suggest we should use fines even more than standard theory recommends. For risk-averse parties, we argue, fines can be a less desirable option, while the reverse is generally true of regulated parties who are risk neutral.[219]

Who is risk-averse? Typically, we think of most humans as risk-averse when making financial decisions, unless they are fully insured against any bad outcome.[220] Risk aversion is another way of saying that people prefer the average of a set of uncertain outcomes to the uncertain prospect itself. That is, they like to avoid extreme outcomes that may be generated by uncertain prospects. Suppose you have $100,000. Would you stake $99,000 on one flip of the coin? Most would say no. Winning would be nice, almost doubling your wealth. But losing would be ruinous. This is how *diminishing marginal utility* leads to risk aversion: you'd rather have $100,000 than a fifty-fifty chance of $199,000 or $1,000.[221]

Insurance and economically similar strategies, such as hedging, help to relieve us of risk aversion,[222] but insurance against regulatory incentives is hardly universal.[223] For one, many insurers refuse to write policies that shield their customers from penalties for intentional acts.[224] Even when enforcement is

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218.   Polinsky & Shavell, *supra* note 22, at 410, 420.

219.   We should distinguish our account from the familiar point that risk aversion makes probabilistic enforcement (enforcement against less than every wrongdoer) socially costly because individuals dislike bearing risk. Garoupa, *supra* note 47, at 278–79; Polinsky & Shavell, *supra* note 22. That analysis assumes that risk aversion is either uniform across the population or is fully observable, and that the regulator can optimize in response; we emphasize the additional deadweight loss that results when the regulator cannot observe individual variation in risk aversion.

220.   GRUBER, *supra* note 6, at 322–23.

221.   *Id.* Here, the term 'diminishing marginal utility' refers to a person's von-Neumann-Morgenstern (vNM) utility. vNM utility is used for purposes of representing a person's decision-making under uncertainty. A person's utility over objects and uncertain prospects (i.e., his expected utility) is an ordinal concept. Thus, the existence of diminishing marginal (vNM) utility does not, and cannot, on its own, imply that a person's expected utility as it enters the social welfare calculus (which requires cardinal inputs) possesses diminishing returns. *See, e.g.*, JOHN E. ROEMER, THEORIES OF DISTRIBUTIVE JUSTICE 145–47 (1996) (discussing this and related issues in preference aggregation). However, there seems to be a consensus in legal scholarship of using a social welfare function to which people's utilities enter with diminishing returns whenever they possess diminishing vNM utility. Thus, we follow this convention here.

222.   GRUBER, *supra* note 6, at 324–25.

223.   Omri Ben-Shahar & Kyle D. Logue, *Outsourcing Regulation: How Insurance Reduces Moral Hazard*, 111 MICH. L. REV. 197, 229 (2012). An important exception is "environmental impairment liability" insurance. *Id.* at 225–26.

224.   Peter Kochenburger, *Liability Insurance and Gun Violence*, 46 CONN. L. REV. 1265, 1288–92 (2014); Rick Swedloff, *Uncompensated Torts*, 28 GA. ST. U. L. REV. 721, 739–40 (2012).

triggered by carelessness, insurance markets may fail to offer affordable coverage because of adverse selection and moral hazard.[225] Further, insurance law often will prohibit contracts to insure against government penalties as contrary to public policy, though of course a government that preferred risk-neutral regulated parties could repeal these prohibitions.[226] For that matter, a government that really wants parties to be risk neutral could also make insurance mandatory, as some have proposed for intentional torts.[227]

In contrast, we typically think of most widely held firms as risk-neutral, because the firm's investors can usually diversify away any firm-specific (and, often, industry-specific) risk.[228] But firms are run by humans, and the costs of contracting to align these humans with the interests of risk-neutral investors may sometimes leave managers still somewhat risk-averse.[229]

A. Varying Utility of a Dollar, or, Regulating Humans

In some models of well-being, fines may not be the optimal instrument for regulating uninsured humans because they lead to different burdens for different people.[230] Even if regulators can set a fine amount at the level that optimally

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225.   That is, insurance markets can fail when the insured has more information about its risks than the insurer, or when the insured can opportunistically increase the insurance payout. GRUBER, *supra* note 6, at 325–33.

226.   Swedloff, *supra* note 224, at 739–40.

227.   *Id.* at 759; Jennifer Wriggins, *Domestic Violence Torts*, 75 S. CAL. L. REV. 121, 152 (2001).

228.   Reinier H. Kraakman, *Corporate Liability Strategies and the Costs of Legal Controls*, 93 YALE L.J. 857, 865 (1984).

229.   *Id.* at 879; Li-Ming Han, *Managerial Compensation and Corporate Demand for Insurance*, 63 J. RISK & INS. 381, 382 (1996). *But see* Victor P. Goldberg, *The Devil Made Me Do It: The Corporate Purchase of Insurance*, 5 REV. L. & ECON. 541, 542–43 (2009) (arguing that firms might buy insurance because of demands of counter-parties, not just manager preferences). For another theory of risk-averse firms, see Murat C. Mungan, *Sharing of Cost Related Information Can Increase Consumer Welfare Under Risk-Aversion*, 15 REV. L. & ECON. 1 (2019).

   Similarly, to the extent that judgments against firms are borne by individuals other than diversified shareholders, those individuals may be able to exert influence to make the firm avoid risk. *Cf.* Brian Galle, *Is Local Consumer Protection Law a Better Redistributive Mechanism than the Tax System?*, 65 N.Y.U. ANN. SURV. AM. L. 525 (2010) (explaining that economic burden of tort judgments can fall on a variety of those connected to a firm); Perry & Kantorowicz-Reznichenko, *supra* note 91; Kraakman, *supra* note 228, at 882 (suggesting that impacts on firm employees may limit penalties regulators will impose on the firm).

230.   Once more, we caution that many economic modelers would instead simply measure utility in dollars, which would lead them to conclude that all dollar-denominated incentives have equal utility effects for all individuals. Our discussion here is intended for those who would opt for a different model. We note, though, that it appears some of those who prefer money-metric utility would account for diminishing marginal utility by allowing risk aversion to enter the utility function, such as by translating risky payoffs into "certainty-equivalent income." Fleurbaey, *supra* note 90, at 462.

   Our discussion can also be readily translated into terms of "welfare weights." Jean Drèze & Nicholas Stern, *The Theory of Cost-Benefit Analysis*, *in* 2 HANDBOOK OF PUBLIC ECONOMICS 909, 930 (A.J. Auerbach & M. Feldstein eds., 1987); *see* Kaplow & Shavell, *supra* note 59, at 4. Some economists who employ "money-metric utility," *see, e.g.*, Boadway, *supra* note 12, at 52, will adjust measured social costs and benefits to reflect social preferences for distribution, which usually reflect the diminishing marginal utility of money. Our argument can be understood as a claim that individual

incentivizes the average person, this same amount will over- or undermotivate most of the population.[231] We have powerful intuitions that this is true. Ask the drivers of Ferguson, Missouri. Fines that would be a nuisance to middle-class payers have deprived poorer families of their cars, and in turn their livelihoods and ultimately their homes.[232]

The "day fines" imposed by some European countries, and the wealth-adjusted punitive damages proposed by some scholars, improve matters but are no cure-all.[233] A day fine is not a fixed amount but instead is simply the income earned by the defendant in one (or more) day's work.[234] Scholarly proposals would adapt this approach to civil litigation, allowing plaintiffs to collect more or less from defendants who would not be optimally deterred by a punitive damages award calibrated to the wealth of the average defendant.[235]

While these approaches probably reduce the variability of the welfare impact of a monetary incentive, they hardly eliminate it. For one, two individuals with identical wealth levels can have very different responses to money.[236] The utility cost of a dollar varies depending on the payer's wealth, but this relationship is not automatic or mathematical: some poor fine payers will be able to adapt to their new hardship, while some wealthy payers may cling fiercely to every dollar.[237]

Another uncertainty relates to time. A fine that looks big relative to current income may be trivial if the defendant has substantial savings or can easily borrow against future earnings.[238] Put another way, the utility of a dollar arguably depends on a person's lifetime wealth, not their wealth at any one moment.[239] Already-existing wealth is somewhat measurable, but we don't know how long a life

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welfare weights are measured with uncertainty. *Cf. id.* at 71–72 (arguing that uncertain project benefits cause utility losses for risk-averse individuals).

231.   This is roughly the same problem as the well-known issue in cost-benefit analysis that "willingness to pay" will vary by household wealth. Bronsteen et al., *supra* note 11, at 1652–53.

232.   Kohler-Hausmann, *supra* note 120, at 686.

233.   Perry & Kantorowicz-Reznichenko, *supra* note 91, at 862–63; Alec Schierenbeck, *The Constitutionality of Income-Based Fines*, 85 U. CHI. L. REV. 1869, 1876–79 (2018).

234.   *Id.*

235.   Perry & Kantorowicz-Reznichenko, *supra* note 91, at 837.

236.   For example, individuals may have varying preferences about how to use their wealth, and so the utility value of wealth may vary depending on the prices of the preferred goods. These prices can themselves be endogenous to (caused by) the policies whose effects we are trying to measure. *See* Kaplow & Shavell, *supra* note 6, at 996–97.

237.   Bronsteen et al., *supra* note 11, at 1654–56. *See generally* Walter J. Blum & Harry Kalven, Jr., *The Uneasy Case for Progressive Taxation*, 19 U. CHI. L. REV. 417 (1952) (noting empirical uncertainties behind assumptions of diminishing marginal utility).

238.   Nicholas Bull, Kevin A. Hassett & Gilbert E. Metcalf, *Who Pays Broad-Based Energy Taxes? Computing Lifetime and Regional Incidence*, 15 ENERGY J. 145, 147 (1994); Don Fullerton & Diane Lim Rogers, *Lifetime Versus Annual Perspectives on Tax Incidence*, 44 NAT'L TAX J. 277, 277–78 (1991).

239.   Fleurbaey, *supra* note 90, at 457.

the defendant will need her savings to support herself over, changes to her potential needs or earning capacity, and so on.[240]

Worse, accurately measuring borrowing capacity is far more uncertain, as that turns not only on future events but also on an individual's present access to credit or insurance products.[241] Compounding all this, individuals vary in their cognitive capacity to save or borrow—for instance, evidence suggests some households impulsively overconsume when they have access to new resources.[242] Thus even two people with identical lifetime incomes may have very different utility from a dollar in any given time period, depending on how efficiently each manages to spread their consumption over time.[243]

Finally, as Kaplow and Shavell have observed, adjusting payments to reflect the subject's wealth in effect imposes a wealth tax.[244] That is, if individuals or firms know that holding more resources will subject them to greater liability, they will (marginally) prefer to have less wealth. Businesses, for instance, might be encouraged to structure themselves as series of shell organizations in order to cabin off assets from claimants.[245] Wealth adjustments, in short, create a tradeoff between deterrence and unwanted distortions, with the result usually being that the optimal incentive allows for some degree of underdeterrence.[246]

As a result, fines or their equivalents are not self-evidently the best policy instrument for regulating humans. Although fines may be the stronger choice on some dimensions, these advantages have to be traded off against the possibility that the variance of a fine is larger than the variance of other choices. Of course, it could

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240.   *See* Matthew D. Adler, *Risk Equity: A New Proposal*, 32 HARV. ENV'T L. REV. 1, 23–24 (2008); Daniel Shaviro, *Beyond the Pro-Consumption Tax Consensus*, 60 STAN. L. REV. 745, 772–73 (2007).

241.   We could perhaps impose fines based on what we believe the defendant's *capacity* to earn will be in the future, but that approach would in effect chain many defendants to the path that offers them the highest earnings. For these reasons—uncertainty and discomfort with what amounts to wage slavery—theorists have long rejected the otherwise appealing notion of imposing taxes based on earning potential. *See* Lawrence Zelenak, *Taxing Endowment*, 55 DUKE L.J. 1145, 1154–72 (2006) (summarizing and examining arguments against taxes on potential income).

242.   Keith Marzilli Ericson & David Laibson, *Intertemporal Choice*, *in* 2 HANDBOOK OF BEHAVIORAL ECONOMICS 2, 25–26 (B. Douglas Bernheim, Stefano DellaVigna & David Laibson eds., 2019).

243.   Galle has previously argued that, despite the difficulties of lifetime comparisons, household wealth should still be a basis on which we judge the fairness of tax and transfer systems. He claims that wealth comparisons measured over shorter periods of time are more practical, while still being morally and economically important. Brian Galle & Manuel Utset, *Is Cap-and-Trade Fair to the Poor? Shortsighted Households and the Timing of Consumption Taxes*, 79 GEO. WASH. L. REV. 33, 89–95 (2010). Mungan takes no position on these questions.

244.   Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667, 672–73 (1994).

245.   *See* Hanson & Logue, *supra* note 69, at 1299; Perry & Kantorowicz-Reznichenko, *supra* note 91, at 857; *see also* Henry Hansmann & Reinier Kraakman, *Toward Unlimited Shareholder Liability for Corporate Torts*, 100 YALE L.J. 1879, 1927 (1991) (summarizing empirical evidence that this occurs).

246.   A. Lans Bovenberg & Lawrence H. Goulder, *Environmental Taxation and Regulation*, *in* 3 HANDBOOK OF PUBLIC ECONOMICS 1471, 1486 (Alan J. Auerbach & Martin Feldstein eds., 2002).

also transpire that despite its variance a fine is still less variant than its alternatives. We discuss that possibility in more detail in Section III.B.

Before moving on, though, we want to emphasize that our observations about fines here can also be applied to other instruments that are ultimately delivered in dollars. For example, in the intellectual property literature, there is debate over which of grants, patents, or other incentives are the best way to encourage innovation.[247] The varying utility value of a research grant might undermine its efficiency, at least if the primary target is individual inventors.

On the other hand, a grant may well offer less variance than a patent, its primary rival. Like the grant, the patent ultimately pays off in dollars—it is simply a temporary monopoly allowing its holder to charge prices above the competitive equilibrium price.[248] But the amount of dollars the patent pays, and its timing, are less certain than with grants. Although the payoff from a patent depends in part on how much the public will pay, and thus arguably the social worth of the invention,[249] the patent's worth could also fluctuate depending on the marketing skill of its holders, the willingness of trolls or competitors to sue, and uncertainty about the scope and validity of the patent.[250] These extraneous factors make the patent's dollar value less sure to match its social value. Of course, grants have the problem that the grant awarder has to figure out how to measure social value, and this too can introduce errors.[251] Our only point is that the literature has so far emphasized the uncertainty of grants without fully recognizing the similar uncertainty of patents.[252]

B. Risk Neutrality, or, Regulating Firms

Our model has very different implications for the regulation of risk-neutral actors. First, we tend to confirm the conventional wisdom. By definition, for any given risk-neutral party, all dollars have equal value.[253] Fines and other

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247.   Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, *in* 2 INNOVATION POLICY AND THE ECONOMY 51 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2002) (comparing intellectual property and alternative incentive mechanisms, namely prizes and procurement contracts); Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 73 AM. ECON. REV. 691 (1983) (same).

248.   Steven Shavell & Tanguy Van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525, 529 (2001).

249.   Gallini & Scotchmer, *supra* note 247, at 54–55; Wright, *supra* note 247, at 703.

250.   Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 TEX. L. REV. 303, 329–30 (2013).

251.   Gallini & Scotchmer, *supra* note 247, at 54–55; Wright, *supra* note 247, at 703.

252.   Critics do observe that willingness to pay for a patented product is not always a good measure of its social benefits. Amy Kapczynski & Talha Syed, *The Continuum of Excludability and the Limits of Patents*, 122 YALE L.J. 1900, 1942 (2013).

   As other writers have noted, it is possible to design mechanisms that combine aspects of grants and patents to blur the distinction between them. *E.g.*, Daniel Jacob Hemel & Lisa Larrimore Ouellette, *Innovation Policy Pluralism*, 128 YALE L.J. 544, 548 (2019). To these authors, we would urge consideration of the variability of the resulting subjective value of incentives to inventors.

253.   That is, the definition of risk neutrality is that the party's utility of adding or losing each dollar does not vary with the number of dollars gained or lost. Thus, the party's wealth is irrelevant, and

dollar-denominated incentives would thus seem to be among the least variant of any possible instrument. If minimizing variance is important, as we argue it is, then fines are even more appealing as a regulatory instrument than prior analysis suggests.[254]

But our model does more than just confirm the usefulness of fines. We offer a new criterion for choosing between instruments that the standard account would have treated as indistinguishable. Remember that the existing case for fines is that they are ex post and that they transfer, rather than waste, the cost imposed on the regulated party. A number of other instruments share these two central features. For example, consider debarments and similar penalties, which revoke the party's right to do business for some period of time. In a reasonably competitive industry, the business opportunities lost by the sanctioned party will be claimed by rivals, enriching them at the party's expense.[255] Prior law enforcement literature has thus far had little to teach us about how to choose between fines and debarment.

In contrast, our analysis suggests fines are usually preferable to debarment. As we sketched earlier, the expected costs of being out of business are probably somewhat known to the regulated party but likely cannot be measured as precisely by the regulator. Debarment thus introduces variance that would not be present in a fine of equivalent expected cost.

Another way in which we add to the prevailing account is in helping planners to decide how much effort they should spend on detection and enforcement. This argument takes a few steps. Basically, the bigger the advantage that the regulator's best available instrument has over the next-best choice, the harder the regulator should work to try to detect and punish (or, similarly, to entice and reward) the parties it wants to incentivize—holding the *expected* cost of punishment constant. That is, we should punish more often in smaller increments. Our theory suggests that the gap between fines and the next best instrument may well be wider than other theorists have appreciated. If so, we should be detecting and imposing fines on more offenders.

To unpack this point a bit more, let's review the regulator's decision about how often to punish. A system that only has to detect one violator is probably

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cannot be a source of difference between parties. We concede that in theory, two risk-neutral actors could assign varying values to a dollar for reasons other than wealth. For instance, incentives might have symbolic value, and this symbolism might be tied to the size of the dollar incentive. But we are unaware of any empirical evidence that differences of this kind are common or of significant magnitude.

254.   We note that we take no view on the question whether deterrence is the best approach to ensuring corporate compliance with law, or whether other modes such as developing a robust compliance culture might be equally as or more effective. For an argument for the latter, see Tom R. Tyler, *Psychology and the Deterrence of Corporate Crime*, *in* RESEARCH HANDBOOK ON CORPORATE CRIME AND FINANCIAL MISDEALING 11, 11 (Jennifer Arlen ed. 2018). For empirical evidence supportive of Tyler's view, see generally Brian Galle, *Why Do Foundations Follow the Law? Evidence from Adoption of the Uniform Prudent Management of Institutional Funds Act*, 36 J. POL'Y ANALYSIS & MGMT. 532 (2017).

255.   *See* N. GREGORY MANKIW, PRINCIPLES OF ECONOMICS 365–66 (1998) (stating that entry of new firms reduces competitor profits).

cheaper than one that tries to find thousands. But the expected cost of an incentive is its cost times the likelihood that it will be imposed. So, if we only detect one wrongdoer, the penalty must be thousands of times higher. Especially in the case of fines, it will often be impossible to meaningfully impose fines of such magnitudes, since the defendant won't be able to afford to pay. We say that the regulatory instrument has been "exhausted" when it is set at such a high level that further increases have no marginal effect.

The possibility of exhaustion thus presents regulators with a trade-off. If they want to spend less on detection and enforcement costs, the penalty will have to be bigger, which means that they may well have to switch away from their first-best instrument and turn to others that are not as efficient. The optimal combination of instrument choice and frequency of detection balances these two factors against one another. The worse the second-best instrument is relative to the first, the more important it is to "max out" the better instrument, bringing it just to the point of exhaustion, but no further.[256] If the better instrument is easily exhausted, we'll want to keep each individual's penalty at just this low level. To maintain the expected cost of the sanction at a steady point, we have to catch more people. Therefore, the bigger the gap between the best and next best choice, the more the regulator should spend on detection.

This brings us back to our point about fines. We've shown that the gap between fines and other options is wider than the existing literature claims. Thus the optimal balancing point between detection costs and exhaustion should tip farther towards detection costs; exhausting the possibility of a fine is worse than others have thought, because fines are a stronger choice.

While much of our analysis is thus supportive of the use of fines, in one important case the argument we just laid out instead cuts in favor of ex ante taxes over fines. Remember from Part I that the main difference between fines and taxes is timing: the fine is imposed after the bad act occurs, while the tax is imposed beforehand on behavior that presents a *risk* of the bad outcome (think of the difference between a ticket for speeding and a tort suit for the car crash that could result). Many commentators, we noted, prefer fines because they allow for government to gather more information before acting.[257]

By our logic here, ex ante taxes start to look like the best policy option when potential defendants are judgment proof. Defendants are judgment proof when they can't borrow or insure themselves enough to pay a meaningful fraction of the

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256.   Another way to put this is that changes in the frequency of detection for the first-best instrument have smaller variance costs than changes in the frequency of its alternatives. When we compare the policy of increasing the probability of conviction, versus increasing imprisonment, the former has the effect of not introducing additional variance. Consider, for example, the situation where no imprisonment is used, the cost is P (probability of detection) times F (the fine amount). Obviously, no heterogeneity is caused by higher P. But, when a regulator increases a prison sentence from 0 to S, the sanction becomes $P(F+S)$, where S varies across individuals. Thus, on the margin, we should use more P than S. This means that we impose fines more *frequently,* but we still use *exhaustive* fines.

257.   *See supra* text accompanying notes 59–73.

optimal fine. Polinsky and Shavell consider whether government should then turn to incarceration (or other nondollar options, presumably, in pure regulatory cases where jail is not an available incentive).[258] Once more, this position is a trade-off: what government gains in information by waiting, it loses in switching from a "transfer" instrument (taxes, which can be used to pay for useful things) to a transferless instrument (prison, which mostly causes deadweight loss).[259]

What we add to this choice is that there are actually two major costs to prison: besides being nontransferable, its variance is also much greater. Prison and other ex post alternatives to taxes create an information-information tradeoff. Government might learn more about the marginal social costs and benefits of the regulated activity, but it now knows less about how regulated actors respond to its chosen incentive.

Of course, prison isn't usually an issue for corporations, the main subject of this Section. The reader can think instead of dissolution, disgrace, or other nondollar penalties that could be imposed on a bankrupt firm.[260] More commonly, our point will apply to individuals. We mentioned in the last section that dollar-denominated incentives, even though varying, could still be less variant than other alternatives. That's one scenario we envision here: it may be better to switch to taxes rather than incarceration when taxes are a less varying instrument than jail. For individuals too poor to pay even the relatively lower prices that ex ante incentives would allow, regulators could use dollar rewards instead.[261]

A final observation we'd make about the risk-neutral case is that risk-neutrality can itself be influenced by the regulator. For example, individuals can be compelled to acquire insurance, or government can construct a regime, such as the social security and unemployment insurance systems, in which government collection of taxes and distribution of revenues serves as the economic equivalent of mandatory insurance.[262] In the case of firms, the finance literature suggests that the costs of bankruptcy and other imperfections in the market for outside financing are (aside from managers acting in their own interests rather than the firm's) the main drivers of whatever risk aversion most firms exhibit.[263] Reforms to bankruptcy

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258. Polinsky & Shavell, *supra* note 22, at 419.

259. Miriam H. Baer, *Pricing the Fourth Amendment*, 58 WM. & MARY L. REV. 1103, 1150–53 (2017); Brian Galle, *Tax, Command . . . or Nudge?: Evaluating the New Regulation*, 92 TEX. L. REV. 837, 864–88 (2014).

260. Another set of alternatives would be to impose individual punishments on managers or investors, but these too can create their own sets of costs. *See* Kraakman, *supra* note 111, at 869–71. And, of course, the managers themselves can be personally shamed. *Id.* at 880.

261. While there is an obvious potential moral hazard concern with rewards, we think this concern is often overstated, an argument we defer for further exposition elsewhere.

262. Ben-Shahar & Logue, *supra* note 223, at 238–47; Levitt, *supra* note 132, at 181–82; Viscusi, *supra* note 11, at 608 (noting that mandatory insurance can be a solution to judgment-proof defendants).

263. Kenneth A. Froot, David S. Scharfstein & Jeremy C. Stein, *Risk Management: Coordinating Corporate Investment and Financing Policies*, 48 J. FIN. 1629, 1632–33 (1993). Empirical evidence does suggest that managerial risk preferences are quite important, though. Gordon M. Bodnar, Erasmo Giambona, John R. Graham & Campbell R. Harvey, *A View Inside Corporate Risk Management* (Duke

(for example, to reduce existing investors' risk of losing control of the firm) thus might have some influence over firm perception of risk.

These maneuvers are obviously not always free or even easy but might be worthwhile to the extent that the risk-neutral case offers a more appealing set of regulatory choices. With risk-averse parties, the regulator often must choose among a set of highly variant instruments so that her task is to pick the least bad. When parties are risk neutral, though, fines and similar instruments—including Pigouvian taxes, fees, and the like—are much more predictable. In other words, switching to a risk-neutral regime may greatly improve the efficiency of the regulator's first-best instrument.[264] These gains could well justify the costs of making parties indifferent to risk.

As an example, consider the possible regulation of risky firearms. The United States currently does little to encourage firearm owners to internalize the social cost of widespread firearm ownership.[265] While there may also be positive externalities from gun owning, such as deterring crime or tyranny, these benefits are probably just as available in a world where firearms create far fewer risks. Incentives for safe gun storage, use, and transfer are likely compatible with whatever benefits firearms offer.[266]

As other commentators recognize, the difficulty is that civil liability would have a highly disparate impact on lower-income households and would usually exceed any gun owner's available wealth.[267] Few owners would have incentives to buy insurance on their own. Compulsory insurance—or, equivalently, a risk-adjusted ex ante Pigouvian regime in which registration fees for riskier weapons are higher—would not only make price-based regulation of guns feasible, it would also make it considerably more efficient by reducing its variance.[268]

Innovation & Entrepreneurship, Working Paper No. 16-6, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2438884 [https://perma.cc/TJ9U-ZHC6].

264. *Cf.* Bruce H. Kobayashi, *Antitrust, Agency, and Amnesty: An Economic Analysis of the Criminal Enforcement of the Antitrust Laws Against Corporations*, 69 GEO. WASH. L. REV. 715, 732 (2001) (noting that insurance makes fines more effective because fewer firms are judgment-proof).

265. INST. OF MED. & NAT'L RSCH. COUNCIL, PRIORITIES FOR RESEARCH TO REDUCE THE THREAT OF FIREARM-RELATED VIOLENCE 2 (Alan I. Leshner, Bruce M. Altevogt, Arlene F. Lee, Margaret A. McCoy & Patrick W. Kelley eds., 2013), https://www.nap.edu/catalog/18319/priorities-for-research-to-reduce-the-threat-of-firearm-related-violence [https://perma.cc/XQE5-HQSQ].

266. For discussion of how liability might affect the marginal incentives of gun owners to reduce risk, see George A. Mocsary, *Insuring Against Guns?*, 46 CONN. L. REV. 1209, 1231–41 (2014). Even Second Amendment advocates concede that regulation of risky gun ownership is likely constitutional. *E.g.*, Stephen G. Gilles & Nelson Lund, *Mandatory Liability Insurance for Firearm Owners: Design Choices and Second Amendment Limits*, 14 ENGAGE: J. FEDERALIST SOC'Y'S PRAC. GRPS. 18, 19–20 (2013).

267. Mocsary, *supra* note 266, at 1228.

268. As the example suggests, compulsory insurance does not *eliminate* risk aversion. Insurance premia or risk-adjusted fees might still impose a heavy burden on some households. But this burden is much smaller than a tort award.

CONCLUSION

Humans, we've argued, are not vending machines. Regulators can't drop an incentive into a slot and expect the same output every time. Although other commentators have shared our view about the subjectivity of human experience, they've drawn very different lessons from it. Some have said that regulators can detect and correct for varying responses. Others have said detection is hopeless and that regulators should abandon the project of regulation.

While we doubt that regulators can ever really identify and correct for subjectivity, we nonetheless largely defend the regulatory state, including the criminal law and economic analysis of it. Uncertainty about how the subjects of regulation will respond to incentives is indeed a problem for rigorous analysis of how to regulate. But it is not a hopeless task. Instead, we've shown ways in which regulation can adapt to the challenge of uncertainty. For example, our framework shows a regulator how to choose between similar instruments, such as fines and suspensions, that prior work did not clearly distinguish.

Along the way, we've shown that subjective responses to incentives unsettle some well-established verities of economic theory. Fines are not always the best way to regulate humans. Sealed records and confidential settlements can be more efficient than shaming and bad reputation. And for firms, small fees or Pigouvian taxes on risks may be superior to large fines on bad outcomes.

We've also added to what we think is already a strong case for fundamentally reforming the U.S. criminal justice system. Prison, to the extent we must resort to it, could well be more efficient if it were less cruel and alienating. It may even be preferable to use rewards, such as targeted education, cash, or criminal-diversion programs, to keep people out of the criminal justice system altogether.[269]

Of course, there is always more ground to cover. One potential extension we want to highlight is the application of our theory to the use of shaming or social norms to control behavior. As others recognize, public opinion and self-image can be powerful tools in shaping human behavior.[270] But available evidence suggests that different individuals respond quite differently to these kinds of incentives,[271] suggesting that norms often won't be the tool regulators should turn to first. At the same time, though, it may be that every formal incentive offered or imposed by government also carries with it a message about social norms.[272] For instance, very small taxes on plastic bags seem to have quickly flipped public perception of whether plastic bags are acceptable.[273] If that is true, then even the most seemingly

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269.   For a review of the relative desirability of rewards and punishments, see Ehrlich, *supra* note 6.

270.   An essential overview is Roland Benabou & Jean Tirole, *Law and Norms* (Nat'l Bureau of Econ. Research, Working Paper No. 17579, 2011).

271.   *Id.* at 12–13.

272.   *Cf.* Kahan & Posner, *supra* note 84, at 374 (pointing out that imprisonment causes shame).

273.   Tatiana A. Homonoff, *Can Small Incentives Have Large Effects?: The Impact of Taxes Versus Bonuses on Disposable Bag Use*, 10 AM. ECON. J.: ECON. POL'Y 177, 177–79 (2018).

predictable of instruments, such as small ex ante taxes, in fact carry a potentially large and unpredictable component.[274] Our account here suggests that managing these side effects may be critically important for regulators.

For the meanwhile, we offer what we think is an important first step in a new direction in regulatory design.

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274.   Much depends on exactly the nature of the information that is conveyed by the formal incentive. For more discussion, see Murat C. Mungan, *A Generalized Model for Reputational Sanctions and the (Ir)relevance of Interactions Between Legal and Reputational Sanctions*, 46 INT'L REV. L. & ECON. 86 (2016).