Using Bounded Rationality

to Fight Crime

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Abstract

Law and economics scholars have traditionally modeled criminal deterrence as a simple function two factors: (i) severity of punishment, and (ii) probability of punishment. Building on this insight, Gary Becker’s (1968) seminal essay argued that optimizing on the benefits of such deterrence and the cost of enforcement should be the policy objective of the criminal law. Yet empirical and experimental research in behavioral economics has shown that individuals often do not respond rationally to incentives. Instead, theories of bounded rationality predict that individuals form heuristics to guide their decision-making when deliberation costs are sufficiently high. This paper combines the insights of Becker’s model of criminal deterrence with a theory of deliberation costs, arguing for a nuanced revision of the objective of criminal law: that the function of the criminal law should not be to create first-order disincentives to commit particular crimes, but rather to instill in individuals the formation of second-order heuristics not to contemplate cost-benefit deliberations of criminal activity in the first place. Rather than altering incentives to affect how individuals decide to act, this paper proposes that the law should alter incentives to affect how individuals decide to decide to act. In addition to the substantive results, this conception of the function of criminal law introduces the novel policy objective of benevolently “biasing” individuals rather than, as is ordinarily the case in behavioral law and economics literature, “debiasing” them. Moreover, for practical applications, it suggests a number of ways

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in which enforcement may be made more effective and less costly, while also suggesting (contrary to much economic thinking about crime) that current policies tend to be excessively punitive.

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Behavioral economics has seen rapid development in recent decades. The soundness of the empirical and experimental literature supporting its claims can no longer be disputed, and it is now well-established as a fertile branch of economic inquiry. Its infiltration into *law and economics* has been a comparatively late arrival, however interest in the psychological foundations of rationality and decision-making within the law and economics movement has grown steadily since the turn of the millennium, and now commands considerable attention.

The vast majority of the *applied* behavioral economics literature focuses on the elimination of cognitive biases and heuristics. Indeed, “debiasing” and “insulation” are practically assumed to be sound policy goals, *ipso facto*, wherever biases and heuristics may be found. Of course, no one disputes that self-interested rationality is a valid *normative* model (in the sense that self-interested welfare maximization yields the best private outcome for an individual). The “revolutionary” claim of behavioral economics is not that the rational actor hypothesis fails to describe how people *ought* to behave, but rather that the rational actor hypothesis fails to describe how people *do* behave in fact. Thus, the thinking goes, strategies to eliminate non-rational behavior will close the gap between how people ought to act and how they do in fact act.

Undoubtedly, debiasing and insulating strategies do tend to effect efficiency, assuming perfect competition. However, the vast majority of markets routinely suffer from one or more forms of market failure — negativing the assumption of perfect competition. In such cases, we may want, as social engineers, to increase the gap between privately optimal behavior and behaviors in fact. Where the private objective and social objective fail to align, it may be possible to exploit systematic non-rational behavior to effect second-order incentive alignment. That is, to use predictable and systematic non-rational behavior as a tool to correct for market inefficiencies. Lamentably (and perplexingly), few scholars have yet seized upon the exploitation of non-rational behavior as a method of effecting incentive alignment.

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1It should be added that while the empirical findings of behavioral economics are well established, the theory underlying apparent instances of systematic non-rational behavior remains relatively undeveloped.
In this paper, I investigate precisely that possibility in the context of criminal law policy, arguing that superior deterrent effects may be achieved with less enforcement and more lenient sentencing by exploiting the phenomenon of “bounded rationality.” Section 1 briefly summarizes the history of economic theories of criminal law, and also addresses some historical objections to the premises underlying economic approaches to criminal law. Section 2 describes how the conventional economic conception of criminal deterrence may be extended to incorporate systematic non-rational behavior. Section 3 cashes out that conceptual work in a formal model, from which an alternative “efficient” level of criminal deterrence may be computed. In Section 4, I suggest some possible practical applications of my model in policymaking. Section 5 concludes with an overview of what I have tried to accomplish in this essay.

1 Background

1.1 The Elements of Criminal Deterrence

The Enlightenment era legal philosopher Cesare Beccaria was among the first instrumentalists, arguing that punishments should not exceed the net benefits derived from incapacitation and deterrence. However, the importance of Beccaria’s work extends well beyond his philosophical rejection of retribution as a ground for punishment. His analysis of deterrence implicitly relied on economic methods and results, an approach which would reemerge two hundred years later when scholars in the law and economics movement began systematically applying economic methods to the study of criminal law. Yet Beccaria’s insights remain a pellucid description of the fundamental framework law and economics scholars employ in analyzing the criminal law; the wealth of insights bears substantial direct quotation:

> It is not only the common interest of mankind that crimes should not be committed, but that crimes of every kind should be less frequent, in proportion to the evil they produce to society. Therefore the means made use of by the legislature to prevent crimes should be more powerful in proportion as they are destructive of the public safety and happiness, and

— Cesare Beccaria, *Dei delitti e delle pene* [Of Crimes and Punishments], Chapter 12, Edward D. Ingraham, trans. (1764) [1819] ("The end of punishment, therefore, is no other than to prevent the criminal from doing further injury to society, and to prevent others from committing the like offence. Such punishments, therefore, and such a mode of inflicting them, ought to be chosen, as will make the strongest and most lasting impressions on the minds of others, with the least torment to the body of the criminal.").
as the inducements to commit them are stronger. Therefore there ought to be a fixed proportion between crimes and punishments.

It is impossible to prevent entirely all the disorders which the passions of mankind cause in society. These disorders increase in proportion to the number of people and the opposition of private interests. If we consult history, we shall find them increasing, in every state, with the extent of dominion. In political arithmetic, it is necessary to substitute a calculation of probabilities to mathematical exactness. That force which continually impels us to our own private interest, like gravity, acts incessantly, unless it meets with an obstacle to oppose it. The effect of this force are the confused series of human actions. Punishments, which I would call political obstacles, prevent the fatal effects of private interest, without destroying the impelling cause, which is that sensibility inseparable from man. The legislator acts, in this case, like a skilful architect, who endeavours to counteract the force of gravity by combining the circumstances which may contribute to the strength of his edifice.

Given the private welfare function, \( P(a_n) = B(a_n) - K(a_n) \), where \( B(a_n) \) is the benefit of undertaking action \( a_n \), and \( K(a_n) \) is the cost of undertaking \( a_n \), it may arise that the optimal choice, \( a^* = \max_{a_n} P(a_n) \) is a criminal act. This is, in Beccaria’s words, the “gravity” that impels people to commit crime: it is simply the choice that maximizes their payoffs. However, by imposing a criminal sanction, \( S(a_n) \), discounted by the probability of enforcement \( \pi \), the law manipulates parties’ cost-benefit calculations by imposing “political obstacles,” such that:

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P^\dagger(a_n) = B(a_n) - K(a_n) - \pi(a_n)S(a_n)
\] (1)

The idea is that when the expected sanction \( \pi(a_n)S(a_n) \) is sufficiently large, then \( a^* \neq a_n \), and parties will voluntarily refrain from undertaking the proscribed activity \( a_n \), since it will no longer be privately optimal.

\(^3\)Beccaria, supra note 2, Chapter 6.

\(^4\)Observe that in an alternative framing of the problem, \( K(a_n) \) could be interpreted to include \( \pi(a_n)S(a_n) \). I have chosen to treat the terms separately for analytical clarity, though prior law and economics scholars writing on criminal law have typically considered \( \pi S(a_n) \) to be an element of \( K(a_n) \). The choice to treat the two terms separately is motivated merely by my preference for clarity over parsimony, and obviously has no effect on the results.
1.2 Criminological Skepticism about Economic Models of Deterrence

Before proceeding to modern approaches to criminal deterrence, I will consider and rebut some objections to Beccaria’s rudimentary formulation in the recent criminal law literature. I have included this discussion with some hesitation, and it bears remarking on what role this plays in my argument. Readers of early drafts of this paper have given vastly differing opinions on the importance of addressing this point. Those whose backgrounds were in law and economics complained that it was an unnecessary digression, while those whose backgrounds were in criminology complained that it was too cursory. So much reveals the methodological divide in criminal law scholarship. Upon consideration, it seems to me that some defense of a critical premise — that punishment has a deterrent effect — is warranted, since at least some portion of readers, whom I hope to reach, will regard a defense of the economic approach to criminal deterrence an essential precondition to further theoretical elaborations. Yet it is not my objective to conclusively establish this point here, and an exhaustive investigation of this issue would lead us far astray. Rather, I should like simply to acknowledge the controversy, point to several persuasive arguments against the criminologist’s skepticism, and proceed quickly to the novel contributions to the economic approach I propose in Section 2.

According to the Beccarian formulation, the expected sanction consists of two

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5 It bears observing (if only because there yet remains a dwindling but still sizable number of lawyers with little or no exposure to law and economics) that numerically, the overwhelming majority of “objections” to the economic approach are not of the learned variety described in this subsection. Rather, the predominant strain of critiques of the economic analysis of criminal law (and indeed, of economic analysis generally) seem to arise from the puerile and abysmally ignorant contention that economic models are unsound because “people don’t think like that.” While such woefully stupid misunderstandings hardly merit reply, I shall in a spirit of charity offer the hopefully edifying reminder that economic models are not meant to provide a psychological account of how people reason, but rather an extensional account of how they behave. Thus, regardless of whether people consciously perform cost-benefit calculations to determine their actions, or whether they are “subconsciously” impelled toward utility-maximizing choices by instinct or habit is immaterial from an economic perspective. That the “failure” of economics to track psychology somehow represents a defect in the theory is based on a gross misconception.

It is true, behavioral economics poses a challenge to rational choice economics, and behavioral economics is founded on “realistic” psychology rather than the Herculean ideal of homo economicus. However, the conflict between rational choice theory and behavioral economics does not arise because behavioral economics furnishes a better account of how people think, but rather because it seems to provide a better prediction of how people will act. Never and nowhere is economics concerned with what goes on in people’s heads, except insofar as it provides convenient indices to how they will ultimately behave.
terms: the probability of enforcement $\pi$, and the magnitude of sanction $S(a_n)$. If the simple model, $P^*(a_n) = B(a_n) - K(a_n) - \pi(a_n)S(a_n)$ is correct, then it follows that, ceteris paribus, a $1/2$ reduction in the probability of enforcement would be wholly offset by a doubling in the magnitude of sanction, and vice versa. That is, by simple arithmetic:

$$\frac{\pi(a_n)}{2} \times 2S(a_n) = \pi(a_n)S(a_n) = 2\pi(a_n) \times \frac{S(a_n)}{2}$$  \hspace{1cm} (2)

However, there exists a substantial body of empirical research suggesting that the equivalencies in Formula 2 fail to obtain in the real world. Instead, the evidence indicates that increasing the probability of enforcement, $\pi$, is vastly more effective than ratcheting up the magnitude of prescribed punishment, $S(a_n)$, implying:

$$\frac{\pi(a_n)}{2} \times 2S(a_n) < \pi(a_n)S(a_n) < 2\pi(a_n) \times \frac{S(a_n)}{2}$$  \hspace{1cm} (3)

It is first worth pointing out that, even if this were generally the case, it would not necessarily be as “fatal” for a severity-as-deterrence approach to criminal punishment as some critics might suppose. It would merely require a trivial modification of the sanction function — assuming the sociological data were sufficiently strong to warrant a modification of the formulation.

However, it would be overhasty to infer Formula 3 from the raw sociological data. Despite the eagerness of some criminal law scholars in declaring the “death” of

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8Or, more generally, $\frac{\pi(a_n)}{xS(a_n)} < x\pi(a_n)S(a_n) < x\pi(a_n) \times \frac{S(a_n)}{x}$.  

9For example, $D(S) = \alpha S - \beta S^2$, such that increasing criminal penalties $S(a_n)$ would yield diminishing effects (i.e., $\frac{\partial D}{\partial S^2} = -2\beta$).
severity-as-deterrence and the economic analysis of criminal law generally to reject economic methodology because it fails to perfectly predict real-world effects would be as silly as rejecting Newton’s laws of motion simply because they fail to predict the travel of a struck tennis ball. While it is true that spin, air pressure, lift, and friction generally will create complications to the extent that the precise flight path of a tennis ball will be practically incalculable, the principles of classical mechanics are hardly “refuted” thereby; the laws of physics reveal a great deal about nature, even when they fail at prediction. Likewise, the results of an economic theory should not be rejected simply because they fail to account for every force operating in the real world. The mere fact that empirical results diverge from theoretical predictions may only signal that additional forces are at work, and that noise from these other forces prevents us from isolating the processes-of-interest in our observations, in which case the proper approach would not be to abandon what progress has been made, but rather to identify and describe the other factors in play.

Lamentably, a significant contingent of criminal law scholars have quite exuberantly declined to pursue this eminently reasonable approach, opting instead to accuse economists of ideological bias and fallacious reasoning. For example, Michael Tonry writes, “[S]ome or much of the work on deterrence by economists may be conscious or unconscious products of ideological, as opposed to merely disciplinary, ways of thinking. . . . Many of the economists who have written on the deterrent effects of punishments are well-known political conservatives—Gary Becker, Richard Posner, Isaac Ehrlich, John Lott—and others such as Joanna Shepherd are less well-known conservatives,” although evidently in a magnanimous mood, he adds, “It is merely human to be deeply attached to one’s intuitions.”

In addition to such overeager announcements of the demise of economic theories of criminal law, such criticisms abound with fundamental misunderstandings about economic modeling. For example, Cheryl Marie Webster and Anthony Doob write, “[Deterrence through severity] strategies assume that potential offenders conduct sophisticated analyses of the relative costs of various penalties.” This is hardly a new criticism of the rational actor hypothesis, though it is easily answered. The

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10 See, e.g., Tonry, supra note 7, at 280 (“[M]acro-level modeling of deterrent effects of changes in sanctions policies by economists and econometricians has reached a dead end, as Ronald Coase in 1978 predicted would happen concerning subjects on which the economist’s advantage was primarily one of technique.”); Cheryl Marie Webster & Anthony N. Doob, supra note 6, at 191 (“[T]he continued centrality of this deterrence theory as a sentencing objective constitutes a false promise, contributing to a waste of resources and a reduction in the public’s confidence in the criminal justice system, while encouraging policy makers to ignore more effective crime control strategies.”).
11 Tonry, supra note 7, at 304-305.
12 Webster & Doob, supra note 6, at 182.
rational actor hypothesis does not assume that people consciously conduct sophisticated cost-benefit calculations. The model is not intended to track deliberation, but rather behavior. The reason why people, on average, will tend to behave in a manner consistent with the rational actor model is not because they are consciously deliberating about welfare maximization, but rather because the net effect of gut intuitions, genetic predispositions, and environmental conditioning ultimately cash out in choices and actions which coincide with payoff maximization. A particular actor may articulate reasons for her actions very different from welfare optimization—and we need not say that one is a “right” or “wrong” account of the decision-making, except insofar as it succeeds or fails at explaining behavior. Certainly, it is problematic for the rational actor model if its predictions fail to track real-world decisions — as appears to be the case (at least superficially) with severity-as-deterrence — but it is not problematic that potential offenders are not consciously performing cost-benefit analyses, as Webster and Doob complain.

Happily, it turns out that a number of the “frictions” at work are easily identifiable. First, the portion of the population that will commit at least one felony in their lives is small — and they may simply be dismissed as outliers. This is not the most satisfying explanation for such deviant behavior, but neither is it unwarranted. It may simply be that criminals have highly idiosyncratic risk-preferences. Another explanation may be time-inconsistent discounting. Yet another possible explanation may be that criminals are psychologically incapable of rationally responding to incentives.

A different cluster of rationales considers whether it might simply be that particu-

\[\text{13See, e.g., Cathy Buchanan & Peter R. Hartley, Criminal Choice: An Economic View of Life Outside the Law, POLICY 54-58, Autumn (1990) (“Results from studies in expected utility theory suggest that the more risk-averse the individual is, the less he will like an increase in penalties compensated by a reduction in capture probability. . . . On the other hand, risk-loving individuals will be deterred more by increases in the probability of capture than compensating increases in penalties. Since crime is a risky occupation, risk-loving and less risk-averse individuals will find it a more satisfactory employment.”).}\]


\[\text{15Id. at 57 (“Some crimes are committed by people who are either temporarily or permanently insane, acting in a fit of passion or under the influence of drugs.”); Sheilagh Hodgkins, Mental Disorder, Intellectual Deficiency, and Crime Evidence from a Birth Cohort, 49 ARCH GEN PSYCHIATRY 476-483 (1992) (finding that men suffering from major mental disorders were four times more likely to be registered for violent offenses, while women with major disorders were 27 times more likely to be violent offenders—though statistically, this still only accounts for a small minority of prison populations).}\]
lar social circumstances make criminal activity optimal for some people\textsuperscript{16} even when the cost of expected sanctions is rationally calculated — in which cases, incidentally, it is likely that the collateral effects of conviction will exacerbate the probability of recidivism, since the effects of post-incarceration collateral consequences tend to decrease the opportunity costs of crime\textsuperscript{17}.

Another source of “friction” is that increasing severity of sanctions fails to affect parties’ private welfare calculations when they are unaware of what the law is — which is likely the case for the vast majority of the population\textsuperscript{18}. It is important to keep in mind that the function $\pi$ represents the perceived probability of enforcement, and $S(a_n)$ represents the sanction believed to follow from $a_n$. Where the legal consequences of lawbreaking are insufficiently publicized, it is no defect of the Becarrian model (or a superficial defect at worst) that deterrence effects fail to obtain. It is trivially the case that actors will not be responsive to imperceptible incentives\textsuperscript{19}.

Ultimately, although the point is not utterly without controversy\textsuperscript{20} even if we take

\textsuperscript{16}John R. Lott, Jr., A Transaction-Costs Explanation for Why the Poor Are More Likely to Commit Crime, 19 J. LEGAL STUD. 243 (1990), observes that because bankruptcy and antislavery laws impose a transaction cost on lending to individuals, whose primary asset is bare human capital (i.e., since debtors cannot be enslaved to extract repayment through forced labor, and also because bankruptcy shields them from debt recovery in certain cases, banks face an increase in the probability that loans will go unpaid), it may be that for some persons the transaction cost of theft may be sufficiently below the transaction cost of borrowing, that theft will remain privately optimal even when penalties are optimal. Ironically, the tradeoff then becomes that prohibiting debt-recovery-through-slavery gets replaced by increased rates of incarceration, and if appears that the most economically disadvantaged end up in chains either way!

\textsuperscript{17}Alec Ewald & Christopher Uggen, The Collateral Effects of Imprisonment on Prisoners, Their Families, and Communities, Chapter 3 in Oxford Handbook of Sentencing and Corrections (Joan Petersilia & Kevin Reitz, eds., 2012). See also John Schmitt & Kris Warner, Ex-offender and the Labor Market, Center for Economic and Policy Research (November 2010).

\textsuperscript{18}See Kirk R. Williams, Jack P. Gibbs, and Maynard L. Erickson, Public Knowledge of Statutory Penalties: The Extent and Basis of Accurate Perception, 23 PACIFIC SOCIOLOGICAL REVIEW 105-128 (1980).

\textsuperscript{19}I do not mean to suggest that greater public education will necessarily result in more effective severity-as-deterrence, though no doubt it could not hurt. Rather, I mean simply to point out another possible explanation for the failure of severity-as-deterrence to manifest in empirical data.

\textsuperscript{20}See, e.g., Daniel Kessler & Steven D. Levitt, Using Sentence Enhancements to Distinguish between Deterrence and Incapacitation, 42 J. LAW & ECONOMICS 343-364 (1999) (arguing that California’s Proposition 8 demonstrates both the observable effect of deterrence and incapacitation in crime rates). But see Cheryl Marie Webster, Anthony Doob & Franklin Zimring, Proposition 8 and Crime Rates in California: The Case of the Disappearing Deterrent, 5 CRIMINOLOGY & PUBLIC POLICY 417-448 (2006) (arguing that a more fine-grained analysis reveals that the crime rates began dropping prior to the passage of Proposition 8, and pointing out other methodological problems in Kessler & Levitt (1999)). But see Steven D. Levitt, The Case of the Critics Who
it as given that the empirical data does not support severity-as-deterrence predictions in society as it presently is, this need not necessarily be interpreted as a refutation of the theory. More than 90% of the U.S. population will never commit a felony in their lives, and it may simply be the case that a severity-as-deterrence model is only effective for approximately 90% of the population. As I have discussed in the foregoing paragraphs, it seems plausible that the portion of the population who commit felonies may for various reasons be unresponsive to the incentive effects of severity-as-deterrence, and it may be that increased sentence severity does not translate to decreased crime rates for the simple reason that the deterrence effect is already maximal in industrialized nations (indeed, I will later argue that sanctions very likely exceed the point at which marginal deterrence yields de minimis returns). On this view, a better test of severity-as-deterrence might be to investigate whether the converse proposition holds: that a reduction in the severity of sanctions results in increased criminal activity.

Finally, a discussion concerning skepticism about economic models in the criminological literature would not be complete without some mention of the sociological data supporting the notion that increasing severity of sanctions generates a deterrent effect. In what is likely the most thoroughgoing technical defense of sanction-as-deterrence, Silvia Mendes and Michael McDonald tackle the sociological data supposedly “refuting” the effect of severity directly, arguing that the apparently limited effects of sentence severity on deterrence may be attributed to conceptual errors on the part of the statisticians interpreting the data.

The dubious findings regarding the inconsistent effect of the severity component of deterrence theory are a consequence of theoretical slippage.

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21Sarah Shannon, et al., Growth in U.S. Ex-Felon and Ex-Prisoner Population, 1948 to 2010, Paper presented at the 2011 Annual Meetings of the Population Assoc. of America (2011) (“By our estimates, about 3.4 percent of the adult voting age population have once served or are currently serving time in a state or federal prison. If we adopt a more inclusive definition of the criminal class, including all convicted of a felony regardless of imprisonment, these numbers increase to 19.8 million persons, representing 8.6 percent of the adult population and approximately one-third of the African American adult male population.”).

22Although, I will later argue that the reduction will have to be substantial to detect such effects.

when moving from the verbal theoretical statement to the statistical representation of that statement. Our purpose is to demonstrate that the failure to include any of the deterrence theory components “unbundles the theoretical package.” For this reason, we argue that the empirical ambiguity with respect to sentence severity arises because sometimes the empirical formulation of deterrence theory fails to keep the theoretical package intact. In particular, statistical models that isolate the components through the use of separate, additive elements do not account for the expected cost calculation as specified in the theory. Sentence length does not work independently of the probability of arrest and conviction. Rather, all three elements operate in combination.

Nevertheless, the balance of opinion among non-economist criminal law scholars seems to be that punishment is less effective than policing, which if true would require at least a minor modification of the Beccarian cost-benefit formula. As the foregoing discussion suggests, I do not agree that such modification is warranted, though I will argue for a more nuanced understanding of costs and benefits in Section 2 for different reasons.

1.3 Becker’s Approach to Crime

Beginning in 1968, with the publication of Gary Becker’s seminal article, *Crime and Punishment: An Economic Approach*, there has been a steady flow of research on criminal law and punishment from an economic perspective. The main line of inquiry has followed Beccaria, Bentham, and Becker in treating instrumentalist objectives (and deterrence foremost) as the exclusive grounds for criminal punishment.

Becker’s model remains the foundation, upon which most subsequent economic theories of criminal law have built. Becker’s model treats crime in price theoretic terms. The basic setup of the model begins with the premise that actors seek to maximize their private welfare. In some circumstances, the optimal choice may be a criminal act. In such cases, the actor’s choice create an externality (i.e., the harm

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26 BECCARIA, supra note 2.


28 Becker, supra note 25.
caused to victims). In the aggregate, the criminal’s benefit and the victim’s loss, taken together, will usually represent a net loss.\footnote{Why this should be the case may not be immediately obvious, since theft, for example, is merely a transfer of wealth; and transfers of wealth are, ceteris paribus neutral for social welfare (assuming a Kaldor-Hicks aggregation criterion). One compelling explanation is that unchecked criminal “transfers of wealth” create a rent-seeking scenario, since criminals must expend resources to obtain their loot, while victims will responsively expend resources to guard their property. Since the “prize” remains a fixed quantity, the effect is nonproductive competition. See generally Becker, supra note 25.}

Policing and punishment create disincentives against the commission of crime (See Formula 1). The effect is analogous to increasing prices on demand. The effect of the law here is to increase the analogical “price” of criminal activity. Naïvely, therefore, our first intuition may be that punishments for all crimes should be maximal. The countervailing consideration however is that policing and punishment are costly.\footnote{Punishment is not always costly. For example, fines carry no social cost.} Thus, the price cannot be raised indefinitely, and optimal enforcement (i.e., where “enforcement” consists of policing and punishment) may be determined to be the point, at which the marginal cost of enforcement is equal to the marginal benefit of crime-reduction.

Translated into everyday terms, Becker’s claim seems eminently sensible. If the destructiveness of crime costs more than enforcement, society should increase policing and penalties. If, on the other hand, things get to a point where we spend more to prevent crimes than the cost of simply allowing the crime to occur, then we have gone too far. The proper investment in crime-prevention is such that society receives an equal return in the reduction of the cost of crime. So far, so good.

2 A New Framework for Deterrence

The Becker model relies upon the “rational actor hypothesis,” which posits that on average, people tend to make utility-maximizing choices. This view of human behavior has come under intense attack in recent decades, although skepticism about it has existed since the earliest days of economics.\footnote{See, e.g., Francis Edgeworth, Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences, 16 (1881) (“[T]he concrete nineteenth century man is for the most part an impure egoist, a mixed utilitarian.”).} Indeed, it would be a mistake to infer from Becker’s assumptions that he believes that they are true,\footnote{Gary Becker, Nobel Lecture: The Economic Way of Looking at Behavior, 101 J. Political Econ. 385 (1993) (“[T]he economic approach I refer to does not assume that individuals are motivated solely by selfishness or material gain. It is a method of analysis, not an assumption...”)} at least no
more than a cartographer believes that Earth is flat.\textsuperscript{33} A theory, by necessity, makes simplifying assumptions. This should not be seen as a concession, but rather the very purpose of theory-building. Were a map perfectly similar to the thing it was meant to represent, it would cease to be a representation, and would be instead a duplicate. Maps help us to understand things by “flattening” reality and transforming it in ways that preserve some relations in the world, while distorting others, to pick out salient information for navigation. This principle applies to theoretical models no less than to geographical representations.

Nevertheless, while this analogy may quell the most puerile criticisms of the traditional economic method, it does beg the inquiry: how does the analysis change when the rational actor hypothesis is suitably nuanced to capture certain sorts of systematic departures from the rational actor model’s predictions?\textsuperscript{34}

Behavioral economics furnishes a panoply of enticing options, which might make a model of human behavior more “realistic.”\textsuperscript{35} However, for a number of complicated reasons, about I have written about elsewhere, I find pure behavioral theories objectionable. Thus, I shall take a somewhat more austere approach, more consistent with mainstream law and economics, preserving the basic framework of the Becker model, and supplementing it with a second-order rational account of “bounded rationality.”

\subsection{2.1 Bounded Rationality}

The behavioral economics movement was sparked by Herbert A. Simon’s essay, \textit{A Behavioral Model of Rational Choice},\textsuperscript{36} which introduced the concept of “bounded rationality” into the economic literature. The idea is that the very act of performing a cost-benefit deliberation is itself costly, and that deliberators are aware of this cost and work it into their deliberations — though standard cost-benefit analysis traditionally assumes motivations about particular motivations. Along with others, I have tried to pry economists away from narrow assumptions about self-interest. Behavior is driven by a much richer set of values and preferences.”).\textsuperscript{33}

\textsuperscript{33}The analogy between theoretical models and maps plays an important illustrative role in the work of the eminent philosopher of science, Ronald Giere. \textit{See generally, Ronald Giere, Explaining Science: A Cognitive Approach (1988).}

\textsuperscript{34}It should be noted that while the rational actor model has been criticized for failing to predict enough human behavior to be a meaningful description, it remains largely undisputed that it is a compelling \textit{normative} model of welfare-maximization.


\textsuperscript{36}69 \textit{Quarterly J. of Econ}. 99 (1955).
tionally failed to account for it. Thus, in a world where information is not costless (as, indeed, it is not in the real world), the perfectly rational actor must devote all his time to accumulating background information and calculating what to do in order to make the “optimal” decision, which is almost certainly a suboptimal way of whiling away the day. Thus, Simon hypothesizes, what people actually do when deliberating is to set a threshold of acceptability, such that if some contemplated activity passes the threshold, it will be “good enough” to act upon, even if it is not the elusive “best” choice.

My model does not follow Simon as far as his hypothesis about thresholds of acceptability. However, I do take deliberation costs and restricted decision-making domains as critical components of my model.

The framework I propose is second-order (although easily extendable to higher orders). Rather than considering the material costs and benefits of actions, my analysis considers the costs and benefits of how to decide on an action. The idea is that when actors regularly encounter similar factual circumstances, they have a variety of ways of deciding how to decide such problems. In some cases, where the stakes are very large, or where the fact pattern occurs infrequently, the actor may choose to perform a cost-benefit optimization. In other cases, where the deliberation costs are substantial relative to the difference in potential payoffs, actors will likely develop rules-of-thumb, cognitive “short cuts,” as a way of automating decision-making, because the cost of case-by-case deliberation would represent a loss.

When selecting among the supernumerary possible cognitive shortcuts, it bears inquiring why an actor would choose one shortcut over another. The answer, which seems obvious on its face, is that he will select the shortcut that is welfare-maximizing, when deliberation costs are included in the calculation. However, incorporating deliberation costs is not as obvious as it may at first seem, since it begs the question why an actor would choose to second-order optimize. The natural answer might be that second-order optimization is third-order optimal. And so on, up the ladder.

There is some danger here that this “passing the buck” leads to an infinite regress. I will not attempt to offer a thorough answer to this deeply theoretical problem here; the infinite regress problem is tangential to the present topic. Briefly however, it suffices to observe that we needn’t consider higher and higher orders of heuristic-selection for the present inquiry, since the second-order account seems a sufficiently plausible description to cover the interesting cases sans argumentative support.

37 Simon refers to this phenomenon as “satisficing.” Herbert A. Simon, Rational Choice and the Structure of the Environment, 63 PSYCHOLOGICAL REVIEW 129 (1956) (“Evidently, organisms adapt well enough to ‘satisfice’; they do not, in general, ‘optimize.’”).

Returning to the problem of criminal deterrence, there exists a salient characteristic, which we might well suppose rational actors will collectivize at a second-order level: criminal activity. It may be that for many people, opportunities to commit criminal acts present themselves, which from time to time happen to be privately optimal. And yet, I suspect that in a majority of such cases, people decline to seize such opportunities, apparently choosing “suboptimal” law-abiding behavior and violating the rational actor hypothesis. There exist a variety of philosophical explanations for such deviant virtuousness — personal morality being the most obvious one. On this view, actors internalize the norm that criminal act \( x \) is bad, and they get enough disutility from performing the act itself that it tips the cost-benefit balance toward some other, presumably legally permissible activity.

There may be something to the moral view. However, I contend that a second-order rational explanation is more persuasive. If disincentives for crime are generally sufficient to deter the first-order rational person from committing crimes, then (given that even petty crimes require some amount of planning and skillful execution) the second-order rational person will simply adopt the second-order heuristic not to commit crime. Thus, while such a second-order rational person may from time to time miss out on golden opportunities to get away with a criminal act, he will refrain from thusly acting — not because of any compelling moral reason, but because such opportunities are so rare that they aren’t worth contemplating. Consequently, they fall outside the domain of viable choices — outside the “bounds” of bounded rationality.

\[ \]

2.2 An Example

A simple example involving a petty crime will hopefully illustrate the point. Suppose that a first-order rational person, call him Smith, parks his car on a particular metered stretch of road. He can either feed the meter or risk incurring a parking ticket. Let us assume that the penalty for parking illegally (i.e., without paying) is set at an efficient level à la Becker, such that the city has calculated the probability of catching a scofflaw, and set the fine at a rate, where repeated violations over time represent a losing gamble.

Smith, sufficiently motivated, could choose to stake out the road for several days,

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monitoring how frequently the meter-maids patrol the block, formulate a more fine-grained estimate of the probability of detection on the particular block at a given time, and decide whether to pay or not on the basis of that calculation. He could then “rationally” decide whether to pay or not, armed with a more refined estimate of probabilities, thus generating a net benefit over time.

Of course, we would not regard Smith’s behavior as rational. Indeed, Smith is not only irrational, he is insane. Stalking meter-maids to accumulate sufficient information to generate an “optimal” decision comes at an enormous cost. Looking at the big picture, the information required to game the system surely represents a titanic net loss, and Smith’s conduct would satisfy only the most myopic conception of “rationality.”

Let us now consider a second-order rational person, call her Jones. Jones has formed the heuristic that she will always pay for parking. From time to time, she will end up paying for parking, even when (unbeknownst to her) the expected benefit of not paying exceeds the expected cost. However, the opportunity cost being negligible, she merrily spends her deliberation efforts on more productive enterprises.

What the example makes clear, I hope, is that first-order rationality often fails to be second-order rational (it may also turn out, though less frequently, that second-order rationality fails to be third-order rational, that third order rationality fails to be fourth-order rational, etc.). What is critical to observe is that the rational actor hypothesis (broadly construed) is not the source of absurdity, for the rational actor hypothesis is as true of Smith as it is for Jones.

Rather, to the extent that on some occasions Smith does not pay for parking, while Jones always does, the question is not whether Smith is irrational or Jones is irrational. Rather, they are both rational at different orders of decision-making. Thusly construed, the rational actor hypothesis—that actors make choices that maximize their private welfare—becomes a more general claim. And whereas first-order rationality may seem absurd in some circumstances, higher-order rationality seems likely to provide a more plausible account of our pre-theoretical understanding of the descriptor, “being rational.” For convenience (and conformity to common usage), I will thus take “rational” to refer to the highest-order rationality within the scope of discussion.

2.3 Cashing Out the Public Policy

So how does this conception cash out as public policy? The proposition that if laws create sufficient disincentives, then rational actors will refrain from committing them, is hardly novel. Nor is the proposition that a subset of the population will
be unresponsive to disincentives, for a variety of psychological and pecuniary reasons, which are difficult or impossible to address through the instruments of criminal punishment.

What is novel here is that enforcement need not be sufficient to effect disincentives for first-order rational actors, since people do not typically behave first-order rationally. Rather, the law should be designed to incentivize the formation of the second-order heuristics, “not to park illegally,” “not to steal cars,” “not to burglarize,” “not to download pirated software,” etc. Indeed, an ideal criminal law regime would be generate the general heuristic, “not to commit crime.” This entails a subtle, but significant shift in the way criminal law policy should be designed, since the target of incentives is only incidentally to create direct disincentives for criminal acts. Its primarily function, I contend, is to incentivize a way of deliberating about the commission of criminal acts.

The incentivization of “not to commit crime” heuristics may be accomplished in several ways. First and most obviously, enforcement should be targeted toward high-profile crimes. More visible enforcement is more likely to create the impression that the probability of detection is high, increasing actors’ subjective assessments of detection probability, and thereby reducing their (subjective) expected payoffs. This is because the information cost for high-profile crimes is low (one need only read a newspaper to discover the latest criminal scandal of the day), whereas the cost of discovering the true rate of criminal detection and punishment is prohibitively high. Punishments for high-profile crimes should also be severe, for the same reasons.

Second, strategies should be developed to prevent the fragmentary formation of heuristics. For example, in the realm of automobile theft, the goal should be to encourage the development of the heuristic, “not to steal cars,” and not the alternative heuristics, “not to steal expensive cars,” or “not to steal new cars.” If thefts of expensive or new automobiles are more aggressively investigated, then savvy criminals may be responsive to the poor payoffs involved with the theft of expensive or new cars, but form the alternative heuristic, “not to steal new or expensive cars,” rather than the intended heuristic, “not to steal cars.”

Asymmetric enforcement of crime may be inevitable, given limited police and prison resources. However, when the disparate enforcement of the law is obvious, actors may form alternative heuristics to exploit the asymmetries in enforcement, rather than adopting a wholesale “not to commit crime” heuristic.

In some sense, the second-order analysis shifts the emphasis from enforcement-in-fact to enforcement-perception. Upon accepting such a conceptual shift, it becomes clear that the principal worry in criminal law is not that some people “get away” with crime, but rather that people will engage in particularized cost-benefit calculations
whether to commit criminal acts. The more perceived exceptions and inequalities exist in the law, the greater the incentive to explore them in the hopes of “gaming” the numbers. The goal, I contend, of criminal punishment should not be to beat criminality at the first level, but to cut criminality off at the stage before it is even contemplated. The criminal law has not succeeded when a would-be criminal undertakes a cost-benefit analysis and is deterred by the expected cost of punishment — such an individual may still act criminally in some subsequent situation if the payoffs are right. Rather, the criminal law succeeds when a would-be criminal elects not to consider the option of committing crimes at all.

Upon reflection, this should not seem a daring proposition. A person who performs cost-benefit analyses whether to commit particular criminal acts, we may fairly suppose, does so because it is rational. The person who is always on the lookout for an opportunity to circumvent the law, if engaging in such criminal activity produces a windfall, does so because the deliberation cost of considering whether to break the law is offset by the windfall benefits won by violating the law when he encounters a promising criminal opportunity. Common sense guides us well here: a person who is constantly peeking into parked cars, to see if someone left the door unlocked is a person who will at some point steal a car — even if he declines to steal this or that particular car. The most cost-effective strategy is not to lock as many cars as we can, but to stop the would-be thief from being on the alert for opportunities to steal cars.

It is my contention that if police and prison resources were better tailored to encouraging the formation of heuristics, rather than the brute prevention of crimes via legal disincentives, then the deterrent effect will be at least equal (and possibly better) than current criminal law practices. Moreover, the likely result would be a savings in police and prison costs and a mitigation of the trend toward overcriminalization. However, at this point, more precise machinery is required to establish those results concretely. And so I will now turn to the formal model in Section 3.

3 The Model

Let $P_j$ denote the payoff function of a typical citizen, $j$. Let $B(x)$ represent the benefit of undertaking activity $x$, and let $[x \in] A_{jn}$ represent the set of choices available to $j$ in fact-situation $n$. Let $K(x)$ represent the cost of undertaking activity $x$. Finally, let $\pi(x)$ represent the probability of enforcement (i.e. the probability of detection, apprehension, and conviction, which we may further analyze as $\pi(x) = d(x) \times a(x) \times c(x)$); and $S(x)$ represent the magnitude of sanction associated with $x$.

Thus, the private payoff for parties contemplating criminal action will be the
Beccarian function (Formula 1), and the first-order optimal choice will be:

\[ a^* = \max_x P_j(x) = B(x) - K(x) - \pi(x)S(x) \]  

(4)

Now, let us consider second-order welfare maximization. Let us represent decision-making process \( k \) with the function \( D_k(F_n, A_{j_n}) = x \), which selects a possible action \( x \) from the set of possible actions \( A_{j_n} \) available to \( j \), given a set of facts \( F_n \). For example, welfare-maximization is one such decision-making process, call it \( D_R \), such that \( D_R(F_n, A_{j_n}) = \max_{x \in A_{j_n}} P_j(x) \). However, there may be an infinite number of decision-making processes, of which \( D_R \) is but one special example.

Let us now describe the second-order payoff function. A heuristic is a decision-making process that is triggered when certain factual circumstances apply. Let us denote the triggering facts as \( f_n \subset F_n \). Now, for any set of facts \( F_x \), if it is the case that \( f_n \subset F_x \), then the heuristic will be applied. Thus, the second-order payoff will be:

\[
P^2_j(D_n, f_n, A_{j_z}) = \sum_{f_n \subset F_i} p(F_i) \left[ (P_j(D_n(F_i, A_{j_z})) - \delta(D_n, F_i)) \right]
\]  

(5)

That is, the second-order payoff of decision procedure \( D_n \) is the sum of first-order expected payoffs when using decision procedure \( D_n \), minus the deliberation cost of \( D_n \), which we denote \( \delta(D_n, f_y) \), discounted by the probability that the situation \( F_i \) occurs. Thus, the second-order optimal choice of decision-making procedure for a given fact-trigger \( f_y \) will be:

\[ D^* = \max_{D_x} P^2_j(D_x, f_y, A_{j_z}) \]  

(6)

Before proceeding, it is worth observing that the optimal decision-making procedure may fail to be unique, depending on the subset of triggering facts \( f_y \). Two heuristics may develop, which are both second-order optimal, but which overlap. That is, one heuristic may be triggered by facts \( f_y \), while another heuristic may be triggered by facts \( f_z \). Particular situations may arise, where some total set of facts \( F_w \) describing an actual circumstance is such that both triggers are activated, \( f_y \subset F_w \land f_z \subset F_w \).

For example, suppose someone were to form the heuristic, “Do not trust X,” with the triggering fact “X is a Cretan.” And further suppose that the same person forms the heuristic, “Trust Y,” with the triggering fact “Y is a philosopher.” Certainly, there will arise a conflict of heuristics, when the person encounters a philosopher from Crete.
However, this is not a problem for the model. When a situation triggers multiple heuristics, which generate contradictory choices, other heuristics will be implicated to resolve the conflict of heuristics. In particular, for two $i^{th}$-order heuristics with overlapping triggering conditions, the $(i+1)^{th}$-order decision-making procedure that led the actor to adopt them should provide a basis for deciding which one trumps and when.

Much more could be said about resolving the problem of conditions that trigger multiple heuristics, however this would take us far afield of the present inquiry (and indeed would require a generalized account of higher-order rationality), but it suffices merely to observe that this is not problematic for the theory in our application here.

**Proposition 1.** *In the absence of deliberation costs (i.e., $\delta = 0$), $D^* = D_R$.*

*Proof.* See Appendix.

Proposition 1 states the intuitively obvious baseline, where the second-order optimal decision-making procedure will be first-order rational deliberation when deliberation costs are ignored. This proposition explains why the first-order rational actor hypothesis is thought to represent a normative ideal.

**Proposition 2.** *The product of a second-order optimal decision-procedure will not always be coextensive with first-order optimal decisions, $\neg\forall a^*(a^* = D^*(F_n, A_j))$.*

*Proof.* See Appendix.

Proposition 2 is a critical point. Therefore, it may be worthwhile to furnish an example to illustrate. Consider the potential car-thief, who peeks into the windows of parked cars, checking to see whether they’ve been left unlocked, whether they have security alarms, whether they have LoJack, whether they have steering wheel locks, etc. Say that he performs a cost-benefit calculation for each car. Let us assign some hypothetical values, to see how a decision that is first-order optimal may fail to be second-order optimal.

\[41\] If the two heuristics were adopted due to different $(i+1)^{th}$-order decision-making procedures, then the $(i+2)^{th}$-order decision-making procedure that led the actor to adopt the two $(i+1)^{th}$-order decision-making procedures should decide which trumps and when, and so on.
Let the probability of enforcement vary, depending on whether the car is parked in a private lot, or whether it is parked on the street, whether the surrounding area is high-traffic, well lit, etc. Suppose the punishment for automobile theft creates a disutility value of 1000. And suppose that for all but one of the cars, there exist various security features, which render theft of the vehicle a net loss for the thief. But notice that Car 50 represents a potential gain — perhaps because the owner left the car unlocked, rendering the cost of undertaking the theft relatively low. Thus, the payoff of stealing Car 50 is positive.

Now, on the first-order Becker-style analysis, the law has—in the particular case of Car 50—failed to set sufficiently high disincentives (note, this may still be an “efficient” level on Becker’s account). The value of the car, less the effort to steal it, less the expected cost of enforcement, and less deliberation cost is $75 - 60 - 1 = 14$. Assuming opportunity cost $OC < 14$, the thief will choose to steal Car 50.

But does the thief really come out ahead? Of course he does not, because even though he made the rational decision not to steal Cars 1-49, each rational calculation cost him 1 in deliberation. Thus, after the whole exercise, the (first-order rational) thief comes out behind, $14 - 49 = -35$.

Contrast the rational thief with a person, who has formed the heuristic “not to steal cars.” Her per-decision deliberation cost will be zero, and her choice in every case will simply be not to steal the car. It is true that she “misses out” on the potential surplus of stealing Car 50. However, she comes out ahead overall, since her total welfare from adopting a “not to steal cars” heuristic will be 0, as compared with the first-order rational thief, whose welfare is $-35$. Thus, the optimal decision-making procedure can, given certain values, generate sets of decisions, which are in the aggregate more optimal than the “optimal.” A startling result.

Let us now consider what happens when we reduce the sanction from 1000 to 900. Becker predicts that decreasing the “price” of crime will increase consumption, leading to more cars being stolen.
<table>
<thead>
<tr>
<th></th>
<th>Benefit-Cost</th>
<th>Enforcement Prob. × Sanction</th>
<th>Deliberation Cost</th>
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<tbody>
<tr>
<td>Car 1</td>
<td>100-80=20</td>
<td>(0.05 \times 900 = 45)</td>
<td>1</td>
</tr>
<tr>
<td>Car 2</td>
<td>109-70=39</td>
<td>(0.04 \times 900 = 36)</td>
<td>1</td>
</tr>
<tr>
<td>Car 3</td>
<td>105-90=15</td>
<td>(0.05 \times 900 = 45)</td>
<td>1</td>
</tr>
<tr>
<td>Car 4</td>
<td>120-85=35</td>
<td>(0.06 \times 900 = 54)</td>
<td>1</td>
</tr>
<tr>
<td>Car 49</td>
<td>90-70=20</td>
<td>(0.04 \times 900 = 36)</td>
<td>1</td>
</tr>
<tr>
<td>Car 50</td>
<td>100-25=75</td>
<td>(0.06 \times 900 = 54)</td>
<td>1</td>
</tr>
</tbody>
</table>

According to Becker’s theory, by reducing the severity of punishment from 1000 to 900, the “price” of crime is decreased, and the result will be an increase in the activity level of criminals. In particular, it seems that Car 2 now represents a net profit of 2, so another car will ostensibly be stolen, due to the reduction in sanction, assuming zero opportunity costs.

On my view, the reduction will not necessarily result in an increase in car thefts, because it remains second-order rational to adopt the heuristic “not to steal cars.” That is, even with the improvement in the expected payoff \(2 + 21 = 23\), the deliberation costs \((-50)\) continue to represent a net loss \((-27)\), while the heuristic “not to steal cars,” remains at 0. Thus, the second-order rational person will continue to prefer not to bother contemplating car theft, even though the potential for a windfall gain has slightly improved.

Thus, despite a 10% reduction in punishment, the effect of deterrence may well remain constant. This result does not entirely contradict Becker’s theory, for price theory effects do play a role, even in my second-order rationality conception. For example, for individuals, whose opportunity cost is \(-35 < OC < -27\), it will be privately optimal to rationally weigh the costs and benefits of attempting a particular theft, and in the examples above, Car 2 will be stolen if sanctions are decreased to 900. However, it is curious how a person could have such low opportunity costs (indeed, it seems that \(doing nothing\) ordinarily has a payoff of 0, so that ordinarily \(OC \geq 0\)). It is possible that \(OC < 0\) if for example, a prisoner of war is being tortured, and must weigh whether to attempt an escape. In that case, the cost of doing nothing may be negative, such that even a long-shot attempt will still be optimal. One must admit, however, that such scenarios are rare.
(with respect to enforcement) than under the Becker model, and that up to a point, enforcement may be reduced without any reduction in deterrence effects.

**Proposition 3.** Assuming actors are second-order rational, maximal deterrence will be achieved at the point where it becomes second-order rational to adopt the heuristic “not to commit crime.”

**Proof.** See Appendix.

The idea here is that assuming actors are rational, the maximal level of deterrence will be achieved when parties choose to adopt a heuristic not to commit crime. The alternatives would be the adoption of, for example, the heuristic, “not to steal locked cars,” or “not to steal cheap cars,” or “not to steal expensive cars,” or “not to steal red cars.” Such alternative heuristics may reduce deliberation costs, so that the net private gains represent an improvement over the “not to steal cars” heuristic.

Practically, one mechanism for combatting the formation of opportunistic heuristics, which exploit asymmetries in enforcement, would be to create increased second-order deliberation costs. For example, if police resources are limited, making it unfeasible to pursue all car theft cases effectively, resources will have to be focused. Some cases will go by the wayside, so greater resources can be spent on effectively pursuing a targeted subset of cases. In deciding which cases to investigate, and which cases to “ignore,” it would be a mistake to focus resources on high value targets or low value targets. Instead, resources should be allocated in a way that would be difficult for would-be criminals to discern. For instance, investigating car thefts, where the stolen vehicle’s license plate ends in an even number from January through June, and investigating stolen vehicles, where the license plate ends in an odd number from July through December. Certainly, if car thieves knew about the policy, they could easily exploit it. However, the deliberation cost involved in generating such a heuristic would be enormous, since in the absence of an informant with “inside information” about police practices, car thieves would have to suss out the necessary information through trial and error and careful analysis of the data.

Certainly, asymmetric enforcement is an inevitable consequence of limited resources, however when asymmetric enforcement falls along obvious lines, it “helps” criminals by reducing second-order deliberation costs and serving up easy-to-follow heuristics to avoid detection. When asymmetries in the allocation of enforcement are unavoidable, the distribution of enforcement resources should be calculated to employ deliberation costs as a tool to “hide” the asymmetries, such that only an industrious econometrist would be capable of discerning the circumstances where the commission of crime entailed an expected gain.
Proposition 4. *Inducing the development of a “not to commit crime” heuristic is less costly than optimal first-order deterrence.*

*Proof.* See Appendix.

Proposition 4 expresses the comparative static that incentivizing the development of a “not to commit crime” heuristic is more cost-effective than Becker’s formulation of optimal deterrence. The practical cash-out is that if deterrence is the goal of criminal law, then we may be spending more than necessary — both on enforcement and punishment — and that *way* we invest those resources is also inefficient.

### 4 Practical Considerations

I am hesitant to speculate about how the framework I have presented will pay out in concrete policy terms. Such conclusions would require both a theory and real-world data, of which I have only offered the former. It is beyond the scope of this paper (and my competence) to offer the latter. However, it may be worth suggesting some common-sense hypothetical applications of my theory, which at least provisionally point the way toward possible real-world implementation.

First, if the reason why most ordinary people do not ever commit felonies is because it is second-order optimal for them to form a “not to commit crime” heuristic, then a substantial majority will continue to refrain from serious criminal activities even if the severity of sanctions and rigor of policing were decreased. One consequence of my theory is that the “consumption” of crime is substantially less elastic than under Becker’s model, and therefore crime rates will remain relatively stable, with respect to changes in enforcement levels. The optimal points of detection effort and sanction predicted by my model will therefore be lower — possibly *much* lower — than that predicted by Becker.

Determining precisely how much less enforcement will effect “optimal” deterrence is a difficult empirical question. However, if I am also right that the deterrence effect given present enforcement levels in industrialized nations has passed the point of diminishing returns, then it may well be that for the < 10% of the population who commit at least one felony offense in their lives, inducing the formation of a second-order heuristic is either impossible or prohibitively costly. Thus, for the > 90% of law-abiding citizens, policing and sanctions may be far in excess of what is required to induce the second-order heuristic “not to commit crime,” and significant reductions in enforcement may have no detectable effect on crime rates.

More practical still, in lieu of empirical research on this point, policymakers can discover what the threshold and optimal points of deterrence are by gradually
reducing sanction severity up to the point where measurable increases in criminal activity are detected. That is, we do not necessarily need studies to get to the desired policy — this can be done through simple trial and error. Reducing punishment levels and policing will also have the ancillary benefit of reducing the supernumerary social injustices associated with the penal system\textsuperscript{43} and result in pecuniary savings for the state.

Moreover, not only can enforcement costs be reduced, but enforcement can also be made more effective. If the narrative that my model tells about law-abiding citizens is that they form a second-order optimal first-order heuristic “not to commit crime,” and criminals tend to be resistant to the formation of such heuristics, then we can use this information to expand the reach of deterrence to the $< 10\%$ who have hitherto been unresponsive to deterrence incentives.

For example, we may be better able to instill general “not to commit crime” heuristics by intervening earlier on in the process of heuristic formation: focusing resources on children and adolescents, increasing policing and sanctions for petty crimes, and reducing poverty (thereby increasing the opportunity cost of criminal activity — though this strategy would also be effective under Becker’s conception, the responsiveness of individuals to increasing opportunity costs is more elastic in my conception, thus the marginal benefit of poverty-reduction would be somewhat greater. Of course, these suggestions are hardly novel. However, my model and alternative policy objective suggest that they may be more effective than traditional economic models would predict, suggesting a different allocation of resources. Moreover, working from a heuristic-formation perspective will sharpen the policy goals of juvenile justice reform, “broken windows” policing\textsuperscript{44} and social welfare programs. It also supplies an economic argument for further investment in such policy goals.

There is also room for much creativity in designing policies around information costs. For example, several of former New York City mayor Rudolph Giuliani’s actions during his time as the U.S. Attorney for the Southern District of New York seem likely to have economized on deliberation costs (albeit most likely inadvertently). For instance, Giuliani famously favored public arrests of high-profile individuals, which attracted much media attention, even though the charges were often later dropped or reduced\textsuperscript{45} To be sure, this strategy has obvious defects: arguably violating the rights of the dubiously humiliated high-profile figures, and risking decreased public confidence in the rule of law. However, the idea of “selling” the notion that white-

\textsuperscript{43}See generally Husak, supra note \textsuperscript{??}.

\textsuperscript{44}George L. Kelling & James Q. Wilson, \textit{Broken Windows: The Police and Neighborhood Safety}, ATLANTIC MAGAZINE (March 1982).

collar criminals (or earlier in Giuliani’s career, mafia bosses) are as vulnerable to enforcement as other citizens surely exploited cheap publicity for the message that the expected payoff for criminal activity is negative. Giuliani also reputedly instituted a policy of aggressively prosecuting different types of crimes exclusively on certain days of the week and neglecting those that were not the arbitrarily chosen prosecution-du-jour. This would effectively “hide” the asymmetries in enforcement by increasing the deliberation cost of discovering what crimes would actually be (aggressively) enforced, and thereby frustrate criminals looking to exploit asymmetries in legal enforcement (the asymmetries of course were still present—limited resources necessitates some sort of distribution of enforcement efforts—the point is that assigning particular offenses to arbitrary days of the week had the effect of making those asymmetries more difficult to perceive and thus more difficult to exploit, discouraging fragmentary heuristic-formation).

Finally, it bears highlighting a critical point, which may be easily confused. I am not arguing simply for an increase in information costs. If the cost of information were increased, then under a trivially modified version of Becker’s theory, criminals would decline to attempt crimes simply because they have become more costly. Rather, my point is that high information costs trigger heuristics, and that by distributing information costs in a certain way (uniformly if possible or unpredictably if resources are limited), would-be criminals are not deterred because the increased cost of information has made the commission of a particular crime unprofitable, but rather because the aggregate cost of rational deliberation has become unprofitable. Even if Becker’s model were tweaked to account for information costs, it would still yield different predictions from the model I have proposed here.

5 Conclusion

There are several insights I have hoped to communicate in this essay. First, I hope to have contributed a methodological novelty, suggesting an alternative role for behavioral economics in social engineering — the opposite of debiasing: “biasing.” As opposed to situations where first-order rational behavior is the normative goal, and where irrational biases and heuristics present obstacles, in the realm of criminal law, first-order rational behavior may sometimes be the source of the problem. In such cases, the law should encourage citizens to develop “irrational” biases, which lead

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46 This story may be apocryphal, but it does not much matter whether Giuliani actually adopted such a policy — it suffices to point out that such a policy would be favored under my model.
them away from self-interested rational behavior. The use of biases and heuristics therefore presents us with a new tool in the policymaker’s toolkit.

Second, I hope to help bridge the divide between the economic theory of criminal law and criminal law sociologists. I concede that further research will be required to determine whether my theory is predictive in fact, however it is at least a plausible framework for making the economic account of criminal deterrence more compatible with the empirical data gathered by social scientists.

Third, I have identified a more nuanced policy goal for the criminal law: encouraging the formation of a “not to commit crime” heuristic rather than merely effecting first-order deterrence for particular cases. And I have suggested several ways of pursuing this new objective. Developing further strategies for generating anti-crime heuristics promises to be a fecund new territory for future research.

6 Appendix

Proposition 1. In the absence of deliberation costs (i.e., , ), \( D^* = D_R. \)

Proof. By definition, \( P_j(D_R(F_n, A_{j_n})) = P_j(a^* = P_j^* . \) Thus, from Formula 5, we know that \( P_j^2(D_R, f_n, A_{j_n}) = \sum_{f_n \in F_i} [p(F_i)P_j^*], \) assuming \( \delta(D_R, F_x) = 0. \) From Formula 6, we know that \( D^* = \max_{D_x} P_j^2(D_x, f_y, A_{j_x}) , \) and because of Lemma 1.1, it follows trivially that \( D^* = D_R. \)

Lemma 1.1. \( \max_{X=\langle x_0,...,x_n \rangle} \sum_{i=0}^n g_i(x_i) = Z, \) such that \( Z = \langle z_0, z_1, \ldots, z_n \rangle = \langle \max_{x_0} g_0(x_0), \max_{x_1} g_1(x_1), \ldots, \max_{x_n} g_n(x_n) \rangle . \)

Proof. Suppose for reductio that \( \max_{X=\langle x_0,...,x_n \rangle} \sum_{i=0}^n g_i(x_i) \neq Z. \) This implies that there exists an ordered set \( Z^\dagger \), such that \( \max_{X=\langle x_0,...,x_n \rangle} \sum_{i=0}^n g_i(x_i) = Z^\dagger = \langle a_0, a_1, \ldots, a_n \rangle \) and that \( \exists a_y \exists z_y (a_y \in Z^\dagger \neq z_y \in Z). \)

We now proceed by mathematical induction (assuming that \( g_i \) is independent of \( g_{i+1} \)). If \( a_0 \neq z_0 \), then \( \sum_{i=0}^0 g_i(z_i) > \sum_{i=0}^0 g_i(a_i), \) since \( z_0 = \max_{x_0} g_0(x) \). Therefore, it must be the case that \( a_0 = z_0 \). And likewise, if \( \sum_{i=0}^k g_i(z_i) = \sum_{i=0}^k g_i(a_i) \) and \( a_{k+1} \neq z_{k+1}, \) then \( \sum_{i=0}^{k+1} g_i(z_i) > \sum_{i=0}^{k+1} g_i(a_i), \) since \( z_{k+1} = \max_{x_{k+1}} g_{k+1}(x) \). Therefore, \( \sum_{i=0}^{k+1} g_i(z_i) = \sum_{i=0}^{k+1} g_i(a_i) \). By induction, this proves that \( Z^\dagger = Z, \) contradicting the assumptions that \( \max_{X=\langle x_0,\ldots,x_n \rangle} \sum_{i=0}^n g_i(x_i) \neq Z \) and that \( \max_{X=\langle x_0,\ldots,x_n \rangle} \sum_{i=0}^n g_i(x_i) = Z^\dagger. \)

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47 This is different from traditional incentive-alignment, which has typically assumed that actors are first-order rational. My methodological contribution will have been to show how inducing systematic non-rational behavior can serve as an additional mechanism for incentive-alignment.
Proposition 2. The product of a second-order optimal decision-procedure will not always be coextensive with first-order optimal decisions, ¬∀a*(a* = D*(F_n, A_{j_n})).

Proof. Suppose that \( \sum_{f_n \subseteq F_i} p(F_i)(P_j(D_R(F_i, A_{j_n})) = r \) and that \( \delta(D_R, f_n) = e \). And suppose there exists some alternate decision-making procedure \( D_Q \), such that \( \sum_{f_n \subseteq F_i} p(F_i)(P_j(D_Q(F_i, A_{j_n})) = q \) and that \( \delta(D_Q, f_n) = h \). It follows trivially that if \( r - q < \sum h - e \), then in some cases, the non-first-order rational choice \( \exists x \exists y(y = D_Q^*(F_n, A_{j}) \land x^* = D_R(F_n, A_{j}) \land x^* \neq y) \).

Proposition 3. Assuming actors are second-order rational, maximal deterrence will be achieved at the point where it becomes second-order rational to adopt the heuristic “not to commit crime.”

Proof. This proof follows trivially from the definitions. In the interest of thoroughness, however: Let \( D_{NC} \) denote the heuristic “not to commit crime.” Clearly then, \( \delta(D_{NC}) = 0 \), regardless of the inputs; and for any \( x = D_{NC}(f_n, A_{j_n}) \), where \( f_n \) contains the fact that the contemplated act is criminal (and only that fact), the output \( x \) will be to decline to commit the crime in question, which presumably generates the private benefit \( 0 \).

Let \( f_a \) include the fact that the contemplated act is criminal and some other factor \( \omega \), and let \( f_b \) include the fact that the contemplated act is criminal and the factor that \( \neg \omega \). Thus, if \( S = \{ F_i : f_a \subseteq F_i \lor f_b \subseteq F_i \} \) and \( T = \{ F_i : f_n \subseteq F_i \} \), then \( S = T \).

Let \( D_{A1} \) and \( D_{A2} \) be alternative heuristics, such that \( D_{A1}(f_a, A_{j_n}) \) is to decline to commit the crime, with deliberation cost \( \delta(D_{A1}) = 0 \); and \( D_{A2}(f_b, A_{j_b}) \) may (or may not) prescribe undertaking the criminal act, with deliberation cost \( \delta(D_{A2}) = \mu \).

Clearly, if \( D_{A2} \) ever prescribes undertaking a criminal act, the combination of \( D_{A1} \) and \( D_{A2} \) will be less than maximally deterrent, because \( D_{NC} \) would decline to undertake that criminal act. If \( D_{A2} \) never prescribes undertaking a criminal act, then the combination of \( D_{A1} \) and \( D_{A2} \) are maximal, but extensionally equivalent to \( D_{NC} \), though possibly with higher deliberation costs, where \( \mu > 0 \). Thus \( D_{NC} \) is the maximally deterrent heuristic, though possibly not uniquely.

Proposition 4. Inducing the development of a “not to commit crime” heuristic is less costly than optimal first-order deterrence.

Proof. If we assume first-order rationality, then the necessary enforcement required to deter potential criminals from committing a potential crime (in a particular situation

\footnote{It may be worth observing here that such “negative heuristics” may be better understood as constraining \( A_{j_n} \), rather than prescribing the “null” action.}
F, such that the factual circumstances \( f \) exist to commit a crime, i.e., \( f \subset F \) will be:

\[
\pi^1S^1 = B - K - \Gamma + \epsilon
\]

where \( \Gamma \) is the opportunity cost, and \( \epsilon \) is some “kicker” to effect \( \pi^1S^1 > B - K - \Gamma \).

For second-order rationality, the necessary enforcement required to deter potential criminals from committing a potential crime will be:

\[
\sum_{f_n \subset F_i} (\pi^2S^2) \geq \sum_{f_n \subset F_i} (B - K - \Gamma - \epsilon - \delta)
\]

It is easy to see that, ceteris paribus, \( \pi^1S^1 > \pi^2S^2 \): first consider if the average payoff for a type of crime \( h \) were \( B_h - K_h - \Gamma_h \), and if the average cost of rational deliberation for such a crime \( \delta_h(D_R, f_n \subset F_i) > 0 \). Trivially then, it would be the case that:

\[
\pi^1hS^1_h = B_h - K_h - \Gamma_h - \epsilon > B_h - K_h - \Gamma_h - \delta_h - \epsilon = \pi^2hS^2_h
\]

Moreover, if \( \pi^2hS^2_h > B_h - K_h - \Gamma_h - \delta_h \) for a set of triggering facts \( f_n \), then according to my model, potential criminals will adopt a “not to commit crime (with triggering facts \( f_n \))” heuristic, and thus \( \pi^2hS^2_h = \pi^2S^2 \), whereas under the first-order rational model, there may be outlier cases \( k \), such that \( \pi^1kS^1_k > \pi^1hS^1_h \). To achieve the same result as a “not to commit crime” heuristic, first-order deterrence theory would suggest the necessary deterrence level should be set at \( \pi^1S^1 = B_j - K_j - \Gamma_j \), where \( B_j - K_j - \Gamma_j \) represents the maximum possible surplus derived from committing a type of criminal act.

Thus, the required enforcement under a first-order deterrence model will be far higher than under a second-order deterrence model. And trivially therefore \( C(\pi^1, S^1) > C(\pi^2, S^2) \).

\[\square\]

\(^{49}\)I will use superscripts \( \pi^nS^n \) to denote sufficient enforcement at \( n \)-order to deter crime.